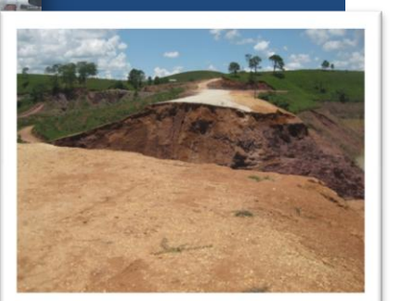
TYPHOON HAIMA IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

Joint Damage, Losses and Needs Assessment – August, 2011



A Report prepared by the Government of the Lao PDR with support from the ADB , ADPC, FAO , GFDRR, Save the Children, UNDP, UNFPA, UNICEF, UN-HABITAT, WFP, WHO, World Bank, World Vision, and WSP

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

TYPHOON HAIMA JOINT DAMAGE, LOSSES AND NEEDS ASSESSMENT (JDLNA)

***

October 2011

A Report prepared by the Government of the Lao PDR
With support from the ADB, ADPC, FAO, GFDRR , Save the Children, UNDP, UNFPA, UNICEF, UN-HABITAT, WFP ,WHO, World Bank, World Vision, AND WSP

Vientiane, August 29, 2011

Foreword

On June 24-25, 2011, Typhoon Haima hit the Northern and Central parts of the Lao PDR causing heavy rain, widespread flooding and serious erosion in the provinces of Xiengkhouang, Xayaboury, Vientiane and Bolikhamxay. The typhoon caused severe damage and losses to the basic infrastructure, especially to productive areas, the irrigation system, roads and bridges, hospitals, and schools. Further, the typhoon disrupted the local people's livelihoods, assets and properties. The poor and vulnerable groups of people are most affected by the typhoon. Without immediate recovery efforts, its consequences will gravely compromise the development efforts undertaken so far by the government, seriously set back economic dynamism, and further jeopardise the already very precarious situation in some of the provinces that were hard hit by the typhoon.

A Joint Damage, Losses and Needs Assessment (JDLNA) was undertaken, with field visit to the four most affected provinces from 25th July to 5th August 2011. The assessment was led by the Ministry of Planning and Investment (MPI) in close collaboration and consultation with the Ministry of Foreign Affair (MoFA), National Disaster Management Office (NDMO) within the Ministry of Labour and Social Welfare (MLSW) and key line Ministries such as the Ministry Agriculture and Forestry (MAF), Ministry Public Works and Transport (MPWT), Ministry of Education and Sport (MES), Ministry of Health (MoH), and Ministry of Natural Resources and Environment (MoNRE) with technical support provided by development partners including the ADB, ADPC, FAO, GFDRR, Save the Children, UNDP, UNFPA, UNICEF, UN-HABITAT, WFP ,WHO, World Bank, World Vision and WSP.

This Report– Typhoon Haima Joint Damage, Losses and Needs Assessment (JDLNA) – which I am honoured to present, is a collective output of the collaboration and efforts made jointly between the Government of Lao PDR and the development partners in assessing the damage, losses and resource needed for recovery, restoration of people's livelihoods, and improving the climate resilience of the affected sectors in the short, medium and longer terms. This report also highlights some of the government commitments to improve its internal coordination and reporting system for disaster emergency response and preparedness between the line ministries at the central and local levels, as well as to establish the Monitoring and Evaluation (M&E) framework for long term reconstruction and recovery.

On behalf of the MPI, NDMO and MoFA, we wish to express our sincere gratitude to the line ministries and development partners for their technical support and participation in the Typhoon Haima Joint Assessment, as well as delivering this report. We would also like to specially thank the Global Facility for Disaster Reduction and Recovery (GFDRR) for providing their staff and capital resources to help us completing the assessments and this report. Since its establishment in September 2006, GFDRR has been contributed to by 36 countries and 6 international organisations which are committed to helping developing countries reducing their vulnerability to natural hazards and adapt to climate change.

We are looking forward to discussing the result of the findings in this report with the development partners and sincerely hope that we can receive their support to help restoring the economy and local people's livelihoods back to normal soon.

H.E. Mr. Somdy Douangdy
Minister of Planning and Investment

Acknowledgements

This report has been jointly prepared by the Government of the Lao PDR (GoL) with support and significant technical contribution from the ADB, ADPC, FAO, Save the Children, UNDP, UNFPA, UNICEF, UN-HABITAT, WFP ,WHO, World Bank, World Vision, and WSP, and received financial and technical support from the Global Facility for Disaster Reduction and Recovery (GFDRR).

This report has benefitted from the guidance, coordination, logistic and technical inputs provided by provincial Governors, Vice Governors and staff at the provincial administration offices, many central government ministries and line departments at the provincial and district offices of the Ministry of Foreign Affairs (MoFA), Ministry of Planning and Investment (MPI), the National Disaster Management Office (NDMO) under the Ministry of Labour and Social Welfare (MLSW), Ministry of Education (MoE), Ministry of Health (MoH), Ministry of Public Works and Transport (MPWT), Ministry of Energy and Mines (MEM), Ministry of Agriculture and Forestry (MAF), Ministry of Industry and Commerce (MIC) and Ministry of Natural Resources and Environment (MoNRE).

Photographs used in this publication were taken by the assessment team or provided by GoL, unless otherwise indicated. To all of these contributors the team would like to express their deepest thanks and appreciation.

Table of Contents

List of Tables

List of Maps

List of Images

List of Figures

Glossary

AADMER	ASEAN Agreement on Disaster Management and Emergency Response
ADB	Asian Development Bank
ADPC	Asian Disaster Preparedness Center
AGCM	Atmospheric General Circulation Model
ARPDM	ASEAN Regional Programme on Disaster Management
ASEAN	Association of South East Asian Nations
ASTAE	Asia Sustainable and Alternative Energy Program
AusAID	Australian Agency for International Development
BBB	Build Back Better
BOP	Balance of Payments
CMAM	Community Management of Acute Malnutrition
CP	Consumer Price Index
CSIROI	Commonwealth Scientific and Industrial Research Organisation
DALNA	Damage, Losses and Needs Assessment
DDMC	District Disaster Management Committee
DEB	District Education Bureau
DESIA	Department of Environmental and Social Impact Assessment
DLSW	Department of Labour and Social Welfare
DMH	Department of Meteorology and Hydrology
DNA	Disaster Needs Assessment
DOE	Department of Environment
DPWT	Department of Public Works and Transport

DRM	Disaster Risk Management
ECLAC	Economic Commission for Latin America and the Caribbean
EIA	Environmental Impact Assessment
EDL	Electricité du Laos
EMP	Environmental Management Plan
FAO	Food and Agriculture Organisation
FFS	Farmer Field School
FMM P	Flood Management and Mitigation Programme
FVAMP	Flood Vulnerability Assessment and Mapping Project
GEF	Global Environment Facility
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GMS	Greater Mekong Sub-Region
GOL	Government of Lao PDR
GFS	Gravity-Fed System
GTZ	Gesellschaft für technische Zusammenarbeit
HAE	Hydro-Agronomic and Economic model
HRZ	High Risk Zone
IASC	Inter-Agency Standing Committee
IDA	International Development Association
IDF	Institutional Development Fund
IEC	Information, Education and Communication
IPCC	Inter-governmental Panel on Climate Change
INGO	International NGO
IEE	Initial Environmental Examination
IPP	Independent Power Producer
IWRM	Integrated Water Resource Management
JDLNA	Joint Damage Losses and Needs Assessment
JICA	Japanese International Cooperation Agency
LANGCOCA	Laos-Australia NGO Cooperation Agreement
LTC	Lao Telecommunication
LWU	Lao Women's Union
MAF	Ministry of Agriculture and Forestry
MCH	Mother and Child Health
MDG	Millennium Development Goals
MDRD	Mainstreaming Disaster Risk Reduction into Development
M&E	Monitoring and Evaluation
MEM	Ministry of Energy and Mines
MIC	Ministry of Industry and Commerce
MoF	Ministry of Finance
MoH	Ministry of Health
MoNRE	Ministry of Natural Resources and Environment
MLSW	Ministry of Labour and Social Welfare
MPWT	Ministry of Public Works and Transport
MRC	Mekong River Commission
MPI	Ministry of Planning and Investment
NAPA	National Adaptation Programme of Action
NDMC	National Disaster Management Committee
NDMO	National Disaster Management Office
NFE	Non Formal Education
NGO	Non Governmental Organisation
NGPES	National Growth and Poverty Eradication Strategy
NPSH	National Policy on Environmental and Social Sustainability of Hydropower Sector

NR	National Road
NSEDP	National Socio Economic Development Plan
NUOL	National University of Lao PDR
PDNA	Post-Disaster Needs Assessment
PDEM	Provincial Department of the Ministry of Energy and Mines
PDPI	Provincial Department of Planning and Investment
PDMC	Provincial Disaster Management Committee
PDR	People's Democratic Republic
PES	Provincial Education Services
PRECIS	Providing Regional Climates for Impact Studies
PROMMS PTI	Provincial Road Maintenance and Management System Public Work and Transport Institute
PWREO	Provincial Water Resources and Environment Office
RCC	Regional Consultative Committee on Disaster Management
RFMMC	Regional Flood Management and Mitigation Centre
RMS	Road Management System
SASOP	Standard Operating Procedure for Regional Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Response Operations
SPDRM	Strategic Plan on Disaster Risk Management
SWAP	Sector-Wide Approach
TA	Technical Assistance
TDRA	Tools for Disaster Risk Assessments
UNDP	United National Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN_HABITAT	The United Nations Human Settlements Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
WASH	Water, Sanitation and Hygiene
WATSAN	Water and Sanitation
WERI	Water and Environment Research Institute
WHO	World Health Organisation
WSP	Water and Sanitation Programme
WB	World Bank
WREA	Water Resources and Environment Administration

SECTION I: EXECUTIVE SUMMARY

Background

From 24 to 26 June 2011, Typhoon Haima swept through the northern and central provinces of Lao PDR, causing widespread flooding in four provinces – Bolikhamxay, Xayaboury, Vientiane, and Xiengkhouang. The floods caused extensive damage to people's livelihoods, property, and to social and physical infrastructure.

The National Disaster Management Office (NDMO) reported that more than 87,403[1] people from 362 villages in 36 districts in those four provinces had been directly affected by the disaster. At least 18 people were killed and one injured as a direct result of the floods. Flood water destroyed houses, crops, schools, hospitals, roads, bridges, electricity polls, extension lines, communication systems, and caused widespread damage to irrigation schemes, aquaculture infrastructure and riverbanks.

The Government of Lao PDR (GoL) at the provincial level acted quickly, helping the communities to evacuate, mobilising volunteers to search for and rescue the victims, and delivering immediate emergency aid as well as temporary restoration of life line facilities and houses of people. In parallel, the central government mobilised resources and funds from the public and private sectors to assist the victims in the affected provinces. The Ministry of Foreign Affairs (MoFA), on behalf of the GoL, also issued an official letter dated 13 July 2011, requesting assistance from the UN agencies and the World Bank, to conduct a Joint Damage, Losses and Needs Assessment (JDLNA) of Typhoon Haima in the four main affected provinces.

In response to the request made by MoFA, the joint assessment team, comprising government staff from key line ministries at the central level and development partners (DP), was mobilised to undertake the JDLNA from 25 July to 5 August 2011. The assessment was completed under the leadership of the Ministry of Planning and Investment (MPI) and the NDMO within the Ministry of Labour and Social Welfare (MLSW) in collaboration with the provincial governments and DP. The scope of the assessment covers the damage and losses in key sectors - including agriculture, housing, transport, education, health as well as industry, commerce, tourism, trade and environment (hydrometeorological services) – that occurred during the period from 24 June to 30 July 2011.

Overall Damage, Losses and Needs

The total monetary value of the damage and losses caused by Typhoon Haima has been estimated to be 353,030 million kip (USD 44,128,726) and 177,446 million kip (USD 22,180,798) respectively. Further, the joint assessment team has estimated that 192,457 million kip (USD 24,057,125) and 374,735 million kip (USD 46,841,904) are the amounts needed in the short and medium term in order to ensure the recovery from this disaster, as presented in Table 1 below. Overall needs are estimated at 567 billion kip (USD 70,000,000).

OVERALL SUMMARY OF DAMAGES, LOSSES & NEEDS								
Sectors	Damage	Losses	Damage	Losses	Short Term Recovery Needs		Medium Term Recovery Needs	
	Million, Kip		USD		Million, Kip	USD	Million, Kip	USD
1. Social								
Housing	11,262.8	7.5	1,407,851	938	-	-	3,552.1	444,015
Health	665.2	1,315.6	83,146	164,444	1,979.8	247,475.0	1,960.0	245,000
Rural Water and Sanitation	4,480.9	1,381.5	560,107	172,689	1,525.6	190,699.0	2,746.1	343,258
Education	1,601.3	282.2	200,166	35,281	209.3	26,168.6	6,146.0	768,251
2. Productive								
Agriculture & Food Security	51,213.8	72,843.4	6,401,722	9,105,423	21,250.6	2,656,326.4	124,740.0	15,592,500
Industry	3,259.7	12,016.6	407,460	1,502,072	4,470.2	558,781.1	1,117.6	139,695
Tourism	204.0	545.7	25,500	68,208	651.2	81,400.0	-	-
Trade	592.0	3,438.0	74,000	429,750	224.4	28,050.0	-	-
3. Infrastructure								
Transport	213,246.2	83,171.2	26,655,781	10,396,405	99,739.1	12,467,382.0	137,713.9	17,214,234
Electricity	2,549.7	2,047.9	318,710	255,993	2,549.7	318,710.0	-	-
Urban Water	776.4	396.8	97,045	49,594	776.4	97,045.0	8,640.0	1,080,000
Irrigation	63,168.5	-	7,896,064	-	57,471.3	7,183,912.3	87,114.0	10,889,250
4. Cross-Sectoral								
Hydrometeoro-logy	9.4	-	1,175	-	1,609.4	201,175.0	1,005.6	125,700
Total	**353,030**	**177,446**	**44,128,726**	**22,180,798**	**192,457**	**24,057,125**	**374,735**	**46,841,904**

Table 1: Overall Summary of Damage, Losses & Needs - By Sector

From the financial standpoint, it is estimated that the transport sector has suffered the most extensive damage – more than 213 billion kip (USD 26.6 million) – as well as the heaviest losses – 83 billion kip (USD 10 million). This represents nearly 60% of all damage and 47% of all losses. The second most affected sector is agriculture and irrigation, which accounts for 33% of the total damage and 41% of losses.

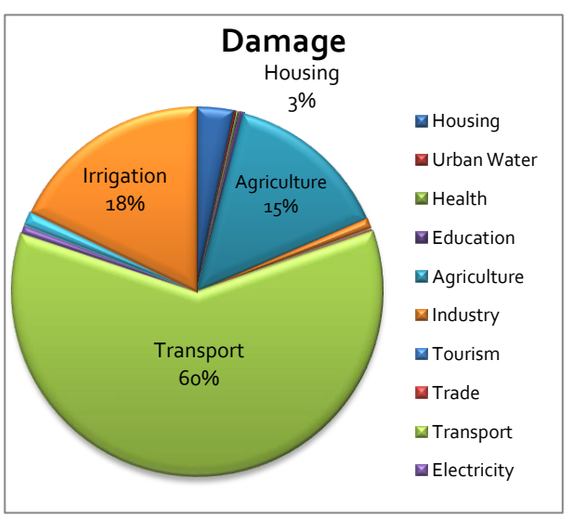


Figure 1: Damage

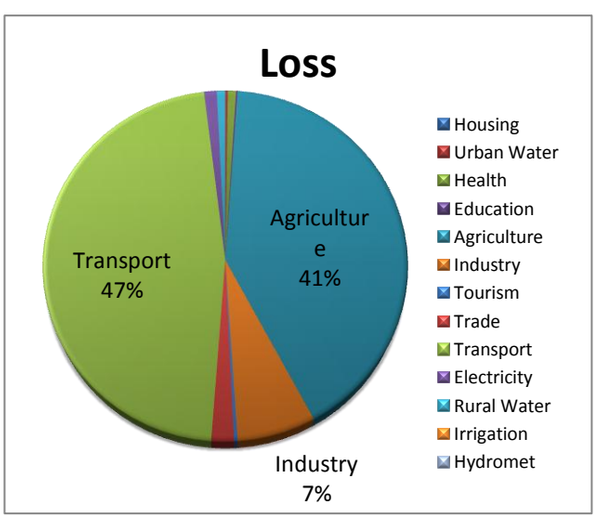
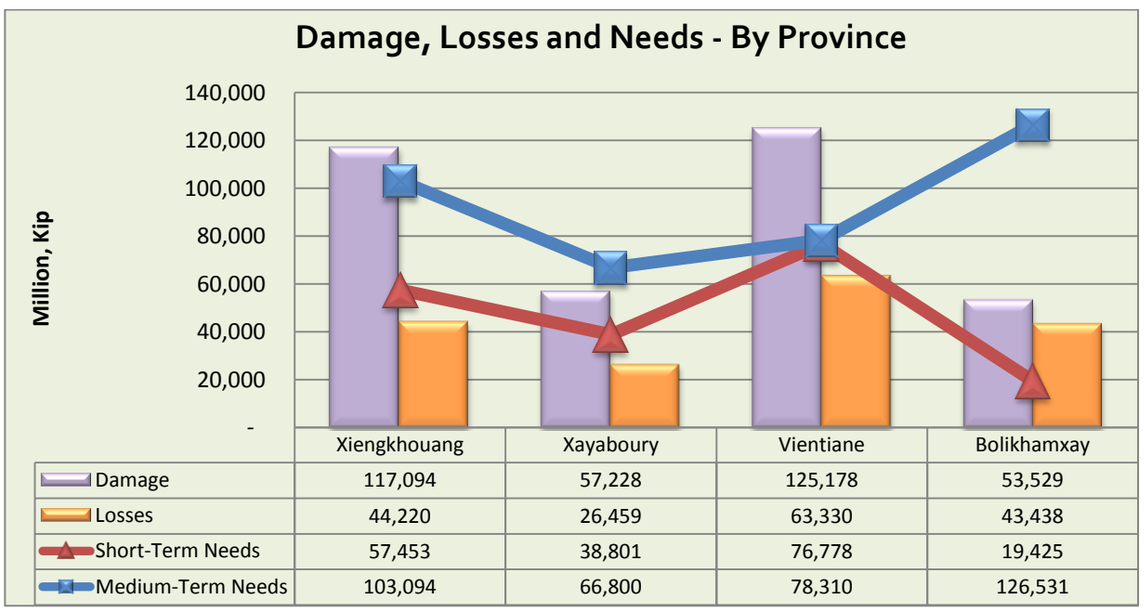


Figure 2: Losses

Province-wise breakup

The graph below shows the breakup of damage, losses and needs between the 4 provinces that were covered by the assessment. It is evident that the Vientiane province has suffered the most damage and losses, followed by Xiengkhouang, owing primarily to the high extent of damage to the transport sector in these two provinces. Correspondingly, these two provinces display the highest figures in terms of short-term needs. Bolikhamxay however has higher agricultural and irrigation needs in the medium term, resulting in high overall medium term needs.



	Xiengkhouang	Xayaboury	Vientiane	Bolikhamxay
Damage	117,094	57,228	125,178	53,529
Losses	44,220	26,459	63,330	43,438
Short-Term Needs	57,453	38,801	76,778	19,425
Medium-Term Needs	103,094	66,800	78,310	126,531

Figure 3: Damage, Losses and Needs - By Province

Ownership-based breakup

As is shown very clearly in the graphs below, the public sector suffered most of the damage (81%), while the private sector bore the brunt of the losses (63%). The majority of public sector damage was incurred on infrastructure (transport and irrigation), while losses in the private sector were mainly concentrated in the transport and agricultural sectors.

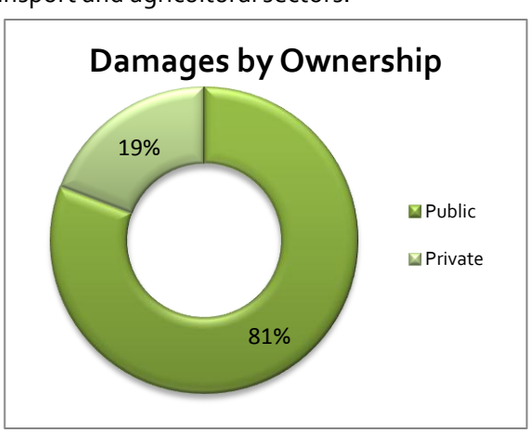


Figure 4: Damage by Ownership

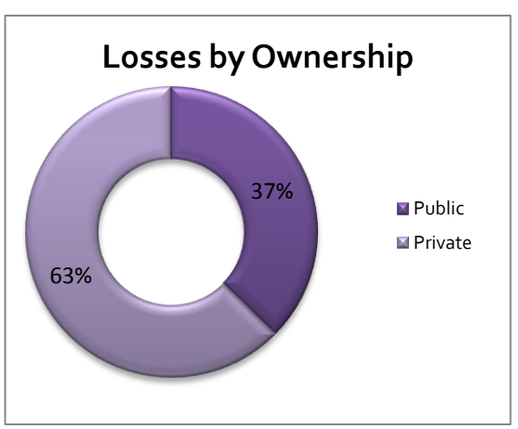


Figure 5: Losses by Ownership

Overall Needs Analysis

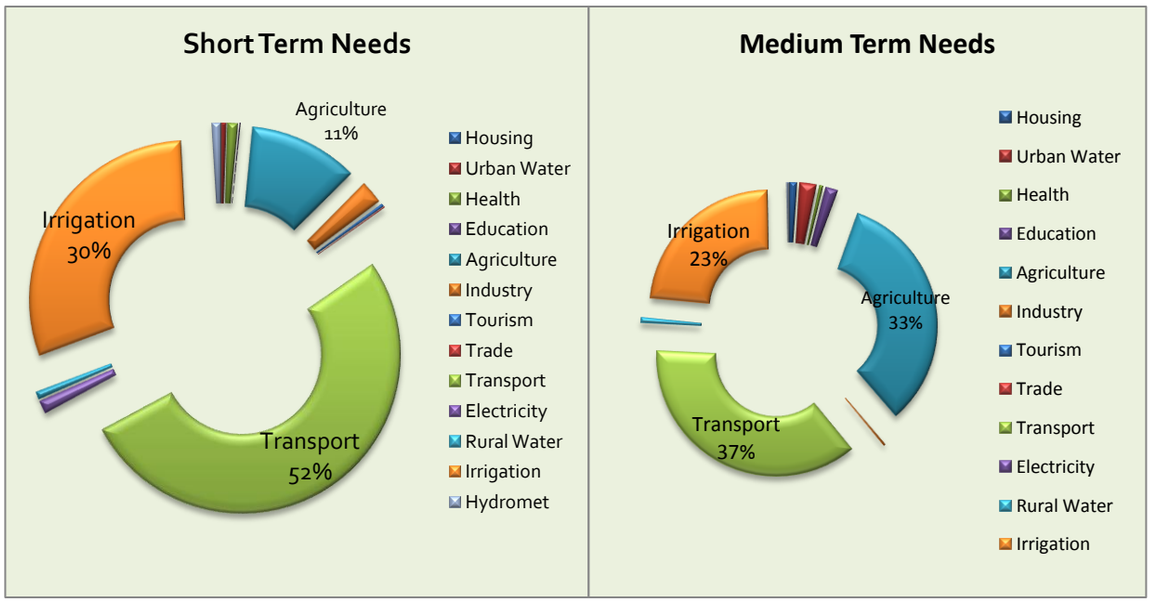


Figure 6: Needs

Corresponding to the damage and losses, the charts above show that the major portion of the needs is also primarily concentrated in the transport, agriculture and irrigation sectors. However, it is important to note that higher amounts needed do not mean that needs in those sectors have the highest priority. Each sector has important needs which must preferably be addressed in parallel, or in a prioritised manner that does not neglect one sector at the expense of another. **Total needs are estimated at 567 billion kip (USD 70 million).** The needs analysis can be broken down into two major portions covering the next 6 to 12 months (short term) and the 1-3 years after that (medium term). The table below summarises the important short and medium term needs in all sectors along with indicative sector-wise budgets.

Sector	Short Term Needs (6-12 Months)	Medium Term Needs (1-3 Years)
Agriculture, Food Security & Irrigation	Provision of rice, other crop seeds and fertiliser for the areas still to be planted	Recovery of affected land that became heavily silted due to mudslides
	Vegetable and other crop seeds for the dry season	Diversification of crops is important for the community. Though they grow vegetables such as long beans, onion, garlic, etc., they need improved seed and technical support for growing vegetables for their own consumption and sale of surplus produce
	Fingerlings and fish brood stock to restock the lost fish in ponds	Extension support is a necessity, along with animal health support
	Though minor repairs have been done to the fish ponds by the communities themselves, in most of the villages, some ponds still need repair works	Rehabilitation of irrigation infrastructure to ensure sufficient water for the next cropping season
	Cash transfer schemes for the flood-affected families to invest in crops, livestock or fisheries	River protection works

	Surveillance of animal diseases needs to be carried out in the flood-affected provinces, with particular awareness of and attention to types and effects of animal diseases	Rehabilitation of fish ponds with proper concrete lining as appropriate and support for fishing gears
	Veterinary medicines, equipment, vaccines and animal feed	Farming communities do not have access to banks, so initiatives to link them with banking facilities
	Cleaning of the water passes, canals and drainage should be one of the top priorities	Promotion of Non-Forest Timber Products (NTFP), mainly herbs for traditional medicines
	Immediate improvement of irrigation canals is necessary for the next crop	Improved animal breeds with herd health programmes, including the institution of biosecurity measures and awareness
	Awareness-raising on disaster risk reduction and preparedness, including media messages on disasters and early warning	Livestock farmer field schools and refreshment courses of Community Animal Health Workers
	Request was made for immediate food support, mainly rice, however the government has responded to the immediate rice needs of the most vulnerable households. Of the 10 percent of villages with a high proportion of households with less than 3 months of rice, it is highly likely that the natural coping mechanisms will be sufficient to sustain food requirements until the harvest in 3 months.	
Total (kip)	**78,721,909,200**	**211,854,000,000**
Total (USD)	**9,840,239**	**26,481,750**
Housing	Emergency supplies, inc. temporary housing materials and household items	Housing reconstruction (a good practice option based on global experience): Financial Grant
		Housing reconstruction (a good practice option based on global experience): In-Kind assistance
Total (kip)	**Not Estimated Yet**	**3,552,119,413**
Total (USD)		**444,014**
Transport	Emergency maintenance and fixing the damaged roads and bridges	Periodic maintenance and rehabilitation
		More systematic approaches based on good practice should be taken into account in designing maintenance and rehabilitation processes. This could include additional embankment protection, raised embankment, improved/paved shoulders, improved drainage, and improve pavement structure
Total (kip)	**99,739,056,349**	**137,713,874,036**
Total (USD)	**12,467,382**	**17,214,234**
Electricity	Further repair of damaged infrastructure	
Total (kip)	**2,549,680,357**	
Total (USD)	**318,710**	
Urban Water Supply	Rehabilitation and reconstruction of network	Advocacy and awareness raising and training on DRR
		Study on BBB
		Capacity building of communities and implementation of demonstration projects on BBB
Total (kip)	**776,360,000**	**8,640,000,000**

Total (USD)	**97,045**	**1,080,000**
Education	Furniture and equipment	Renovation and reconstruction of the damaged school buildings in 25 affected schools
Total (kip)	**209,349,000**	**6,146,010,000**
Total (USD)	**26,169**	**768,251**
Health	Outreach activities (Health education, enhanced surveillance, vector control)	Relocation of two health facilities
	Renovation of health facilities and replacement of damaged equipment, furniture, medicine and supplies	
Total (kip)	**1,979,800,000**	**1,960,000,000**
Total (USD)	**247,475**	**245,000**
Rural Water and Sanitation	Emergency supplies (chlorine tablets/powder, bucket, soap, jerry cans, aluminium sulphate etc.	Well chlorination/cleaning, rehabilitation of water supply systems and sanitation
	Well chlorination/cleaning, rehabilitation of water supply systems and sanitation	IEC materials, technical guidelines, chlorine use leaflets
	IEC materials, technical guidelines, chlorine use leaflets	
Total (kip)	**1,525,592,000**	**2,746,065,600**
Total (USD)	**190,699**	**343,258**
Hydrometeorology	Fixing of damaged equipment	Upgrade the reporting and receiving system from analogue to digital which will be compatible with the region and global systems
		Support at least 2 staff at DMH to obtain higher degree in meteorology
		Provide mobile phone and SIM cards for the remaining districts and villages that installed staff/slope gauges for reporting the data
		Install faxes for hydrometeorology office in districts lacking thereof to ensure timely reporting of weather data including disaster warning
		Training provincial, district and village staff on data reporting and analysis techniques
		Fix or relocate the meteorological building at Thoulakhom district (size 6X7 sq m) and Phonehong district (size 10X10 sq m) that are flooded every year
		Build the capacity of the new staff to work on hydrometeorology services
		Fix or relocation of the office in Pakxan district to higher ground
Total (kip)	**1,609,400,000**	**1,005,600,000**
Total (USD)	**201,175**	**125,700**
Grand Total (kip)	**187,111,146,906**	**373,617,669,049**
Grand Total (USD)	**23,388,893**	**46,702,208**

*Note: This table does not include needs for industry, tourism and trade

Table 2: Short and Medium Term Needs by Sector

Sectors Assessment in Brief

The following is a brief summary of the assessment's findings in each of the sectors:

Housing: The housing damage that occurred due to Typhoon Haima can be attributed to a combination of storm winds and rains, flash floods, and in some cases landslides. The overall effect of the disaster was relatively minor on the housing structures; most households that were flooded were able to recover by cleaning their house after the water had receded. 352 houses were reported by local government officials as damaged, of which 77 (22%) were reported as completely destroyed and 275 (78%) partially damaged, in the four affected provinces. The monetary toll for the housing sector, including both damage and losses, is estimated at 11.3 billion kip (USD 1.4 million), of which damage to housing structures accounts for 30% of the total sum and the cost of households assets accounts for 70%. Housing reconstruction forms the bulk of the recovery needs, estimated at 3.5 billion kip (USD 444, 014).

Transport: Typhoon Haima caused damage to some sections of national, provincial, and tertiary road networks, to bridges in Xiengkhouang, Xayaboury, Vientiane, and Borikhamxay, as well as to river bank protection in Xayaboury and Borikhamxay. The magnitude of the damage varies from province to province. Mountainous districts in the Xiengkhouang province and the Xaysomboun district of Vientiane are the worst affected. The damage is estimated at USD 26,6 million.

Losses were mainly incurred in the form of higher vehicle operating costs, loss of revenue of the truck and bus operators during periods when roads were cut off, costs of clearing landslides, and emergency repair works for the damaged roads and bridges in order to restore traffic flow. Losses in tertiary roads and bridges are considered minimal, given that the traffic volumes are so low. The losses are estimated at about USD 10.4 million. The total need for the recovery is estimated at USD 29.6 million.

Electricity: Overall, damage and losses caused to the electricity sector by Typhoon Haima were relatively modest from a national perspective. The impact was minimal on the production, import and export of electricity. However, the distribution network in the four provinces was affected, with several electrical poles, transformers, wiring, and meter-sets incurring damage. Losses occurred due to temporary disruptions in service and to the emergency repair works that was undertaken. The losses were curtailed by prompt recovery efforts by the government. Although the sector was spared by Typhoon Haima, there are several initiatives that can be undertaken in the medium to long term, towards making it more resilient, given that electricity is a vital input to all other sectors and that the sector must prepare itself for future disasters.

Urban Water Supply and Sanitation: Typhoon Haima and the subsequent flooding caused damage to the piped water supply network in the Xiengkhouang and Xayaboury provinces, which amounts to 776 million kip (USD 97,045). The damage caused a disruption in the water supply service for 14 days in Xiengkhouang and for 3 days in Xayaboury, affecting 5182 households in total and resulting in losses of over 396 million kip (USD 49,594). The water supply systems have been temporarily repaired in both provinces, but permanent repairs and replacements are still required, and in the long term there is a need for various disaster risk reuction (DRR) and building back better (BBB) activities – such as awareness and capacity building – which would cost 8.6 billion Kip (USD 1,080,000).

Education: Typhoon Haima caused heavy rains and flooding in 25 schools in the four northern and central provinces of Laos. School buildings, furniture, teaching and learning materials, textbook, and teachers' guides were damaged. The floods caused damage and losses which were estimated at USD 235,000, while the needs for recovery and reconstruction are estimated at USD 804,000 for the short-term and long-term recovery and reconstruction. The stress has to be put on the necessity to build back better school buildings, safety learning and teaching environment.

Health: Health facilities (1 district hospital in Bolikhamxay, 5 health centres in Xiengkhouang and 1 district health office in Xayaboury) were damaged to various degrees by the flooding. The health services were hardly disrupted, as staff were able to resume services quickly. In some cases, villagers were unable to access services due to damaged roads and bridges. However, district and provincial health staff organised mobile teams to support affected villages and provided medical care, performed health and hygiene sensitisation, and took measures towards enhanced disease surveillance and vector control. Disease outbreaks of diarrhea, "Hong Kong foot" and conjunctivitis have been reported. The post-Haima flood assessment for the health sector revealed damage estimated at 664.17 million Kip (USD 83,020), and losses of 1,309 million Kip (USD 163,581).

Rural Water and Sanitation: The assessment indicated that the damage cost as a result of Typhoon Haima amounted to USD 560,107, while losses were estimated at USD 172,689. Based on these figures, the total recovery needs and/or reconstruction needs amount to USD 762,796. This sum is needed to meet the requirements of three consecutive phases of recovery for that sector: short-term (USD 190,699), medium-term (USD 343,258), and long-term (USD 228,838).

Both water supply and sanitation facilities fall under two categories, namely public, which includes gravity-fed water systems (GFS), boreholes and school latrines; and private, which includes wells, rain-water containers, and household latrines. Across the four provinces, covering 31 affected districts, 690 units of GFS were affected, with most schemes damaged at 20-60%. It is clear that GFS in the Xiengkhouang province were affected the most. In total, 2,356 boreholes, with the highest number affected in Bolikhamxay (977 units) and in Vientiane (878 units), and 17,500 units of wells were damaged. Household latrines were found to be affected at all locations, and the most affected provinces are Xiengkhouang (25,876 units) and Vientiane (31,078 units). Though a number of school latrines are reported to be affected, however, there is no cost for any reconstruction as most of the latrines required only minor mud clearing and cleaning in order to bring them back to functioning condition.

The short-term needs (less than 6 months) were estimated to be of 664.17 million Kip (USD 83,021) for physical recovery and of 1.315 billion Kip (USD 164,330) for outreach activities. It was recommended that risk mappings should be conducted in order to identify health facilities at risk of future disasters, and to consider the relocation of such at-risk facilities to safer areas. The severely damaged Bolikhan District Hospital and the moderately damaged Kham Health Center (Xiengkhouang) were recommended for relocation, a project which would add 1.96 billion Kip (USD 245,000) to the medium/long-term needs (beyond 6 months).

Agriculture, Food Security and Irrigation: Crops are the sub-sector which suffered the most extensive damage due to the floods induced by Typhoon Haima. Major affected crops were lowland and upland rice, maize, vegetables, cash crops and fruit trees, planted on approximately 7200 hectares of land. It was estimated that throughout the 31 districts of the four provinces, the lowland area planted with rice, corn and vegetables was

immersed for several days. Irrigation channels have been damaged, with many of the schemes needing reconstruction. The assessment found that immediate attention needs to be given to either rehabilitating or rebuilding irrigation canals, weir, canal intake and other structures, such as sluice gates.

