Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

The KETSANA TYPHOON in the LAO PEOPLE's DEMOCRATIC REPUBLIC (September 29, 2009)

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DAMAGE, LOSS AND NEEDS ASSESSMENT

A Report prepared by the Government of the Lao PDR
With support from the World Bank, ADB, ASEAN, FAO, AusAID, GFDRR and ADPC

Vientiane, November 2009

Foreword

On September 29, 2009, coming from Vietnam, Typhoon Ketsana crossed the southern part of the Lao PDR before moving into Cambodia.

While sweeping through our five southern provinces, the typhoon caused incredible damage and loss, affecting more than 180,000 people, or almost 30,000 households. We also deplore 28 storm-related deaths. The sufferings, damages and losses caused by Ketsana are of a magnitude our country has not yet seen; without immediate recovery efforts, its consequences will gravely compromise the development efforts undertaken so far, seriously set back the economic development dynamism and further jeopardize the already very precarious situation of some of the districts hit, especially those who are still among the poorest of our country.

This Report – Post-disaster Needs Assessment (PDNA) – is complementary to the Joint Assessments made by the Government of Lao PDR, the United Nations Agencies and INGOs, whose purpose was to update the preliminary data collected during the first few days of the disaster and so to organize the immediate short-term responses to this grave humanitarian crisis.

The PDNA addresses the damages and losses registered in a number of sectors and identifies resource needs in the medium and longer term to address the urgent requirements for recovery and restoration of the livelihoods of the affected population.

The Government has mandated the Ministry of Planning and Investment (MPI) to assume overall responsibility for the medium and longer term plans of recovery and restoration of the livelihoods of the affected people and districts. An assessment team, supported by the World Bank, ADB, ASEAN, FAO, AusAID, GFDRR, and ADPC visited the affected provinces of Attapeu, Xekong, Salavan and Savannakhet from October 21 to October 29. The preliminary report summarizes damages and losses and recovery needs for the social, productive and infrastructure sectors. It clearly states the magnitude of the problems as well as that of the resource needs. In doing so, we hope to inform as accurately as possible our partners in development of the extent of our *medium and longer term* resource requirements.

The recovery efforts to be undertaken urgently are defined in the document as 'medium-term needs'; the recovery efforts will enable the sectors to reach their pre-disaster levels, i.e., they will be back to where they were before the disaster struck our country. His should be achieved within 24 months. The longer-term needs are defined as those that will enable the sectors to improve the quality and the standards of their undertakings, to consolidate communities by moving them to safer places and to ensure that the longer-term environment protection (e.g.

river bank consolidation) will contribute to permanently minimize the risks of future disasters. These longer-term needs will be integrated into the priorities of the next five-year development plan (2011-2015), presently under preparation.

We are keenly looking forward to discuss the PDNA with our partners in development at the Dissemination Workshop.

We wish to express our sincere gratitude to the World Bank, Australia, ADPC, GFDRR, FAO, ADB and ASEAN for their unceasing support for the development of our country and their special effort to help us to overcome the Ketsana disaster. We wish to stress that we are entirely responsible for what is written in this report and the way it is written.