Many of the large animals, such as cattle, buffaloes and pigs, could be saved from the flood. In some cases animals were already kept at higher ground level. Wherever that was not the case, in general communities were nonetheless able to shift them to higher grounds in time to avoid losses. This was made possible partly thanks to prior media (including radio) broadcasts concerning the typhoon, and to the fact that water levels rose gradually. However, many chickens and ducks were lost during the flood. Symptoms of animal diseases were reported in some villages, especially after the animals consumed contaminated drinking water; however no major animal disease was encountered in any of the provinces.

The inland fishery sub-sector, which provides protein as well as cash income to local communities, was affected to some extent by the floods. Some damage in fish ponds was reported, and some of them were destroyed. In a number of areas, a significant number of fish and fingerlings were reportedly lost. However, the total damage to the fishery sector remains limited compared to that incurred by crops. Damage and losses in the agriculture sector reached 51 billion kip (USD 6,401,722) and 72 billion kip (USD 9,105,423) respectively. Overall sector needs sum up to 78 billion kip (USD 9,840,239) in the short term and 212 billion kip (USD 26,481,750) in the medium term.

Environment / Hydrometeorology: The most affected province is the Vientiane province, with damage there reaching 5.7 million kip – out of a sectoral total of 9.4 million kip – as a result of the damage to temperature measurement devices, the weather station antenna, and staff gauges installed at Nam Lik and Nam Xong. In addition, minor damage resulted from staff gauges installed at Nam Ngiu and Nam Xan, which were worth 2.0 and 1.7 million kip respectively, being completely washed away. The Provincial Water and Environment Office (PWREO) has begun mobilising resources to fix the damaged equipment. There is an urgent need to replace / upgrade some of the legacy equipment and improve these facilities, which would cost approximately 1 billion kip (USD 125,700).

Social and Macroeconomic Impacts, Industry, Trade, and Tourism: Overall, the economic impact of Typhoon Haima is moderate at the national level but relatively significant at the provincial level. It is also uneven between those affected provinces. Based on this report's estimates, the aggregate loss in value added in the current fiscal year (FY10/11) from the disaster is estimated at about 102 billion kip (or USD 12.7 million) at current market prices[2]. The loss in value added is estimated to be around 0.16 percent of the national GDP and 0.84 percent of GDP of the four affected provinces all together (in nominal terms). The estimated loss in value added is about 11.9 billion kip (USD 1.4 million) in industry and 3 billion kip (USD 0.35 million) in services (especially trade and tourism). Trade and tourism activities were affected mostly in the Xiengkhouang and Vientiane provinces (Vangvieng district) during June-July 2011, due to road damage and floods at some touristic sites. Some fuel stations and retail shops were also affected by flooding in Xiengkhouang and Xayaboury. Industry, which consists mainly of small and medium sized enterprises, was affected to a lesser extent by the typhoon, and only a small

[2] The aggregate loss in value is equal to the sum of value added losses in all sectors. For each sector, the gross economic (revenue or output) losses estimated for that sector (if any) are multiplied by input-output coefficients used in National Income Accounting to arrive at losses in "net" or value-added terms.

number of rice millers and sawmills were reported as partially damaged by the typhoon. In addition, there was a 2-3 days interruption in small scale production due to the cutoff of electricity in flooded districts. The impact of Typhoon Haima on the balance of payments is insignificant. Further, Typhoon Haima is unlikely to have a much adverse impact on government revenue. However, the recent impact on agricultural production caused by this typhoon (as well as by Nock Ten and possibly by other future storms) is likely to fuel food inflation in coming months.

Disaster Risk Management and the Way Forward

The main hazards in Lao PDR are flash-floods, landslides, forest fires, acute water shortages during specific months of the year, occasional wind storms and typhoons, agricultural pests, rodent infestations and animal (and human) epidemics. Climate change and variability is likely to intensify and increase the frequency of floods and droughts.

Although several institutional arrangements and strategic approaches for disaster risk management (DRM) exist in Laos, there are several constraints and challenges that Typhoon Haima has revealed within this existing system. Several DRM actors are undertaking different programmes to address some of these challenges. However, a lot more needs to be done towards fully institutionalising DRM. The way forward involves the development of a 'recovery planning framework' through a consultative process that involves all key stakeholders, including various levels of government and international development partners. The recovery planning framework is proposed to be based on:

a. The clear articulation of priority needs in each sector, of which this assessment provides a very comprehensive picture;

b. The development of criteria for cross prioritisation across sectors, leading to the establishment of cross sectoral priorities for action to be taken immediately and in the medium term;

c. An indicative timeline for the implementation of priority interventions, and;

d. The development of key indicators for measuring physical progress and monitoring and evaluating (M&E) the performance and effectiveness of the proposed recovery interventions.

Once this is established, the following institutional arrangement for oversight, implementation, and monitoring and evaluation is proposed.

Institutional oversight of the implementation of the recovery plan is proposed through the National Disaster Management Committee (NDMC), chaired by a Deputy Prime Minister from the Ministry of Defense and comprising high ranking authorities from the Ministry of Planning and Investment (MPI), NDMO, and sector ministries concerned. The NDMC will meet twice a year to follow up on the implementation of the recovery plan.

For the implementation of the recovery plan, MPI, in collaboration with NDMO, will be responsible for coordinating and monitoring the implementation of the recovery plan for all sectors. The recovery plan for each sector will be implemented by the relevant Ministries and its offices at provincial level. Sector ministries will be responsible for planning, monitoring, preparing the report, providing technical assistance, training, and liaison with donors and MPI, while the actual implementation, which includes planning, procurement, implementing, supervising and accounting for civil works, will be carried out by provincial departments.

Similary, for the rapid response , NDMO will be responsible for coordination, monitoring, and also implementation of the response. In this context, it is also important to acknwoledge the role of the Inter-Agency Standing Committee (IASC) on Disaster Management, whose key role is to ensure effective and efficient coordination between the Government and the international community in times of disaster. The IASC in Lao PDR comprises NDMO members on the one hand, and development partners from the international community on the other hand – including International Non-Governmental Organisations (INGOs), the United Nations Country Team (UNCT), the World Bank (WB), and the Asian Development Bank (ADB). Led by the Government (NDMO) and co-chaired by the UN Resident Coordinator in his/her capacity as the Designated Official, the IASC remains the key coordinating body of humanitarian action, with a role encompassing preparation, response and mitigation of emergencies and disasters in Lao PDR. As such, IASC is involved in capacity building, effective and efficient coordination, and confidence building, and plays a crucial role in ensuring good humanitarian response. The latest experience from Typhoon Haima has further substantiated the importance of good coordination between and amongst Government and the international community to respond better during times of disasters.

In parallel, at the provincial level, the provincial disaster management committee (PDMC), chaired by the vice governor, as established by Prime Minister decree 158, and comprising the director of the Provincial Department of Planning and Investment (PDPI), the Department of Labour and Social Welfare (DLSW), and other provincial sector departments, will be responsible for coordinating and monitoring the implementation of the recovery plan implemented by sector departments. The sector departments will report to PDMC and their respective sector ministries. PDMC will subsequently report to the Provincial Governor and the NMDC . PDPI and DLSW will report to MPI and NDMO respectively.

Districts and communities will be involved in the process of the implementation of the plan (See diagram below).

Government procurement guidelines and the financial management (FM) system will be applied, including with regards to financial reporting, arrangement of audit, and accounting procedures. Each provincial department will operate the FM system, and transfer accounting details to the disbursement division of each sector ministry on a monthly basis, who will subsequently report to donors, the Department of Planning, and the MPI.

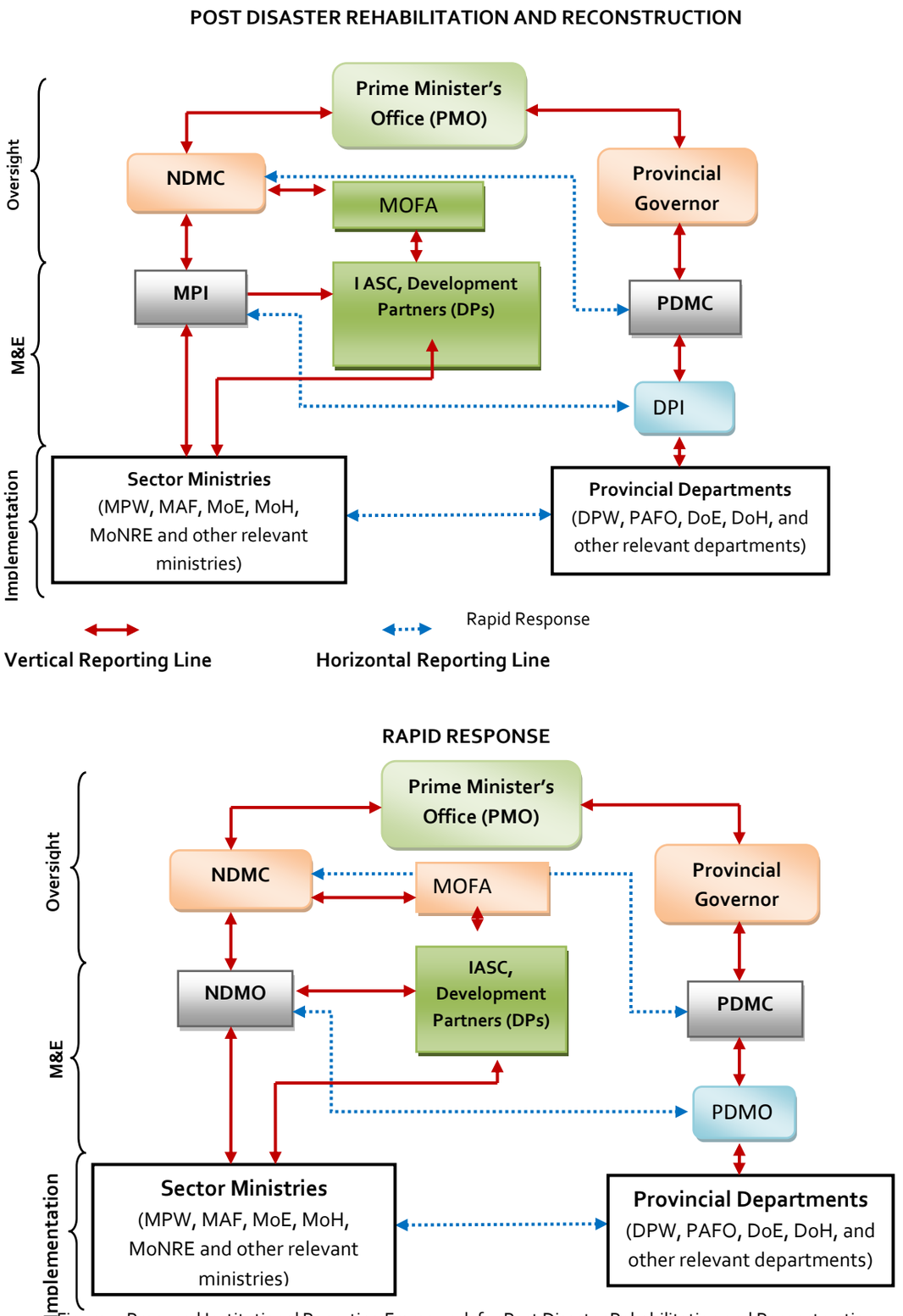


Figure 7: Proposed Institutional Reporting Framework for Post Disaster Rehabilitation and Reconstruction

Strategic Framework for Recovery and DRM Institutionalization: Key Needs and Priorities

Overall, DRM is a cross-cutting agenda that requires both time and commitment from all levels of the country's leadership for full institutionalisation. More often than not, much of the damage, losses and needs outlined in this report are symptoms of deeper issues that are root causes and must be addressed in order to prevent similar damage and losses in subsequent disasters. Some of the DRM needs can be undertaken in the short term, while others would require a longer term commitment from development partners and the government.

In the wake of Typhoon Haima and of the lessons learnt from it, the joint assessment team has identified the following priorities that can be undertaken under the five-pillar strategy of DRM, which is illustrated by the figure below. Any proposed solution must be seen in the light of pragmatism, given that DRM in Lao PDR is at a nascent stage and that the implementation capacities within the GoL are relatively limited. Therefore any DRM initiative must undertake capacity building as an underlying pillar for all activities. Furthermore, some initiatives such as catastrophe risk financing are more sophisticated interventions and thus it is advisable to first undertake less complex initiatives before graduating to more sophisticated ones.

Pillar 1: Institutional Capacity Building

Given the low institutional capacity for DRM in the Lao context, this is by far the most important pillar within the DRM framework. Several needs exist at all levels without which strategising and implementation of all other pillars would be impossible. Needs range from intra-provincial learning to creating legal, regulatory and M&E frameworks to awareness building to the development of standard operating procedures (SOPs). Thus capacity building must be considered a top priority.

Pillar 2: Risk Identification and Assessment

Several provinces (e.g. Vientiane) and sectors (e.g. electricity) identified the lack of structured risk assessments as preventing them from making better informed decisions with respect to longer term planning. It is important therefore that the outcomes of this exercise, in the form of strategic plans that are underpinned by such risk assessments, should be brought to fruition.

Pillar 3: Strengthening Emergency Preparedness and Early Warnings

Although the country has made significant strides in this area, a key message that arose from the joint assessment field visits was that last mile connectivity was lacking. A complete review of early warning systems in Laos is thus in order.

Pillar 4: Risk Mitigation Investments for Reducing Exposure to Natural Hazards

Building back better is a need that almost all sectors found important. This was especially true in the infrastructure sector in order to prevent hard fought development gains from being lost to future disasters.

Pillar 5: Catastrophe Risk Financing and Transfer

Although these are more advanced products, disaster risk transfer and financing are options that are recommended in the longer run, given Lao PDR's vulnerability to disasters.

Implementation Plan for the DRM Strategic Recovery Framework

Based on the analyses above and the key DRM needs that have been identified, the joint assessment team proposes the following indicative implementation plan for the recovery framework. Please note that each item mentioned below would require a detailed analysis for project preparation. Itemised budgetting and identification of stakeholders will be carried out in that phase.

Strategy Pillar	Need	Activities - What has to be Done to Resolve the Need	At What Level Should this Activity be Undertaken	Suggested Indicator of Progress	Indicative Timeframe		
					2011-13	2014-16	2016-21
I. Institutional Capacity Building	IA. Ensure that all provinces have equal capacities for preparedness and DRM institutionalisation	Inter-provincial learning events to share lessons learnt and best practices	Province, District, Village	# of provinces/districts where training events undertaken			
	IB. Address training needs due to staff turnover	Ongoing trainings to refresh skills and awareness on DRM. This could include study tours to other countries/cities that have successfully undertaken DRM interventions	Central, Province, District, Village	# of staff trained			
	IC. Standardised and harmonised information collection and management	Roll out of the Lao Disaster Database and training in all provinces	Province, district	# of provinces that utilise the LDD			
	ID. Awareness and emergency preparedness plan and Standard Operating Procedure with clear roles and responsibilities	Development and roll out of preparedness plans and SOPs with clear roles and responsibilities; along with light equipment	Province, district, community	# of provinces that have an emergency preparedness plan and SOP			
	IE. Joint Assessment lessons learnt can be incorporated into future assessments	Learning events	Province, district	# of provinces/districts where learning events undertaken			
	IF. Monitoring and Evaluation of the Recovery Framework	Development and implementation of an M&E system	Central, Province, district	# of periodic evaluation reports resulting from the system			
	IG. Regulatory mechanism to support DRM	Incorporation of DRM into new and existing legal and regulatory frameworks	Central	# of regulations developed and enforced			

II. Risk Assessment	II. Provincial and sectoral long term planning and strategies have to be underpinned by detailed risk assessments and must incorporate DRM	(i) Detailed, province and district Level multi- hazard risk and vulnerability assessment & modelling and updating of existing national assessments	Central, Province, District, Village	# of provinces with a multi-hazard risk assessment			
		(ii) Creation of longer term sector and provincial strategies and implementation plans (e.g. land use planning) with DRM incorporated	Central, Province, Sector	# of provinces/sectors where the long term strategy is underpinned by a risk assessment and address DRM			
		(iii) Creation of sector guidance notes (e.g. building codes) for the implementation of the above plans	Sector	# of sector guidance notes developed and disseminated			
III. Strengthening Emergency Preparedness & Early Warnings	III.A Ensure that last mile connectivity for early warning messages are completed	(i) Programme to assess and strengthen every link of the early warning chain	Central, Province, District, Village	# of villages that have access to an early warning system			
		(ii) SOPs and training for provincial and district authorities, as well as for communities at risk	Central, Province, District, Village, Community	# of villages that are trained and have SOPs for disasters			
IV. Risk Mitigation Investments	IV.A Protect river banks from erosion and overflow IV. B Investments in BBB for all infrastructure projects	(i) Detailed study on river bank protection	Province	# of river bank protection studies carried out			
		(ii) River Bank Protection and Road Improvement Programme	Province, district	# of km of reinforced roads and river bank protection constructed			
V. Introducing Catastrophe Risk Financing	V. Longer term products to transfer or mitigate disaster risks	(i) Feasibility study to identify products for disaster risk financing such as agricultural insurance, contingency funds. (ii) Establishment of Disaster Response Fund	Central, Province	# of provinces that benefit from a catastrophe risk financing product			

Table 3: Implementation Plan for the DRM Strategic Recovery Framework

Affected Provinces

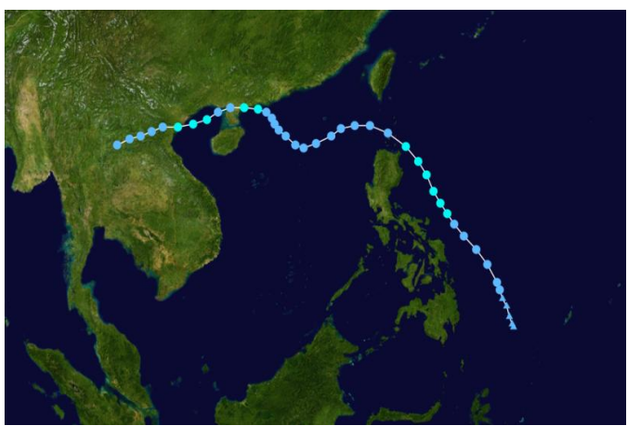
Map 1: Affected Provinces

SECTION II: THE DISASTER, RISKS AND RECOVERY

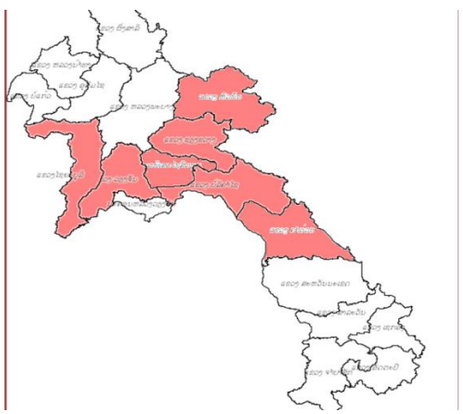
Overview of the Disaster

Between 24 and 26 June 2011, Typhoon Haima No. 4 hit the northern and central provinces of Lao PDR, passing through the Houaphan, Xiengkhouang, Xayaboury, Vientiane, Bolikhamxay and Khammouane provinces with wind speeds of 10 km per hour. On 26 June 2011, torrential rains due to Typhoon Haima caused widespread flooding in 4 provinces: Bolikhamxay, Xayaboury, Vientiane and Xiengkhouang.

The floods caused extensive damage to people's livelihood, property, and to social and physical infrastructure along the major river banks. The map below (Map 2) shows the track and progression of Typhoon Haima, while the map of Lao PDR highlights the provinces through which Haima passed.



Map 2: Progression of Haima Typhoon (points showing the location of the storm at 6-hour intervals), Typhoon Haima 2011 Track. Source : NASA



Map 3: The provinces along the path of Typhoon Haima

The Immediate Effects

The National Disaster Management Office (NDMO) reported that more than 87,403[3] people of 362 villages in 36 districts had been directly affected by the disaster. At least 18 people were killed and one injured as a direct result of the floods. Flood water destroyed houses, crops, schools, hospitals, roads, bridges, electricity poles, extension lines, communication systems, and caused widespread damage to irrigation schemes, aquaculture infrastructure and riverbanks. Details of the immediate effect of the disaster are summarised in Table 4 below.

	PROVINCE					
	Xayaboury	Bolikhamxay	Xiengkhouang	Vientiane	Khammouane	Houaphan
Affected						
District	9	4	8	11	4	
Village	78	39	236		62	7
Family	6490	4414	3082	2613	845	
Population	32816	28395	11385	10464	4343	
Women	17260		6338		2273	
Death	2	2	8	5		1
Missing						
Injured			1			

Table 4: Summary of the Impact

The Immediate Response

The Lao Government acted quickly, helping the communities to evacuate, mobilising volunteers to search for and rescue the victims, and delivering immediate emergency aid as well as temporary restoration of life line facilities and houses of people. In addition, it has continued to provide food support to the most affected communities. During field visits by the JDLNA teams, communities expressed satisfaction with the timeliness and quality of the relief and early recovery support provided by various government agencies.

Immediately after the disaster, the provincial governments activated existing Emergency Response Committees (Xayaboury, Vientiane provinces) or established new ones (Xiengkhouang, Bolikhamxay), chaired by the provincial vice governors. The provincial authorities also formed sub-committees in order to achieve a better response. Rapid assessment teams from line departments were dispatched to collect information from the affected sites after the disaster. Provincial Emergency Response Committees reported the disaster situation in each province to the central government. Provincial Disaster Management Offices, as secretariat to the Disaster Management Committee, played an active role in coordinating the emergency response in the Xayaboury, Vientiane and Bolikhamxay provinces. In the Xiengkhouang province, a new secretariat was nominated within the governor's office to support the Emergency Response Committee.

The provincial authorities also mobilised resources (Cash; 2,127.9 million kip, FI and NFI: 3,293.4 million kip) to provide relief and response assistance to the affected communities. The security personnel and Youth Volunteers were mobilised for search & rescue, temporary restoration of damaged bridges and houses etc., distribution of relief items, cleaning of debris from public places, buildings and houses.
Strong willingness and leadership were demonstrated during the relief and response by the provincial authorities. However, it is important to note that the effectiveness and degree of success was at variance from province to province. Relief and response efforts had better results in those provinces where the leadership had relatively better understanding of the disaster and had some preparedness measures in place.

The response efforts in the provinces would have been greatly facilitated by better preparedness planning and operational procedures for emergency response. Similarly, the training of volunteers in light search and rescue and other life saving techniques could have added to their effectiveness. The provision of simple equipments

such as life jackets and rescue boats for example will further enhance the effectiveness of the community volunteers in future disasters.

Socio-Economic Background of the Affected Areas

Lao PDR, the only land-locked country of the Association of the South East Asian Nations (ASEAN), covers a total of 236,800 km² with a total population of 6,205,341. Per capita income is USD 753.3.

Laos is one of 48 Least Developed Countries (LDC) in the world. Within the Mekong Region, Laos, Cambodia and Myanmar are considered LDCs. Set up by the United Nations Economic and Social Council (ECOSOC); three main categories govern the criteria qualifying a country as a "LDC". They are:

- low-income (three-year average GNI per capita of less than USD 905, while a figure above USD 1,086 allows a country to graduate from the list)
- human resource weakness (based on indicators of nutrition, health, education and adult literacy) and
- economic vulnerability (based on instability of agricultural production, instability of exports of goods and services, economic importance of non-traditional activities, merchandise export concentration, handicap of economic smallness, and the percentage of population displaced by natural disasters)

Lao PDR has considered graduating from LDC status as one of the main national development goals. The 7th National Socio Economic Development Plan (NSEDP) reiterates the Government's aim to take Lao PDR beyond the threshold separating LDCs from more developed countries by 2020. But doing so will require not just GDP growth, but also a greater focus on the quality and equity of that growth, focusing on human development. Lao PDR has seen rapid growth over the last decade. This is being driven by Foreign Direct Investment (FDI), which is having a major impact on the economy, environment and society. In 2009 alone there were over USD 4.3 billion dollars worth of FDI approvals, mainly in energy and hydropower, mining, and agriculture, representing about 70% of GDP. This is a stunning increase from the USD 28 million registered in 2005. The 7th NSEDP forecasts strong and growing FDI flows to sustain a target GDP growth rate of at least 8% per year.

Despite such growth, in attempting to graduate from LDC status, the Lao Government acknowledges the importance of linking this aspiration to a more human development focus goal, especially focusing on MDG achievement. Despite such steady economic growth, issues of equality and equity still remain a main concern in the Lao development landscape.

In Laos there are 3 particular MDGs for which the country is still "seriously off-track" namely, 1) Poverty pertaining to hunger (malnutrition and food insecurity), 2) Maternal mortality (MMR of 405 in 2005) and 3) Environmental sustainability.

MDG Progress in Lao PDR

MDGs	Target	Seriously off Track	Off Track	On Track	No Target	Data Gaps
Goal 1: Poverty and Hunger	Reduce extreme poverty by half			●		
	Reduce hunger by half	●				
	Achieve full and productive employment and decent work for all				●	
Goal 2: Universal Primary Education	Universal primary schooling		●			
Goal 3: Gender Equality and Women's Empowerment	Eliminate gender disparity in all levels of education		●			
Goal 4: Child Mortality	Reduce child mortality under five years of age by two-thirds			●		
Goal 5: Maternal Health	Reduce maternal mortality by three-quarters		●			
	Universal access to reproductive health	●				
Goal 6: HIV/AIDS, malaria, and other diseases	Halt and reverse the spread of HIV/AIDS			●		
	Achieve universal access to HIV/AIDS treatment			●		
	Halt and reverse the spread of malaria			●		
	Halt and reverse the spread of TB			●		
Goal 7: Environmental Sustainability	Reverse the loss of environmental resources	●				
	Reduce rate of biodiversity loss				●	
	Halve the number of people without safe drinking water in rural areas		●			
	Halve the number of people without safe drinking water in urban areas			●		
	Halve the number of people without sanitation in rural areas		●			
	Halve the number of people without sanitation in urban areas			●		

These development issues are highly affected natural disasters in Laos. Experience of Typhoon Ketsana in 2009 clearly showed the linkage between immediate humanitarian needs to longer-term development issues such as food insecurity and nutrition. Such nexus is elaborated further in the section of "Agriculture – Nutrition and Food Security". One of the important lessons learned from Typhoon Ketsana was to consider these longer-term development interventions, based on seriously off-track MDGs, to prevent the plight of compounding negative impacts in already vulnerable communities. To this extent, it is important that immediate results from the Joint Assessment are analysed in tandem with the key development issues confronting the country today, so as to

ensure that appropriate prioritisation for recovery efforts is undertaken by the Government and international community partners.

	% Share of GDP FY09/10			
	Xiengkhouang	**Xayaboury**	**VTE pro**	**Bolikhamxay**
Agriculture	51%	40%	47%	35%
Industry	33%	31%	35%	29%
Services	16%	29%	19%	36%

Table 5: GDP Share of the Main Sectors in the Affected Provinces,
Source: FY09/10 Implementation Reports of Provincial Socio-economic Development Plans

Province	Area Total	Population	Female	No. of villages	GDP p.c, p.a (USD)
Xayaboury	16,389	367421	181884	445	1350
Xiengkhouang	16358	263697	130607	502	852
VTE pro.	22554	467452	229756	n/a	751.4
Bolikhamxay	14863	256371	126701	n/a	1029

Table 6: Summary of Social Background of the Affected Provinces
Source: FY09/10 Implementation Reports of Provincial Socio-economic Development Plans

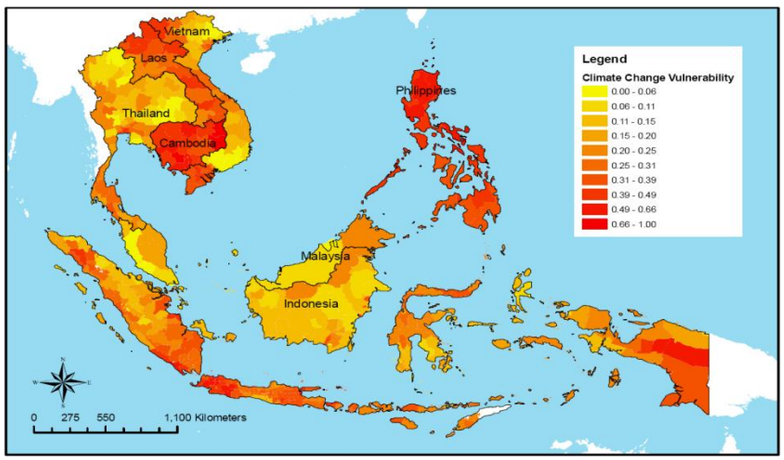
Lao PDR's Vulnerability to Natural Hazards and Climate Change

As a low income country and an agriculture-based economy, Lao PDR is considered as one of the most vulnerable countries to the future impacts of climate change in Southeast Asia[4], especially in the form of droughts and floods causing landslides, river bank erosion and reduced food security. The most vulnerable areas are low lying areas along the Mekong River and its major tributaries in the central and southern parts, as well as the mountainous areas in northern parts of Laos.
Laos is also prone to earthquakes. On March 24 and May 16 this year, 2 earthquakes with magnitudes of 6.8 and 6.1 respectively occurred in the north-western and northern parts of Laos. No damage or injuries were reported in either incident.

Floods and droughts are considered the most frequent and damaging disasters in Laos. Historical data recorded from 1966 to 2009 shows that Laos experiences an average of 1.5 severe flood and drought every year. Specifically, in the past few years, the country was hit by the Kammuri flooding (August 2008) which affected about 200,000 people and damaged 50,000 ha of arable land, followed by Typhoon Morakot (August 2009) and Typhoon Ketsana (end of September- early October 2009) which caused significant damages to several

[4] Yusuf. A & Francisco. H., 2010, *Hotspots! Mapping Climate Change Vulnerability in Southeast Asia*, Economy and Environment Program for Southeast Asia

provinces in the central and southern parts of Laos. Typhoon Ketsana alone affected more than 180,000 people and the total damage and loss amounted to USD 58 million.



Map 4: Climate Change Vulnerability Map for Southeast Asia
Sources: Yusuf & Francisco, 2010

Historical Hazard Risk Profile

Lao PDR has a rugged mountainous terrain in its northern parts, while the remaining areas are constituted of valleys and floodplains. The main hazards in Lao PDR are annual river floods and flash-floods, landslides, forest and community fires, acute water shortages during specific months of the year, occasional wind storms and typhoons, agricultural pests, rodent infestations and animal and human epidemics. Human-induced hazards such as fire, traffic accidents and unexploded ordinances (UXOs) also exist in Lao PDR. These disasters are increasing in frequency and intensity due to climate variation and global warming as well as deforestation and environmental degradation.

EM-DAT (EM-DAT, 2010) has published a broader profile of disasters in Lao PDR. The profile shows that drought has affected a large population: in five drought events more than 4.25 million were affected. Epidemics have proven to be the biggest killer with about 742 people killed in five events. More frequent events are floods in the Mekong River which have affected more than 3.45 million people.

Disaster Type	Description	Number of events	Number of deaths	Total number of people affected	Damages USD
Drought	Drought	5		4,250,000	1,000,000
	Unspecified	3	44	9,685	
Epidemic	Bacterial Diseases	2	534	8,244	
Epidemic	Viral Diseases	3	208	2,000	
Flood	Unspecified	10	76	1,878,600	2,480,000
Flood	Flood	8	358	1,569,740	37,128,000
Storm	Unspecified	2	8	38,435	302,301,000
Storm	Typhoon	3	64	1,397,764	103,650,000

Table 7: Natural Disaster Profile of Lao PDR from 1990-2010 (Source: EM-DAT, 2010)

Typhoon Ketsana in 2009 is the most recent major disaster in Lao PDR, and claimed 28 lives and USD 58 million worth of damage and loss to infrastructure and livelihood of people.

There is a serious need to diagnose all possible hazards in the country and develop strategies to mitigate the negative impacts of these multiple hazards and climate change.

UNDP's hazard, risk and vulnerability assessment report shows that out of the 141 districts in Lao PDR, 56% are defined as epidemic-prone areas, 34.7% are flood-prone areas, 29.8% are earthquake-prone areas, 19.1% are landslide-prone areas, 4.9% are storm-prone areas and 4.9% are UXO-prone areas.

Projected Impact of Climate Change

Climate change and variability is likely to intensify and increase the frequency of floods and droughts. Due to the lack of specific climate change impact research and downscaling models for Laos, the most relevant data available on climate change impacts and vulnerability assessments in Laos is obtained from the Southeast Asian for START (SEA SART)[5] team. The team has carried out climate change research in the Mekong basin including Thailand, Laos and Vietnam using the first high-resolution long term climate project projection model called Conformal Cubic Atmospheric Model (CCAM) which was developed specifically for the Australasian region by the Commonwealth Scientific and Industrial Research Organization (CSIRO) Division of Atmospheric Research in Australia. The climate change impact simulations used in their research is presented in terms of increasing concentration of carbon dioxide over time. This research is still in its initial phases but does provide some useful data for generic policy development and early action on climate change in Lao PDR.

The projected impacts on the temperature and rainfall pattern across the Lower Mekong Basin (see Figure 7 below) are as follow[6]:

- the average temperature across the Mekong River Basin (MRB) will increase about 1-2˚C
- there will be a significant change in the number of hot days (defined as above 33˚C) and cool days (defined as below 15˚C) in the region, namely the number of hot days will increase by 2-3 weeks and the number of cool days will decline by 2-3 weeks; and
- the amount of precipitation is also likely to increase by 10-30%.

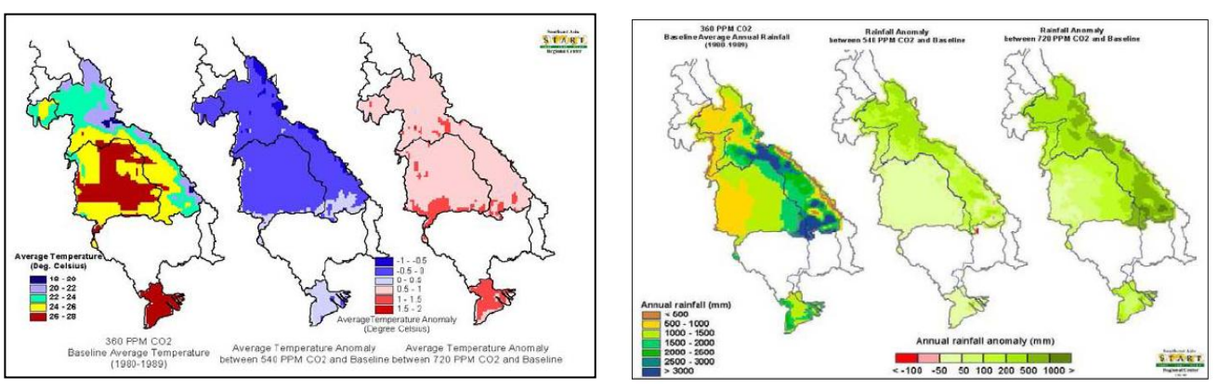


Figure 8: Projected Mean Temperature and Rainfall Changes in the Lower Mekong Basin (source: Chinvanno & Snidvongs, 2005)

[5] The Global Change **S**yst**e**m for **A**nalysis, **R**esearch and **T**raining network jointly initiated by the International Geosphere-Biosphere Program, International Human Dimension Program and World Climate Research Program.

[6] Chinvanno, S. and A. Snidvongs (eds.), 2005. *The Study of Future Climate Changes Impact on Water Resource and Rain-fed Agriculture Production. Proceedings of the APN CAPaBLE CB-01 Synthesis Workshop, Vientiane, Lao PDR, 29 - 30 July 2004*. SEA START RC Technical Report No. 13, 113 pp.

The Japan Meteorological Agency also produces similar result on future climate scenarios for the MRB with the SEA START team using their own Atmospheric General Circulation Model (JMA AGCM). The research indicates that the annual average rainfall will rise by 4.2% in average across the basin over the 21st century. Annual average temperature is also projected to increase by 2.6°C across the MRB. The intensity and frequency of extreme weather events are also projected to increase, leading to a greater risk of flooding[7].

Another piece of research conducted is by CSIRO (Eastham et al, 2008), which reviewed A1B scenario data from AGCM models that were used in the Inter-Governmental Panel on Climate Change's (IPCC) Fourth Assessment Report. Following statistical analysis, 11 AGMCs1 were selected to assess the impact of climate change in agriculture and hydrological systems of the LMBs for the 2030s. The results demonstrate that there is a significant variation between models with respect to rainfall projections. However in general most models concur in forecasting increased precipitation in early August, and a greater amount of precipitation especially in the late wet season[8].

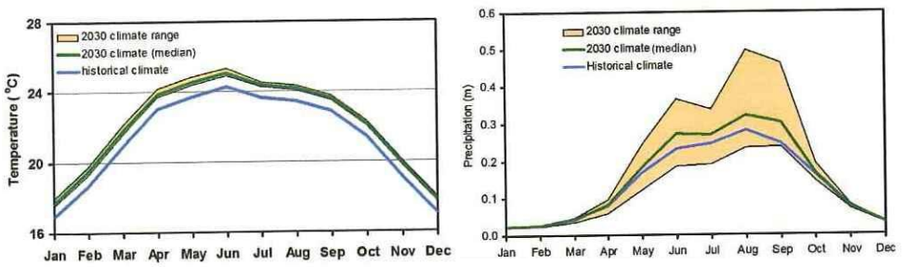
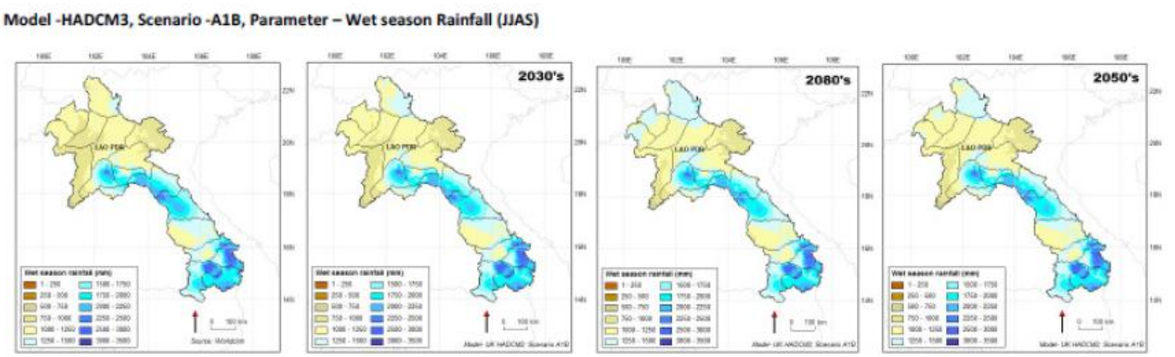


Figure 9: Change in Mean Monthly Precipitation in the Mekong Basin (source: Eastham et al, 2008)

Finally, the study conducted by the Water and Development Research Group (Helsinki, Finland) and the SEA START[9] using the regional climate model PRECIS (Providing Regional Climates for Impact Studies, UK Met Office) shows that the amount of rainfall is likely to increase in the north-eastern, central and southern parts of Lao PDR. The mean temperature is also likely to increase about 1-2 degree Celsius (see Figure below).



[7] Kiem, A.S., Ishidaira, H., Hapuarachchi, H.P., Zhou, M.C., Hirabayashi, Y., and K. Takeuchi, 2008. *Future hydroclimatology of the Mekong River basin simulated using the high-resolution Japan Meteorological Agency (JMA) AGCM.* HYDROLOGICAL PROCESSES. **22,** 1382–1394.

[8] The World Bank & Department of Water Resource of MoNRE Thailand, May 2011., *Hydro Agronomic Economic (HAE) Model for Mekong River Basin and Local Adaptation in Thailand Annex II- Climate Change Modeling*, Mott MacDonald Limited, Bangkok, Thailand

[9] TKK & SEA START RC 2009., "Water and Climate Change in the Lower Mekong Basin: Diagnosis & recommendations for adaptation", Water and Development Research Group, Helsinki University of Technology (TKK), and Southeast Asia START Regional Center (SEA START RC), Chulalongkorn University in *Water & Development Publications*, Helsinki University of Technology, Espoo, Finland. p 71.

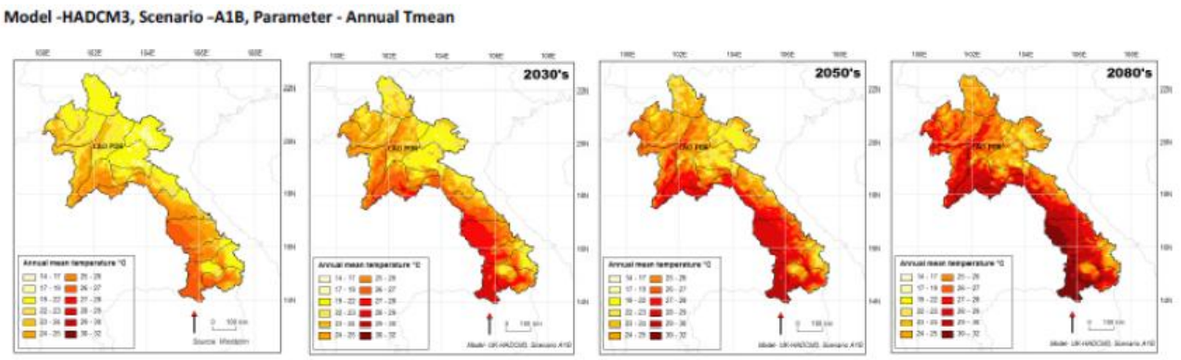


Figure 10: Climate Projection (Precipitation and mean temperature) for Lao PDR in 2030s, 2050s and 2080s
(Source: TKK & SEA START RC, 2009)

The Water Resource and Environmental Research Institute (WERI) within the Ministry of Natural Resources and Environment (MoNRE), with World Bank support, is conducting a high resolution climate change scenario using downscaling method such as PRECIS for the Xe Bang Fai River Basin, under a project called *Hydro-Agronomic and Economic (HAE) Model and Local Adaptation in Northeastern Thailand and Lao PDR*. The HAE model for the Xe Bang Fai River Basin is expected to be completed by the end of 2012.

Overall Damage, Loss and Needs Quantification Methodology

Although the UN Economic and Social Commission for Latin America (ECLAC) Methodology provides standardised tools for the conduct of Damage, Loss and Needs Assessments, international good practices and experts agree that the methodology needs to be flexibly applied to each country situation, and to the type and scale of each given natural disaster. In the case of the Laos Haima assessment, the methodology has been adapted to maximise conformity to the country context. Accordingly, the damage and needs assessment sector guidance developed by the Ministry of Planning and Investment (MPI) with support from the Asian Disaster Preparedness Center (ADPC) formed the basis of the quantification methodology, while also incorporating data collection templates and good practices from the Ketsana assessment.

Arrangements and Process for Data Collection and Validation – A multi-pronged approach towards damage determination, classification, collation, quantification and validation was developed and implemented, entailing: (a) development of customised and criteria-based sector templates for collection, collation and classification[10] of secondary damage data, allowing for simultaneous damage dis-aggregation at district level and re-aggregation at provincial level, thus allowing room for later data validation at various levels and using various techniques; (b) the setting up of a central Disaster Needs Assessment (DNA) Data Team for data cleaning, filtering and collation functions and ; (c) rapid mobilisation of sector teams including members from government and development partners, in all provincial headquarters, for data procurement and for extending support to provincial government departments in template-based consistent data collection.

[10] Such as standardised facility and infrastructure classification and damage classification into categories of partial damage and full destruction.

Damage and Loss Validation and Quantification Methodology:

Damage and Loss Quantification – Damage and loss quantification was carried out broadly using the UN ECLAC methodology. Direct damage is quantified according to the *cost of replacement* of damaged assets by items presenting the same original characteristics and design, and without deducting the asset's depreciation due to usage or tear and wear. Losses have been calculated as changes in economic flows caused by the disaster and have been measured in monetary terms at current prices. For example, these include unexpected expenditures such as temporary shelters and temporary schools facilities, higher operational costs and lower revenues in the provision of services, etc. Losses are often based on sector-specific assumptions over the length of the recovery period. Damage and losses have been further split across public and private sectors to assist in macro-economic analysis and to guide the development of public sector recovery strategies that optimally also take into account the recovery of private sector assets and services.

Geographic Scope, Limitations and Cut Off Period for Damage and Loss Inclusion – The geographic scope of this assessment is limited to areas significantly affected by Typhoon Haima only, and to damage caused by heavy flooding and flash floods; any progressive flooding due to regular rainfall and other events due to constant hazards are not accounted for in this assessment. It is therefore proposed that the Government should account for any continuous flooding or progressive flooding of new areas (e.g. as a result of Nock-ten) during the course of the monsoon period, by either applying reasonable additional damage allowances/factors to the currently assessed damage and losses, or should continue to conduct similar assessments in other areas that are reportedly at risk of being affected by further flooding.

Damage Validation for this Assessment: Damage validation for this JDLNA has required: (a) upfront data validation through desk review and detailed analysis of pre-disaster asset and infrastructure baseline data by the sector teams; (b) provision of inventory-based post-disaster damage data by the provincial governments; (c) analytical validation of damage data by sector teams, employing techniques and plausibility checks such as relative-to-baseline analyses, cross-sectoral and cross-district comparisons of relative damage (percentage), disaggregated analysis at various levels, comparisons across vertical and horizontal streams of district and provincial data; and (d) limited, sample based physical validation through visits by the sector teams.

Needs Quantification – Reconstruction needs have been calculated using the replacement value of assets and infrastructure, with the inclusion of building back better (BBB), limited relocation provisions, and longer term disaster risk management factors. The principle of BBB has been selectively and differentially applied across sectors and within sectors to ensure a cost-optimised reconstruction approach – one that provides adequate disaster resilience in high-risk areas, depending on their relative hazard exposure and vulnerability. Accordingly, unit rates for reconstruction across the sectors were determined through an analysis of: (a) typical pre-disaster building designs for various public and private sector facilities and assets; (b) regular schedules of rates collected from provincial governments, and; (c) additional or strengthened structural elements into the building designs.

Guiding Principles of the Needs Assessment and Recovery Strategy

Effective and comprehensive recovery requires a common framework to be adopted by all organisations and institutions involved, to ensure speed, consistency and equity across recovery and reconstruction efforts. The following guiding principles outline key considerations for planning and implementing early recovery and reconstruction activities, in line with global good practices. The JDLNA team has used these principles as a basis for its needs assessments and proposed reconstruction strategies for various sectors.

- ***Rapid rebuilding of people's livelihoods.*** Accelerate the revitalisation of the local economy – there is a critical need for an early revival of production, trade and the creation of income and employment opportunities in support of people's own initiatives. The Government of Lao PDR needs to take an informed decision, while cognisant of its resource constraints, as to the extent of private sector recovery that it is willing either to support directly, or at the minimum to facilitate through creating conditions conducive for quicker and effective recovery. Direct and indirect measures, that also form the basic premise on which certain sector strategies and needs assessments have been based (such as agriculture and housing), include possibilities of subsidies and incentives for livelihoods regeneration and revival of trade and commerce. An example would be the relaxation of existing agricultural loans, and increased access to additional ones.

- ***Community Inclusion and Use of Local Knowledge and Skills.*** This ensures the optimal use of local initiatives, resources and capacities. Planning and execution is based on local knowledge, skills, materials and methods, and enterprises, taking into account the need for affordable solutions. This principle further promotes community participation in all aspects of the recovery process and partner with local institutions. It encourages decision-making concerning planning, design and implementation at the lowest level possible, to ensure community ownership and empowerment, and to ensure solutions are locally appropriate.

- ***Focus on the most vulnerable and socially disadvantaged groups such as children, women, and the disabled.*** Disasters increase the vulnerability of all, but especially of those who are already disadvantaged. Recovery programming needs to give priority to the most vulnerable groups, including female-headed households, children and orphans, and the poor, and take into account those with special needs, to avoid their being overlooked.

- ***Secure development gains – while differentiating between regular development and disaster recovery.*** Recovery planning must attempt to re-establish and secure previous development gains, and areas not affected by the disaster should not lose out due to increased allocation of public resources to the disaster-affected areas. It must however be noted that while disaster recovery provides opportunities for improving the disaster resilience of affected infrastructure and assets, it should not include improvements or enhancements that fall under the purview of regular development. Sector strategies proposed in this report are essentially based on this dual principle of "building upon existing development gains but not through recovery interventions that overlap with already planned or proposed development activities". Sector damage estimates and strategies must also, if possible, take into account any major setbacks in pre-disaster progress achieved towards the respective sector MDGs, and propose measures for bridging such gaps in the course of regular development.

- ***Building Back Better and Longer Term Disaster Risk Management.*** While avoiding radical redesigning and restructuring, there is a need to ensure that realistic building back better measures are considered in the

design of infrastructure to be rebuilt. This report attempts to propose building back better measures in each sector, while being cognisant of possible resource shortfalls for the recovery process. Accordingly, longer term and potentially costlier disaster risk management interventions are included but accounted for separately in each of the sector needs assessments.

- ***Coordinated and coherent approaches to recovery.*** Ensure full and effective coordination among all involved agencies based on comprehensive information exchange, flexibility in administrative procedures, and uniformity of policies. Furthermore, future development planning and activities in the affected areas need to ensure that they complement and build upon the proposed reconstruction activities such as through sustained and improved standards of construction.

- ***Restoring capacities to manage the recovery process.*** The capacity of local public administration, including infrastructure, must be rebuilt. Along with local and national institutions, encourage and empower all levels of civil society to participate in and manage the recovery process. In this regard, the role of local governments needs to be given priority. It would also be important to mobilise private investment – both human and financial, by ensuring that the local private sector has incentives and technology to participate fully in reconstruction.

- ***Transparency and accountability.*** Achieve transparency through open processes and wide dissemination of information on all aspects of the recovery process.

Recovery Framework, Monitoring and Evaluation

Implementation arrangement and monitoring

Institutional oversight of the implementation of the recovery plan is proposed through the National Disaster Management Committee (NDMC) chaired by a Deputy Prime Minister from the Ministry of Defence and comprised high ranking authorities from MPI, NDMO, Ministry of Finance (MoF) and sector ministries concerned. The NDMC will meet twice a year to follow up on the implementation of the recovery plan.

There can be different sources of funding for the recovery, including government budget, development partner's funds, private sector and community resources. Different development partners may finance the recovery plan for different sector either through ongoing projects or new projects, following financing instruments agreed with the government. Through these instruments, development partners may provide support directly to the sector ministries or provinces and districts.

Meanwhile, based on request from sector ministries, provinces, and districts, MPI will prepare budget allocation and submit it to the Government for approval accordingly. In this regards, in order to optimise and to avoid any overlap in resources from government and development partners, MPI, in collaboration with NDMO, will be responsible for coordination and monitoring the implementation of the recovery plan for all sectors.

The recovery plan for each sector will be implemented by the relevant Ministries and its offices at provincial level. Sector ministries will be responsible for planning, monitoring, preparing the report, providing technical assistance, training, and liaison with donors and MPI, while the actual implementation will be carried out by

provincial departments, who will be in charge of planning, procuring, implementing, supervising and accounting for civil works.

At provincial level, Provincial Disaster Management Committees (PDMC) will be responsible for the coordination and for monitoring the implementation of the recovery plan implemented by sector departments. PDMC will report to the NDMC and MPI. The sector departments will report to PDMC and their respective sector ministries (see Figure 11 below).

Districts and communities will be involved in the process of the implementation of the plan.

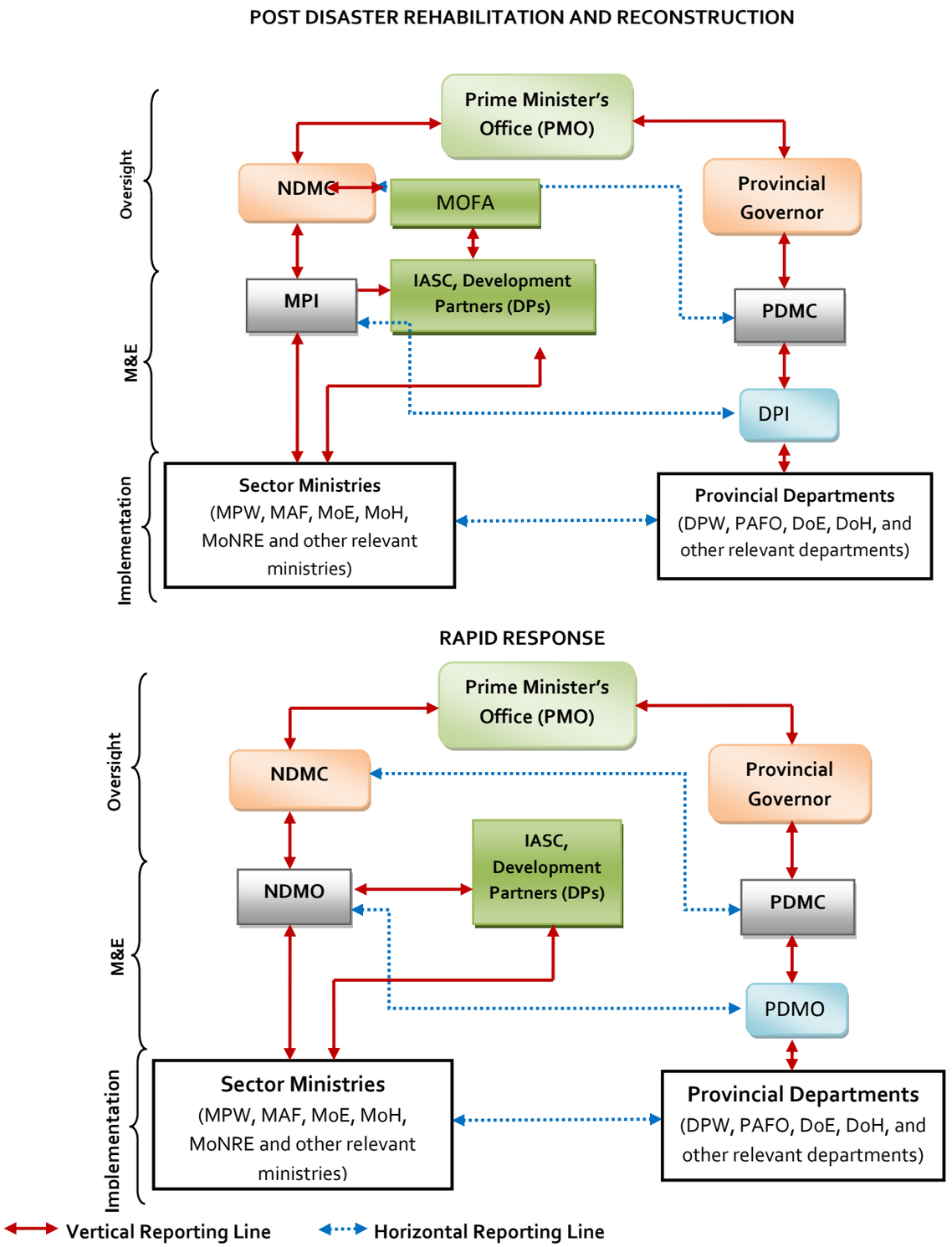


Figure 7: Proposed Institutional Reporting Framework for Post Disaster Rehabilitation and Reconstruction, and Rapid Response

Government procurement guidelines and the financial management (FM) system will be applied, including with regards to financial reporting, arrangement of audit, and accounting procedures. Each provincial department will operate the FM system, and transfer accounting details to the disbursement division of each sector ministry on a monthly basis, who will subsequently report to donors, and to the Department of Planning of the MPI.

The Environmental and social safeguards of the recovery plan implementation will be managed by provincial and sector ministries, and will be monitored by Environmental Offices at provincial level and the Environmental Impact Assessment (EIA) department of the Ministry of Natural Resource and Environment (MoNRE).

There is a need for further development of strategic implementation plans, distribution mechanism, sector and inter-sector coordination, monitoring activities and finally, a solid financial planning schedule, including the following tasks. For many of these tasks, technical assistance is needed, given limited national capacity; capacity building is of the highest importance.

- Take stock of the resources available:
- in the short-term (emergency needs, i.e., the next six months)
- in the medium-term (in the next 24 month – recovery needs for sectors)
- Ensure smooth transition from short-term (emergency, humanitarian needs) to medium-term recovery needs, according to sectors, 'clusters' and affected district priorities
- Establish a financial planning schedule of resources available, including government and donors resources, for emergency aid and recovery needs
- Put into place a coordination mechanism to ensure synergy of efforts and resource use
- Prepare consequent work plans for each sector to avoid duplication and multiplication of decision-making centres, on the basis of prepared project proposals by provinces and/or sectors
- Define distribution mechanisms at provincial and district levels
- Establish a transparent supervising, monitoring and evaluation mechanism.

With regard to the longer-term needs (up-to-five years: disaster-resilient reconstruction, etc.), it would be addressed through mainstreaming of DRM into the implementation of the 7th National Socio-economic Development Plan (2011-2015).

Special attention and extensive support would be crucial for the many vulnerable ethnic communities in the affected districts to rehabilitate their damaged assets and restore their livelihood.

The rehabilitation of the basic rural infrastructure which was damaged (road access, irrigation schemes) needs to be completed, and the availability of agricultural input needs to be ensured, before the next planting season calls for special attention.

There is also a need for intensive technical training and follow-up hand-on assistance that will have to be provided by provincial and district offices (agriculture and forestry offices, public work and transport offices, etc.) to affected people, to enable them to build back their assets and their livelihood and to prepare themselves to cope with possible future natural calamities. This can only be done with active support from the donor community and through technical assistance. Technical assistance is also urgently needed in order to support the Government with coordination, financial planning, project preparation and monitoring.

Results-based Recovery Framework: As the general development community moves towards results-based frameworks for designing, implementing and evaluating its interventions, a similar push is needed for recovery

and reconstruction programs and projects in post-disaster settings. It is therefore proposed that the process of developing a 'recovery planning framework' is initiated immediately and through a consultative process that involves all key stakeholders, including various levels of government and international development partners. The recovery planning framework is proposed to be based on: (a) a clear articulation of priority needs in each sector, of which this assessment provides a very comprehensive picture; (b) the development of criteria for cross prioritisation across sectors, leading to the establishment of cross-sectoral priorities for action in immediate and medium term; (c) an indicative timeline for the implementation of priority interventions, and; (d) the development of key indicators for measuring physical progress, monitoring, and evaluating the performance and effectiveness of the proposed recovery interventions.

Results-based Oversight for Recovery: Developing and institutionalising a central system for monitoring and evaluating recovery performance will allow the government and development partners to react in real-time to fast-changing post-disaster settings. This will enable them to make mid-course corrections in programme design and implementation, and to reassess development outcomes as well the processes underlying them. Such a central oversight mechanism could be hosted and operationalised at the central MPI, through a dedicated recovery oversight unit, that is linked to similar units at the provincial level. Such a cell could also provide policy advice and guidance to sector line ministries that could relay similar guidance to their provincial counterparts. Based on such central policy principles and sector recovery strategies, provincial line departments who would normally be responsible for implementation in most sectors, could submit their implementation plans for review and approval at the central MPI level.

Monitoring of Intermediate Outcomes and Evaluation of End-Program Results: Central to the above approach would be the development and operationalisation of an overarching 'Results Framework (RF)' that strategically harmonises and integrates all the strategic pillars and areas of a reconstruction programme. The RF will help establish a more streamlined results chain by focusing on key results/outcomes and by measuring intermediate outcomes instead of outputs. Intermediate outcomes would be designed in this system to capture and track the intended changes as they begin to unfold or otherwise, and provide the tools not only for monitoring and evaluation, but importantly for controlling the process and pace of progress in achieving the desired results.

Multiple M&E Systems for Recovery: A central Results Framework or M&E system could be flexibly designed to simultaneously exist at the programme, sector and project levels, but effective and efficient M&E would require focusing on what needs to be essentially measured as opposed to trying to measure each and every project or output. M&E systems for recovery and reconstruction programmes can exist on many levels, and it is important to differentiate between them. These can be at the level of the overall national reconstruction program (which is by definition multi-sector and thus broad-based). At one level below, this can be done also at the sector level, encompassing all projects by all agencies covering one particular sector. Further down, an M&E system can also exist at the project level, covering individual projects. It is important to recognise that, at this level, not all projects need to be evaluated for impact, as it is often unfeasible to do so. Finally, M&E can be done at the level of beneficiary households, often by conducted household surveys. It is here that social impact assessment and participatory monitoring tools such as community scorecards can be utilised.

Participatory and Demand-Driven Grievance Mechanisms: Designing and putting in place participatory and demand-driven grievance redress mechanisms (GRMs) at the provincial and district levels would be critical to ensure the legitimacy and perceived success of the proposed reconstruction programmes. Such a mechanism

must not only include the process of tracking complaints and follow up solutions but should also provide real-time feedback and feed forward loops. Furthermore, the process should be able to provide valuable information to the project and sector teams to design risk mitigation strategies. It is also important to highlight that the nature of a participatory grievance redress mechanism at the project level will be quite different from one at the level of the overall reconstruction programme. In fact, designing such a mechanism at the project level should be a priority for any reconstruction effort as it will be used by direct project beneficiaries and become a crucial part in measuring the performance and impact of the project.

Gender

The disaster assessment process provided a number of clear messages with regard to gender:

a) Sex disaggregated data is not always available, nor is baseline data available in some areas. In others, local staff need assistance with regular data entry, and to have a better understanding of why it is important. This in turn requires feedback to the field regarding the results of any data collection and information, and regarding how data can be used in forward planning;

b) To ensure that women's needs are adequately recognised, teams need to use a combination of methods including holding separate meetings with men and women, ensuring that disaster assessment and relief teams are composed of both men and women, and when combined meetings are held, ensuring that both men and women can put forward views (as often men will answer 'for' women). Seeking the views of the Lao Women's Union (LWU) and any local women's groups/NGOs is also important.

c) Pregnant and lactating women have particular additional nutritional and health care needs following disasters, as do frail aged men and women and those with disabilities, which means it is more complicated for them to access appropriate food supplies and health care, and to meet their daily needs.

d) Women are often the ones responsible for rice planting, and have particular problems following floods (as do men in the same situation) when their crops are wiped out, because they suddenly find themselves unable to repay the loans they need to buy rice seeds, and government supplies are insufficient. Consideration could be given to increasing government supplies of rice seeds, making arrangements for extended loan periods, and/or developing a form of disaster insurance to cover such situations.

e) Following a disaster, it is important to ensure schools should be functioning again, and to have some temporary child care for younger children so that their parents can attend to immediate requirements.

f) Access to clean water is an issue for both men and women, so sufficient supplies of chlorine tablets and similar items should be maintained, with priority being given to those who have particular health needs (pregnant and lactating women, the frail aged, and young children). Leadership by senior women (such as female governors and vice governors) can encourage women to think more widely of income generation opportunities, and can also help ensure that opportunities that arise are allocated equitably between men and women.

In areas where women may be tempted after a disaster to travel to neighbouring countries to earn money (which can lead them into sexual exploitation and health risks), the government may consider providing special temporary relief (to avoid longer term problems and costs) and/or to have a special package of information available to inform women (and others) of the risks, of their rights, and ways in which they can protect themselves.

g) Districts should be encouraged to develop disaster relief plans, in advance of the next disaster, and local communities and both men and women should be encouraged to participate in their development, so that a broad range of ideas can be considered.

SECTION III: ANNEXES

Housing

Summary of damage, losses and needs in the housing sector

	Damage	Losses	Recovery Needs and Reconstruction Needs		
			Short term	Medium term	Long term
Kip	11,262,806,097	7,500,000	n/a	3,552,119,413	Minimum 5,280,000,000
USD	1,407,851	938	n/a	444,014	Minimum 660,000

Table 8: Summary of Damage, Losses and Needs in the Housing Sector

Housing Characteristics in Lao PDR

Based on the 2005 Census data, a typical house in the affected provinces has wooden floors, a mixture of wooden and bamboo walls, and mostly zinc or at times grass roofs. The proportion of semi-permanent housing (made of bamboo, plywood and grass) varies from about 2% in Xiengkhouang to about 17% in Vientiane. The average house size in the four provinces is 49 m^2, varying from 44m^2 in Vientiane to 54 m^2 in Xiengkhouang. Many wooden houses are raised at 2.5 – 3.0m above the ground. Typically, an average household in Lao PDR comprises of 5.9 persons, according to the 2005 Census. This varies between a maximum of 6.4 for Xiengkhouang to a minimum of 5.4 for Xayaboury.

Floods Damage Overview and Analysis for Sector

	Damage (Kip)	Losses (KIP)
Xiengkhouang	**5,041,466,710**	
Paek	191,142,197	
Kham	165,363,555	
NongHed	498,873,832	
Khoun	2,154,121,448	
Thathom	755,048,185	
Mork	1,131,180,694	
Phakxay	145,736,798	
Xayaboury	**1,440,140,923**	**7,500,000**
Xayaboury	1,440,140,923	
Vientiane	**1,763,685,435**	
Tulakom	41,794,043	
Xaysomboon	1,721,891,392	
Bolikhamxay	**3,017,513,029**	
Bolikhan	3,017,513,029	
Total (KIP)	**11,262,806,097**	**7,500,000**
Total in USD	**1,407,851**	**938**

Table 9 Floods Damage and Losses in Regions

Overall Extent of Damage: The housing damage that occurred due to Typhoon Haima can be attributed to a combination of storm winds and rains, flash floods, and in some cases landslide. The overall effect of the disaster was relatively minor on the housing structures; most households that were flooded were able to recover by cleaning their house after the water had receded. 352 houses were reported as damaged, of which 77 (22%) were reported as completely destroyed and 275 (78%) partially damaged by local government officials[11] in the four affected provinces. Most housing damage seems to have been caused by location-based disadvantages such as houses built in river courses, or in landslide prone slopes and localities, as well as by poor construction.

Regional variations: Most of the damage to housing (44%) occurred in Xiengkhouang province (34 houses completely destroyed, 120 houses partially damaged); particularly in the Khoun, Mork and Thathom districts. In Xayaboury damage to housing was reported only in the Xayaboury district, and similarly in Bolikhamxay only in the Bolikhan district. In the Vientiane province most damage occurred in the Xaysomboon district, and particularly in the village of Nam-Ngone, which was heavily affected by a landslide.

Damage to household goods: Despite the relatively small number of housing units damaged by Typhoon Haima, a large proportion of households[12] suffered damage to their house contents, including house equipment, furniture, food supply and other machinery.

Losses: Very little actual losses were reported. Affected households were reported to be residing with relatives; only in Xayaboury province did the authorities provide a temporary shelter to the households whose house had been totally destroyed.

The total monetary toll to the housing sector – damage and losses combined – is estimated at 11.3 billion kip (USD 1.4 million), of which damage to housing structures accounts for 30% of the total sum and the cost of households assets accounts for 70% (see Table 11: Overview of Damage to Housing Sector). Please refer to the damage quantification process below.

Humanitarian/Social impact

Based on the field visits, it is evident that the impact of the Typhoon Haima on the affected people was devastating, particularly when considering the damage to their houses and household items together with the damage to their rice stocks and this year's crops. Many affected households are temporarily residing with relatives who are living in the same village, or have built temporary houses. There was no evidence or available information regarding the relocation of affected households to other villages; although in some cases authorities mentioned that some of the affected villages were due to be relocated in the future.

[11] MPWT or MoLSF

[12] There is evidence that houses that may not have been classified as damaged may still have incurred damage, in the form of damage to household assets. Normally a housing assessment would use the universe of damaged houses to estimate the damage to household assets. However the PDNA methodology allows the accounting for damage to household assets in houses not otherwise classified as damaged. To take stock of such affected houses, on which no concrete data is available, we have multiplied the number of damaged houses by a factor of 7, based on an average of the ratio of flooded/damaged houses from two provinces.

Needs, Proposed Sectoral Recovery and Reconstruction Strategies

	Recovery and Reconstruction		
	Short-term (Kip)	**Medium-term (Kip)**	**Long-term (Kip)**
Emergency supplies, inc. temporary housing materials and household items	Not estimated		
Housing reconstruction (a good practice option based on global experience): Financial grant		2,486,483,589	
Housing reconstruction (a good practice option based on global experience): In-kind assistance		1,065,635,824 (in-kind equivalent)	
Building Back Better (BBB)			5,280,000,000
Capacity building in the housing sector			Not estimated yet
Mapping low-land/disaster prone areas			Not estimated yet
Awareness raising and relocation of highly vulnerable communities/houses			Not estimated yet
Total (kip)		**3,552,119,413**	**5,280,000,000**
Total (USD)		**444,014**	**660,000**

Table 10: Needs for Recovery and Reconstruction Strategies

Short term needs: In all four provinces the local authorities have already provided some assistance to the affected households, mostly in the form of rice provisions, but in some cases also through the provision of housing construction materials (such as nails). Whilst many affected people have already moved to temporary housing (mostly self-financed) or repaired their damaged houses, there will be many households in need of further assistance in terms of housing reconstruction materials, including wood, roofing and tools. Based on the field visits, there is also an urgent need to provide everyday household items to affected people, as many households lost a significant proportion of their household contents and assets in the floods.

Medium to Long Term needs:

a) **Housing Reconstruction:** A good practice option based on global experience of housing reconstruction is a combination of financial and in-kind grants (see Table 12: Housing Needs Estimate). In-kind grants would consist in the provision of materials available locally at no or low cost, such as wood and gravel, as well as land provisions.

It is expected that the communities would contribute labour in the reconstruction process. Meanwhile, the financial input required is estimated at 2.5 billion Kip (USD 310,810)[13].

b) Building Back Better: Capacity building of public sector and communities, and analytical work on affordable Building Back Better (BBB), will be conducted across key public sectors with a stake in infrastructure, including housing, transport, health, agriculture. This will include pilot BBB projects in 2 or 3 districts. The cost required for implementation is estimated at USD 660,000.

c) Capacity building in the housing sector: There is a need for building capacity at government institution as well as at community level in the field of disaster-resilient housing construction. This also includes drafting guidelines on early warning systems, safe houses and other disaster risk reduction activities.[14] Further dialogue with the communities on DRR measures specifically tailored to their situation is required.

d) Mapping low-land/disaster prone areas: A detailed risk mapping exercise will be undertaken. Any future land allocations for housing should be carefully mapped against the risk of a natural disaster in the area.

e) Awareness raising and relocation of highly vulnerable communities/houses: Any community/house located in a high risk area needs to be made aware of the associated risks. Relocation of vulnerable buildings/facilities within the village to less hazardous locations as well as any potential relocation of vulnerable communities or households should be undertaken in close consultation with the affected people of both genders.