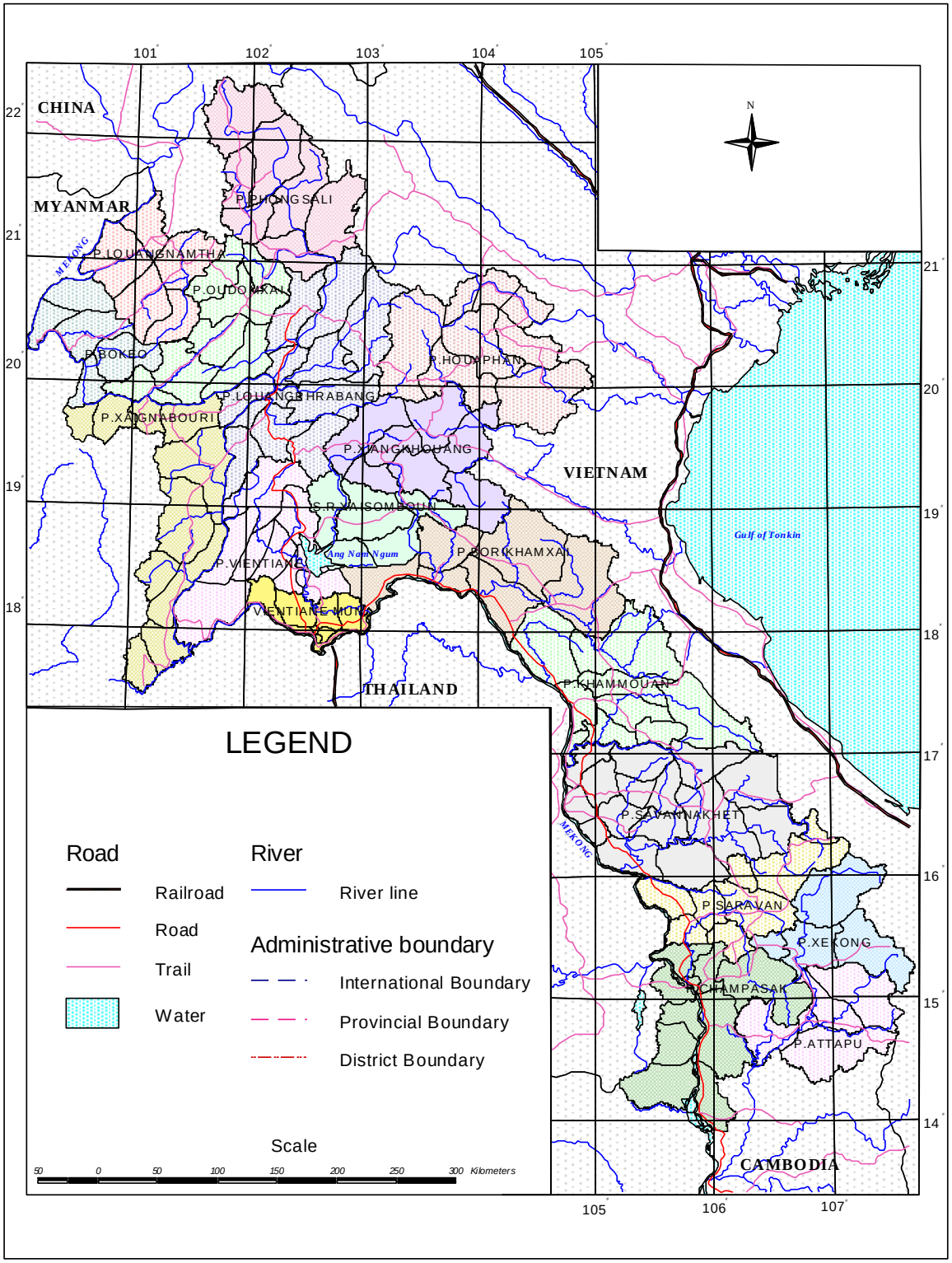
Financial support for this assessment was provided by the Global Facility for Disaster Reduction and Recovery (GFDRR). The Government of Laos PDR would like to thank Government of the Commonwealth of Australia for their generous support to the GFDRR in carrying out the Damage, Loss and Needs Assessment. Since its establishment in September 2006, GFDRR has evolved into a partnership of 25 countries, regional and international organizations that are committed to helping developing countries reduce their vulnerability to natural hazards and adapt to climate change

Thanks to the excellent work done by the National Disaster Management Office, Line Ministries and the precious support from our partners, we are now in a position to start assuming responsibilities in an area – disaster preparedness – which will become increasingly crucial, especially with the climate changes under way.

To all our partners in development, we wish to express our deep appreciation for the work done by them in our country and especially for the quick and generous efforts they have so efficiently deployed in helping us facing first the humanitarian needs of the Ketsana disaster and now, we are sure, its longer-term consequences.

H.E. Mr. Sinlavong Khoutphaythoune
Minister
Ministry of Planning and Investment

LAO PEOPLE'S DEMOCRATIC REPUBLIC



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Acronyms and Abbreviations

AADMER	ASEAN Agreement on Disaster Management and Emergency Response
ADB ADPC	Asian Development Bank Asian Disaster Preparedness Center
ARPDM ASEAN	ASEAN Regional Programme on Disaster Management Association of South East Asia Nations