Province / *Affected District*	# houses (baseline)	# houses flooded	# houses Completely Destroyed (CD)	# Partially Damaged (PD)	% CD & PD Houses	Replacement Value of CD and PD Houses (KIP)	Cost of Household Assets (KIP)	Losses (temporary shelter) (KIP)	Total damage and losses (KIP)
Xiengkhouang	37,192	796	34	120	0.41%	1,587,094,273	3,454,372,437		
Paek	12,780		1	5	0.0%	58,064,425	133,077,772		
Kham	7592		3	1	0.1%	65,806,348	99,557,207		
NongHed	5247		2	14	0.3%	147,096,542	351,777,290		
Khoun	5158		7	63	1.4%	623,224,824	1,530,896,624		
Thathom	2376		7	15	0.9%	251,612,507	503,435,678		
Mork	1847		14	17	1.7%	402,580,011	728,600,683		
Phaxay	2192		0	5	0.2%	38,709,616	107,027,182		
Xayaboury	12,610	540	3	46	0.39%	377,339,079	1,062,801,844	7,500,000	
Xayaboury	12610		3	46	0.4%	377,339,079	1,062,801,844	7,500,000	
Vientiane	15,214	n/a	19	35	0.35%	519,533,945	1,244,151,490		
Tulakom	10886		1	0	0.0%	15,743,453	26,050,590		
Xaysomboon	4328		18	35	1.2%	503,790,493	1,218,100,899		
Bolikhamxay	6,999	n/a	21	74[15]	1.4%	883,930,054	2,133,582,975		
Bolikhan	6999		21	74	1.4%	883,930,054	2,133,582,975		
Total	72,015		77	275	0.49%	3,367,897,351	7,894,908,746	7,500,000	11,270,306,097
Total in USD						420,987	986,864	938	1,408,788

Table 11: Overview of Damage to Housing Sector

[13] A cost estimation for housing reconstruction has been calculated based on a uniform subsidy to be provided for affected households whose houses were completely destroyed or partially damaged. For CD houses, the costs include a Build Back Better (BBB) provision, which is an additional 20% to the current average house replacement cost. This includes a provision for relocation costs.

[14] Needs b, c and d identified based on discussions with the Ministry of Public Works and Transports (MPWT) and UN-HABITAT. Estimation requires further research, and proposals can be developed upon request.

[15] Partially damaged houses in Bolikhamxay calculated using the (PD to CD) damage ratio in Xiengkhouang province, to make the damage classification criteria consistent. No numbers were available on partially damaged houses in Bolikhamxay.

Province	Housing reconstruction (a good practice option based on global experience)						BBB
	Construction of Houses by Building back Better & Uniform Subsidy: Completely Destroyed Houses		Construction of Houses by Building As Usual & Uniform Subsidy: Partially Destroyed Houses		Total CD and PD		Building Back Better
	Financial Grant (Kip)	In-kind Grand (Kip, equivalent value)	Financial Grant (Kip)	In-kind Grand (Kip, equivalent value)	Total Financial Grand (Kip)	Total In-kind grant (Kip, equivalent value)	
Xiengkhouang	501,111,407	214,762,031	589,542,831	252,661,213	1,090,654,238	467,423,245	
Xayaboury	44,215,712	18,949,591	225,991,419	96,853,465	270,207,131	115,803,056	
Vientiane	280,032,845	120,014,076	171,949,992	73,692,854	451,982,837	193,706,930	
Bolikhamxay	309,509,986	132,647,137	364,129,396	156,055,455	673,639,382	288,702,592	
Total (Kip)	**1,134,869,950**	**486,372,836**	**1,351,613,638**	**579,262,988**	**2,486,483,589**	**1,065,635,824**	
Total USD	141,859	60,797	168,952	72,408	310,810	133,204	660,000

Table 12: Housing Needs Estimate

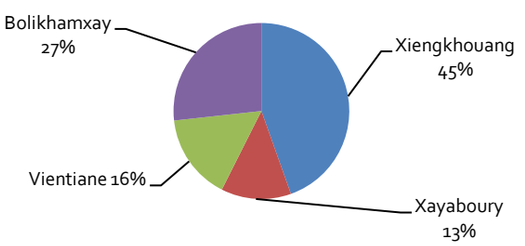


Figure 11: Proportion of Damage by Province

Damage Quantification Process for Housing

Collection, Validation & Rationalisation of Damage Data: Secondary data has been collected from provincial government officials in all four provinces. Qualitative data was collected through field visits to the affected villages. In most cases, data provided and officially notified by the provincial government entities has been taken as a starting point for damage analysis.

Housing Damage: For this analysis, the term 'Damage' refers to the monetary value of structural damage caused to housing by the floods. The damage cost for a typical house, ranging from 3.6 to 18 million kip, varies between the provinces, depending upon the severity of damage (partial or complete), the replacement cost of a typical house as provided by the provincial authorities, and the size of the house. Information on the extent of partial damage or house type was not available for most provinces, so these have not been factored in.

Using the aforementioned inputs, a detailed model based on UNECLAC's Damage and Loss Assessment methodology for calculating the value of the damage incurred to the housing stock was developed for the assessment. This model provided a control sheet with dynamic rates to estimate the unit damage cost for each area, based on the variable factors listed above.

These figures have then been used to determine the total value of damage to housing units that were completely destroyed. Damage to partially damaged houses, considered repairable, is assumed to be 40% of damage to an equivalent house that has been completely damaged.

Household Goods: In the case of a completely destroyed house, the value of household assets has been estimated to be around 40% of the actual cost of the housing unit. In the case of a partially destroyed house, the value of household assets has been estimated to be around 40% of the repair costs of the housing unit.

Temporary Shelter, Demolition & Debris Removal: Only Xayaboury province reported on having provided temporary shelters for households that had their houses totally destroyed.

Some Anecdotes and Picture Stories from the field

Floating houses: During a village consultation (Phonkham village, Kham district, Xiengkhouang province), a special feature of a local house design drew our attention, because it seemed it could have prevented damage to other houses, at least in that particular village. The houses which seemed particularly well equipped to face flooding were resting on stilts which were placed on concrete foundation stones, but their stilts were not fixed to those stones. When the flood began, those houses were lifted off the stones, and floated. After the water level went down, the houses that were displaced were lifted back onto their original place with the help of the military. When asked whether this shrewd design was intentional with flooding in mind, the villagers did not know – they simply followed the tradition.

Image 1: An example of a "floating house". ©UN-HABITAT

Image 2: Driving in Xiengkhouang, the assessment mission encountered a group of villagers moving a whole housing structure by hand. The house owner had decided to relocate his new house to a different part of the village that was less prone to flooding. ©UN-HABITAT

Recovery will take years: On a field trip to the village of Phonkham, in the Kham district, I spoke to one man who lost his house in the flood as a result of Typhoon Haima. At the moment he lives in a temporary hut that cost him 3 million kip to build. His community will provide in-kind assistance, but in order to reconstruct a house equivalent to his old one, he needs to save a minimum of 15 million kip. He wasn't able to estimate how long that would take him, apart from "many years".

Whole village flooded: The village of Kenjon in Bolikhan District, Bolikhamxay, is located in a valley close to the river. After three days of heavy rain, the whole village flooded eventually, and its residents were forced to evacuate to higher ground in the middle of the night. Most of them managed to take some possessions with them, except for some unfortunate families that were on their rice fields at the time and consequently lost everything. There are 56 households in the village, and according to Dee, a 40-year-old woman from the village, all of the houses suffered damage to some extent. Ten houses were destroyed completely. Many households have now moved to higher ground and live by the road near the old village, where they have constructed temporary shelters and new houses. They do not wish to return to the village as they are now scared of living by the river.

Image 3: A man showing the water level in the village of Kenjon. ©UN-HABITAT

Image 4: A house totally destroyed in the village of Kenjon. ©UN-HABITAT

Image 5: Reconstruction in process in the village of Kenjon. ©UN-HABITAT

Image 6: This family was at their rice field when their house in the village was flooded and destroyed. They lost all their belongings, and now live in a temporary shelter that has been constructed from materials donated by relatives and other community members. ©UN-HABITAT

Transport

Summary of findings: Typhoon Haima caused damage to some sections of national, provincial, and tertiary road networks, to bridges in Xiengkhouang, Xayaboury, Vientiane, and Bolikhamxay, as well as to river bank protection in Xayaboury and Bolikhamxay. The magnitude of the damage varies from province to province. Mountainous districts of the Xiengkhouang provinces and the Xaysomboun district of Vientiane are the most affected. The damage is estimated at USD 26.6 million.

Losses were mainly incurred in the form of higher vehicle operating costs, loss of revenue of the truck and bus operators during periods when roads were cut off, costs of clearing landslides, and emergency repair works on the damaged roads and bridges in order to restore traffic flow. Losses in tertiary roads and bridges are considered minimal, as the traffic volumes are so low. The losses are estimated at about USD 10.4 million. The total need for the recovery is estimated at USD 29.6 million.

Province	Damage	Losses			Recovery needs		
	Public	Public	Private	Total	Short term	Medium	total
Xiengkhouang	9,950,000	2,980,000	1,350,000	4,330,000	4,770,000	5,260,000	10,040,000
Xayaboury	3,250,000	1,440,000	260,000	1,700,000	2,420,000	4,360,000	6,790,000
Vientiane	10,360,000	3,300,000	1,020,000	4,320,000	5,270,000	4,770,000	10,040,000
Bolikhamxay	3,090,000		50,000	50,000	0.00	2,810,000	2,810,000
Total	**26,660,000**	**7,720,000**	**2,680,000**	**10,400,000**	**12,470,000**	**17,210,000**	**29,680,000**

Table 13: Summary of Damage and Losses in Transport (USD)

Sector Background

Road is the pre-dominant mode of transport in Lao PDR as well in the affected provinces, serving nearly 90 percent of total domestic transport, and carries crucial economic weight in the movement of goods and persons. The total length of road network in the four affected provinces is 12303 km, 15 % of which, mainly national road, is paved road and the remaining 85% is gravel and earth surface road. Earth roads, and particularly district and rural roads, are not built according to engineering standards, which is one of the reasons for their difficult access during the rainy season. The road network varies from province to province, as shown in the table below.

Roads (km)	Xiengkhouang	Xayaboury	Vientiane	Bolikhamxay	Total
National Roads	750	527	607	510	**2394**
Provincial Roads	755	897	1114	608	**3374**
Tertiary	2260	1531	1832	912	**6535**
Total	**3765**	**2955**	**3553**	**2030**	**12303**

Table 14: Total Road Network in Four Affected Provinces, km

Road network has been classified based on its functionality. The national road is the road connecting the capital Vientiane to provincial centres and international border check points, while provincial roads connect provincial centres with district centres, district roads connect district centres to cluster of villages (Kumban) and rural roads connect cluster of villages to villages and farms. To simplify this typology, in this report, roads that are neither

national nor provincial are grouped under the category 'tertiary roads'. The Ministry of Public Works and Transport (MPWT) is responsible for managing the road network, but has increasingly delegated the responsibility of the implementation of road planning, contract management for road construction, and maintenance of provincial road and tertiary roads to its provincial branches, the Department of Public Works and Transport (DPWT).. The transportation sector relies on privately owned operators.

1. Damage assessment

Typhoon Haima's effects on the transport sector were largely confined to the road system, including road pavement structures, drainage systems, bridges, culverts, and river bank protection. Partial damage has affected a total length of 3415 km of road in the four provinces. The road network in Xiengkhoung and Vientiane is the most affected. The geographic characteristics of part of those provinces - which include hilly landscapes - mean that the road network is built along valleys, and follows their uneven topographic features. These two provinces suffered from both landslide and flash floods. Xayaboury and Borikhamxay have mainly suffered from flooding. The damage to the roads in these two provinces is mainly on road surface, drainage, culverts and river bank protection.

Roads	Xiengkhouang	Xayaboury	Vientiane	Bolikhamxay	Total
National Roads	498	90	223	0	**811**
Provincial Roads	309	396	155	166	**1026**
Tertiary	857	248	201	272	**1578**
Total	**1664**	**734**	**579**	**438**	**3415**

Table 15: Total km of Road Network in Four Affected Provinces with Partial Damage

The unit price of MPWT prepared in July 2009, which is USD 150000 per Km for double surface treatment road, 25000 USD per KM for gravel roads, has been used to estimate damage and need . As the magnitude of damage varies between different road sections, different coefficients of road damage have been applied for the estimation of damage and needs.

The typology of damage was reconfirmed after the assessment by surveys conducted by the Provincial Department of Public Works and Transport (DPWT) that differentiated and classified various types of damage, such as full and partial, and accordingly adjusted needs where required. It is recommended that future post disaster assessment use such differential damage classification.

The damage has caused some districts and villages to become completely disconnected from the road network at time of the floods, and many villages still have difficulty accessing the main road, which is a constraint for the transportation of food and other necessary supplies to the affected people.

In Xiengkhouang, several sections of paved road No 7, which is the main road connecting Xiengkhouang to Vietnam, were damaged due to landslides, floods and damage to the road embankment. Many provincial road sections were also damaged by floods, with 19 suspension bridges broken. 44% of the total road network in the province has been partially affected.

In Xayaboury, the most affected area is in the Xayaboury district, which is located along river Nam Houng that runs through the middle of Xayaboury town. The district has suffered from flooding almost every year over the last five years. The floods have come along with sediments that have been deposed at the bottom of Nam Houng, and have caused the riverbed to become shallow, thus reducing the space for river water and making it more prone to flood. 25% of the road network was partially damaged and 120 m of river bank protection was also damaged by the flood. Some section of river bank also suffered from erosion and need protection.

Figure 12: A completely damaged bridge in Xiengkhouang Province

The Vientiane province has two types of geographical conditions: hilly and flat. The hilly district suffered most from the typhoon, as continuous heavy rain for several days caused soil dilution and landslides. The road network has been damaged by landslide and damage to the road embankment. Districts in flat areas have also suffered from the floods, but the magnitude of damage is inferior to that in hilly districts.

The nature of damage to the Bolikhamxay road network is similar to that in the districts of Vientiane and Xayaboury which are located in the flat areas. Most of damage was incurred by district and rural roads. The river banks of river Namsan, in the Pakxan district, also suffered from erosion and urgently need protection. 22% of the road network has been partially damaged.

Damage and losses in Billion Kip					Damage and losses in USD			
Province	**Damage**	**Losses**			**Damage**	**Losses**		
	Public	**Public**	**Private**	**Total**	**Public**	**Public**	**Private**	**Total**
Xiengkhouang	79.60	23.82	10.78	**34.61**	9,950,000	2,980,000	1,350,000	**4,330,000**
Xayaboury	26.01	11.50	2.12	**13.62**	3,250,000	1,440,000	260,000	**1,700,000**
Vientiane	82.92	26.42	8.15	**34.57**	10,360,000	3,300,000	1,020,000	**4,320,000**
Bolikhamxay	24.72		0.37	**0.75**	3,090,000		50,000	**90,000**
Total	**213.25**	**62.12**	**21.43**	**83.55**	**26,660,000**	**7,760,000**	**2,680,000**	**10,440,000**

Table 16: Damage and Losses for Public and Private Transport

Loss Assessment

Losses to the transport sector include higher vehicle operating cost, reduced volumes of goods and passengers transported, and the interruption of transport services during the flood due to periods when the road was impracticable, which affected the revenues of truck and bus operators. In addition, the losses also include the costs of the reestablishment of practicable traffic conditions during the disaster through emergency maintenance. These include the clearing of landslides, the temporary diversion of roads, and the building of temporary bridges.

4. Preliminary Recommendations for Needs

Needs identified on the basis of losses should focus on resumption of the population's normal activities. This means emergency interventions should quickly restore good traffic conditions (treatment of problematic

sections of road that complicate traffic, removal of earth and rocks, reconstruction of collapsed bridges, etc.) in order to diminish further losses. Gradual improvements in the stricken areas will reduce the burdensome travel times caused by road damage.

The estimated need has been revised downwards from what was proposed by provincial governments for the following reasons: (i) part of the proposed repair works should be classified as part of regular maintenance activities, (ii) based on field visits, the assessment team observed that the estimated needs had been overrated.

Figure 13: A section of road that was washed away in Xiengkhouang Province

Given the urgent need for repair and the considerable amount of resources needed to restore the road network back to normal condition, the recovery plan should be divided into two phases: (i) short term recovery, and (ii) Medium to longer term.

(i)Short term: this will include the emergency maintenance and fixing of the damaged roads and bridges, carrying out emergency maintenance of critical sections of the road network, so that the traffic flow can be restored to normal condition and emergency support can reach the victim.

(ii) Medium term: this will include periodic maintenance and rehabilitation, following MPWT's maintenance procedures, and would require six month to two years of implementation. A Build Back Better approach should be taken into account in designing maintenance and rehabilitation operations, so that roads and bridges can withstand future floods, especially for the most critical or the most vulnerable structures or segments of road, that are most exposed to recurring floods. This could include additional embankment protection, raised embankment, improved/paved shoulders, improved drainage, and improved pavement structure.

Province	Recovery needs in billion Kip			Recovery needs in USD		
	Short term	Medium	Total	Short term	Medium	Total
Xiengkhouang	38.19	42.11	**80.30**	4,770,000	5,260,000	**10,040,000**
Xayaboury	19.40	34.90	**53.71**	2,420,000	4,360,000	**6,780,000**
Vientiane	42.15	38.19	**80.35**	5,270,000	4,770,000	**10,040,000**
Bolikhamxay	0.00	22.51	**22.51**	0	2,810,000	**2,810,000**
Total	**99.74**	**137.71**	**236.86**	**12,460,000**	**17,210,000**	**29,680,000**

Table 17: Transport Recovery Needs in Short and Medium Term

Given that the capacity of Department of Public Work and Transport (DPWT) at provincial level in managing the reconstruction and local contractors has improved over the last five years, through the implementation of donor funded road projects and trainings, the provinces have the capacity to manage the maintenance and rehabilitation of the damaged roads. However, there may be a need for technical assistance to ensure the quality of the works.

Even under the normal circumstance, the country has experienced shortages of funds for the maintenance of its road network, particularly with regards to provincial and tertiary road networks. As such, financial support from development partners is crucial to fix the damage and to restore road connectivity in the affected provinces.

Needs in relation to risk reduction

These needs will be based on all the preventive measures to be taken in order to forestall disasters, among which information and awareness play an important part. Low quality of road construction and maintenance, inappropriate design, and inadequate budget allocation for road maintenance are also a root cause for severe damage to the road sector during natural disasters. Therefore, improving the road works quality, improving road design with sufficient drainage structure, and sufficient budget for road maintenance are crucial to minimise the impact cause by national disasters.

Other measures to be taken can be listed as follows: risk mapping including hydrological and geotechnical studies so as to outline sustainable technical options, preparing inventories of critical and vulnerable sections of the road network and bridges, improving technical standard specification, developing technical guidelines and designing manuals, and improving construction and maintenance oversight mechanism.

5. Socio-economic Impact

In general, the socioeconomic impact of the damage was felt mostly during the time when roads were cut off, except for districts and villages that remained isolated for several weeks after the typhoon.
Since the disaster, road access to these villages and districts has been nearly impossible. In some districts where road network was partially damaged, the movement of staple foods and passengers to the village, and of local produce out of the village, has been significantly reduced and more time-consuming.

For the transport sector, the damage had an impact on the balance of payments due to the increased volume of imports of equipment, fuel, and construction materials to replace destroyed infrastructure. Furthermore, traditional exports have shrunk as a result of production losses in the regions affected by the damage, especially agricultural produce such as rice, and other crops.

6. Disaster Risk Management

In some mountainous areas, serious erosion has increased. Erosion depends on local slopes, soil composition, rainfall patterns, land use, humidity, and vegetation. Overall erosion of the mountains will continue and even increase over time. Accordingly, the recommendation is to protect watersheds and thereby protect infrastructure, farm fields, and surrounding villages.

Technical assistance is needed to support MPWT in carrying out hazard mappings and preparing inventories of critical and vulnerable sections of road network and bridges, based upon which, it will be able to prepare a road improvement programme that can be implemented in longer term. Assistance should also include support to further improving technical standard specification and guidelines, and to designing manuals taking into account disaster resilience aspects. The training of engineers at MPWT, DMPWT, and district levels, and of consultants and contractors, on those improved standards and technical guidelines, should also be included in medium term needs.

As the quality of road construction and maintenance is a root cause of severe disaster damage, it is strongly recommended that MPWT should strengthen its mechanisms for quality control at both central and local level, and the control capacity of provincial and district authorities. In addition, adequate maintenance is also crucial to minimise disaster impact. The assessment team observed from the field visit that the damage to many road

sections had been exacerbated by insufficient or inexistent maintenance. To address this issue, it is strongly recommended that adequate budget should be allocated for road maintenance, and that contingency funds should be establish and operationalised, from which resources could be disbursed quickly to fix disaster damage.

MPWT and DPWT should set a framework for the implementation of a programme of improvement of critical roads and bridges, mobilising resources from road maintenance funds, development partners, and other sources. In Xayaboury, where flood has occurred every year since 2008, the planning of urban land use should be thoroughly reviewed. An urban development plan including urban drainage systems with water gates for river Nam Houng, river bank protection, and river Nam Houng dredging, needs to be established and implemented. Similarly, in several districts in Bolikhamxay, where flood has occurred very often, a holistic approach in addressing floods needs to be taken into account.

A large portion of material produced by erosion is transported by rivers. The sediments carried by rivers are responsible for sand deposits and flooding along the watercourse. The recommendation in this case is to implement a programme of intensified tracking of the sedimentation process, in order to measure the form of the riverbed and regularly check its level after each flood, analyse the size of the deposit and its composition based on samples, monitor surface runoff deposits, and measure deposit concentrations at monitoring stations during floods. The data will be used for morphological studies, with the ultimate objective to forecast future evolutions of the sedimentation process. These forecasts could then be used to estimate the corresponding adjustments needed for human activities.

To stop riverbank erosion or restore an eroded section, permanent bank protection would be an appropriate action. The type of protection will depend on the local situation.

Another significant aspect is to have spatial planning, through which provinces and districts will have better understanding on effective land use planning, and will be enabled to use it as a tool for pursuing area based development thanks to better collaboration and coordination among sectors, while minimising the impact of future natural disasters.

Electricity

Summary of findings: Overall, as is evident from the table below, the damages and losses caused to the electricity sector by Typhoon Haima were relatively modest from a national perspective. The impact was minimal on the production, import and export of electricity. However, the distribution network in the four provinces was affected, with several electrical poles, transformers, wiring, meters, etc., being damaged. Losses occurred due to temporary disruptions in service and due to the emergency repair that was undertaken. The losses were curtailed by prompt recovery efforts by the government. Although the sector was spared by Typhoon Haima, there are several initiatives that can be undertaken in the medium to long term, towards making it better prepared and become more resilient, given that electricity is a vital input to all other sectors and that the sector must prepare itself for future disasters.

	Damage			Losses			Needs
	Total	Public	Private	Total	Public	Private	Short Term
Kip	2,549,680,357	2,549,680,357	-	2,047,946,665	2,047,946,665	-	2,549,680,357
USD	318,710	318,710	-	255,993	255,993	-	318,710

Table 18: Damage, Losses and Needs for Electricity in Public and Private

Sector Background and Pre-disaster Situation: The primary authority for electricity in Laos is Electricité du Laos (EDL), a state-owned corporation under the Ministry for Energy and Mines which owns and operates the country's main generation, transmission and distribution assets, and manages electricity imports into its grids and exports from its stations. According to current EDL estimates, the percentage of households that have an electricity connection in Laos is *76.42%.* The percentage of households that have an electricity connection in the Xiengkhouang province is 66.4% (51.4 % of villages), in Xayaboury 73.4% (61.8 % of villages), in the Vientiane province 88.1% (94.6% of villages) and in Bolikhamxay 89.8% (80.19% of villages).

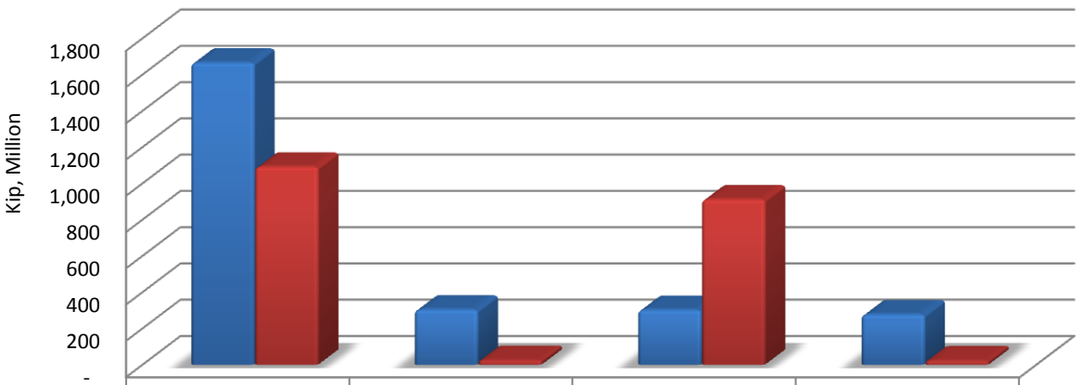
On a provincial level, the Xiengkhouang province receives most of its power from neighbouring provinces and from Vietnam. Xayaboury currently has small dams but imports most of its electricity from the Vientiane province and from Thailand. The Bolikhamxay province receives power from neighbouring provinces and from Thailand.

Province	Households				
	Total # of Households	Electrified Households			
		Total with Electricity	Grid	Solar	% of Electrified Households
XienKuoang	40,471	26,888	25,615	1,273	66.44%
Xayabouly	67,427	49,494	49,494	-	73.40%
Vientiane Pr.	85,581	75,474	74,241	1,233	88.19%
Bolikhamxay	43,697	39,246	38,828	418	89.81%

Province	Villages				
	Total # of Villages	Electrified Villages			
		Total with Electricity	Grid	Solar	% of Electrified Villages
XienKuoang	509	262	240	23	51.47%
Xayabouly	446	276	276	-	61.88%
Vientiane Pr.	502	475	445	30	94.62%
Bolikhamxay	323	259	250	9	80.19%

Table 19: Households and Villages with Electricity

Damage and Loss Assessment: As is evident from the graph below, Xiengkhouang was the most affected province with respect to damage and losses, followed by the Vientiane province, which suffered more losses than damage.



	XienKuoang	Xayabouly	Vientiane Pr.	Bolikhamxay
Damages	1,666,107,500	303,963,333	302,334,000	277,275,525
Losses	1,092,246,750	23,173,183	912,000,000	20,526,732

Figure 14: Damage and Losses by Province

Xiengkhouang – The total damage in Xiengkhouang amounted to 1,666,107,500 kip (USD 208,263) and losses to 1,092,246,750 kip (USD 136,531). Seven of the eight (88%) districts in this province were affected namely Paek, Kham, Nonghaed, Khoun, Phaxay, Mok and Thathom, with Khoun and Thathom being affected the most. In both Khoun and Thathom, the reason for a larger damage cost is that one high voltage pole (115 KV in each district was damaged requiring emergency repair (loss).

Xayaboury - The total damage in Xayaboury amounted to 303,963,333 kip (USD 37,995) and losses to 23,173,183 kip (USD 2,897). Most of the damage occurred to electrical poles, wiring and meters while the losses are essentially a function of the revenue lost as a result of disruptions in service in 18 villages, which lasted between 36 hours to 6 days.

Vientiane Province - The total damage in the Vientiane Province amounted to 302,334,000 kip (USD 37,792) and losses to 912,000,000 kip (USD 114,000). Four out of thirteen (31%) districts, namely Hinherb, Hom, Thoulakhom and Xaysomboun were affected. Losses occurred as a result of a service disruptions and a small drop in demand immediately after the disaster and the higher amounts of losses could be explained by the presence of mines in this province. Nam Ngum dam in the Vientiane province was not affected - which could have caused major disruptions. Vientiane province also has Nan Ngum 2, a major endeavour under construction, which, according to local sources faced minor disruptions due to landslides and erosion as a result of the typhoon.

Bolikhamxay - The total damage in Bolikhamxay amounted to 277,275,525 kip (USD 34,659) and losses to 20,526,732 kip (USD 2,566). Four out of seven (57%) districts were affected - Bolikhan, Thaphabat, Khakere and Viengthong. As in the case of the Vientiane province, losses occurred as a result of service disruption and a small drop in demand immediately after the disaster.
Overall, macroeconomic losses due to electricity disruptions have not been strongly felt.

Preliminary Recommendations for Needs:

Short Term Recovery Needs by Province		
Province	**Kip**	**USD**
Xiengkhouang	1,666,107,500	208,263
Xayaboury	303,963,333	37,995
Vientiane Pr.	302,334,000	37,792
Bolikhamxay	277,275,525	34,659
Total	**2,549,680,357**	**318,710**

Figure 15: Short Term Recovery Needs by Province

Short term recovery (6-12 months): One reason for the relatively modest level of losses in the four provinces has been the prompt response of the government to the disaster, and its action towards repair and restoration of services which led to fewer days of outages. Thus, the major needs identified in the short term are to assist with further repair of damaged infrastructure, using the basic principle of restoring essential infrastructure to pre-Haima levels, which are estimated to cost **2,549,680,357 kip (USD 318,710)** per table above.

Medium term recovery (1-3 Years): The assessment team working in conjunction with the EDL has identified the following medium term needs and recommendations that would help the electricity sector become more resilient to disasters in the future. Each of these recommendations would warrant a detailed further scoping assessment and hence have not been estimated.

1) **Risk Assessments:** The EDL identified that in the longer term, they would like to relocate distribution infrastructure, which are located in high risk areas, to safer locations but cited the lack of comprehensive risk assessments in these provinces, which would facilitate better informed decision-making and long term strategies. Thus, a comprehensive assessment to inform longer term planning is imperative.

2) **DRM in Safety Standards, Specifications, Planning Processes and Strategies:** Questions were raised regarding revisiting safety and disaster risk management (DRM) standards in order to assess if current specifications for transmission and distribution equipment took into account hazards such as flash floods. Thus, it would be important to incorporate multi-hazard DRM into future safety standards, specifications, planning processes and strategies. This may also result in the need to retrofit existing infrastructure to ensure mitigation of future disasters.

3) **Coordination with Other Sectors:** Since electricity is closely linked to every other sector, the team also recommends the need to ensure that the strategies for the electricity sector are closely linked and aligned with those of all other sectors. For example, if villages or houses were to be relocated, towards building back better, the electricity connections must be moved and reconstructed as well.

4) Capacity Building: Any plan or strategy is usually only as good as its final execution and thus it would be imperative to undertake capacity building measures in the form of trainings towards preparedness and DRM standards for managers, engineers, planners, contractors, etc., in the electricity sector. Community awareness activities for end users regarding dos and don'ts during a disaster are also important.

Urban Water Supply

Summary of findings

Typhoon Haima and the subsequent flooding caused damage to the piped water supply network in Xiengkhouang and Xayaboury provinces worth about 776 million kip (USD 97,045). The damage caused a disruption to water supply service for 14 days in Xiengkhouang and for 3 days in Xayaboury, affecting 5182 households in total and resulting in losses in excess of 396 million kip (USD 49,594). The water supply systems have been temporarily repaired in both provinces, but permanent repairs/replacements are still required, and in the long term there is a need for various disaster risk reduction (DRR) and building back better (BBB) related awareness and capacity building activities.

Damage	Losses	Recovery Needs and Reconstruction Needs	
		Short term	Long term
776,359,576 Kip	396,755,034 Kip	776,360,000 kip	8,640,000,000 kip
USD 97,045	USD 49,594	USD 97,045	USD 1,080,000

Table 20 Summary of Damage and Losses in Urban Water Supply

Pre-disaster Situation

Nam Papa State-owned Enterprises (NPSE) is responsible for urban or public water supply in Laos, reporting to the Department of Public Works and Transport (DPWT) in the provinces, under the aegis of the Ministry for Public Works and Transport (MPWT) which hosts the Department for Housing and Urban Planning (DHUP). The Nam Papas are responsible for piped water supply systems in urban and peri-urban areas. Based on the 2005 census, access to piped water supply in Laos was available to 13% of all households and 43% for households in urban areas. Currently the urban water supply network covers, approximately, 20% of the households in the flood-affected provinces.

Province	Total number of Households	Water Supply System, number of household connections	% of population coverage
Xiengkhouang	40,036	5,509	13.1
Xayaboury	58,420	7,692	13.2
Vientiane Province	84,091	31,006	41.0
Bolikhamxay	43,697	4,906	11.6
Total	226,244	**49,113**	**19.7**

Table 21: The Current (2011) Total Household Connections in Each Province (source: Nam Papas)

Damage assessment

Typhoon Haima and the subsequent flooding caused damage to the piped water supply network in two out of the four affected provinces: Xiengkhouang and Xayaboury. There was no reported damage in the Vientiane and Bolikhamxay provinces. In the two affected provinces damage to the water supply network disrupted the water

supply service to 5182 households (more than 30,000 people[16]). In Xiengkhouang, the Khoun, Kham and Mok districts were affected, and in Xayaboury, damage was reported in Xayaboury district only.

The assessment involved working closely with government counterparts from within the Ministry of Public Works and Transport, namely the NPSEs in the affected districts. The reported damage included three water treatment plants (WTP) and several pipe breakages in distribution networks. In Xiengkhouang a water reservoir was damaged and a water pump was also damaged as part of the broken WTP. Whilst in Xiengkhouang there were no reported breakage in piped household connections, in Xayabouri eight connections were reported as damaged.

The total value of all damage is in excess of 776 million kip (USD 97,045). In Xiengkhouang the damage amounted to 609 million kip, representing 78% of the total damage. Within Xiengkhouang the most affected district was Khoun. In Xayaboury the damage totalled 168 million kip, 22% of the total damage.

Province	District	Damage (Kip)	Losses (Kip)
Xiengkhouang		608,859,576	278,579,034
	Kham	146,855,360	111,645,100
	Khoun	412,004,216	135,952,480
	Mork	50,000,000	30,981,454
Xayaboury		167,500,000	118,176,000
	Xayaboury	167,500,000	118,176,000
Grand Total	**Kip**	**776,359,576**	**396,755,034**
	USD	**97,045**	**49,594**

Table 22: Summary of Damage and Losses in Urban Water Supply

Loss Assessment

The water supply was disrupted for 14 days in Xiengkhouang and for 3 days in Xayaburi, until necessary repairs were completed to restore the services. During this time, losses were accrued through the materials required for emergency repair, lost revenues in service fees, cost of disinfection and supplying the affected households with emergency water supplies.

The total value of all losses is in excess of 396 million kip (USD 49,594). In Xiengkhouang the losses amount to 279 million kip, representing 70% of the total losses. Within Xiengkhouang, districts bearing biggest losses were Khoun and Kham. In Xayaboury the losses totalled 118 million kip, representing 30% of the total losses.

Preliminary Recommendations for Needs

Short-term

Short term needs are related to supplying affected households with alternate water sources as well as making the required emergency repairs in order to restore the water supply services. At the time of the assessment, these steps were already undertaken and the water supply network had been temporarily restored. Any cost incurred for these have been covered in the loss assessment section.

[16] Calculated based on average HH sizes for affected provinces from the 2005 Census

In order to ensure an undisrupted service in the future, there is a need for the permanent repair or replacement of those damaged components in the water supply network that have been temporarily repaired for the time being. The total cost of this is 776,359,576 Kip (USD 97,045).

Long-term

The following long-term needs have been identified in the urban Water and Sanitation (WATSAN) sector:

1. Advocacy and awareness raising and training on disaster risk reduction, and development of DRR strategies at the provincial levels by the Department of Public Works and Transport in partnership with the water service providers ;
2. Study on building back better (improved design and construction) and implementation of demonstration projects, involving:

2.1 Water treatment plants including intake, bank protection and pump stations;
2.2 Safety of water sources;
2.3 Transmission and Distribution networks;
2.4 On-site sanitation facilities.

3 Capacity building of communities and implementation of demonstration projects on building back better, whereby communities provide labour:

3.1 Community-based disaster reduction management;
3.2 Capacity building on cluster approach to Water, Sanitation and Hygiene (WASH) emergency preparedness and response;
3.3 Support capacity building for provincial Nam Papas in their role of facilitating service delivery and planning for flood affected areas.

Province	Recovery and Reconstruction (USD)				
	Short term	Long term			
	Rehabilitation and reconstruction of network	*Advocacy and awareness raising and training on DRR*	*Study on BBB*	*Capacity building of communities and implementation of demonstration projects on BBB*	Total Long term needs
Xiengkhouang	76,107	*25,000*	*205,000*	*50,000*	280,000
Xayaboury	20,938	*25,000*	*205,000*	*50,000*	280,000
Vientiane	n/a	*25,000*	*185,000*	*50,000*	260,000
Bolikhamxay	n/a	*25,000*	*185,000*	*50,000*	260,000
Total (USD)	**97,045**	***100,000***	***780,000***	***200,000***	**1,080,000**
Total (kip)	**776,360,000**	***800,000,000***	***6,240,000,000***	***1,600,000,000***	**8,640,000,000**

Table 23: Summary of Recovery and Reconstruction Needs

3. **Socio-economic impact:** The disruption of water supply affects women and children in particular, as within the household they tend to be responsible to collecting water. Even though some drinking water was supplied by the local governments and other aid organisations, most households had to purchase water at a much higher price than usual. Limited water supplies affected general hygiene levels as people were not able to wash as regularly as usual. There were indirect losses to local businesses that could not open due to lack of water supply.

	Recovery and Reconstruction (USD)											
	Short term	Long term										Total Long term
			Study on BBB					Capacity building of communities and implementation of demonstration projects on BBB				
Province	Rehabilitation and reconstruction of network	Advocacy and awareness raising and training on DRR	Water treatment plants	Safety of water sources	Transmission and Distribution networks	On-site sanitation facilities	*Total BBB*	Community-based DRR demonstrations	Capacity building on WASH emergency preparedness	Capacity building for provincial Nam Papas	*Total*	
Xiengkhouang	76,107	25,000	150,000	25,000	20,000	10,000	*205,000*	30,000	10,000	10,000	*50,000*	280,000
Xayaboury	20,938	25,000	150,000	25,000	20,000	10,000	*205,000*	30,000	10,000	10,000	*50,000*	280,000
Vientiane	n/a	25,000	150,000	25,000	n/a	10,000	*185,000*	30,000	10,000	10,000	*50,000*	260,000
Bolikhamxay	n/a	25,000	150,000	25,000	n/a	10,000	*185,000*	30,000	10,000	10,000	*50,000*	260,000
Total (USD)	**97,045**	**100,000**	**600,000**	**100,000**	**40,000**	**40,000**	***780,000***	**120,000**	**40,000**	**40,000**	***200,000***	**1,080,000**
Total (kip)	**776,360,000**	**800,000,000**	**4,800,000,000**	**800,000,000**	**320,000,000**	**320,000,000**	***6,240,000,000***	**960,000,000**	**320,000,000**	**320,000,000**	***1,600,000,000***	**8,640,000,000**

Table 24: Summary of Recovery and Reconstruction Needs in Detail

Photos

Image 7: Damage to Water Reservoir in Kham District, Xiengkhouang Province

Image 8: Damage to Pipes in Kham District, Xiengkhouang Province

Image 9: Damage to Water Intake no.2 Khoun District, Xiengkhouang Province

Education

Summary of findings: From 24 to 26 June, 2011, Typhoon Haima caused heavy rains which resulted in the flooding of 25 schools in the four northern and central provinces of Laos. School buildings, furniture, teaching and learning materials, textbook, and teachers' guides were damaged. The floods caused damage and losses estimated at USD 235,000 in total. The needs for recovery and reconstruction are estimated at USD 804,000 for the short-term and long-term recovery and reconstruction works, which will aim at building back better school buildings, safety learning and teaching environment. (Table 24)

Damage USD			Losses USD			Recovery Needs USD	Reconstruction Needs USD
Public	Priv-ate	Total	Public	Private	Total		
200,000,000	0	200,000,000	35,000	0	35,000	26,000	768,000

Table 25: Education Sector Damage, Losses, Recovery and Reconstruction Needs

Pre-disaster situation

Distribution of educational institutions in the 12 affected districts in four provinces.

In June 2011, before Typhoon Haima struck, there were 2,295 learning institutions in the 12 affected districts of the four provinces, namely Xayaboury, Xiengkhouang, Vientiane, and Bolikhamxay, in which 335,791 students were enrolled for the academic-year 2010-2011 (see Table 25**).**

Type of schools	Xayaboury		Xiengkhouang		Vientiane province		Bolikhamxay		**Total**	
	# of schools	# of students	# of schools	# of students	# of schools	# of students	# of schools	# of students	**# of schools**	**# of students**
Kindergarten	132	4,984	32	1,894	82	3,911	31	1,339	**277**	**12,128**
Primary	413	47,796	472	44,839	502	69,945	321	40,550	**1,708**	**203,130**
Secondary	85	28,690	75	27,955	99	42,451	51	21,437	**310**	**120,533**
Total	**630**	**81,470**	**579**	**74,688**	**683**	**116,307**	**403**	**63,326**	**2,295**	**335,791**

Table 26: Number of Institutions and Students Enrolled Before Floods in the Four Affected Provinces

Post-disaster situation

Because the floods occurred at a time when educational institutes were closed and students were out of school for the holiday, the number of educational institutions and student enrolment has not been affected by the flood. However, the flood-struck schools will require at least two weeks to clear debris and mud from classrooms and school compounds, repairing school furniture such as students' benches and tables, and so on. Additionally, school teaching materials – textbooks, teachers' guides for the flood-affected schools, etc., must urgently be supplied before the beginning of the new school year in September, 2011.

Damage and Loss Assessment

Out of a total of 2,295 schools (Table 24), 25 schools were affected to various degrees by the floods. In Xayaboury, 6 schools (out of 630), in Xiengkhouang 10 schools (out of 579), in the Vientiane province 3 schools (out of 683), and in Bolikhamxay 6 schools (out of 407) were flooded.

The province with the education sector most affected by the floods caused by tropical typhoon Haima is Xiengkhouang (10 schools), followed by Xayaboury and Bolikhamxay (6 schools each). The least affected province of the four is Vientiane (3 schools).

Due to geographic constraints, school sites are located in the lowland, close to the rivers and hill valleys, which are very vulnerable to disaster. Inappropriate building materials, poor design, poor participation of community people during the selection of the sites and the construction of the schools, lack of awareness and information about the coming typhoon, absence of an emergency plan, and ill-suited school locations are some of the underlying causes for the damage inflicted on semi-permanent and temporary schools.

Type of schools	Kindergarten		Primary Schools		Secondary Schools		Total	
	Pre-Disaster	Post Disaster (affected)	Pre-Disaster	Post Disaster (affected)	Pre-Disaster	Post Disaster (affected)	Pre-Disaster	Post Disaster (affected)
Xayaboury	132	1	413	4	85	1	630	6
Xiengkhouang	32	0	472	8	75	2	579	10
Vientiane province	82	0	502	0	99	3	683	3
Bolikhamxay	31	1	321	5	51	0	403	6
Total	**277**	**2**	**1,708**	**17**	**310**	**6**	**2,295**	**25**

Table 27: Number of Schools Affected by the Flooding

Magnitude of damage

Out of a total of 25 damaged schools, 9 schools incurred minor damage (<20% of construction costs), 8 school moderate damage (between 20-50%), 4 were severely affected (between 50-100%) and 2 schools were completely destroyed.

Preliminary Needs Assessment

It is expected that 6 schools need to be rebuilt, namely those which were severely damaged and fully destroyed. 19 schools need to be repaired to various degrees. The Provincial Education Services (PES) are preparing funding proposals for the renovation and rebuilding of school buildings, based upon which the Ministry of Education will seek support from Government, NGOs and international donors. In the meantime, in some communities, district and provincial authorities have already established arrangements for schools to be ready for opening at the beginning of the new school-year, in September 2011.

The field surveys carried out in late July and early August 2011 indicate that the educational sector's damage can be estimated at 1.6 billion Kip (USD 200,000), while losses are estimated at 0.28 billion kip (USD 35,000) and the resource needs at 6.4 billion Kip (USD 795,000) (Table 4). To estimate the resource needed for school building reconstruction/repair (per unit), the cost per square meter (sq m) was multiplied by the total school size (itself calculated in function of the number of classrooms, sized 7m x 8m each); while school furniture needs were estimated by cost per unit multiplied by numbers of items needed.

	Xayaboury	Xiengkhouang	Vientiane province	Bolikhamxay	Total (Kip)	Total (USD)
Total damage	316,000,000	977,000,000	210,000,000	98,000,000	1,601,000,000	200,000
Total losses	66,000,000	177,000,000	25,000,000	14,000,000	282,000,000	35,000
Total needs	113,000,000	4,552,000,000	953,000,000	738,000,000	6,356,000,000	795,000

Table 28: Summary of Damage, Losses, and Needs (Kip)

Education Sector Needs	Recovery and Reconstruction (Kip)		
	Short-term	Medium-term	Long-term
Xiengkhouang	174,000,000	4,378,356,000	
Xayaboury	22,600,000	89,975,000	
Vientiane	2,920,000	949,999,000	
Bolikhamxay	9,829,000	727,680,000	
Total Kip	**209,349,000.00**	**6,146,010,000.00**	
Total USD	**26,000**	**768,000**	

Table 29: Education Sector Needs for Recovery and Reconstruction

Medium-term measures:

The Government will ensure that the newly built and repaired educational institutions adhere to school construction guidelines in order to avoid any future damage and losses. A large-scale programme of building reconstruction aimed at making new school buildings flood resistant is an absolute requirement. To achieve this goal, the Government will review the existing building codes and develop disaster resilient/resistant building codes for all educational institutions, to be adopted for the construction of new school buildings. The Government will also prepare school contingency & emergency planning for evacuation in case of emergency. This implies a medium term plan for the formation and mobilisation of school emergency response teams (first aid, search & rescue, early warning). In this sense, the Government will do its utmost to reduce disaster risk (DRR) through school education as a medium-term strategy.

Medium-term Needs:

In the medium-term, government needs for the renovation and reconstruction of the damaged school buildings in 25 affected schools is estimated at 6.1 billion Kip (USD 768,000), which will allow it to in rebuild semi-permanent school buildings and construct new permanent ones resistant to floods.

Longer-term Needs:

In the longer term, the Ministry of Education will undertake a joint development programme in collaboration with other ministries and agencies to further improve educational institutions in the flood-affected areas. With a view to improve vital security standards, programmes will be developed to establish school buildings with

emergency shelters in preparation to possible flood recurrence and to any other forms of disaster in the high risk zones of flood affected areas. Incorporation of safe building codes into school construction (new school and reconstruction after a disaster) and construction of safer schools as emergency shelters will do a lot to prevent future damage in the educational sector.

Typical Case Study from the field mission: Khaen Yong Primary School

Khaen Yong Primary School is located in the Bolikhan district of Bolikhamxay. There are two teachers teaching thirty-six students from grade one to grade five. They use a multi-grade teaching approach by combining grade one, two, and three together into one classroom and grade four and five in another classroom. When heavy rains came on 24th to 26th June, the school was flooded and students benches, tables, blackboards, as well as other teaching and learning materials like textbooks, teachers' guides, were swept away from the classrooms. The flood level at the school reached a height of three meters, but the school being closed for the holiday, there was no one inside.

Image 10: The Empty Classrooms of Khaen Yong Primary School After the Flooding from Typhoon Haima

Nang Khamla, second from left, is a grade two student. She told the assessment team that not only was her house swept away by floods, but so was her teacher's. After the flood, her parents built a new temporary thatched house near her school. However, she is not sure if she will have an opportunity to start school again this coming September, as her teacher, Mr. Peuang – a father of three, hasn't been living here since the floods, no longer having a house. He went to live with his cousin in the Thaphabath district of the Bolikhamxay province.

Image 11: Students in Affected Area

Health

1. Summary of findings

The total damage and losses of the health sector were estimated to be approximately 2 billion kip (250,000 USD). If the relocation of two health facilities was considered, the recovery and reconstruction needs would be almost 3 billion kip (375,000 USD).

Damage Kip (USD)			Losses Kip (USD)			Recovery Needs Kip (USD)		Reconstruction Needs Kip (USD)
Public	Private	Total	Public	Private	Total	Physical Recovery	Outreach Activities	Relocation
665,170,000 (83,146)	NA	665,170,000 (83,146)	1,315,000,000 (164,444)	NA	1,315,000,000 (164,444)	664,170,000 (83,021)	351.680,000 (43,960)	1,960,000,000 (245,000)

Table 30: Health Sector Damages, Losses, Recovery and Reconstruction Needs

2. Pre-disaster Situation

The affected Northern Xiengkhouang province is very different from the three centrally located affected provinces (Bolikhamxay, Vientiane, and Xayaboury) with regards to access to health care and to other health related indicators. In the Xiengkhouang Province the total fertility rate (mean number of live births a woman would hypothetically have at end of reproductive age) is higher than in the other affected provinces (4.6 vs. 2.9-3.3), the proportion of antenatal care at birth is lower (21.1% vs. 34.5-48.2%), and the infant mortality is higher (136 vs. 74-93 per 1,000 births).

The government is primarily responsible for the provision of health care services in Lao PDR, through provincial hospitals (basic and speciality care), district hospitals (basic care) and health centres. In addition, a few private medical clinics and many private pharmacies provide outpatient services, health advice and medicine. At village level, voluntary health workers such as village health workers, traditional birth attendants and sanitation workers are providing primary health care services. The consultation fees for outpatients in government health facilities are between 25,000 and 35,000 Kip. In-patient services start with 65,000 Kip, but can be much higher. Medicine and additional examinations are usually at the patient's own expenses.

3. Damage Assessment

Health facilities in three out of four Haima-affected provinces were damaged by flooding. The damage was inflicted by flood water on the buildings, equipment, furniture, medicine and medical supplies, among others. In total, the damage to health facilities was estimated to be 665.17 million Kip (USD 83,146).

The damage varied between the health facilities; they were assessed as more than 50% damage for the Bolikhan District Hospital (Bolikhamxay), 20% damage for the Xayaboury District Health Office (Xayaboury) and between 15 and 30% for the five health centres in Xiengkhouang. No health facility was damaged in Vientiane Province. Health services of affected provinces were hardly disrupted as staff was able to resume services quickly. However, there were instances of villagers being unable to access services due to damaged roads and bridges.

Province	Damage Kip (USD)			Losses Kip (USD)		
	Public	Private	Total	Public	Private	Total
Bolikhamxay	353,700,000 (44,213)	NA	353,700,000 (44,213)	292,400,000 (36,555)	NA	292,400,000 (36,555)
Vientiane P.	0 (0)	NA	0 (0)	462,600,000 (57,824)	NA	462,600,000 (57,824)
Xayaboury	112,400,000 (14,045)	NA	112,400,000 (14,045)	297,500,000 (37,187)	NA	297,500,000 (37,187)
Xiengkhouang	199,100,000 (24,888)	NA	199,100,000 (24,888)	263,000,000 (32,879)	NA	263,000,000 (32,879)
Total 1,974,000,000 (246,603)	**665,170,000 (83,146)**	**…**	**665,170,000 (83,146)**	**1,315,000,000 (164,444)**	**…**	**1,315,000,000 (164,444)**

Table 31 Damage and Losses in Health Sector

4. Loss Assessment

District and provincial health staff organised mobile teams to support affected villages. Health staff in Bolikhan District for example provided care during the flood through a makeshift tent. Enhanced surveillance activities detected disease outbreaks of diarrhoea, "Hong Kong foot" and conjunctivitis.

In total, the losses of the health sector added up to 1.315 billion Kip (USD 164,444). The majority of these losses were costs for conducting disease prevention activities (health education, distribution of insecticide treated bed nets, use of abate to control mosquitoes, etc.), and enhanced disease surveillance, as well as surveillance for pregnant women and young children, and medical treatment. The Vientiane province suffered the highest losses in the health sector, mainly due to their intensive outreach activities. In total, damage and losses to the health sector accounted for 1.974 billion Kip (USD 246,603).

It was discussed to relocate the previously flood-affected and severely damaged Bolikhan District Hospital and the Kham Health Centre to safer grounds at an estimated cost of 1.6 billion Kip (USD 200,000) and 360 million Kip (USD 45,000), respectively

5. Preliminary Recommendations for Needs

Short-term needs (next 6 months)

Renovation of health facilities and replacement of damaged equipment, furniture, medicine and supplies is needed to enable the provision of health services.

The provincial and district mobile teams should continue to routinely visit the affected villages in order to provide preventive (enhanced disease surveillance, enhanced mother and child health – MCH – care, health education, etc.) and curative care for 3-4 months. In the meantime, routine health interventions should be maintained in the non-affected areas.

Rapid response teams (including clinicians) should be prepared to undertake outbreak investigations and provide health education (emphasising basic hygiene and disease prevention) and treatment. Team members should include MCH staff to provide specific care for pregnant women, newborns, and assist with delivery at home if required. Medicines such as antibiotics against bacterial respiratory infections and anti-inflammatory, antibiotic and antifungal creams to treat patients suffering from "Hong Kong" foot need to be made widely available. Ensure that families in affected villages have access to safe water and oral rehydration salt.

Medium/Long-term needs (beyond 6 months)

Relocation of the severely damaged Bolikhan District Hospital (BKX in the table below) and the moderately damaged Kham Health Centre (Xiengkhouang – XK in the table below) to a safer place should be considered, as they have been affected by floods in the past.

Subsector Needs	Recovery and Reconstruction: Kip (USD)	
	Short-term	Medium- and long-term
Outreach activities (Health education, enhanced surveillance, vector control	BKX: 292,440,000 Kip (USD 36,555) VT: 462,590,000 kip (USD 57,824) XB: 297,500,000 (USD 37,187) XK: 262,110,000 kip (USD 32,764) Total: 1,315,000 Kip (USD 164,330)	
Renovation of health facilities and replacement of damaged equipment, furniture, medicine and supplies	BKX: 353,700,000 kip (USD 44,213) XB: 112,360,000 kip (USD 14,045) XK: 199,100,000 kip (USD 24,888) Total: 664,170,000 Kip (USD 83,020)	
Relocation of two health facilities		BKX: 1,600,000,000 Kip (USD 200,000) XK: 360,000,000 Kip (USD 45,000) Total: 1,960,000,000 Kip (USD 245,000)

6. Socio-economic Impact (Human dimension)

Data collected from MCH teams at provincial level showed number of women accessing services remained stable for both ante-natal care and post-natal care, with little seasonal variation. Prior to the flood, the proportion of pregnant women with at least one antenatal visit (with the exception of Xayaboury which was 100%) was 87% in Vientiane province; 60% in Bolikhamxay and 45% in Xiengkhouang (National Health Statistic Report FY 2009-2010). Approximately 40 % to 60 % of pregnant woman in the flood-affected areas deliver their babies at home where the health facilities were damaged with health staff attending at home, therefore there will be additional requirement for travelling costs for staff to assist at home. However, only 26 % of children less than six months of age are exclusively breastfed. Overall there are approximately 35,000 women at a reproductive age; 24,000 children under-five and 1,500 pregnant and lactating women in the affected areas who are at risk of becoming moderately or severely malnourished.

The full impact of the floods on the lives of people in four affected provinces was difficult to estimate. This was partly due to sparsely available data pre and post flood. It is surmised that areas where there is shortage of clean water, the particular needs of pregnant and lactating women may not be met. In normal times, access to MCH services was low due to distance and transport problems. Hence with broken roads and bridges, this difficulty would be exacerbated, particularly in the district of Xaysomboun in the Vientiane province. It is hard to know for this district how many women require services and are not able to access them, since health staff cannot reach those villages due to the same problem. Flood situation puts mothers and newborns at higher risk, particularly low birth weight babies, who risk hypothermia as a result of damp conditions, as well as more diseases - hence more surveillance is required to all newborn babies.

7. Disaster Risk Management Issues

Preparedness for floods and other disasters should be further enhanced at provincial and district level, including a contingency fund to be able to cope with disasters. Training on counselling should be included so that psychological care after disasters may be provided in the future. This could be started at central and provincial level. Best practices and lessons learnt on natural risk management should be considered in the health plan. The Disaster Management Committee at each level should undergo a revision of its terms of reference (ToR), role, functionality, and needs assessment tools. Risk mappings should be conducted to identify health facilities at risk of future disasters, and relocation to a safer place should be considered.

8. Annex

Methodology

Data collection

Background data was collected from different sources such as the National Health Statistic Report FY 2009-2010, the Lao Reproductive Health Survey 2005 or estimated from the 2005 Lao Population Census.

In the affected provinces, data was provided from various institutions and departments such as the Provincial and District Health Offices, affected health facilities, Mother and Child Health Centres, EPI, Centres for Laboratory and Epidemiology, HIV/AIDS etc. Prices per sq m of the different health facilities were provided by Ministry of Planning and Investment (MPI), the Department of Planning (MoH) and the World Bank taking into account current prices from health care infrastructure projects of ADB and World Bank.

Information about outreach activities and their costs taking into account government rates for per diem were provided by Provincial and District Health Office Directors.

For pricing of destroyed equipment either the current market price in Laos was used (when sufficient information available) or the old price at date of procurement was used (when information was not available).

Analysis – Assumptions and Unit Rates Used

8,000 kip = 1 USD
Health Centre Type B: 60 sq m on average; USD 210 per sq m wall.

District Hospital and Health Office together: 200 m2 on average; 245 USD per m2 wall.

Enhanced surveillance communication for 3-4 months: 200,000 kip per Provincial Health Office per month; 100,000 kip per District Health Office per month; 50,000 kip per Health Centre per month.

Photographs

Image 12: Health Cluster Team Discusses with Bolikhamxay Provincial Health Office Staff

Image 14: Destroyed EPI and PHC building, Bolikhan District Hospital (Bolikhamxay)

Image 13: Patient room, Bolikhan District Hospital (Bolikhamxay)

Image 15: Bolikhan District Hospital (Bolikhamxay)

Rural Water and Sanitation

Summary of findings

The assessment indicated that the damage cost as a result of Typhoon Haima is USD 560,107.00 while the loss cost is USD 172,689.00. Based on these figures, the total of the recovery needs and/or reconstruction needs amount to USD 762,796.00, dividing into three terms of periods: short-term (USD 190,699.00), medium-term (USD 343,258.20), and long-term (USD 228,838.80).

Both water supply and sanitation facilities fall under two categories, namely public, which includes gravity-fed water systems (GFS), boreholes and school latrines; and private, which includes wells, rain-water containers, and household latrines. Across the four provinces, covering 24 affected districts, 690 units of GFS were affected, with most schemes damaged at 20-60%, and it is clear that GFS in the Xiengkhouang province were affected the most. In total, 2,356 boreholes, with the highest number affected in Bolikhamxay (977 units) and in Vientiane (878 units), and 17,500 units of wells were damaged. Household latrines were found to be affected at all locations, and the most affected provinces are Xiengkhouang (25,876 units) and Vientiane (31,078 units). Though a number of school latrines are reported to be affected, however, there is no cost for any reconstruction as most of the latrines required only minor mud clearing and cleaning in order to bring them back to functioning condition.

Damage		Losses		Recovery and Reconstruction (USD)		
Private	**Public**	**Private**	**Public**	**Short-term**	**Medium-term**	**Long-term**
USD 391,864 3,134,912,000 kip	USD 168,243 1,345,944,000 kip	USD 72,623 580,984,000 kip	USD 100,066 800,528,000 kip			
USD 560,107 4,480,856,000 kip		**USD 172,689 1,381,512,000 kip**		**USD 190,699.00 1,525,592,000 kip**	**USD 343,258.20 2,746,065,600 kip**	**USD 228,838.80 1,830,710,400 kip**

Table 32: Rural Water and Sanitation Damage, Losses, Recovery and Reconstruction

Note

- The recovery and reconstruction cost = damage cost + loss cost + supervision and administrative cost
  - Damage cost + Loss cost: USD 732,796
  - The balance is the supervision and administrative cost (USD 30,000)
  - Recovery/reconstruction: USD 762,796
- Unite rates:
  - Gravity-fed water system (>60%): USD 7,000 - USD 10,000
  - Well (>60%): USD400- USD 500
  - Boreholes (>60%): USD 1,500
  - Latrine (>60%): USD 50

2. Pre-disaster Situation

In Lao PDR, there are few alternative technological options for water supplies aside from protected water sources. Most of the water supply systems in hilly and mountainous areas draw advantage from the topography and are based on gravity flow, e.g. in the Xiengkhouang and Vientiane provinces, while the remaining two affected provinces of Xayaboury and Bolikhamxay rely on shallow wells and borehole water supply systems.

The involvement and participation of community is recognised as a fundamental requirement for sustainable sector development. An indication for the increased awareness and demand for water and sanitation services is

the willingness of people, even in disadvantaged areas, to contribute their own resources to the construction of facilities. For instance, the community contribution throughout the country covered almost 30% of the total construction cost of a gravity fed water system, to build latrines themselves.
The total water supply systems and sanitation facilities in each province can be found in the following table.

Province	Water Supply System				Sanitation	
	GFS	*Well*	*Borehole*	*Rain water container*	*household latrine*	*School Latrine*
Xiengkhouang	337	432	16	-	25,876	74
Xayabouri	114	2,015	1,317	-	7,449	158
Vientiane Province	157	8,891	325	-	31,078	212
Bolikhamxay	82	6,162	833	445	19,529	472
Total	**690**	**17,500**	**2,491**	**445**	**83,932**	**916**

Table 33: Total Water Supply Systems and Sanitation Facilities (units)

3. Damage assessment

Approximately, 92,573 people in 193 villages of 24 districts across four provinces of Xiengkhouang, Xayabouri, Vientiane and Bolikhamxay were affected. Up to 2,684 schemes of water supply systems and 4,699 family latrines, and one school latrine were damaged during the peak of the floods. As a result, thousands of families had no water for daily domestic consumption and drinking during and after the flood.

A damage, losses and needs assessment was conducted under the leadership of the Ministry of Planning and Investment in collaboration with National Disaster Management Office (NDMO) and with support from World Bank and UN agencies, which pertain to the Inter Agency Standing Committee on Natural Disaster Response Preparedness (IASC). The assessment provided the most comprehensive overview to date of the impact of and needs arising from the disaster. The UN system designated UNICEF, UN-Habitat and WB-WSP as the sector focal point for the Water, Sanitation and Hygiene (WASH) assessment following the floods. An assessment tool was designed and finalised by a World Bank expert, and government teams were called for training and dispatched to collect information in the affected provinces.

The assessment involved working closely with government counterparts from within the Ministry of Health, namely: the Center for Environmental Health and Water Supply, Center for Information Educational Health; and various provincial health departments of the above mentioned provinces.

In the provinces assessed, many sanitation facilities could not be used and people were defecating in flood water. The lack of clean water and poor sanitary conditions were putting the health of these communities at great risk. Therefore, water supplies were required and the rehabilitation of water supply systems and of sanitation facilities were also needed to ensure adequate access for communities to sanitation and hygiene, in order to prevent outbreaks of water-borne diseases.

Province	Water Supply System				Sanitation	
	GFS	*Well*	*Borehole*	*Rain water container*	*household latrine*	*School Latrine*
Xiengkhouang	57	25	0	-	705	0
Xayabouri	7	476	0	-	119	0
Vientiane Province	27	878	18	-	1,027	0
Bolikhamxay	2	977	33	184	2,798	2
Total	**93**	**2,356**	**51**	**184**	**4,649**	**2**

Table 34: Affected Water Supply Systems and Sanitation Facilities

Gravity-fed water system. The assessment highlighted that water was either contaminated or not available in the affected areas. The majority of affected communities were using protected and unprotected dug wells prior to the flooding. In total, 93 systems were affected out of 690, i.e. 13.5%. More systems were affected in the Xiengkhouang and Vientiane provinces than elsewhere. The damage level of the system in the Vientiane Province is in average above 80%, except for the system in Hinhurb district, which only suffered minor damage (about 20%). It is clear that the localities with the highest number of damaged systems are Kham, Khoun and Thathom. Technically, 1/3 of water intake of gravity fed water systems was destroyed, while 2/3 suffered minor damage due to landslides.

Boreholes. Out of 2,491, 51 boreholes were affected (18 in the Vientiane province and 33 in the Boilikhamxay province). There was no reported damage of boreholes in the Xiengkhouang and Xayaboury provinces. The damage level for boreholes in these two provinces ranges between 20% and 60%. When the damage is <20%, all that is required is clearing mud and cleaning the system.

Wells. Dug-wells, privately owned in general, have been damaged more than other water supply facilities in all four provinces (13 districts out of 24). 2,356 units out of 17,500 have been damaged by the flood and the highest number was found in the Bolikhamxay and Vientiane provinces, in comparison with the other two. The damage of the wells in Bolikhamxay accounts for about 74% of the total well damage in the four provinces.

Rain water jar. Damage only occurred in the Bolikhan district of Bolikhamxay (184 cement jars out of 445). Generally, the damage included jars over-spilling with flood water and requiring cleaning, jars being broken and needing replacement. The damage cost is very limited – USD 276.

Family latrines. In total, 4,649 latrines out of 83,932 were damaged by the flood in 18 districts across the four provinces. Among the four provinces, Bolikhamxay has the highest number of latrines damaged, which is as high as 2,798 units. About 60% of damaged facilities have incurred levels of damage ranging between 20-60% (needing partial replacement); meanwhile the remaining 32% have only incurred a level of damage of <20% (needing cleaning).

School latrines. Among the four provinces, school latrines in the Viengthong district (1 unit) of Bolikhamxay were damage during the typhoon – 1 set and the damage cost is estimated at USD 3,000.

	Damage						Losses						
	Public			Private			Public			Private			
Xiengkhouang	GFS	Borehole	**Total**	Well	Latrine	**Total**	GFS	Borehole	**Total**	Well	Jars	Latrine	**Total**
Kham	13,625	-	**13,625**	10,000	1,500	**11,500**	5,530	-	**5,530**	1,734	-	197	**197**
Khoun	15,375	-	**15,375**	-	13,250	**13,250**	7,541	-	**7,541**	-	-	438	**438**
Mork	18,125	-	**18,125**	-	6,500	**6,500**	17,901	-	**17,901**	-	-	328	**635**
Nong Het	1,625	-	**1,625**	-	-	**-**	934	-	**934**	-	-		**2,559**
Pek	500	-	**500**	-	-	**-**	625	-	**625**	-	-		**1,125**
Phaxay	16,000	-	**16,000**	-	6,625	**6,625**	10,937	-	**10,937**	-	-	656	**3,684**
Thathom	11,500	-	**11,500**	-	563	**563**	2,450	-	**2,450**	-	-	184	**184**
Sub-total			**76,750**			**38,438**			**45,918**				**8,822**
Total						**115,188**							**54,740**
Xayaboury													
Hongsa	2,625	-	**2,625**	-	-	**-**	668	-	**668**	-	-		**-**
Xieng Hone	6,750	-	**6,750**	1,800	2,220	**4,020**	1,035	-	**1,035**	580	-	2,800	**-**
Phieng		-	**-**	20,950	-	**20,950**	-	-	**-**	2,825	-	750	**3,575**
Xayaboury	2,125	-	**2,125**	12,510	1,250	**13,760**	3,800	-	**3,800**	18,640	-	938	**19,578**
Sub-total			**11,500**			**38,730**			**5,503**				**23,153**
Total						**50,230**							**28,656**
Vientiane													
Feuang	250	-	**250**	6,950	-	**6,950**	43	-	**43**	8,089			**8,089**
Hinhheup	1,125	-	**1,125**	375	-	**375**	209	-	**209**	-		728	**728**
Hom	65,646	-	**65,646**	-	-	**-**	5,481	-	**5,481**	-			**-**
Kasi		-	**-**	5,450	-	**5,450**	-	-	**-**	2,747		3,600	**6,347**
Maed	2,290	-	**2,290**	-	-	**-**	170	-	**170**	-		469	**469**
Toulakhome	-	813	**813**	3,225	-	**3,225**	-	234	**234**	2,438		3,600	**6,038**
Xaysomboon	168,609	-	**168,609**	-	-	**-**	2,250	-	**2,250**	-			**-**
Vangvieng	33,493	63	**33,556**	5,950	-	**5,950**	2,806	17	**2,823**	2,999		5,006	**8,005**
Sub-total			**272,289**			**21,950**			**11,210**				**29,676**
Total						**294,239**							**40,886**
Bolikhamxay													
Bolikhan	9,375	1,150	**10,525**	32,200	-	**32,200**	8,743	173	**8,916**	7,487	276	19,373	**27,136**
Pak Kading	-	4,000	**4,000**	10,800	1,140	**11,940**	-	174	**174**	2,945	-	275	**3,220**
Pakxan	-		**-**	-	-	**-**	-	-	**-**	3,815	-	2,905	**6,720**
Thaphabath	-	4,300	**4,300**	23,500	-	**23,500**	-	240	**240**	158	-	1,006	**1,164**
Viengthong	12,500	-	**12,500**	-	1,485	**1,485**	662	-	**662**	-	-	175	**175**
Sub-total			**31,325**			**69,125**			**9,992**				**38,415**
Total						**100,450**							**48,407**
Grand-total	**USD 391,864 3,134,912,000 kip**			**USD 168,243 1,345,944,000 kip**			**USD 72,623 580,984,000 kip**			**USD 100,066 800,528,000 kip**			
	USD 560,107 4,480,856,000 kip						**USD 172,689 1,381,512,000 kip**						

Public = Gravity-fed water system, borehole and school latrine
Private = Wells, rain-fed jars, and family latrine

Table 35: Rural Water and Sanitation Summary Table

4. Loss Assessment

The loss cost for this assessment include (1) extra cost of using alternative water sources – the main alternative being bottled drinking water and rain water, (2) extra cost incurred during reconstruction of the structure to its original condition, and (3) emergency supplies provided by government agencies, international development agencies included chlorine tablets, chlorine powder for well disinfection, buckets, jerry cans, soap, etc. , and Information, Education and Communication (IEC) materials for use by health education outreach teams.