ASTAE	Asia Sustainable and Alternative Energy Programme
AusAID	Australian Agency for International Development
BOP	Balance of Payments
CPI	Consumer Price Index
DALNA	Damage, Loss and Needs Assessment
DDMC	District Disaster Management Committee
DEB	District Education Bureau
DESIA	Department of Environmental and Social Impact Assessment
DHM	Department of Hydrology and Meteorology
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
FFS	Farmer Field School
FMM P	Flood Mitigation and Management 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 Laos
GFS	Gravity-fed System
GTZ	Gesellschaft für technische Zusammenarbeit
HRZ	High Risk Zone
IASC	Inter-Agency Standing Committee
IDA	International Development Association
IDF	Institutional Development Fund
INGO	International NGO
IEE	Initial Environmental Examination
IPP	Independent Power Producer
IWRM	Integrated Water Resource Management
JICA	Japanese International Cooperation Agency
LANGCOCA	Laos-Australia NGO Cooperation Agreement
LTC	Lao Telecommunications
MAF	Ministry of Agriculture and Forestry
MDG	Millennium Development Goals
MDRD	Mainstreaming Disaster Risk Reduction into Development
M&E	Monitoring and Evaluation
MEM	Ministry of Energy and Mines
MOF	Ministry of Finance
MOH	Ministry of Health

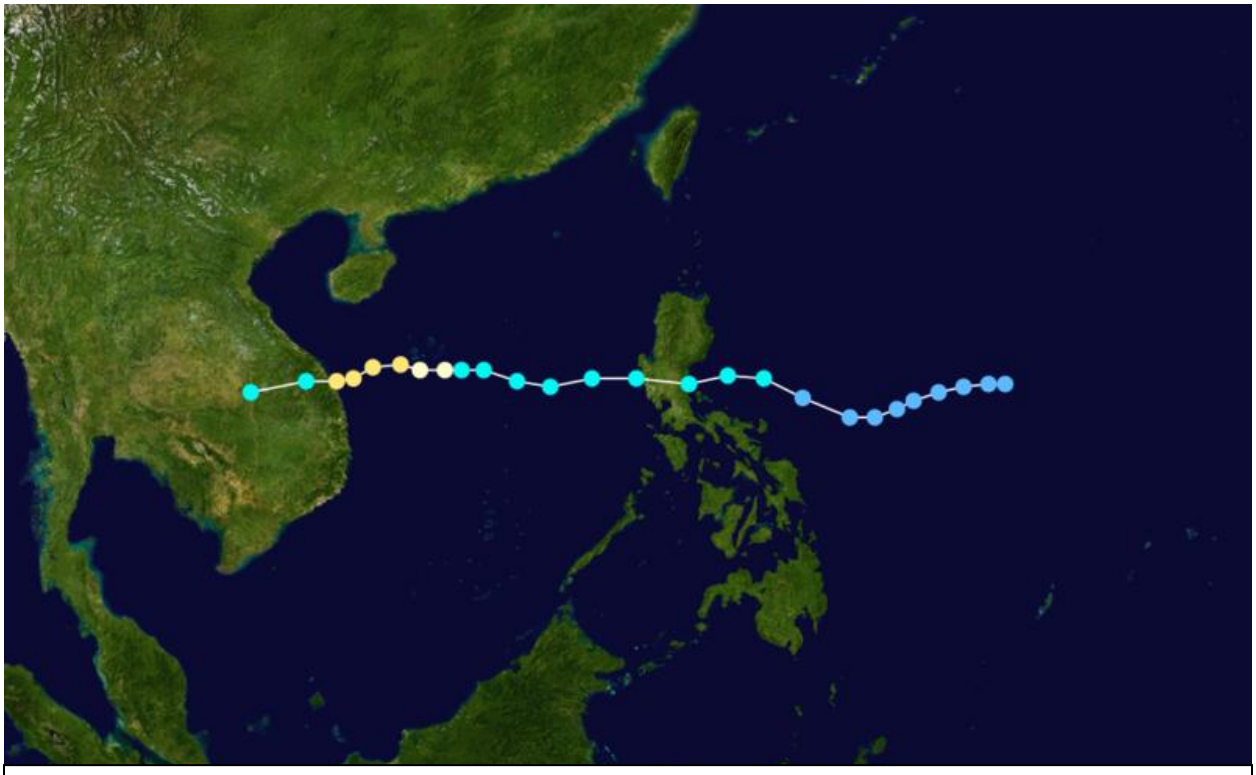
MLSW	Ministry of Labour and Social Welfare
MPWT	Ministry of Public Works and Transport
MRC	Mekong River Commission
MPI	Ministry of Planning and Investment
NAPA	National Adaptation Programme of Action
NDMC	National Disaster Management Committee
NDMO	National Disaster Management Office
NFE	Non Formal Education
NGO	Non Government Organisation
NGPES	National Growth and Poverty Eradication Strategy
NPSH	National Policy on Environmental and Social Sustainability of Hydropower Sector
NR	National Road
NUOL	National University of Lao PDR
PDNA	Post-Disaster Needs Assessment
PDEM	Provincial Department of the Ministry of Energy and Mines
PDMC	Provincial Disaster Management Committee
PDR	People's Democratic Republic
PES	Provincial Education Services
PROMMS	Provincial Road Maintenance and Management System
PTI	Public Work and Transport Institute
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
VDC	Village Development Committee
WB	World Bank
WREA	Water Resources and Environmental Administration