Total of the loss cost is USD 172,689 (please see detail in the table above)

Subsector Needs by province	Recovery and Reconstruction (USD)		
	Short-term	Medium-term	Long-term
Xiengkhouang			
Emergency supplies (chlorine tablets/powder, bucket, soap, jerry cans, Aluminium Sulphate, etc.)	18,551.20	0	0
Well chlorination/cleaning, rehabilitation of water supply systems and sanitation	23,188.99	71,885.87	0
IEC materials, technical guidelines, Chlorine use leaflets	2,480.99	7,712.24	0
Community-based Disaster Preparedness training	0	0	53,065.41
Sub-total-1	**44,221.18**	**79,598.11**	**53,065.41**
	176,884.70		
Xayaboury			
Emergency supplies (chlorine tablets/powder, bucket, soap, jerry cans, Aluminium Sulphate, etc.)	8,612.05	0	0
Well chlorination/cleaning, rehabilitation of water supply systems and sanitation	10,765.06	33,371.71	0
IEC materials, technical guidelines, Chlorine use leaflets	1,151.75	3,580.27	0
Community-based Disaster Preparedness training	0	0	24,634.65
Sub-total-2	**20,528.87**	**36,951.98**	**24,634.65**
	82,115.50		
Vientiane Province			
Emergency supplies (chlorine tablets/powder, bucket, soap, jerry cans, Aluminium Sulphate, etc.)	36,585.90	0	0
Well chlorination/cleaning, rehabilitation of water supply systems and sanitation	45,732.37	141,770.35	0
IEC materials, technical guidelines, Chlorine use leaflets	4,892.90	15,209.76	0
Community-based Disaster Preparedness training	0	0	104,653.41
Sub-total-3	**87,211.18**	**156,980.11**	**104,653.41**
	348,844.70		
Bolikhamxay			
Emergency supplies (chlorine tablets/powder, bucket, soap, jerry cans, Aluminium Sulphate, etc.)	16,250.85	0	0
Well chlorination/cleaning, rehabilitation of water supply systems and sanitation	20,313.56	62,972.07	0
IEC materials, technical guidelines, Chlorine use leaflets	2,173.34	6,755.93	0
Community-based Disaster Preparedness training	0	0	46,485.33
Sub-total-4	**38,737.77**	**69,728.00**	**46,485.33**
	154,951.10		

Table 36: Subsector Needs by Province

Subsector Needs by province	Recovery and Reconstruction (USD)		
Total for all four provinces	**Short-term**	**Medium-term**	**Long-term**
Emergency supplies (chlorine tablets/powder, bucket, soap, jerry cans, Aluminium Sulphate, etc.)	80,000.00	0	0
Well chlorination/cleaning, rehabilitation of water supply systems and sanitation	100,000.00	310,000.00	0
IEC materials, technical guidelines, Chlorine use leaflets	10,699.00	33,258.20	0
Community-based Disaster Preparedness training	0	0	228,838.80
Total (USD)	**190,699.00**	**343,258.20**	**228,838.80**
Kip	**1,525,592,000**	**2,746,065,600**	**1,830,710,400**

Table 37: Subsector Needs for All Provinces

Note

- The recovery and reconstruction cost = damage cost + loss cost + supervision and administrative cost as the following;
  - Damage cost + Loss cost: USD 732,796
  - The balance is the supervision and administrative cost (USD 30,000)
  - Recovery/reconstruction: USD 762,796
- Unite rates:
  - Gravity-fed water system (>60%): USD 7,000 - USD 10,000
  - Well (>60%): USD 400- USD 500
  - Boreholes (>60%): USD 1,500
  - Latrine (>60%): USD 50
- Unite rates of emergency supplies:
  - Chlorine tablets (Aquatabs) (pack of 10) including freight cost: USD 0.75 / pack
  - Chlorine powder: USD 2.5 / kg
  - 90g bathing soap bar: USD 0.3 / bar
  - Jerry cans (10 litre) local made: USD 3.2 / each
  - Buckets (10 litre): USD 1 / each
  - Aluminium sulphate: USD 2/ kg
  - De-watering pump: USD 430 / set

5. Methodology

Damage is generally estimated as the cost of repair of partially destroyed assets, or the cost of replacement of totally destroyed assets. Damage occurs at the time of the disaster or shortly after the disaster and is to be measured in physical terms for which monetary replacement value is subsequently estimated. The unit costs to be adopted for repair or replacement should be the costs prevailing just before the disaster. For example, for the rural water supply and sanitation, damage will include the cost of:

- Total or partial destruction of physical assets like wells, pumps, storage tanks, pipes, sewerage facilities, solid waste collection and disposal facilities

Losses are generally the foregone revenues and additional expenses due to the disaster. Examples in the rural water supply and sanitation include:

- Loss in revenue due to non-provision of water to the users during the period of rehabilitation and reconstruction
- Loss in revenue due to decrease in water demand because of mass destruction by the disaster in urban areas

- Higher cost of chemicals to ensure quality of drinking water
- Higher water distribution costs when using tanker trucks to reach users
- Higher cost due to more intensive operation of systems to compensate for water losses in damaged system components
- Cost of cleaning of sewerage systems and treatment plants after flooding and removal of debris
- Higher transport cost to collect and dispose of solid waste

6. Preliminary Recommendations for Needs

Short-term

To ensure immediate needs of potable water and sanitation of villages affected by the flooding are met; and to ensure that the flood-affected population receives life saving and other appropriate information on water and sanitation.

- Post-disaster hygiene activity to be carried out and IEC materials to be provided to the affected population. The focus of the hygiene promotion is on household drinking water storage, hand-washing with soap, sanitation-related information (contamination route), as well as information on household treatment options, especially for treating turbid water.
- Rehabilitation of damaged community and school water supply and sanitation systems, especially the restoration of boreholes hand pumps in the worst affected areas.
- Rehabilitation of gravity-fed water systems and distribution of spare parts for hand pumps, cleaning and disinfection of boreholes.
- It is important that the skills and roles of local Nam Saat staff be leveraged to facilitate service delivery and planning for the flooded affected areas.
- Since bringing the condition of gravity-fed water system back to its functioning condition takes time, drinking water shall be provided.

Medium to long term

The objective will be to ensure the rehabilitation/restoration of water and sanitation facilities in schools, health centres and communities damaged by the floods in four affected provinces; to ensure the effective coordination of the Water and Sanitation sector on emergency preparedness and response; to focus on capacity building of national counterparts and key stakeholders at all levels on disaster preparedness and response; as well as to mainstream at higher level the Community-Based Disaster Preparedness (CBDP) training especially in the Vientiane and Bolikhamxay provinces.

- Support local health staff (provincial and district health offices) in terms of capacity in order to allow more effective monitoring and reporting on conditions in the affected villages and on the progress of response activities.
- As proposed at the time of Typhoon Ketsana, it is necessary to build capacity in order to ensure the activation of the cluster approach in WASH emergency preparedness and response activities.
- As disasters in Lao PDR seem to become increasingly frequent, it would be wise to establish regional community-based preparedness and response mechanisms, which would cover the northern, central and southern regions.
- At the same time, there need to be further coordination and collaboration between the WASH sector and other sectors, especially in dealing with environment protection and climate-change adaption.

7. Socio-economic Impact (Human dimension)

- Consider gender, age and diversity, livelihood

- Affected people suffered from not having water for drinking and domestic use during and after the flood, or during the rehabilitation of water sources, as well as no latrine for defecation, especially women.
- Generally, women are responsible for collecting water for domestic use (cooking, washing, cleaning). Since most of the water supply systems have been damaged, or are not functioning properly, women are expected to look for and bring back water from other sources, which are often far from home.

8. Disaster Risk Management Issues

- Build capacity of local authorities and communities on disaster risk reduction in natural disaster prone areas.
- In order to respond to any disaster in a timely fashion, there ought to be a mechanism in place to facilitate the mobilisation of resources and stockpiles.

9. Annex

Group discussion

Village: Phaxay

Vangvieng district, Vientiane province

02 Aug 2011

Villagers who participated in the group discussion included village volunteers, Lao Women's Union members, and a teacher. The following issues were discussed:

- The gravity-fed water scheme, which supplied water to 2 other villages and 1 school nearby places, was damaged (20-60%), making water seemingly unusable - therefore, bottled water is the alternative most villagers have chosen (only for drinking however). The estimated drinking water consumption is of 3 litres/person/day. Luckily, villagers were able to collect sufficient rainfall to meet the remaining of their general household consumption needs (cooking, washing, bathing etc.).
- There was no major damage to family latrines – only 3 latrines were seriously damaged, but are now functioning again after cleaning and replacement of spare parts, especially shelters.
- Soon after the flood, relief activity was carried out by the Lao Red Cross of the Vientiane Province branch. The emergency supplies that the villagers received included chlorine tablets, jerry cans (10 litre capacity), soaps, and buckets. Health education activities were also carried out by the Lao Red Cross, focusing on domestic water treatment (how to use chlorine tablets), and household and personal hygiene.

Provinces	People and organisations visited
Xiengkhouang	▪ Provincial Health Department and Provincial Environmental Health and Water Supply, 27 A July 2011
Xayaboury	▪ Dr. Latsavong, Khamseng and Sithat, Provincial Health Department and Provincial Environmental Health and Water Supply, 29 July 2011
Vientiane	▪ Visited affected area, Phoxay Village, Vangvieng District, 01 Aug 2011 ▪ Team of Provincial Health Department and Provincial Environmental Health and Water Supply, 02 Aug 2011
Bolikhamxay	▪ District Health Office Team, Bolikhan District, 04 Aug 2011 ▪ Dr. Khamphao, Provincial Health Department, 05 Aug 2011 ▪ Visited affected areas, Bolikhan District, 04 Aug 2011

Table 38: Data Source, People and Org Visited

Summary of Findings

Crops are worst affected by the floods induced by Typhoon Haima. The following tables summarise the total damage and losses in the four provinces in the crop, irrigation, livestock and fisheries sub-sectors. The main affected crops were lowland and upland rice, maize, vegetables, cash crops and fruit trees, planted in approximately 7200 hectares of land. It was estimated that throughout the 31 districts located in these four provinces, much of the lowland area planted with rice, corn and vegetables was under water for several days. Irrigation channels have been damaged with many of the schemes in need of reconstruction. The assessment found that immediate attention needs to be made to either rehabilitate or reconstruct the irrigation canals, weir, canal intake and other structures, such as sluice gates.

Many of the large animals, such as cattle, buffaloes and pigs, could be saved from the flood. In some cases animals were either already kept at higher ground level. Wherever that was not the case, in general communities were nonetheless able to shift them to higher grounds in time to avoid losses. This was rendered possible partly thanks to prior media (including radio) broadcasts concerning the typhoon, and to the fact that water levels rose gradually. However, many chicken and ducks were lost during the flood. Symptoms of animal diseases were reported in some villages, especially after the animals consumed contaminated drinking water; however no major animal disease was encountered in any of the provinces.

The inland fishery sub-sector, which provides protein as well as cash income to local communities, was affected to some extent by the floods. Some damage in fish ponds was reported, and some of them were destroyed. In a number of areas, a significant number of fish and fingerlings were reportedly lost. However, the total damage to the fishery sector remains limited compared to that incurred by crops.

Sector	Damage Kip (million)			Losses Kip (million)			Recovery Needs[17] Kip (million)	Reconstruction Needs[18] Kip (million)
	Public	Private	Total	Public	Private	Total		
Crop		46358	46358		68954	68954	12,439	116,800
Irrigation	63169		63169				57,471	87,114
Livestock		2107	2107		1797	1797	4,016	7,940
Fisheries		2749	2749		2092	2092	4,795	
Total			**114382**			**72843**	**72,685**	**145,963**

Table 39: Summary of damage and losses in agriculture sector in Kip

[17] Recovery Needs (short-term) are calculated based on the data and information from the Joint Damage and Need Assessment Mission, and combined with MAF report on " the status of agricultural production in wet season related to the mitigation of the impact of disaster in the rainy season of 2011" from 5 August 2011

[18] Reconstruction Needs (medium-term) are based on the data and information from the above-mentioned MAF report. MAF report however also included data from few other provinces in addition to the four provinces and the data were collected for few more days beyond 30 July 2011, which was the cut-off date for the Joint Damage and Need Assessment. These figures are however used as medium-term needs for the four provinces as they are the most affected.

Sector	Damages USD (million)			Losses USD (million)			Recovery Needs USD (million)	Reconstruction Needs USD (million)
	Public	Private	Total	Public	Private	Total		
Crop	-	5.80	5.80	-	8.63	8.63	1.56	14.62
Irrigation	7.90	-	7.90	-	-	-	7.19	10.90
Livestock	-	0.26	0.26	-	0.22	0.22	0.50	0.99
Fisheries	-	0.34	0.34	-	0.26	0.26	0.60	-
Total			**14.31**			**9.12**	**9.10**	**18.27**

Table 40: Summary of damages and losses in agriculture sector in USD

Pre-disaster Situation

Agriculture is the mainstay of rural economy. More than 90% of the rural farmers in Lao PDR practice subsistence farming for their livelihoods. Farmers grow rice as the main staple crop, as well as other crops such as corn, cassava, and also vegetables, such as eggplant, tomatoes, onions, ground nut, chilly, etc. The majority of the land is planted once a year with a main staple crop (i.e., rice). During the dry season, some areas are cultivated with secondary crops. Some farmers also plant cash crops, such as sugar cane and rubber. Irrigated land allows biannual rice harvests, but this remains rather limited. In addition to cropping, farming communities raise livestock, in particular cattle, buffaloes, chickens and ducks. Livestock supplements do not only increase the levels of food security and nutrition quality for households, but it also generates cash for the families, through the sale of eggs, meat, and dairy products. Similarly, local farming communities manage fish ponds for their food and nutrition security as well as for additional community income. In addition, communities also usually have fruit trees in their farms, mainly to meet the family needs but which allow them to sell the surpluses in the local market. Trading of fruits is also done on the national highways and feeder roads. The following tables represent pre-disaster agriculture situation in the four provinces, which clearly illustrate the importance of agriculture sector for the farming communities in the provinces.

No.	Provinces	No. of Districts	Crop Planted (ha)			
			Lowland Rice	Upland Rice	Other crops	Total
1	Xayaboury	8	19,802	10,263	48,979	79,043
2	Xiengkhouang	8	18,004	6,040	16,560	40,604
3	Vientiane	11	39,456	258	1,738	41,452
4	Bolikhamxay	4	19,663	1,240	3,445	24,348
Total		**31**	**96,925**	**17,801**	**70,722**	**185,448**

Table 41: Total crops planted in the four provinces before Typhoon Haima

No.	Provinces	No. of Districts	Livestock (No)					
			Buffalo	Cattle	Pig	Goat	Poultry	Total
1	Xayaboury	8	39,067	52,979	94,541	6,734	1,219,025	1,412,346

2	Xiengkhouang	8	50,426	112,406	71,311	14,520	867,221	1,115,884
3	Vientiane	11	61,420	125,380	83,779	13,292	1,314,455	1,598,326
4	Bolikhamxay	4	19,704	32,298	42,667	9,403	442,832	546,904
Total		**31**	**170,617**	**323,063**	**292,298**	**43,949**	**3,843,533**	**4,673,460**

Table 42: Total number of livestock in the four provinces before Typhoon Haima[19]

No.	Provinces	No. of Districts	Irrigated land area (ha)
1	Xayaboury	8	4,129.40
2	Xiengkhouang	8	2,943.00
3	Vientiane	11	6,512.00
4	Bolikhamxay	4	2,968
Total		**31**	**16,552**

Table 43: Total irrigated land area in four provinces before Typhoon Haima

Damage and Loss Assessment

Crops and Irrigation Infrastructure

Crops

The floods induced by Typhoon Haima had severe effects in the agriculture sector. According to information and data received and compiled during the detailed damage and needs assessment in the four most affected provinces, agriculture crops including lowland and upland rice, maize, vegetables, cash crops and fruit trees, planted in approximately 7200 hectares of land, have been damaged or lost by the flood water. It was estimated that throughout the 31 districts located in these four provinces, much of the lowland area planted with rice, corn and vegetables was under water for several days. During the field visits carried out by the assessment team, deposits of silt were observed in many crop lands. Some farming communities visited in the villages confirmed that they have been able to quickly replant some of the areas thanks to the support extended by the Government, which provided agriculture inputs.

[19] These data are mainly derived from the figures from 2010

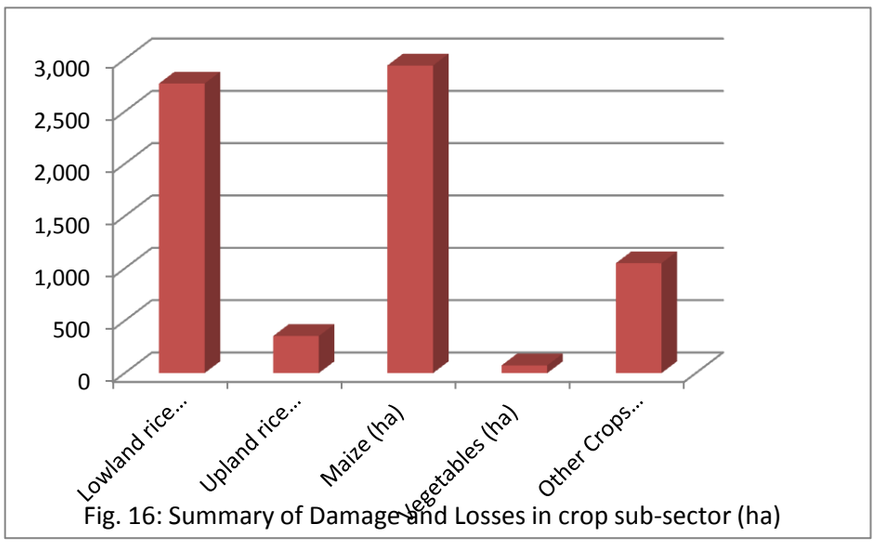


Fig. 16: Summary of Damage and Losses in crop sub-sector (ha)

The diagram (left) summarises the total areas of land, in hectares, concerned by major crop damage and loss in the Xiengkhouang, Xayaboury, Vientiane and Bolikhamxay provinces. Major damage and losses have been incurred by rice-planted areas, both lowland and upland. Some damage has also been recorded to fields of maize, cassava, vegetable, chilly, sugarcane, and other crops. The total estimated losses and damage in the crop sub-sector amounted to about 115 312 million Kip. As per the data and information compiled by the assessment team, crops in about 3% of the productive agricultural crop lands were damaged or lost. In addition, a total of 48.3 million tons (MT) of rice seeds (including seedlings) were lost to the flood. Some of the villages visited by the assessment team asserted that before the flood, they were producing rice surplus, and even reported having supplied surplus rice to the local markets. Given the scale of the disaster, there now is a threat to the food security of households, as well as to the marketing potentials of many communities, which directly impacts their farming-based livelihoods.

Ready to rebuild their lives if some external support is received

Ms Yard, 40, lives in the village of Wang Soy in the Xayaboury province with her two children, an 18 year old daughter and a twelve year old son. Her husband died two years ago, and since then, she has been raising her children on her own. She teaches in a local school, but also does some daily-paid jobs to maintain her livelihood. She had a house next to the river bank, a small kitchen garden where she used to grow vegetables for her daily consumption, and some fruit trees that supported much of her supplementary food needs. A few chickens contributed to her household food security and nutrition as well.

She recalls the horrifying moment on 25 June when the water level started rising, at around midnight, and first swept away the neighbouring house. She hurried to evacuate herself and her two children and attempted to save any possession she could quickly take to higher ground. Unfortunately, before she could collect some of her meagre belongings, she saw her house washed away by the water, along with her stock of rice, which consisted of 5 bags.

She lost her house and all her belongings, her food stock, her vegetable garden, her clothes - everything. She has been supported by the Government with a temporary shelter, and it is her cousin who is now feeding her and her family. She is confused, tired, frustrated and undecided. She does not know whether to migrate from the village, and if so, where to. However, she still shows her level of resilience and smilingly says, 'I will rebuild my life if some support comes through'.

A remarkably positive sign nevertheless observed during the assessment was that since it was not too late for the wet planting season, some farmers mobilised to replant the lowland rice as quickly as possible, either with the input support received from the Government[20] or through inter-family lending. Farmers in the Xiengkhouang and Xayaboury provinces reported to have replanted more than 30% of the lowland rice after the flood. This has given a feeling of relief to many farming communities. Meanwhile, a few farmers in the Xiengkhouang province are reported to have sold their food stocks and other assets to buy rice seed to immediately replant.

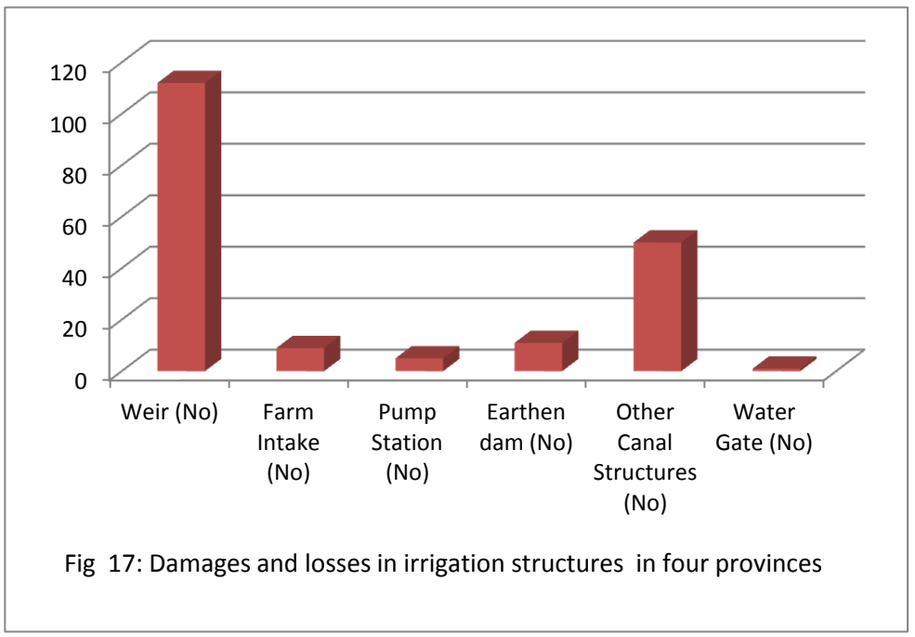


Fig 17: Damages and losses in irrigation structures in four provinces

Farmers also tend to have fruit trees in their farmland, in particular banana trees. No significant loss or damage has been reported in that area of cropping.

The assessment team also observed rubber plantations in some districts of the flood-affected provinces. There was however no report of any major damage or losses affecting commercial plantation.

The communities normally store their rice harvest in traditional storage containers made of local materials. Due to high water level in the lowland areas, many of these storages and the rice they contained were immersed in flood water; some of them were damaged. After the water level receded, the communities were able to save some of these rice stocks; however, a significant portion was lost. The assessment team observed farmers drying up their rice in the sun in villages; however some of the rice was visibly rotting, and displaying an abnormal colour. Remaining rice stocks inside storages that could not be saved was found to be already germinating and not suited for human consumption.

Farm machineries, such as hand tractors, threshers, etc., suffered minor damage in most of the provinces, and the communities could repair them on their own. Some communities in the Vientiane and Bolikhamxay provinces reported to have carried their tools and equipment to higher ground after hearing the early warning messages on radio and the TV.

Irrigation Infrastructure

Irrigation channels have been damaged, with many of the schemes in need of reconstruction. During the field visits, the communities confirmed that immediate attention needs to be given to either rehabilitating or reconstructing the irrigation canals, weir, canal intake and other structures, such as sluice gates. Overall, the floods-affected irrigation infrastructure in the four provinces accounts for a large proportion of the total lowland irrigation system, with a total damages and losses figure of about 63 169 million Kip. Communities visited in all the four provinces have confirmed having performed manual repairs to the irrigation canals to the extent allowed

[20] Government provided rice and corn seeds to the farmers in all the provinces after the flood and the farmers responded very positively to this support.

by their capacities; however requests have been made for the urgent prioritisation of rehabilitation and reconstruction, as the damage to irrigation systems could largely affect the forthcoming harvest as well as upcoming harvests. Indeed water may not be available in many crop lands if the situation remains unchanged. A new irrigation scheme, for instance, which was recently brought into operation in Na Sam village in the Xayaboury province, has been damaged beyond the repair capacity of the farmers, and has left all the 44 households in a condition of great distress (See the Case Study in the box below). If the intake structure and stone rip rap is not immediately repaired, there could be a significant reduction in rice production in the village.

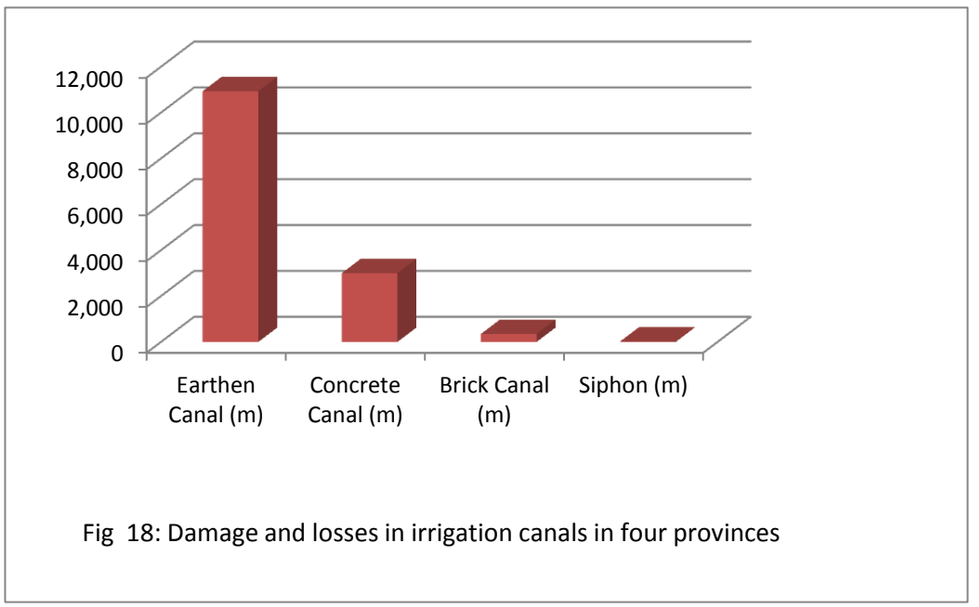


Fig 18: Damage and losses in irrigation canals in four provinces

The diagram above illustrates the total damage and losses to irrigation infrastructure in the four provinces. The lost or damaged weirs were of various types, such as temporary earthen weirs, gabion weirs and concrete weirs.

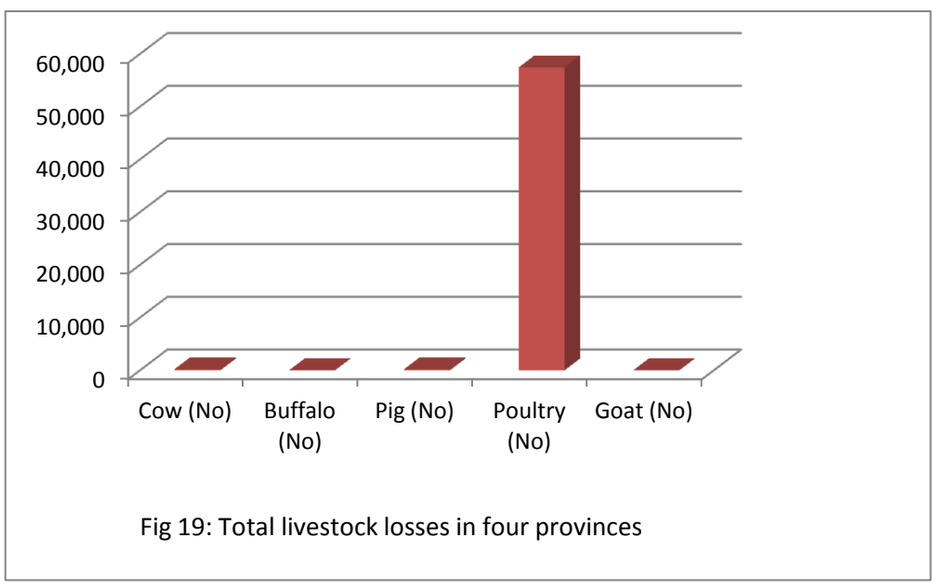


Fig 19: Total livestock losses in four provinces

Livestock and Fisheries

Livestock

The communities were informed in advance about the flood. Many of the large animals, such as cattle, buffaloes and pigs could be saved from the flood. This was due to the fact that they were either

already kept at higher ground level, or that the communities were able to shift them to higher grounds after receiving the flood warning. Furthermore, some of the communities visited in the provinces explained that the water level had risen gradually, which allowed them to shift their animals to higher grounds in time. A family visited in the Xayaboury province told the assessment team about how quickly they packed their chickens in bags and moved them out of the house to a safe place.

The above diagram illustrates the number of livestock lost in all the four provinces. Some private poultry farms have reported the loss of thousands of chickens due to flooding. The assessment team visited one private chicken farm in the Xayaboury province that confirmed the death of nearly 4500 units of chicken. Thanks to a quick access to capital, a part of the farm has restarted with a new stock of chickens. The total amount of damage and losses in the livestock sub-sector approximate 3 905 million Kip in the four affected provinces.

Livestock has however been affected to a certain extent by muddy water from the flooding and by wet weather conditions, that raised fears of communicable animal diseases, such as Foot-and-Mouth Disease (FMD) in the immediate aftermath of the floods. Since the families had to bring drinking water from upland, they managed to give some water to the livestock for drinking as well. However, this was a bit difficult for families with larger number of animals. Members of the local communities, trained as veterinary paraprofessionals, provided required support to the livestock with assistance from provincial department of agriculture; however they lacked the required medicines and vaccination in sufficient quantities for FMD.

Fisheries

Inland fishery (i.e., aquaculture) is another source of livelihood, which provides protein as well as cash income to the local communities. As per the data collected in the provinces and verified through field visits, there has been some damage recorded at the fish ponds, and some of them have been destroyed. In most cases, a large number of fish has been reported as lost to the floods. As high as 10,000 units were thus reportedly lost in one pond in low-lying areas close to the river and streams. Overall, the total amount of damage and losses in the fishery sector is reported to be around 4 840 million Kip in the four affected provinces.

Province	Damage Kip (million)			Losses Kip (million)		
	Public	Private	Total	Public	Private	Total
Xiengkhouang	9793.86	15924.68	25718.54	-	1382.40	1382.40
Xayaboury	22792.51	4808.88	27601.39	-	10499.47	10499.47
Vientiane	28821.80	8287.32	37109.12	-	19075.82	19075.82
Bolikhamxay	1760.34	22192.89	23953.23	-	41885.69	41885.69
Total	**63168.51**	**51213.77**	**114382.28**	**-**	**72843.38**	**72843.38**

Table 44: Summary of damage and losses in agriculture sector (crops, livestock, irrigation, fisheries) in the four provinces in Kip

Province	Damage USD (million)			Losses USD (million)		
	Public	Private	Total	Public	Private	Total
Xiengkhouang	1.23	1.99	3.22	-	0.17	0.17
Xayaboury	2.85	0.60	3.45	-	1.31	1.31
Vientiane	3.61	1.04	4.64	-	2.39	2.39
Bolikhamxay	0.22	2.78	3.00	-	5.24	5.24
Total	**7.90**	**6.41**	**14.31**	**-**	**9.12**	**9.12**

Table 45: Summary of damage and losses in agriculture sector (crops, livestock, irrigation, fisheries) in the four provinces in USD

Impact on Food security and Nutrition

Food security situation before the floods

In late 2010, a joint FAO-WFP Crop and Food Security Assessment[21] in all provinces identified over 111,000 people in need of food assistance. However, these populations were mainly located in the South, where Tropical Storm Ketsana in 2009 and the erratic rainfall in 2010 caused severe damage and poor harvests.

Provinces in the north and in the centre of Lao PDR were considered as less vulnerable. The total rice harvest in Xayaboury was greater in 2010, whereas in Xiengkhouang, Vientiane, and Bolikhamxay, the harvests were slightly lower compared to 2009, as indicated in the table below.

	Wet season, lowland						Annual total, July - June						% change in production from 2009 to 2010
	Area ooo ha		Yield t/ha		Prod. ooo t		Area ooo ha		Yield t/ha		Prod. ooo t		
	2009	2010	2009	2010	2009	2010	2009/ 2010	2010/ 2011	2009/ 2010	2010/ 2011	2009/ 2010	2010/ 2011	
Xiengkhouang	21	20	3.99	3.83	82	75	29	28	3.42	3.29	100	91	-9.2
Vientiane	52	52	4.35	3.85	227	202	70	68	3.95	3.69	275	250	-9.1
Bolikhamxay	34	33	3.90	3.83	133	127	43	42	3.90	3.77	167	157	-5.9
Xayaboury	28	30	4.07	4.11	113	125	45	48	3.39	3.47	154	166	8.1

Table 46: Paddy area, yield and production by province, 2009/10 and 2010/11

[21] (FAO/WFP Crop and Food Security Assessment Mission to Lao People's Democratic Republic; March 2011

Source: FAO/WFP CFSAM, 2011

Impact on food security

The assessment team visited the four provinces of Xiengkhouang, Xayaboury, Vientiane and Bolikhamxay. The objective of this categorisation was to identify and prioritise geographical areas and villages which were the most in need of food assistance. The indicators assessed the percentage of households within each village that had less than 3 months of rice, 3-6 months of rice and more than 6 months of rice.

Of 239 affected villages, 11 percent were found to have a high proportion (75-100 percent) of households with less than 3 months of rice, and a further 21 percent of villages had a medium proportion (50-75 percent) of households with less than 3 months of rice. Unfortunately it was not possible to compare this data with the equivalent data for a 'normal' year and identify a gap between them, which would have allowed the team to ascertain that the cyclone was the only reason accounting for this poor food security performance. It is likely that many households identified as having less than 3 months would have been in a not-so-different situation regardless of the typhoon, since the assessment took place during the lean season, 3 months before the harvest.

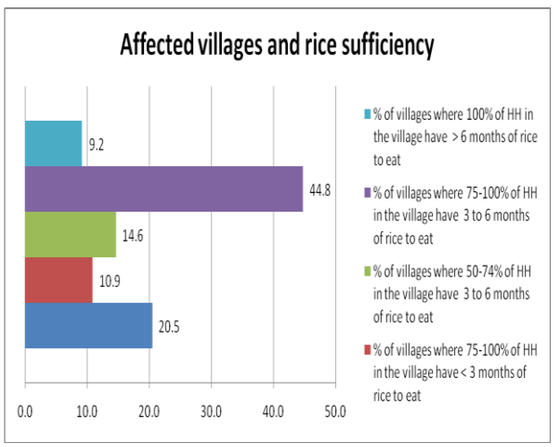


Fig 20: Photo of household drying rice that was damaged by flood water during Typhoon Haima, Ban Phoukham, Xiengkhouang Province. 27 July 2011

Food insecurity is also a major factor contributing to malnutrition, along with poor health practices. Therefore whenever food security is not guaranteed, there is a risk for malnutrition, and thus nutrition should be included in the food security assessment.

Nutrition situation before the floods

Malnutrition is a significant problem in Laos. Chronic malnutrition, as measured by stunting, is extremely high across the country. The national average rate is 40%[22], which according to international criteria reflects a 'severe public health problem'. Due to chronic nutrient deficiencies, over half of all children in rural areas will not meet their full growth potential. Map one highlights the critical stunting rate in 2006 in the four affected provinces (above 40 %), with the exception of the Vientiane province, where the levels were found to be serious (30-39 %)[23].

[22] Ministry of Health, 2009, *National Nutrition Strategy and Plan of Action*
[23] Comprehensive Food Security and Vulnerability Assessment, WFP 2006.

Wasting, measured by low weight for height and resultant from short-term inadequate food intake and disease, stands at 6%[24]. However there are large geographic variations across Lao PDR, illustrated by 2010 data indicating, for instance, that the wasting rate exceeded 10% in Saravan and Savannakhet and 18% in Attapeu. Typhoon Ketsana further destabilised a fragile nutrition situation in southern Laos. Map two illustrates the 2010 wasting levels of 8.2% and 8.4% in the Bolikhamxay and Vientiane provinces respectively[25].

Micronutrient deficiencies are extremely prevalent. Over 40% of under-five children are iron deficient and 63% of under-two children are iron deficient. Almost 45% of children under 5 and 23% of women between 12 and 49 years of age suffer sub-clinical Vitamin A deficiency[26].

Poor dietary diversity is a major contributor to micronutrient deficiencies and stunting in Laos. In a 2010 survey, only 16% of children in Lao PDR were receiving the necessary diet in terms of quantity and dietary diversity[27].

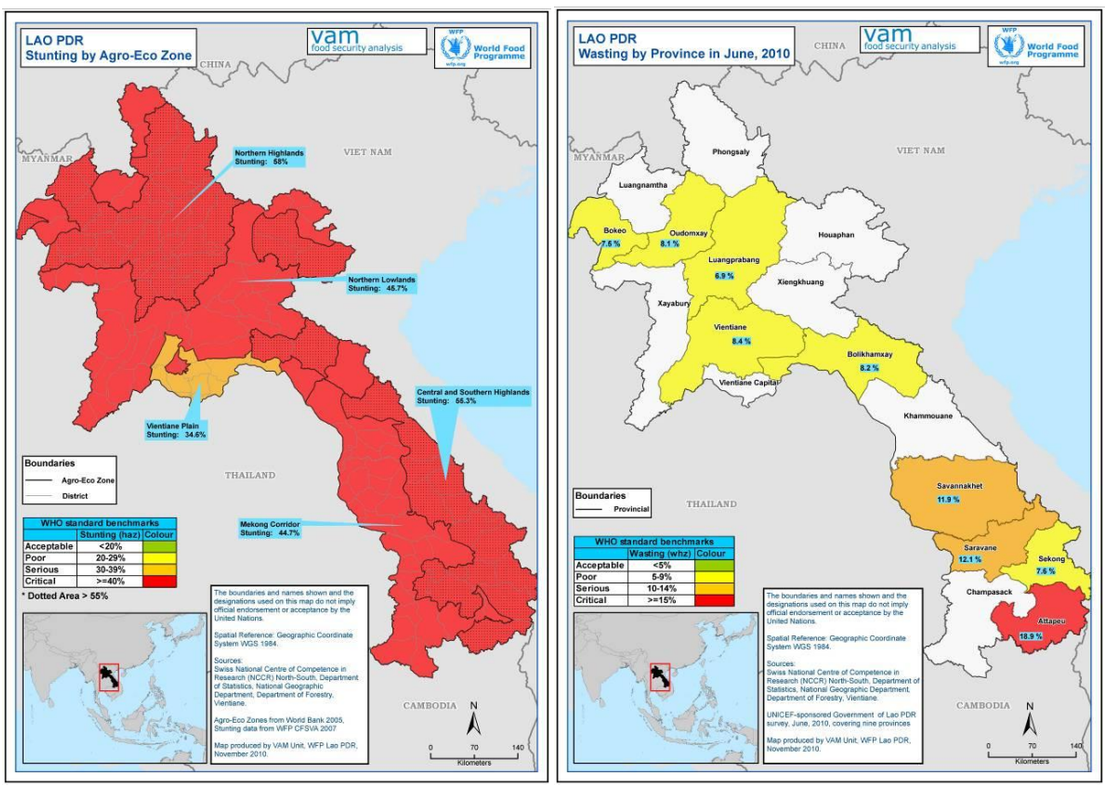


Fig. 21: Wasting levels in Bolikhamxay and Vientiane Provinces (Based on data from 2010)

3.3.4 Impact on nutrition

Nutrition monitoring in Lao PDR is largely limited to the measurement of weight for height as a component of routine Mother and Child Health (MCH) services. MCH services are provided by health centres, hospitals, and outreach services at the community level in some areas. The weight for height data collected during the flood

[24] Ministry of Health, 2009, *National Nutrition Strategy and Plan of Action*
[25] (National Institute of Public Health, 2010, *Nutritional Assessment in 2008-2009 Flood and Typhoon Affected Provinces of Lao PDR)*.
[26] Ministry of Health, 2009, *National Nutrition Strategy and Plan of Action*
[27] Ibid

assessment is analysed in the light of the WHO 1978-1982 Child Growth Standards, that indicate when a child has a healthy weight, or is considered 'at risk', moderately wasted, and severely wasted.

There are problems with the current nutrition monitoring system including the low capacity of health staff to conduct proper height and weight measurements; lack of proper anthropometric equipment in every health centre and outreach team; exclusion of a denominator of total screened children (Vientiane province); low screening coverage; outdated WHO Child Growth Standards, and the absence of height for age (stunting), weight for age (underweight) and iron deficiency anaemia measures. Due to the limitations in the routine monitoring, the collected data should be interpreted with caution. There are no current plans for a post-Haima nutrition assessment, except for the Xayaboury province where Save the Children is active and is considering the need for a comprehensive assessment.

Wasting Indicator

The wasting data collected in the assessment indicates a wasting rate, prior to Haima, of under 5% in all four provinces. The available information suggests that the pre-Haima wasting rate as at an acceptable level in four provinces. However, the lack of reliable and valid wasting data and the extremely high levels of underlying chronic malnutrition and micronutrient deficiencies in all provinces in Lao PDR suggest the presence of risk factors that may worsen the nutrition situation post-flood. However, while risk factors exist, the relatively low level of agricultural damage due to Haima and the approaching harvest in October should prevent a rapid increase in wasting levels.

Preliminary Recommendations

The agriculture and food security sector assessment team, based on the compilation of secondary data, and the field assessment and consultations carried out, recommend interventions through three different phases. The short-term interventions are recommended to be implemented as soon as possible, in order to enable the local farming communities to go back to their field with winter crop inputs. These interventions have been discussed with the Ministry of Agriculture and Forestry (MAF).

The medium-term and long-term recommendations should be aligned to the priorities, plans and policies of the Government of Lao PDR. Furthermore , as suggested by the MAF, further consultations will have to be conducted at the provincial, district, community, and central level as a part of a broader recovery and rehabilitation process which will seek a more holistic approach, taking into consideration cross-cutting elements, such as environmental issues.

The agriculture and food security team has therefore formulated the following preliminary recommendations for the short-, medium- and long-term:

a) Short-term Recovery Needs (0-6 months):

- Provision of rice, other crop seeds and fertiliser for the areas still to be planted
- Vegetable and other crop seeds for the dry season
- Fingerlings and fish brood stock to restock the lost fish in the ponds
- Though minor repairs have been done to the fish ponds by the communities themselves in most of the villages, some ponds still need repair works
- Cash transfer schemes for the flood-affected families to invest in crops, livestock or fisheries

- Surveillance of animal diseases needs to be carried out in the flood-affected provinces, including awareness of types and effects of animal diseases
- Veterinary medicines, equipment, vaccines and animal feed
- Cleaning of the water passes, canals and drainage should be one of the top priorities
- Immediate improvement of irrigation canals is necessary for the next crop
- Awareness-raising on disaster risk reduction and preparedness, including media messages on disasters and early warning
- Request was made for immediate food support, mainly in the form of rice - however the government has responded to the immediate needs in rice of the most vulnerable households. Of the 10% of villages with a high proportion of households with less than 3 months of rice, it is highly likely that the natural coping mechanisms will be sufficient to sustain food requirements until the harvest in 3 months.

b) Medium Term Reconstruction and Rehabilitation Needs (6-24 months):

- Recovery of affected land that are heavily silted due to mudslides
- Diversification of crops is important for the community. Though they grow vegetables such as long beans, onion, garlic, etc., they need improved seeds and technical support for growing vegetables for their own consumption and sale of surplus produce.
- Extension support is therefore a necessity, along with animal health support
- Rehabilitation of irrigation infrastructure to ensure sufficient water for the next cropping season.
- River protection works
- Rehabilitation of fish ponds with proper concrete lining as appropriate, and support for fishing gears
- Initiatives to link the farming communities with banking facilities, to which they do not have access currently, are recommended
- Promotion of Non-Forest Timber Products (NTFP), mainly herbs for traditional medicines
- Improved animal breeds with herd health programmes, including the institution of biosecurity measures and awareness.
- Livestock farmer field schools and refreshment courses of Community Animal Health Workers

c) Long Term Development Needs (24-60 months):

- Many villages produce rice more than they can consume. The surplus is sold on the market. The normal yield is 4 MT/ha and in most of the areas only one crop per year is grown during the rainy season. Similarly, the yield of corn is 6-7 Mt/ha. If supported with modern technology and marketing for their produce, the socio-economic condition of the community will largely improve as they will be able to produce two crops a year both in upland and lowland
- Strengthening the farmers groups and building their capacity on livelihood diversification, collaboration with banks, and government line agencies for required technical support
- Herd and flock health programmes, including the institution of biosecurity measures and awareness
- Livestock farmer field schools and refreshment courses of Community Animal Health Workers
- Diversification of livelihood opportunities with due focus on agro-based home industries
- Fishery is at a very primitive stage. This is another area that needs support in the longer-term
- Most of the land has 1 rice crop, and some areas with irrigation have 2 main crops. Improvement of irrigation infrastructure facilities could help irrigate the remaining areas to get two main crops per year. A large surplus can be expected that could be marketed, generating cash income to the farming communities, which would eventually improve their resilience to, and enhance their coping capacity against such floods in the future.

	Recovery and Reconstruction Costs (USD)	
	Short-term Recovery	**Medium-term Reconstruction**
Subsector Needs		
Crops	1,560,000	14,610,000
Irrigation	7,190,000	10,910,000
Livestock	500,000	990,000
Fisheries	600,000	-

Table 47: Needs in agriculture and food security sector

d) Long-term development needs Nutrition Sub-sector

- Nutrition monitoring strengthening

To improve the routine monitoring, MCH provincial and district departments require technical and financial support. An adequate routine monitoring system would provide a baseline of the nutrition situation, and act as an early warning system in the event of increasing malnutrition incidence following a shock. Nutrition monitoring should include additional indicators of height for age and weight for height, and the WHO Child Growth Standards should be updated to the latest version (2006).

- Improved basic nutrition capacity

Health staff at provincial, district and health centre level requires capacity building in basic nutrition. The FAO-MoH Basic Nutrition Training of Trainers, which covers nutrition requirements throughout the lifecycle, recognising and treating malnutrition, growth monitoring and infant and young child feeding, has been implemented in eleven provinces, reaching provincial and district staff. Increased coverage of basic nutrition training to more provinces and reaching the health centre and the village levels, would promote understanding of nutrition principles and how to prevent, identify and treat malnutrition.

- Increased coverage of treatment options for acutely malnourished children

WHO has began training of major hospitals in the treatment of acute malnutrition. Currently, Provincial hospitals in Vientiane Capital, Attapeu, Saravan, Savannakhet, Champassak, Houaphan, Oudomxay, Luangprabang and Xiengkhouang have been trained and equipped to treat malnourished children with therapeutic foods. A Community Management of Acute Malnutrition (CMAM) Programme exists in 13 districts in Attapeu, Saravan and Savannakhet, where malnourished children can receive community based treatment. The district hospitals in all 13 CMAM districts have also been trained in Severe Acute Malnutrition (SAM) management. In the Haima flood-affected provinces, there are no existing services to treat malnutrition that are identified through MCH screening, with the exception of Xiengkhouang Provincial Hospital. MCH staff report that when a child is identified as wasted, the health centre staff provide education on 'healthy diet', and 'taking more care' of the malnourished child. National scale-up of malnutrition management, including availability of supplementary foods for moderately malnourished children to be treated in the community context, is recommended.

Socio-economic Impact on Livelihoods

A majority of the rural Lao population makes a living out of a combination of farming and non-farming activities, including hunting and the gathering of timber and non-timber forest products. The assessment reported severe damage and losses of crop land, fish ponds, and some livestock as well as damage to irrigation systems. These are likely to have serious implications on the livelihoods of the people who were affected by the recent flood. Damage to some critical rural infrastructure, such as roads and bridges, would potentially limit access and mobility of people in the affected communities to forests and markets. Small businesses, including home-based agro-businesses, were also reported to be affected. At the time of the assessment, most of the markets were accessible, except the ones whose access was rendered difficult or impossible due to damaged bridges. Prices were reported to have escalated in comparison with the pre-flood period.

Farmers living in easily accessible areas, for instance villages near the capital, Vientiane, usually have access to bank credit. However, after the flood and the loss of their crops, they were found to be under stress, due to fears regarding their capacity to repay their loans and

Hopes of betterment of living condition shattered by the devastating flood

Mr Phongchan is 57, and is considered as a senior citizen in Nam Sa village in Xayaboury province. He has a wife and two children. Mr Khumpan is also 57, has 7 children, and works as the head of local farmers' association in the village. The village is home to 80 households, with 80 hectares of farm land distributed between them. Despite having a fertile land and enjoying the privilege of a stream flowing aside, the entire village only manages to grow one main crop per year.

The villagers were very satisfied when, earlier this year, a new irrigation project was completed, with two intakes from the nearby stream. This raising the farmers' hopes for better living conditions, as they were confident they could now yield two rice crops per year. This was also the first time they could irrigate the totality of the 80 hectares of land. The farmers recall with dismay the early warning that was sent to them prior to Typhoon Haima, which prompted them to take their possessions to higher grounds. While they could were able to save the assets they could carry with them, they felt completely helpless as they watched the damage caused to the crops in their fields, including vegetable gardens, and to the irrigation infrastructure they had just started to use. "The water came up to here", Mr Phongchan illustrates by pointing at his chest level, as he's already standing on a dirt heap on the ground. "I dreamt of producing more, so that my 5 children that have temporarily migrated to the city and live on daily-paid jobs could come back and lend me a hand", says Mr Phongchan with deep sorrow. Mr Thamin similarly regrets the losses of vegetables planted in 15 hectares of land, about 8000 units of fish lost from two ponds, and the crops damaged in about 30 hectares of land. Joined by few other villagers, they nevertheless still smiled and said, "This flood, which was much smaller than that of 1973 but was still of an unprecedented scale for us, shattered our dreams of having better living conditions. We hope that the government will provide us the required support so that we can repair our canal intake and the channels, and make our dream come true".

interests. Farmers living in distant provinces, such as Xiengkhouang and Xayaboury, practiced inter-families lending and borrowing. Some communities have been found to have put into place revolving funds. However, the credit potential of such funds was inferior to 10 million Kip. Inter-family borrowing existed at an average interest rate of 5%, and some communities even borrow rice, seeds and seedlings to be repaid with interest after the following harvests. The system looked to be working well in the communities. A major impediment reported by the communities during the assessment was the difficulty to access bank credits, due to rigorous bureaucratic procedures and to inconvenient bank locations. Farmers were also reluctant to secure the loans with their land as collateral.

Disaster Risk Reduction and Preparedness Issues

Flood is a recurrent phenomenon in Laos. Although the most devastating one in local people's memory remains the 1973 flood, floods of different scales have occurred in different parts of the country since then. The country experienced floods with various degrees of severity in 2006, 2008 (induced by Typhoon Ketsana), 2009 and 2010. The assessment team thus also attempted to analyse the reasons for such recurrent floods, their overall impact, and appropriate measures to reduce flood disaster risk. This was done with a view to enhance the resilience and capacity of the rural farming communities to get better prepared against such flood disasters. During the field visits, while interacting with the communities, few questions were raised on preparedness and disaster risk reduction. The communities confirmed having experienced floods in their villages recurrently, and the latest one in June 2011 came to them as a big shock, and they did not have much idea on any action on preparedness or immediate response. However, the farming communities were very sensitive and committed to achieving better preparedness, to avoid major damage and losses in the future.

Of concern to them was silt deposition in river beds and irrigation channels due to soil erosion, heavy siltation of water exits in the mountain passes, lack of proper drainage system in the lowlands of the villages, sudden accumulation of water from various sources[28], deforestation, lack of proper irrigation structures such as sluice gates, and the lack of proper protection for river banks. Another major concern was the lack of information on the effects of larger floods, and the lack of awareness on actions to be taken for improving resilience and better preparedness. When asked, many community members replied that they would try to avoid building houses in lowland and vulnerable areas; however if a flood of such scale was to occur more frequently, they would have no other alternative but relocating the village to higher grounds. However, they were equally concerned with the difficulty they would face in terms of farming-based livelihoods, access, and drinking water if they moved to higher ground. Furthermore, the communities concurred to say that they had learnt a lesson from the flood in terms of the importance to have adequate cash savings and food stocks in the event of disaster. Women groups in the Vientiane province stressed the need of capacity building, while also recognising the need for diversified livelihood mechanism also giving due importance to agro-based home industries. 'One Village One Product' concept successfully implemented by Thailand to minimize the dependence on rain fed rice crop was another point the communities were interested in.

It is evident that efforts need to be made to mainstream disaster risk reduction (DRR) in the agriculture and food security sectors. Building the capacity of the communities to get better prepared against such flood disasters is therefore a necessity. Meanwhile, DRR initiatives need to be closely coordinated with the departments of forestry while building the awareness of the local people on the issue of the protection of forests and of the environment. The local communities regarded better prepared to such floods in the future as an absolute priority.

[28] Notably, farmers in Xayaboury and Vientiane provinces reported to have faced problems with blockages in the drainage system due to siltation and proper infrastructure, which further contributed to accumulation of water from various sources helped submerge their crop land for longer period.

'Stop felling the trees to prevent damages from floods', say the women in Xiengkhouang Province

The village of Phonkharm in the Xiengkhouang province is one of the worst affected villages. Rice crops, livestock, fish ponds and irrigation infrastructure have been severely damaged. Rice stocks have been lost due to the high water level, and this has threatened the food security and nutrition situation in the village. One fatality was also reported in this village.

The assessment team organised a detailed consultative group discussion with the flood-affected families in the village. Both men and women actively participated in the group discussion. A group comprised of 24 persons, including 7 women, and led by Mr Pingjanmanegong, head of the village, interacted with the agriculture sector assessment team and shared their experience of the flood.

The discussion also touched upon the issue regarding risk reduction and better preparedness against such flood disaster. The women were interestingly very vocal on this aspect, as they felt more could have been saved had there been proper initiatives to this end. While asked what could have been done to avoid such massive damage and losses during the flood, the women asserted that a flood of this scale happened because the communities were felling trees, the soils were getting loose, and the water retention capacity of the soil was largely reduced. The women univocally said that if the people do not stop felling the trees on the hills, the problem of floods will remain the same, and more disasters can be expected to happen.

Environment

Meteorology and hydrology services performed by the Department of Hydrology and Meteorology (DMH) under the Ministry of Natural Resources and Environment (MoNRE) are one of the important areas for supplying hydrological (water level and flood risks) and meteorological (weather and climate) related data and timely forecasts to line sectors for socio-economic development, food security, environment protection and climate risks reduction, through disaster monitoring and early warning. The GoL has the responsibility, by virtue of regional and global agreements such as those supported by ASEAN, the Mekong River Commission (MRC) and the World Meteorological Organisation (WMO), to provide meteorological and hydrological data. At present, it is found that the analogue system is used for data collection and reporting in Lao PDR, while a digital system is used in neighbouring countries. It is crucial and one of the key priorities that the current system should be upgraded, so as to harmonise it with the systems used in neighbouring countries and to ensure the continuation of the regional information exchange.

Pre-disaster

Currently, there are a total of 17 main synoptic stations in all provinces in Lao PDR. The central station is in the Vientiane capital, where a meteorological radar tower, a meteorological satellite receptor, and a seismic observation station are installed. Apart from these, there are a total of 113 rain gauges, 109 water level gauges, and 49 water discharge measurement in Lao PDR.

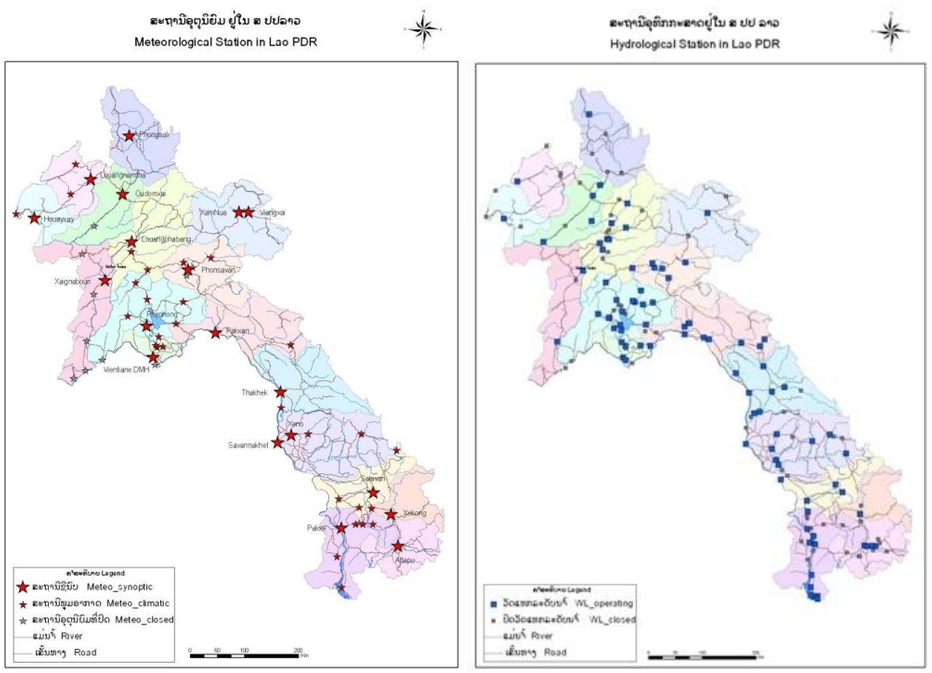


Figure 22: Map of meteorological stations and staff gauge in Lao PDR

Source: DMH, 2011

In the 4 provinces affected by Typhoon Haima, weather stations and staff gauges are installed in the main districts to collect and provide weather data to the central station as summarised in Table 1 below:

Province	Total number of districts	Total number of districts with weather stations	Name of the district	Number of staff gauges	Names of the river that has staff gauges installed
Xiengkhouang	8	3	Pek, Kham and Phoukout	9	*At Phoukout district:* Nam Chat Nam Sui Nam Ngum (Phiengluang) *At Pek district:* Nam Kho (Lat Ngone) Nam Ngum (Lat Buak) Nam Thuang (Phou Keng) Nam Gguan *Khoun district:* Nam Ngiu *Kham district:* Nam Mat (Na pa)
Xayaboury	11	1	Xayaboury	2	Mekong river, Paklai district Nam Houng, Xayaboury district
Vientiane	13	7	Phonehong, Thoulakhom, Kasy, Hom, Xaysomboun, Vangvieng and Longxane	3	Nam Lik, Kasi district; Nam Xong, Vangvieng district
Bolikhamxay	7	2	Khamkeut district (Lak 20), Pakxan district	7	Nam Xan, Kao district; Nam Ngieb, Mai district Nam Kading, Pakkading district Nam Phao, Khamkeut district Mekong river, Bolikhan district Nam Xan, Hatxiengtong district Nam Mang, Thabok district

Table 48: Summary of hydrological and meteorological stations installed in Xiengkhouang, Xayaboury, Vientiane and Bolikhamxay provinces

Damage data

According to the data reported by the Provincial Water Resources and Environment Office (PWREO) in 4 affected provinces of Xiengkhouang, Xayaboury, Vientiane and Bolikhamxay, the weather stations and staff gauges in the province of Xayaboury were not affected since they are installed on high ground, and the staff gauges are marked on the bridge's column at Nam Houng. However, the most affected province is Vientiane, with total damage reaching 5.7 million Kip and affecting temperature measurement devices, the weather station's antenna, and staff gauges installed at Nam Lik and Nam Xong. The Xiengkhouang and Bolikhamxay provinces reported minor damage resulting from the staff gauges installed at Nam Ngiu and Nam Xan, worth 2.0 and 1.7 million Kip respectively, being completely washed away. The PWREO of Bolikhamxay district already mobilised resources to fix the damaged staff gauge.

Province	District	Description of the damage	Damage (%)	Damage value (Kip)
Xiengkhouang	Khoun	Staff gauge were washed away at Nam Ngiu	100	2,000,000
Vientiane	Vangvieng	Ground temperature measurement equipment	20	1,300,000
		Weather station's antenna at the district meteorological office	10	2,000,000
		2 Staff gauge were washed away at Nam Xong	100	2,240,000
	Kasi	1 staff gauge plate was damaged	20	0,120,000
Bolikhamxay	Kao	4 staff gauge were damage at Nam Xan	100	1,700,000
TOTAL DAMAGE				**9,360,000**

Table 49: Damage to hydrological and weather stations

Identification of needs in the short, medium and long term

Discussions and consultation made with the PWREO staff at affected provinces and the DMH staff in the capital Vientiane, as well as field visits to observe the damaged equipment, revealed that most of the equipment used in meteorological offices at province and central levels is quite old, often more than twenty years old, and in some cases dating as far back as the 1970s. This has affected the reliability and quality of the data provided to the central level, and has also limited the speed of reporting, as it is still manually collected, recorded and reported through faxes. Lao PDR has failed the last two tests conducted this year by the WMO as a result of using analogue system. Notice was sent to DMH requesting it to upgrade the system to a digital one, in order to make it compatible with the regional systems, but lack of funding has prevented the country from moving forward.

The most urgent and needed assistance, from the hydrometeorology perspective, is to upgrade the central and provincial reporting systems to a digital system, which will cost approximately USD 200,000. The upgrade will ensure systematic reporting and reception of meteorological data from the provinces in a timely manner, which will prove particularly convenient in the area of disaster risk management.

Another priority is to mobilise funding to fix the damaged equipment caused by Typhoon Haima, for example, fixing the weather station's antenna in the Vangvieng district, and a few staff gauge at Nam Xong and Nam Lik in the Vientiane province. This will cost approximately 6 million Kip (USD 750).

In the medium and longer terms, there is a real need to fix the meteorological offices that have been flooded on an annual basis – a hindrance causing disruption of work and damage to equipment and furniture in the offices. For instance, the office in the Thoulakom district, Vientiane province, a wooden building built prior to 1975, requires immediate maintenance or relocation to higher ground. The office in the Pakxan district, Bolikhamxay province, located about 1.5 km from the Mekong River, also needs to be relocated.

The local government highlighted that there is a need to install additional equipment (mainly weather stations, staff or slope gauges) at other strategic locations, such as in the Xanakham district in the Vientiane province, located on the Mekong River near Thailand.

Finally, a lack of highly qualified and knowledgeable staff on meteorology is another main obstacle faced by the government at both provincial and central levels. There were a number of senior staff working at DMH and selected provinces who graduated from the former Soviet Union in meteorology, but such a course is not available in Lao PDR or neighbouring countries. In order to ensure a long term, sustainable management of the

data and the provision of services to the line sectors, there is a strong demand for technical capacity building of staff specialising in meteorology in the medium and long term, as well as for the conduction of short training courses on basic data collection techniques and analysis for existing and new staff at the provincial and district levels in the short term..

Province	Term	Identified priorities	Requested budget (USD)
All country	Short	Upgrade the reporting and reception system from analogue to digital so as to make it compatible with the region and global systems	200,000
Central	Medium-long	Support at least 2 staff at DMH to obtain higher qualification/degree in meteorology	50,000
Xiengkhouang	Medium	Provide mobile phone and SIM cards for the remaining districts and villages that installed staff/slope gauges for reporting the data	700
	Long	Install weather stations and rain gauges in the remaining 5 districts in the province	56,500
	Medium to long	Training provincial, district and village staff on data reporting and analysis techniques	800
Xayaboury	Medium	Install faxes for hydrometeorology offices in the districts lacking thereof, to ensure timely reporting of weather data, including disaster warning	10,000
	Long	Install weather stations for the remaining districts (10)	105,000
	Medium to long	Training provincial, district and village staff on the data reporting and analysis techniques	800
Vientiane	Medium	Fix or relocate the meteorological building at Thoulakhom district which is flooded every year (size 6X7 sq m)	6300*
	Medium	Fix or relocate the meteorological building at Phonehong district which is flooded every year (size 10X10 sq m)	15,000
	Long	Install the staff/slope gauges at the Mekong river and weather station for Xanakham district	11,300
	Medium to long	Build the capacity of the new staff to work on hydrometeorology services	800
Bolikhamxay	Medium	Fix or relocate the office in Pakxan district to higher ground	15,000
	Medium to long	Build the capacity of the new staff to work on hydrometeorology services	800
	Long	Build 2 meteorological stations at Thabok and Thaphabaht districts	30,000
TOTAL			**503,000**

* Estimates based on the current construction prices of USD 150/sq m

Table 50: Budget needed for environment

The Economic and Social Impacts

Introduction

This section presents estimates of the economic and social impacts of Typhoon Haima-related damage and losses. These are measured at the macroeconomic level—including the performance of the country's economy (productive sectors), the balance of payments, and the fiscal sector—and also at the personal or household level, where declines in income and livelihoods are estimated.[29] The main provinces affected by Typhoon Haima are Xiengkhouang, Xayaboury, Vientiane and Bolikhamxay.

The Macroeconomic Impact[30]

Pre-Disaster Economic Situation and Early Projections

Lao PDR's economy has grown at a fairly fast pace over the last 20 years, with an average growth rate of 6.8 percent in 1991-2010. There was a significant decline in poverty - the incidence of poverty fell from 46% of the population in 1993 to about 27.5% in 2008, using Lao PDR national poverty line. The key productive sectors include agriculture (32% of GDP), industry (30.8% of GDP) and services (37.3% of GDP), see Figure . Although the share of agriculture in GDP has declined rapidly in recent years, the sector remains very significant to local people as over 70% of population still engages in agriculture related activities.

*The Lao economy has also performed relatively well in the midst of the global financial crisis***.** The real GDP growth accelerated on average to 7.9% per annum during the last five years (2006-2010) including 7.5% in 2009 and 8.4% in 2010, driven largely by natural resources sectors. Foreign Direct Investment (FDI) in resource and non-resource sectors has bounced back, supported by the recent recovery in regional demand and the rise in prices of commodities for the country's exports. The headline inflation has been low in recent years, about 4.5% in 2007. It climbed to 7.6% in 2008 due to the food and oil price crisis but was below 1% in 2009 and 6% in 2010. Real GDP growth is expected to be robust in 2011 with projected growth of 8.6 percent compared to 8.4% in 2010. The natural resources and manufacturing sectors are expected to drive growth this year. The service sector also shows signs of improvement, particularly in transport, tourism (hotels and restaurants) and retail trading. Agriculture (fishery, livestock and crops) is expected to benefit from the recent increase in regional demand and higher food prices.

The Consumer Price Index (CPI) headline inflation has risen in recent months due to higher commodity prices. The headline inflation has been high in recent months due to higher fuel and non-rice food prices although it has

[29] The impacts of flood from Typhoon Haima are assessed against the pre-flood state of the economy and level of social wellbeing. To estimate economic impact, the baseline data of Lao economic outturn in fiscal year 2009/10 and expected performance in the current fiscal year (2010/11) were comprised. The economic team also met with provincial economic related departments, chamber of commerce and business associations, and several affected businesses. The analysis shows how the forecast will be affected by the Haima-caused losses. With regards to the social impact, numerous reports and studies describing the situation prior to the occurrence of the flood were used to develop a baseline for comparison to post-flood conditions. The analysis shows how living conditions, including livelihoods, employment and income, will be impacted from flood losses.

[30] Note: Since this analysis is done in the middle of the rainy season and covers impacts only from Typhoon Haima (not include Nock Ten and other upcoming storms), it does not provide a complete picture of potential damage and loss to Lao economy. Thus, a more comprehensive post disaster review is needed at the end of the rainy season to be able to capture the holistic picture of damage and loss and take a comprehensive policy response for reconstruction and recovery.

declined slightly to 9.5% (y/y) in June from a peak at 9.8% in May 2011. Core inflation (excluding food and energy) increased slightly from 3.8% (y/y) in May to 4.2% in June. The fuel prices rose by 31.2% (y/y) in June 2011 from 29% in May and 26.5% in April. Food inflation has been high in recent months about 15.1% (y/y) in June and 15.6% in May despite recent drops in rice prices. The main items fuelling food prices are meat (due to an animal disease outbreak in the centre and southern regions in early 2011), fish, poultry and vegetables (mostly due to the seasonal factor, see Figure . The annualised inflation is projected at around 8.7% in 2011.

Figure 23. Share of GDP by sector, FY2009/10

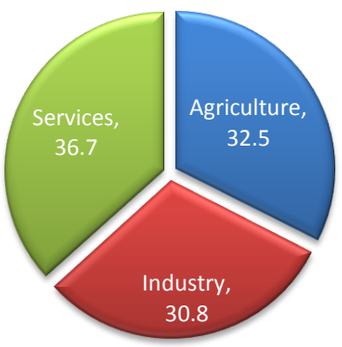
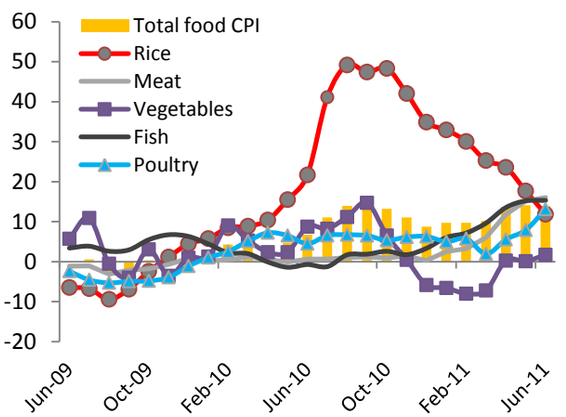


Figure 24. Recent food inflation (12-month percent change)



Source: MPI (DOS) and World Bank

Higher copper and gold prices, combined with the withdrawal of quasi fiscal spending, are pushing the fiscal deficit down this year. The budget deficit is expected to drop to 2.8% in FY10/11 from 5.7% of GDP in FY09/10 due to slow expansion of expenditure (for both current and capital spending) and projected higher revenue (especially resource tax revenues) as well as strong GDP growth. Domestic revenue is expected to increase to 14.4% of GDP in FY10/11 from 13.3% in FY09/10 following anticipated transfers of taxes, royalties and dividends from the resource sectors as a result of higher commodity prices.

Lao export earnings are projected to soar in 2011, driven by higher commodity prices and increased regional demand. Lao exports grew rapidly by almost 43% (in nominal terms) in 2010 (boosting total merchandise exports to about USD 2 billion) and are projected to grow by nearly 30% in 2011, driven largely by resource exports (electricity and copper). Imports rose by about 11% in 2010 and are expected to grow by 22% in 2011, driven by higher imports of capital and consumption goods as well as the rise in petrol prices. Although the

overall trade balance is expected to improve, the current account deficit is expected to widen slightly to about 9.4% of GDP in 2011 from about 8.6% in 2010, mainly on the account of larger transfers of profits and debt service payments abroad by large resource projects. The capital account surplus is projected to increase from 9.9% of GDP in 2010 to 12.1% in 2011 with a corresponding surge of new investment, especially from large resource mega projects (hydro and mining). Overall balance was in surplus at 1.3% of GDP in 2010 and is expected to increase to 2.8% in 2011 due to strong resource account surplus (about 12.7% of GDP in this year compared to 10.7% in 2010).

Impact on Economic Growth

Overall, the economic impact of Typhoon Haima is moderate at the national level but relatively large at the provincial level and it is also uneven between those affected provinces. Based on this report's estimates, the aggregate loss in value added in the current fiscal year (FY10/11) from the disaster is estimated at about 102 billion kip (or USD 12.7 million) at current market prices[31]. The loss in value added is estimated to be around 0.16% of the national GDP and 0.84% of GDP of the four affected provinces all together (in nominal terms), see Table 51 below.

Compared to other productive sectors, agriculture is affected mostly by the typhoon in all four provinces. About 7,208 hectares of low land and upland cultivated areas for rice and other crops (especially maize and cassava) were damaged. In addition, a significant number of livestock/birds and fish ponds were smashed by the flood, resulting in a loss in total agricultural value added of approximately 86.8 billion kip (USD 10.9 million). Besides, the estimated loss in value added is about 11.9 billion kip (USD 1.4 million) in industry and 3 billion kip (USD 0.35 million) in services (especially trade and tourism). Trade and tourism activities were affected mostly in the Xiengkhouang and Vientiane provinces (Vangvieng district) during June-July 2011 due to road damage and flood at some touristic sites. Some fuel stations and retail shops were also affected by the flood in Xiengkhouang and Xayaboury. Industry, which consists mainly of small and medium sized enterprises, was affected to a lesser extent by the typhoon, and only a small number of rice millers and sawmills were reported as partially damaged by the typhoon and about 2-3 days interruption in small scale production due to electricity being cut in flooded districts.

[31] The total loss in value-added means the loss in net revenue or value that could have been generated after subtracting all the purchase of material and services as inputs. The total loss is equal to the sum of value added losses in all sectors. E.g. the loss in the value added in the transport sector means the revenue that could have been received from transport services after subtracting cost of inputs (such as fuel). Therefore, in this case, the value added in this sector would be lower than the value of damage and loss of this sector. Similar concept applies to other productive sectors as well.