Executive Summary

a. Context and first responses

The Ketsana Typhoon entered the southern part of the Lao PDR on September 29, 2009, causing extensive damages to people's propriety, social and physical infrastructure and to the area's productive capacity. The country's five southern provinces: Attapeu, Xekong, Salavan, Savannakhet and Champassak were affected to various degrees, with Champasak being less affected than the other provinces, especially Attapeu and Xekong. Laos is among the four countries that have been affected by Typhoon Ketsana. Map 1 shows the path and the progression of Typhoon Ketsana.

Map 1 : Progression of Ketsana Typhoon (points showing the location of the storm at 6-hour intervals)



Source: Wikipedia:WikiProject Tropical cyclones/Tracks. The background image is from NASA. Tracking data from the National Hurricane Center or the Joint Typhoon Warning Center. Retrieved from: http://en.wikipedia.org/wiki/File:Ketsana_2009_track.png

The floodwaters swept away houses, crops, schools, hospitals, roads and bridges and caused wide-spread damages to irrigation schemes, aquaculture infrastructure and the riverbanks of the area's two main rivers, Xekong and Sekaman. The National Disaster Management Office (NDMO), the Provincial Disaster Management Committees (PDMC) and the District Disaster

Management Committees (DDMC) reported that more than 180,000 people were affected and deplored 28 storm-related deaths.

The Lao Government acted quickly, delivering immediate emergency aid, after a first assessment of the damage and loss by the local authorities and the central government's provincial and districts services had been made. On October 9, the Ministry of Foreign Affairs informed the international community of the extent of the disaster and appealed for international support. On October 22, the UN Flash Appeal was issued. An assessment mission visited the five provinces from Oct. 19-24: ten teams, led by the Government, assessed immediate needs (humanitarian assistance) in the disaster-stricken areas. A 'Joint Assessment of Impact and Needs arising from the September 2009 Ketsana Typhoon' was published on October 29 by the Government of the Lao PDR IASC in-country Team for Natural Disaster Response Preparedness. The Flash Appeal Report and the Joint Assessment reflect short-term humanitarian needs and as such are the Government's priority responses to the immediate needs. Map 2 shows the poverty situation in the country (2008) with the Southern part clearly appearing as the poorest region in the Lao PDR.

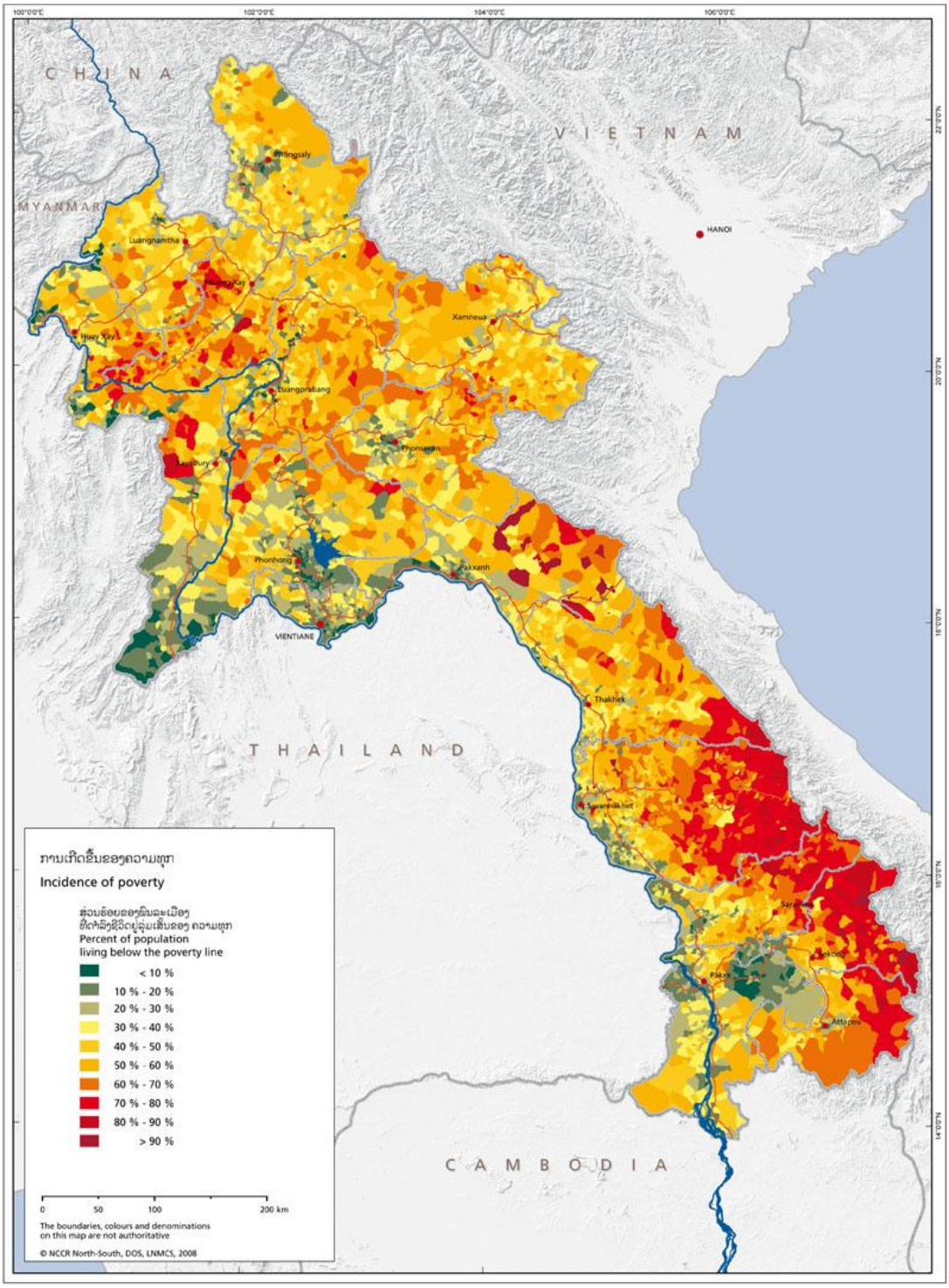
b. Medium and Longer-term Damage, Loss and Needs

A team led by the Ministry of Planning and Investment, with the participation of 12 line ministries and supported by development partner agencies, including the World Bank, Asian Development Bank, FAO, ASEAN, GFDRR, FAO and ADPC has concluded a field assessment (October 20-29) to estimate damage and losses, and the required needs in the affected provinces and affected sectors from a medium and longer-term perspective.

This Report summarizes, in a preliminary form, the main results *by sectors* of the medium and longer-term assessment undertaken with regard to damage, loss and resource needs. As such, it not only completes the short-term assessments of damage and humanitarian needs as presented in the two above mentioned documents; it also presents the basis on which to plan i) the recovery and restoration of livelihood efforts, needed to bring back the sectors and the affected districts to their "pre-29-September level", i.e. their pre-disaster situation (medium-term financial needs) and ii) the longer-term requirements enabling the sectors to reach a higher level of standards and quality in their undertakings, ensuring that future investments are disaster resistant (longer-term needs, to be integrated in the next five-year planning exercise).

In this way, recovery, reconstruction and restoration of livelihoods of the affected areas will ensure that similar catastrophes will be prevented.

I.1
ອັດຕາການເກີດຂຶ້ນຂອງຄວາມທຸກ
Incidence of poverty



Map 2 : Poverty situation in the Lao PDR (2008)

c. Social and economic background of the affected areas

The Lao PDR, the only landlocked country of the Association of the South East Asian Nations, covers a total of 236,800 km^2 with a total population of 6,205,341. Per capita income is 753.3 US$. The Ketsana Typhoon hit the southern part of the country, namely the 5 southern provinces of Attapeu, Xekong, Salavan, Savannakhet and Champasak, in which 26 districts were affected in various degrees, 18 of them, very severely. Map 2 shows the 2008 poverty situation in the Lao PDR; the southern provinces clearly appear as the poorest area of the country.