	Value added loss	Share in FY10/11 national GDP	Share in total sector of national GDP	Share in provincial FY10/11 GDP				
				XK	XY	VTE prov	BK	Total of 4 provinces
	mil US$	% share						
Total GDP	12.7	0.16	**0.16**	0.96	0.30	0.72	1.84	0.84
Agriculture and Forestry	10.9	0.14	0.44	0.62	0.26	0.55	1.82	0.72
Industry	1.5	0.02	0.05	0.30	0.01	0.15	0.02	0.10
Services and Trade	0.4	0.00	0.01	0.08	0.05	0.03	0.02	0.04
Memo Items								
Projected FY10/11 GDP prior to Typhoon Haima at current prices								
FY 10/11 GDP								
Total in LAK (bil)	64,152							
Total in USD (mil)	8,019							
Total loss and damage								
Total loss value LAK (bil)	535							
Total loss value USD (mil)	67							
Value-added loss								
Total in LAK (bil)	102							
Total in USD (mil)	12.7							
Loss in value-added as % of national GDP (pre-typhoon projection for FY10/11) (%) =						**0.16**		
Exchang rate (kip/US$)	8000							

Table 51. Loss in Value Added by key sector (all in current prices)

Source: MPI (DOS), World Bank and team's estimates.

Based on the estimated short and medium term recovery needs (assumed that it is fully financed), the reconstruction and rehabilitation activities are expected to bring some value added to the national GDP, about 41.5 billion kip in FY2010/11, 196.2 billion kip in FY2011/12 and 102.6 billion kip in FY2012/13 (in nominal terms). The projected contribution is insignificant for the national GDP but still important for the local economy. The disaster recovery efforts will help promote local economies, especially in agriculture, construction and services in affected areas.

Impact on Balance of Payments

The impact of Typhoon Haima on the balance of payments is insignificant as it will increase the country's import bill only by 0.5% in this fiscal year and 0.6% in the next year (FY2011/12). In addition, the loss in exports is about 0.5%. Key imports for reconstruction activities (damaged basic infrastructure, agricultural land clearance, irrigation and other extension services) include: construction materials, fuel, equipment, agricultural tools, seeds and fertiliser. The imports of food (especially rice of around 12,000 metric tons -- based on the lost numbers but also depending on the yield of this rainy season's harvest in October-November 2011) would be needed to ensure the country has a sufficient rice stockpile to supply local markets during the next dry season. The exports of agricultural products (mostly crops and livestock) are likely to suffer but have trivial adverse impact on the Balance of Payments.

Impact on Fiscal Budget[32]

Based on this report's short and medium term recovery needs, the total public expenditure requirements for the flood relief are estimated to be 515.4 billion kip (USD 64.4 million). As of end-July 2011, the Government has already spent about 7.1 billion kip (in total for the four provinces) on disaster relief and recovery programmes, including assistance to farmers for agricultural inputs, reconstruction and repair of damaged structures, infrastructure rehabilitation, death and medical benefits, and food and cash assistance to households. The anticipated annual budget needed for reconstruction efforts (taking into consideration short and medium term implementation capacity) is about 43.3 billion kip (or nearly 1% of public investment programmes - PIP) in the current fiscal year (FY2010/11), 301.1 billion kip in FY2011/12 (about 3% of total PIP budget) and 171 billion in FY2012/13, approximately 1.8% of total PIP budget). The breakdown of budget needs for the four affected provinces are presented in Table below.

	FY10/11		FY11/12		FY12/13	
	bil kip	% share	bil kip	% share	bil kip	% share
Xiengkhaung	12.3	6.7	85.2	42.5	48.4	-
Xayabury	8.1	4.0	56.1	25.7	31.8	-
Vientiane	11.9	4.7	82.3	29.6	46.8	-
Bolikhamsay	11.2	6.8	77.5	43.4	44.0	-
Total (4 provinces)	43.3		301.1		171.0	

Table 52. Projected annual budget for recovery needs in four affected provinces (billion kip)

Source: MoF and team's estimate and projections.

Typhoon Haima is unlikely to have a much adverse impact on government revenue. Revenue collection in the affected areas has been quite low traditionally (deficit provinces). Most individuals in these areas fall into the zero-income tax category; the agricultural sector—where the overwhelming share of economic losses occurred—is not taxed, given the primary nature of the crops cultivated, and most manufacturing in these areas is small-scale and informal. Nevertheless, it will put more pressure on already constrained government spending, especially on public investment programmes (PIP), and push up the overall budget deficit in the current and next fiscal years. Moreover, the combined damage and losses from Haima with Nock Ten and other possible new typhoons this year will certainly have a larger impact on Lao economy and put more burdens on the government expenditure. Since the most affected provinces have very small annual expenditures envelop, they would rely on the Government and donor community to provide assistance and resources to finance the recovery needs.

[32] In Lao PDR the fiscal year starts in October and ends in September.

Possible Impact on Inflation

Food prices in Lao PDR are vulnerable to shocks, especially natural disaster (flood and draught), animal disease outbreaks and other seasonal factors, and to a lesser extent global food prices. Thus, the recent impact on agricultural production from Typhoon Haima (as well as Nock Ten and other possible storms) is likely to fuel food inflation in coming months. The damage to crops and transport infrastructure, caused by the flood, may disrupt the supply of food and other commodities inside the country as well as cross-border trade. Major reconstruction activities in the flooded areas will likely increase demand and prices for construction materials and labour. A cautious monetary policy stance and fiscal prudence would be needed to contain inflation. In addition, it would be necessary to increase food stockpile (for at least over next six months) and take other necessary responses to boost local food production, especially in the upcoming dry season.

Institutional Arrangements for Disaster Management

In 1997, the Government of Lao (GoL) created a simplified institutional model that provides an effective basis to guide disaster risk reduction and emergency response management efforts, with the assistance of the United Nations Development Programme (UNDP).The establishment of the National Disaster Management Committee (NDMC) through the Prime Minister's decree 158 (August 23, 1999) and the creation of its secretariat, the National Disaster Management Office (NDMO) were important steps forward undertaken by the Government. The responsibilities of the NDMC include the development of disaster management policies, the mobilisation and coordination of national and international assistance, information management and public awareness, disaster preparedness, response and recovery, and the promotion of local disaster management committees at the district and village levels.

A subsequent decree 097/MLSW and the National Strategic Plan for Disaster Risk Management 2003-2020 (1139/MLSW of 18 April 2003) provided the current policy framework for disaster management in the country, which aims at reducing the risk of disasters affecting the communities and at strengthening the capacities of disaster management bodies at the national, local and community levels on disaster risk management.

Lao PDR has adopted the Hyogo Framework of Action at the World Conference on disaster risk reduction in Kobe in 2005 and is also a signatory of the Delhi Declaration of 2007, the Kula Lumpur Declaration 2008, and the Incheon Declaration of 2010. Thus, the GoL had recognised disaster risk reduction as a key development priority that encompasses hazard mitigation and vulnerability reduction through an effective preparedness strategy aimed at reducing the effects of natural and man-made disasters, particularly in rural areas[33]

[33] H.E. Dr. Ty Phommasack, Vice Minister of Agriculture and Forestry 3rd Asian Ministerial Conference on disaster risk reduction December 2-4, 2008, Kuala Lumpur proceedings. pp. 131-132

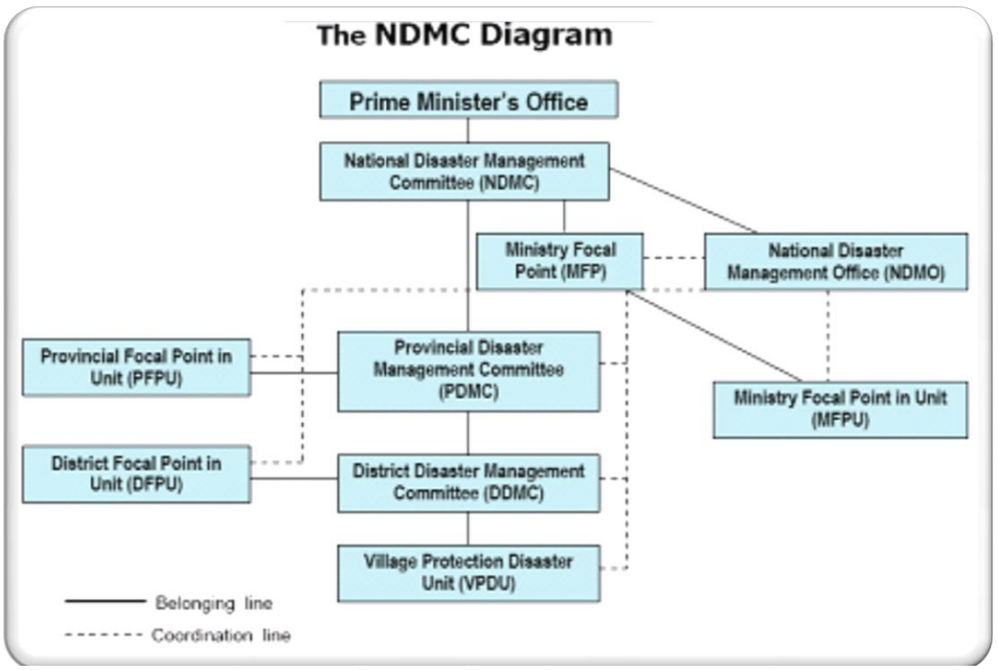


Figure 25: Organisational Diagram of National Disaster Management Committee

Country Current Strategic Approach for Disaster Risk Management

Disaster risk management is an integral part of the Lao National Growth and Poverty Eradication Strategy (NGPES-2004) and Lao PDR's Seventh National Socio-Economic Development Plan (20010-2015). The NGPES defined three main strategies to achieve the overall objectives of the National Environment Strategy 2003-2020, namely the improvement of natural resources management, the improvement of the institutional framework and its capacity, and the improvement of environmental management. The 7th NSEDP emphasises mainstreaming disaster risk reduction in the development planning process. It also realises that disaster risk management is one most important factor for sustainable growth, and for achieving higher performances in some of the indicators which determine graduation from the list of LDCs.

The national Strategy for Disaster Risk Management 2003 sets out disaster management strategic goals for 2005, 2010 and 2020 (short, medium and long term goals) for Lao PDR. It specifically aims to;

- Safeguard sustainable development and reduce the impacts and damages of natural and human-made disasters to the community, society and the country's economy
- Shift strategy from relief and response after disaster to mitigation of disaster impacts to community, society and economy and to preparedness before disasters strike, with emphasis on hazards such as floods, drought, landslide and fire
- Ensure that disaster management is a joint responsibility of both the government and the people through the building community capacity and
- Promote sustainable protection of the environment and the country's natural wealth such as forests, land and water resources.

Devastating and recurrent disasters have challenged the government to adopt more robust measures to cope and mitigate the impact of these disasters on development goals. The chronic problem of floods during the rainy season, which are often followed by drought in the north and central Laos, further exacerbates poverty and food insecurity, and pushes the already poor and food insecure further to the edge of chronic poverty.

NDMO has taken coordinated steps toward risk mitigation and preparedness for disasters. NDMO has drafted a National Disaster Management Plan to strengthen disaster management mechanisms. The plan further clarifies the roles and responsibilities of the government at national and local level. It also recommends strengthening and upgrading the authority of NDMO to better coordinate, advise policy and manage disaster risks in the country. The plan aims at the implementation of the national strategic goals for disaster risk management specified in the National Strategy for DRM 2003. Similarly, NDMO has also drafted a DRM legal framework to further strengthen DRM institutions and implementation of the national disaster management plan.

NDMO is also supporting the capacity of NDMC members through trainings and technical support. It conducted a Hazard, Risk and Vulnerability assessment with detailed mapping and identification of at risk areas, which is providing immense information to all the line ministries for risk sensitive planning and programming. The NDMC membership has been expanded to include all the line ministries and departments.

Additionally, community-based DRM is the top priority of the GoL. The NDMO, with support of various ministries and international organisations, is implementing a number of projects in various vulnerable communities.

Challenges and Constraints of the Current Approach

The government has realised the importance of DRM. It is evident from various policies and strategies that it is one of its top priorities. However, it has been recognised that to ensure effective implementation of these strategies, policies and plans, it is crucial that there should be a re-positioning and restructuring of NDMO within the sectoral and governmental architectures, in order to grant it more influence in decision-making and a say in the allocation of resources. Additionally, there are notable overlaps and coordination bottlenecks in the DRM sector. Therefore the clarification of mandates and the problem of institutional overlaps need to be resolved in order to ensure effective disaster management in the country.

In addition to these broad observations and overarching themes, specific challenges have been identified:

1. Lack of sufficient capacities and resources in terms of staff, equipment and funding limits the ability of disaster management office at national and local levels to perform its mandated role. This results is a weak preparedness level of government and communities, which limit their ability to cope with disasters. Even relatively small-scale disasters produce devastating effects on the lives and livelihoods of people and damage hard-gained infrastructure development.
2. There is a strong need for all sectoral ministries to take a more proactive role in DRM.
3. The provincial authorities are not properly equipped and prepared for large-scale disasters. Although provincial authorities managed disaster response using all the means available to them, had preparedness measures been in place in the form of preparedness plans, trainings, and standard operating procedures, the provincial authorities would have better managed the response and recovery interventions.
4. Early warning and communication was a major issue for the local authorities and communities
5. Information management and data collection was also a challenge

6. Institutional arrangements, and the distribution of roles and responsibilities, were found an area where improvements are needed in order to ensure better disaster management
7. There is a lack of disaster preparedness planning at provincial, district and village levels
8. Community preparedness is the highest priority for the GoL. NDMO needs to scale up community based DRM.

DRM Stakeholder Analysis

There are a number of agencies and stakeholders supporting the GoL and people to cope with disasters. However, the interventions are insufficient and often too patchy to effectively reduce the impact of disasters. There is a clear need for more coordinated planning and implementation, and to upscale DRM interventions at all levels for effective disaster risk reduction in-country. Table 17 below shows the involvement of different agencies supporting some of the disaster preparedness initiatives in Laos:

Organization's name	Project's name	Objective	Duration	Project area
Oxfam Solidarity Belgium	Building disaster prepared and resilient communities in Kasi district, Vientiane province	General objective : To increase resilience and reduce vulnerability in rural communities in Kasi district and institutions Specific objective To improve disaster preparedness and strengthen the disaster management system in 10 rural communities in Kasi district	16 September 2010 to 15 September 2011	Kasi District, Vientiane province
Oxfam Australia	Community Based Disaster Risk Management in Upland Communities	To build knowledge, skills and resources to mitigate, prepare for and respond to droughts and other disasters at provincial, district and village (leadership and households) level in 70 target communities in three districts of three provinces To improve food security and the income of selected poor and vulnerable households in 70 target villages To decrease the impact of human diseases and unexploded ordinance (UXO) IN 70 target villages	July 2007 to 2012	Met District, Vientiane province Taoil District, Salavan province Kalum District, Xekong province
UNDP	Institutional Strengthening and Capacity Development on Disaster Risk Management in Laos PDR	Expected outcome By 2011, the livelihoods of poor, vulnerable and food insecure populations are enhanced through sustainable development (within the MDG framework) Enhanced ownership and capacity for pro-poor planning, implementation and harmonised aid coordination, and disaster management Increased capacity within the Government to prepare and respond to natural as well as man-made disasters at all levels	January 2010 to-December 2011	Working NDMO office
Save the Children Australia	Xayaboury Integrated Hazard Mitigation project	To increase the planning, management and implementation capacity for district risk reduction	2007-2012	Xayaboury and Xienghone

	(SIHMP)	To increase community resilience to mitigate the impact of risk and hazard To increase the capacity of key sectoral and planning agencies at the province and district levels to promote resilience and secure livelihoods by mainstreaming DRR into their plans and operation Ensure efficient and effective project management		District
Save the Children Australia	Establish Disaster Information System	To support Xayaboury province authority in developing Disaster Risk Information system (Including incident report) in Xienghone District. To provide technical support to NDMO to initiate establishment of the National Disaster information system To support the NDMO to document and share the lesson learnt and good practice obtained through the implementation of the Xayaboury and Xienghone district risk assessment activities to promote its future replication.	2010-2011	Xienghone District Xayaboury Province
Save the Children Australia	Disaster Risk Reduction for Children (DREC) Xienghone district	To support primary and secondary schools to deliver disaster risk education To support child and youth activities which increase community resilience To support development of provincial development action plane for sustained implementation of disaster risk reduction education	July 2008-July 2009	Xienghone district , Xayaboury
CARE International in Laos	Strengthened participation of Sekong province peoples in the National Disaster Management Strategy for Lao PDR	General objective To reduce vulnerability in Sekong province through support to strategy on DRR that enables stakeholders to better prepare themselves to mitigate and respond to natural disaster Specific objective To support the provincial and district DRR stakeholders to create and implement a sustainable DRR/M programme in Sekong province.	15 Month Dec 2010-Feb 2012	Sekong province
World Vision	Poverty reduction and Disaster Risk Reduction		2009-2014	Yommalad Khammoaun province
World Bank/GFDRR	Operationalisation of Strategic Plan for Disaster Management (OSPDM) in Lao PDR	The project aims to help Government to implement the National Strategy Plan on DRM with more focuses on building capacity, increasing awareness and strengthening early warning systems in the country. The main activities are ; Analysis of existing institutional capacity/legal	2010-2012	National 3 provinces (Sekong, Saravan and Attapeu)

		framework Assisting in implementing the SPDM strategy national level Strengthening the early warning system Institutional strengthening through capacity-building on DRR Mainstreaming DRR into development agenda		
Japan Governme nt/Japan Embassy in Lao PDR	The Improvement of Capabilities to Cope with Natural Disasters Caused by Climate Change	The objective of the programme is to contribute to disaster management of the Lao People's Democratic Republic, which is not sufficiently equipped against natural disasters due to lack of budget and equipment. This is done through the extension of the grant for the acquisition of equipment necessary for preparation against natural disasters – especially flood and drought, and of equipment necessary to life-saving activities and the delivery of emergency supplies.	2010-2012	Working with NDMO
ADPC	Flood Preparedness Programme	Main Activities : - Awareness-raising and enhancing people's capacities in dealing with floods, - Preparation and implementation of flood preparedness programmes, and - Integration of flood preparedness and emergency management into local development plans.	2008-2010	Khammouan and Savannakhet Provinces

Figure 26 List of Projects Supporting NDMO for Disaster Preparedness in Laos
Source: National Disaster Management Office (NDMO) government of Lao PDR.

NDMO is mandated as the secretariat of the NDMC and is responsible for:

- Being a central focal point with all domestic and out-of-country partners networks on disaster management (DM)
- Coordinating and organising preparedness, prevention, mitigation and recovery activities in pre- disaster, during disaster and post- disaster periods
- Promoting DM training for Government employees and public at countrywide level,
- Acting as centre for DM information collection, assessment and dissemination on an annual basis
- Coordinating and organising shelter, food and other relief assistance to the victims when disasters occur.

Key disaster preparedness priorities of the NMDO focusing on the 4 affected provinces;

- Strengthening the existing disaster management system in 4 provinces
- Enhancing and strengthening early warning system
- Disaster information management and disaster risk assessment, and rapid and post-damage need assessment
- Promoting community-based disaster risk management

NDMO being the focal point agency for DRM, it is the key agency implementing DRM activities together with key line ministries concerned such as MPI, and the Ministry of natural resources and environment (Meteorology and

Hydrology Department). This would also help further strengthening its capacity, leadership and sustained DRM in Lao PDR.

Key Lessons Learnt in Disaster Response Management

1. Provincial level Disaster Management Institutional Arrangements

The NDMC, chaired by the Deputy Prime Minister, is the highest body for disaster management in Lao PDR. The NDMO, located in MoLSW, is the secretariat to the NDMC. One of the responsibilities of the NDMC is to establish similar committees in provincial, district and village levels for better preparedness, response and recovery from natural disasters. The Provincial Disaster Management Committees (PDMCs) have been established in all provinces including the disaster four affected provinces (Xiengkhouang, Xayaboury, Bolikhamxay and Vientiane in 2005).

Situation: Immediately after the disaster, the provincial governments activated existing Emergency Response Committees – ERC (Xayaboury, Vientiane provinces) – or established new ones (Xiengkhouang, Bolikhamxay), chaired by the provincial vice governors.[34]. The provincial authorities also formed sub-committees for better response. For example, in Xiengkhouang, five sub-committees (Communication, Infrastructure, Production, Recovery and Social Welfare) were formed under the ERC. Rapid assessment teams from line departments were dispatched to collect information from the affected sites after the disaster. Provincial ERCs reported on the disaster situation in their respective provinces to the central government. Provincial Disaster Management Offices (PDMOs), as secretariat to the Disaster Management Committees, played an active role in coordinating the emergency response coordination in the provinces of Xayaboury, Vientiane and Bolikhamxay. In the Xiengkhouang province, a new secretariat was nominated within the governor's office to support the ERC.

The provincial authorities also mobilised resources[35] (Cash; 2,127.9 million kip, FI and NFI: 3,293.4 million kip) to provide relief and response assistance to the affected communities[36]. The security personnel and youth volunteers were mobilised for search & rescue, temporary restoration of damaged bridges and houses etc., distribution of relief items, clearing of debris from public places, buildings and houses.

Analysis: The local governments have reacted to the situation effectively and provided relief and response assistance to the affected people as much as they were able to. Strong willingness and leadership were demonstrated during the relief and response by the provincial authorities. The authority could; (1) mobilise some resources locally that helped to a large extent to support the affected communities, (2) provide some immediate relief assistance to the affected communities and gain the their confidence, (3) undertake temporary repairs to damaged infrastructure and private houses, in order to help communities resume normal lives and to foster their spontaneous recovery.

However, it is important to note that the effectiveness and degree of success of these activities varied from province to province. Relief and response efforts had better results in those provinces where the leadership had a

[34] The set up of the emergency response committees are the same as Provincial Disaster Management Committees in the Xayaboury, Bolikhamxay, and Vientiane provinces. By contrast, in the Xiengkhouang province, although the chair and other members are the same as in other provinces, the vice chair and the secretariat are the Lao Front for Construction (LFC) and the Governor's office respectively, instead of DoSW. The PDMC has been dissolved and new terms of reference have been drafted for this new committee.

[35] The Xayaboury province had already established a provincial relief fund before the disaster. The fund was secured through donations from the provincial officials on an annual basis.

[36] Provincial authorities mobilised resources from different sources, including the private sector, individuals, and the government.

relatively better understanding of the disaster and had some preparedness measures in place. For example, the Xayaboury province collected the information based on the Lao Disaster Database (LDD) format, which was recently established in the province by NDMO. Therefore the sectoral data collected was more harmonised and comprehensive, compared to other provinces.

The provinces had no preparedness planning and standard operating procedures, which could have further improved the emergency response and better protected the lives and properties of people.

Training of the provincial officials and development of a harmonised assessment tool for the provincial officials will help reduce the challenges of data collection and management

Additionally, the volunteers were not trained in light search and rescue and other life saving techniques. They did not have all the necessary means and equipment to help the victims. Simple equipments such as life jackets and rescue boats, for example, will further enhance the effectiveness of the community volunteers.

Province	districts affected	Villages affected	Families	People		Total Damage		Resources Mobilised					Total relief	
				affected	killed	(million) Kip	**USD**	Volunteers	Cash (Million Kip)	USD	Relief (million Kip)	USD	million Kip	USD
Vientiane	11	?	2,613	10,464	5	125,178	15,700,000		228	28,500	295	36,875	524	65,500
Xiengkhouang	8	176	3082	11,385	8	117,094	14,600,000	3,326	1,059	132,375	197	24,625	1,256	157,000
Xayaboury	9	78	6,490	32,816	2	57,228	7,200,000	No data	290	36,250	1,280	160,000	1,570	196,250
Bolikhamxay	4	39	4,414	28,395	2	53,529	6,700,000	No data	514	64,250	359	44,875	873	109,125
Total	32		16,599	83,105 *	17	353,029	44,200,000		2,091		2,131	266,375	4,223	527,875

Table 53: Resources Mobilised and Affected People who received Assistance in Each Province
Source: National Disaster Management database.

Recommendations:

Short to Medium term – 6 -12 months:

1. Further strengthening the capacity and institutionalisation of the provincial disaster management committees to reduce disaster risks, and prepare for effective disaster response and recovery.
2. Develop standard operating procedures and further clarify the role and responsibilities of the committees and members.
3. Promote emergency response preparedness, such as training of search and rescue, first aid, relief and response teams of youth and community volunteers with necessary light equipment (boats, life jackets, etc.).
4. Encourage local level disaster risk management planning.
5. Conduct a post disaster lessons learnt exercise to identify the best practice and provide opportunity to the provincial authorities to learn from each other.

Long term:

1. Institutionalisation and mainstreaming of DRM at provincial level sectoral planning and programmes.

2. Early Warning System and Communication for Preparedness and Response

Situation: The disaster alert was sent to provincial authorities from the Meteorology Department and NDMO hours before the typhoon. For example, the Xiengkhouang province received the alert at 4:00 PM and heavy rain started at 7:00 PM.

The alert message was difficult for the provincial authorities to interpret and understand. The alert message sent to the districts warned of heavy rain and flood in provinces. However, the district authorities were not able to understand if their particular district would be affected. Some of the communities were informed and alerted about the floods – for example, communities along the river in the Xayaboury district were informed during the night that they needed to evacuate, and the flood started at 3:00 am in the morning.

The Department of Meteorology and NDMO has successfully established a partnership with World Meteorology Organisation (WMO) recently. The WMO is providing real time weather data to the Lao Meteorology Department regularly. It has been used during the Typhoon Haima and Nok Ten.

Analysis: The partnership of the Lao Meteorology Department and NDMO with WMO is a significant progress for the early warning system in Lao PDR. This concludes the upstream linkage and access to the real time weather data. The upstream information needs to be extended downstream to vulnerable communities. The alert messages should be delivered well in advance and understandable by the communities and local authorities. There is an evident limitation to and a lack of effective early warning systems.

Although the alert message was relayed to local authorities, due to the lack of pre-defined appropriate communication, coordination and operating procedures, no significant actions were taken until the flood started. There are no standard operating procedures in place to help local authorities understand the alert and determine which actions to take once it is received. Due to the limited time for evacuation, most of the communities could save their lives and livestock, but could not save their other important belongings, such as household items and food stocks.

Recommendations:

Medium Term:

1. Establish an end user early warning system to enable a quick, effective and efficient spread of information to the provincial and district authorities and to the communities.
2. Train provincial and district authorities on information communication and early warning dissemination
3. Develop standard operating procedures for provincial and district authorities, Meteorology Department and NDMO
4. Train at-risk communities for better preparedness and understanding of early warning messages.

3. Information management and data collection

Provincial assessment teams (composed of officials from line departments) collected information on damage and losses from the affected communities. The data was collected and reported to the provincial ERC and governor. The committees shared summary reports with the NDMO, while the line departments were provided with detailed reports. The line departments also sent their individual reports to their respective ministries in Vientiane. The line departments collected data either by visiting the affected area or through telephone calls or fax from the concern department officials at the district level. At the central level, the data/information is kept within the respective departments. NDMO also receives the summary report.

Generally there is no harmonised approach for information collection, verification and data management. The line departments collect the information and store it. There is no single database that could collect all the

damage data and the relief assistance data for future use. Xayaboury is the only province that started implementing the Lao Disaster Database with support from NDMO.

Analysis: The harmonisation, quality and accuracy of the data are the biggest challenge. In addition to the data, information management is another concern that leads to confusion and unnecessarily complex information. In some sectors, there was very limited data collected to share with the joint assessment teams. Meanwhile, in some other cases, the data collected was not good enough to be used by the teams. Therefore the provincial authorities also emphasised the need to strengthen their information management system, data harmonisation, and their capacity to ensure data quality.

Recommendations:

Short term – up to 6 months: NDMO should conduct immediate training and ensure the implementation of the Lao Disaster Database in all four provinces.

Medium to long term – 6 to 36 months:

1. Establishment of information management system
2. Development of information and communication procedures to process and verify information
3. Establishment of emergency operation centres

4. Community-Led Recovery and Disaster Preparedness

Situation: Based on the teams' observation of and consultation with the communities visited, it was obvious that the flood has affected the livelihoods of several communities. It was noted that the communities living along the rivers are more vulnerable to floods. These communities received no early warning regarding the imminent floods that were going to be caused by Typhoon Haima, and were not prepared for such a disaster. Most communities had not experienced serious floods for almost 4 decades. As a result of this disaster, some communities will require alternative livelihood recovery and skill development.

In the communities visited, it was reported that the water level had risen slowly. Therefore villagers were able to alert each other of the danger of flood and helped each other to evacuate to higher ground or neighbouring villages. Community members saved their lives and livestock but could not take their rice stocks and other belongings, since in most cases they started evacuating when the water had already flooded their villages. The government provided relief and response support. The communities, with support of local government, youth volunteers, and the Lao Army, were able to temporarily fix the damage. However, according to interviewed inhabitants, some localities still require immediate support (access to drinking water, etc.), especially the ones located in areas that are difficult to access.

Analysis: The return period of such large scale disasters is of approximately 40 to 50 years; therefore communities are not prepared for such disasters. The government policy of clustering communities (e.g. the Khumbans) for better provision of social services, sometime results in the formation of villages in vulnerable lowlands that are prone to floods. Additionally, a number of development interventions in the affected areas have been unwisely planned, as is illustrated by the construction of roads which blocked and/or changed the natural course of rain drainage, and thus intensified flooding. Communities had limited or no awareness about disaster preparedness. They had no disaster preparedness plan. Further, no early warning and community action plan existed for better preparedness and response.

Recommendations:

Immediate and medium term:

1. Community-led recovery and rehabilitation:
2. Promote quick employment generation activities focusing on production sector to compensate for food shortage of 5 to 6 months, until the communities get the harvest of the re-planted paddies.
3. Support immediate rehabilitation of critical micro infrastructures such as drinking water wells, village roads, etc.
4. Skill and micro-enterprise development interventions focusing on the most vulnerable groups of the communities, in order to diversify the agriculture-based livelihoods of the communities.
5. Community-based disaster preparedness measures:

1. Early warning system,
2. Hazard, risk and vulnerability assessment of the community,
3. Search and rescue, first aid, evacuation and emergency management trainings and skills.
4. Community evacuation shelter, search and rescue equipments (boat, life jackets etc)
5. Community disaster preparedness plan

Longer term:

1. Mainstreaming of DRR into the community development plan
2. Relocation of the vulnerable communities to the higher/safer ground

5. Institutionalisation of the Damage, Loss and Needs Assessment Methodology in Lao PDR

Given the Government's keen interest in promoting and institutionalising the JDLNA methodology throughout the government system at various tiers, this section records some of the lessons learnt from the Haima assessment and proposes some further measures for the fuller institutionalisation of the methodology in the prospect of future disasters.

Strengths of Current PDNA Process and Capacities in Laos PDR

- Prior Development of Customised Sector Guidance Notes and Data Collection templates provided a *head-start* for the assessment – albeit with some last minute course corrections on data collection

- MPI provided strong leadership and commitment to the process, and close involvement at central and sectoral levels with other partners

- The Government's own data collection at various levels was very impressive, and provided most of the data in a form ready to be transferred into the template form – particularly on damage. In the future, data collection respecting the same central templates will enhance efficiency and consistency of the process across provinces

- Very rigorous data inventories were available particularly for public sectors – developing means to acquire similar data inventories for the private sector data is highly advisable

- The government employed mechanisms for multi-tier and cross-sector validation

Important Considerations for Future Needs Assessments: First, it must be well understood that the most important purpose of conducting a "Joint Damage, Losses and Needs" type of assessment is to provide **strategic**

underpinnings for medium to long-term reconstruction and recovery planning, prioritisation, and programming, rather than a mere quantification and validation of physical damage and losses. Thus, the most important part of the process is arguably the development of sector-level recovery and reconstruction strategies, in the areas of public and private infrastructure, services, and livelihoods, based on the corresponding needs quantified through the assessment process. Setting the policy parameters and strategic options for recovery and needs assessment in key sectors could include the following aspects:

- Restricting Recovery to Recovery – and avoiding overlaps with regular developmental agenda
- Extent of Building Back Better (or Smarter?) and Use of Differential BBB Factors across sectors
- Possibilities of Relocation of Extremely Vulnerable Communities and Public Assets
- Possible Incentives for Private Sector Recovery and Livelihoods Restoration
- Enhancing and Strengthening Medium to Longer Term Disaster Risk Reduction and Preparedness – and Institutionalising DRM in Regular Development
- Taking Advantage of this Opportunity to Address Development Issues that May Be Root Causes of Disaster.

Way Forward for the Institutionalisation of PDNA in Lao PDR: Some suggested measures for a fuller institutionalisation of the JDLNA methodology in Lao PDR, in the light of contemporary international practice include the following:

- Although sector templates have been developed by MPI, those could be further defined, for instance by elaborating field data collection templates, and incorporating of elements of human recovery, importantly including gender dimensions.
- There is a need for more systematic "ex ante data preparedness", by which is meant the development of more detailed baseline information, which forms a crucial element of loss estimation and damage validation
- More harmonised approaches to damage classification across administrative domains and sectors are required.
- Similarly, the development of further means of data validation is a necessity – this would include the ready availability of data collection records and compilation at the central level; relative to baseline validation; cross sectoral validation; validation through satellite imagery, etc.
- A Central Multi-Sectoral Data Input and Analysis Model for Future PDNAs/JLDNAs is available through the Haima JDLNA, but needs to be developed into a more generic and flexible 'end to end' computer programme that can receive and process data inputs automatically, to the extent possible. This would enable enhanced sector damage, losses and needs estimates – and would reduce the need to use repetitive, manual, laborious and at times inconsistent sector estimation methods.
- Development of "Standardised Recovery & BBB Strategies and Factors" for various sectors and various types and scale of disasters is deemed essential to pre-inform future disaster responses. It is recommended that the Government commissions a public sector study of which smarter, cost-optimised building back better practice is the most adequate in the case of Laos, depending on the scale and intensity of damage caused by future disasters.

- Development of Standard Operating Procedures (SOPs) or an Operational Manual for JLDNA institutionalisation is highly recommended. Partners like the ADPC could support the government in developing such standard procedures on the lines of similar procedures developed or under development in other countries. Knowledge exchange visits to such countries which are in the process of institutionalising the methodology is also recommended.

6. Recovery and Risk Financing

Immediate Financing Needs for Post Haima Recovery: The Government of Lao PDR is planning a conference upon the release of the JDLNA report, in order to foster the interest and solicit funding from various bilateral donors and multilateral financial institutions. This will contribute toward bridging the demand/supply gaps in recovery funding following Typhoon Haima. A general practice is that donors and international financial institutions pre-engaged in a certain sector, or enjoying a comparative advantage, will prefer to fund those particular sectors. It would be important to oversee that other less "attractive" sectors do not get ignored on account of such preferences. Additionally, an emerging international good practice is to establish aid tracking system to keep monitoring the availability, receipt and effectiveness of funds received from multiple donors.

Ex Ante Contingency Recovery Funding for Future Disasters: Well-designed risk financing programmes enable disaster-prone countries to avoid major economic disruptions following natural disasters, by meeting their post-disaster funding needs without resorting to major budget reallocations, additional taxation, or external borrowing. Risk financing instruments are becoming even more relevant given the increased vulnerabilities and uncertainties due to climate variability and change. The GoL may consider designing a risk financing programme that involves calculating its resource gap – the difference between likely maximum losses from a given disaster and ex-post resources available to the government – and then determining the most cost-effective way of funding this gap. To meet its post-disaster funding needs, the government can resort to a combination of ex post sources of funding and ex-ante funding arrangements. Ex-ante funding arrangements include reserve funds, contingent capital facilities, and risk transfer instruments (insurance and reinsurance). Disaster response financing can have two main elements:

(a) A Disaster Response Fund that would provide funding for recovery, and could potentially be supplemented through a combination of grants, credits or loans, and standby arrangements with international partners, and;

(b) Catastrophe Risk Financing of Rare Events, entailing the possibility of buying risk coverage from the international capital market including re-insurers in case of catastrophic and rare events. This would allow the injection of liquidities immediately after the disaster and thus enhance coping mechanisms, while providing hazard contingent budget support. Depending on the peril, the insurance arrangements would follow parametric or index based triggers. For Lao PDR, the coverage could include weather related events (such as major floods and typhoons) only.