Many of the 26 districts affected are among the poorest districts of the country, being food insecure and having high rates of stunting. The disaster struck when household food stocks were at their lowest levels and farmers preparing for the harvest season. Some of the stricken districts are the most heavily UXO affected areas of the country.

Attapeu province is one of the least densely populated areas of Laos (114,300) occupying 10320 km^2. The National Vulnerability Report (2001) ranks two thirds of Attapeu as most vulnerable, where 45.3 % of the populations are living below the official poverty line. Net school enrolment is among the lowest in the country. Severe flooding occurred in 1997, 2001 and 2008, but no comparison with the 2009 floods.

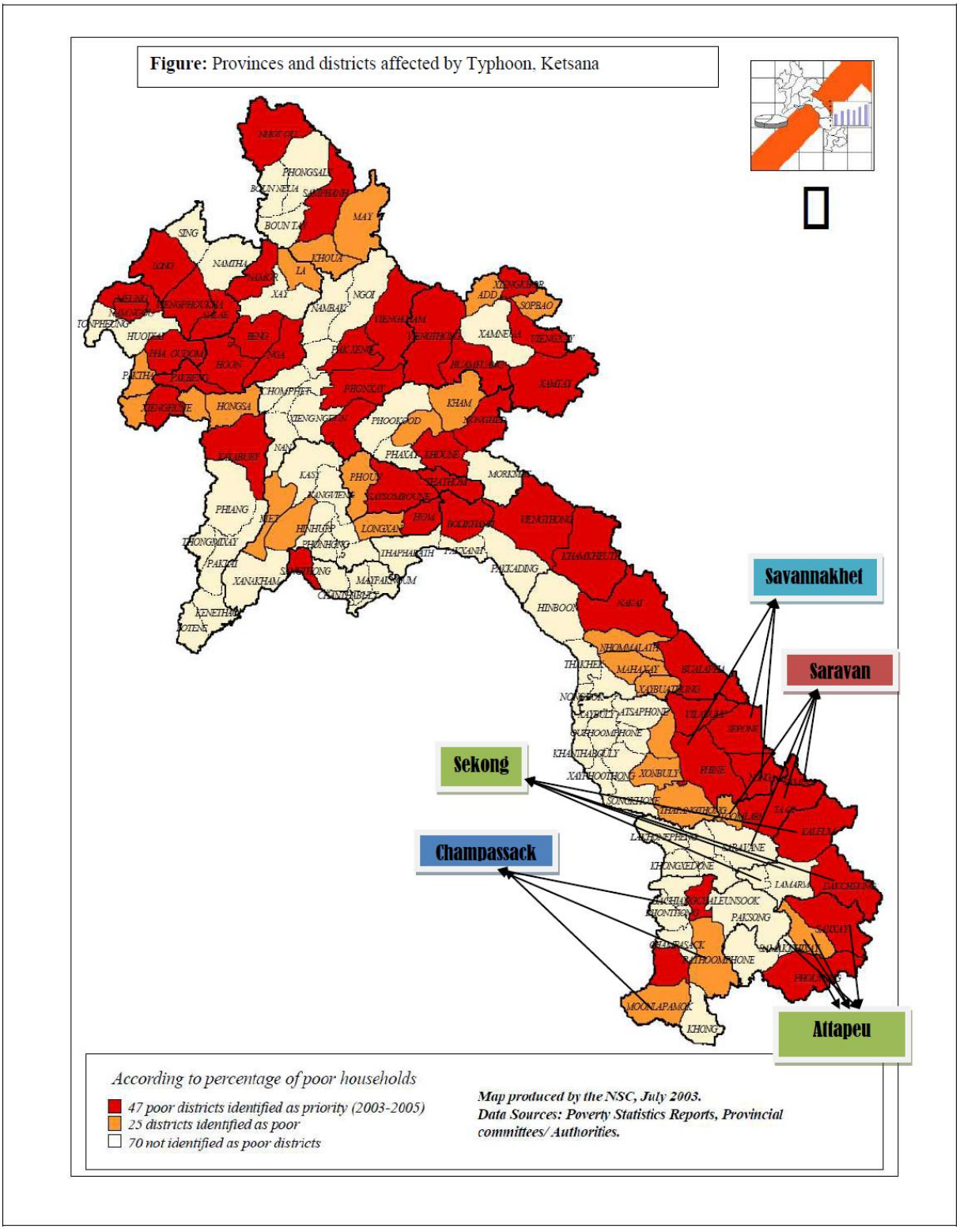
Salavan province ranks third out of the nine provinces severely handicapped by the presence of UXO. 39.6% of its population lives below the poverty line. Population is 336,600 for 10,691km^2 with a population density of 31 inhabitants per km^2.

Xekong province is the second smallest province (7,665km^2) of the country with the lowest population (83,000) and the lowest population density (11 inhabitants per km^2). Xekong is among the most remote areas of Laos; even some of its largest villages are virtually inaccessible by road for at least half of the year. 44.7% of the total population lives below the poverty line.

Savannakhet province occupies 21,774 km^2 with a population of 824,662 and an average population density of 37. 37.1 % of the population lives below the poverty line. Savannakhet lies in the middle of the East-West corridor linking Thailand to Vietnam.

Champasak province is the third largest province of the Lao PDR (15,415$km^{2)}$, with a population of 575,600 and a population density of 37. 35.6 % of its population is below the poverty line.

Map 3 identifies the five provinces affected by the Typhoon.



Map 3 : The five southern provinces affected by Typhoon Ketsana

d. The Lao PDR's Vulnerability to Natural Disasters and Climate Change

The major natural disasters that regularly occur in the Lao PDR are floods and droughts. Floods occur during May and September when Monsoon rains accumulate in the upper Mekong river basin, droughts occur between November and March, i.e. between Monsoon seasons.

Flash floods in the northern mountainous areas are also common. It is estimated that the south and central regions, where two thirds of the population live, face an average of 1.5 serious floods or droughts every year.

The Lao PDR is also susceptible to landslides, pest infections and fire due to slash and burn agriculture. The areas most at risk from floods are those located along the Mekong River and its main tributaries, whereas the areas in the upland in the north and a few southern provinces like Savannakhet and Khammouan are more prone to droughts.

Before Ketsana Typhoon, Typhoon Moracot in August 2009 had already made significant damages to several provinces, and the Kammuri flooding of August 2008 affected about 200,000 people and damaged 50,000 ha of arable land.

A low income country and an agricultural based economy, the Lao PDR is considered as one of the most vulnerable countries to future climate change impacts in Southeast Asia, especially in the form of droughts and floods causing landslides, river bank erosion and reduced food security. Recently, in the northern region of Laos, totally unprecedented signs of earthquakes have been noticed, much to the population's disarray.

e. Disaster Risk Management

Disaster risk management is an integral part of the Lao National Growth and Poverty Eradication Strategy (NGPES-2004) and the Lao PDR's Sixth National Socio-Economic Development Plan (2006-2010). The NGPES defined three main strategies to achieve the overall objectives of the National Environment Strategy 2003-2020, namely the improvement in the management of natural resources, the improvement in the institutional framework and its capacity as well as the improvement of the environmental management.

The National Disaster Management Committee (NDMC), an inter-ministerial committee, was established through the prime ministerial Decree No 158/PM August 1999, with the responsibility for developing policies and coordinating disaster risk reduction activities throughout the country. The National Disaster Management Office (NDMO) is the secretariat of the NDMC and is located in the Ministry of Labour and Social Welfare (MLSW). Disaster management committees are established at the provincial district and village levels (MLSW decree No 097/MLSW June 2000.

A proposal is under consideration for expanding the present membership of the NDMC (health, education, public works and transportation) to include additional sectors such as energy and mining, planning and investment, water resources and environment, science and technology as well as the Lao Women Union and the Lao Youth Union to ensure a wider coverage of disaster risk reduction. Typhoon Ketsana clearly showed that early warning systems must be further improved.

The NDMO is preparing a Strategic National Action Plan for Disaster Risk Management (DRM), with UNDP support, to focus on getting more ownership by various sector ministries (line ministries) in advancing DRM in the country. A draft of this Action Plan should be ready by the end of 2009.

Priority Disaster Risk Management Needs (2010-2012) in the affected provinces have been identified and estimated at 3.1 million US$ to address climate change vulnerability and adaptation. However, a full integration of disaster risk management into all development sectors is a process that will require many years, and investment at a much higher level.

f. Medium and Longer-term Sector Impact Assessment

Methodology used and some terminology

The Post-Disaster Medium and Longer-term Assessment of damage, loss and needs is based on the damage and loss assessment methodology, first developed in the 1970' by the UN Economic Commission for Latin America and the Caribbean (ECLAC). Since then, the methodology has been continually updated and expanded as well as customized for application in different regions of the world.

The methodology used provided a satisfactory framework for identifying and quantifying the social, economic and environmental impact of the natural disaster of Ketsana Typhoon. The methodology adopted by the post-disaster assessment team provides a good indicator of reconstruction requirements, and losses present the reduction or decline in economic activity and personal and family income.

Damage is the replacement value of totally or partially destroyed physical assets, to be included in the reconstruction programs.

Losses are defined as the loss in economic flows that arise from the temporary absence of the damaged assets; they include losses in production, in revenues and higher costs of goods and services.

The assessment teams relied on the gathering of *primary data* collected through household surveys, and focusing on the most visible aspects of the disaster. The surveys included questions on health, education, women and children, food and nutrition, water and sanitation, agriculture, livelihood, housing, emergency measures.

Secondary data were provided by a range of provincial and district offices, UN agencies, national surveys, MDG evaluation and others.

Together, they propose a realistic view of the damage and losses caused by Typhoon Ketsana and assess the reconstruction and livelihood restoration needs in a trustful way.

The assessment (primary data) was, however, handicapped by the fact that destruction of roads and bridges often prevented the teams from visiting the affected areas, while the absence of time series for various indicators (secondary data) sometimes hampered baseline analysis.

Each sector assessment starts with a quick description of the pre-disaster situation, followed by the evaluation of the post-disaster situation regarding damage and losses and a discussion of the resource needs requirements. Each sector discussion contains various tables informing about details, distribution, etc. and formulates recommendations.

Sector assessments – Recovery Needs to Reach Pre-Disaster Situation

The social sectors assessed include: housing, health and education, while the productive sectors are composed of agriculture, commerce and industry, and tourism. Transport, telecommunications, power, water and sanitation, as well as water resources are the sectors listed under Infrastructure sectors.

The post-disaster needs assessment (PDNA) aimed at i) identifying damage and loss for each sector, ii) identifying recovery needs for each sector to return to its pre-disaster situation (identified by the 'medium term needs', with an implementation period of up to 2 years) and iii) outlining longer-term resource needs to ultimately achieve a higher level of security for people and disaster-resilient sector investment in order to improve disaster preparedness in the affected provinces (up to 5-year).

Recovery Needs by sector to reach pre-disaster level (up to 2 years).

The main findings of the PDNA with regard to recovery needs are summarized in Table 1. Total damage and loss amounts to 58 million US$. The needs to go back to pre-Ketsina levels amount to 51.9 million US$, of which 40 million US$ for the 3 most affected sector, namely housing, agriculture and transport.

Table 1: Synoptic Table of Damage, Loss and Needs, by sector (in million US$)

Sectors	**DAMAGE**	**LOSSES**	**TOTAL Damage and Loss**	**Recovery Needs** (medium-term)
Social sectors:	**10.2**	**0.8**	**11.0**	**13.7**
of which : Housing	8.2	0.4	8.6	8.8
Productive sectors:	**19.8**	**2.5**	**22.2**	**16.6**
of which : Agriculture	15.6	2.0	17.5	15.0
Infrastructure sectors:	**21.3**	**3.5**	**24.8**	**21.5**
of which Transport	14.2	3.3	17.5	14.2
Total of sectors:	**51.3**	**7**	**58**	**51.9**
Hous. + Agri . + Transp.	38	5.7	43.6	38.0

Hereafter, a summary of assessment of damage, loss and recovery needs ('medium-term needs') by sector (for more details, please refer to the sector analysis).

Social Sectors:

1. Housing:

The total estimated value of damage and loss incurred in the **housing subsector** amounts to 73,477 billion kip (USS 8.6 million), representing the third highest amount of the total damage and losses of all sectors, after agriculture and transport. Rebuilding and rehabilitating homes will be one of the priority reconstruction efforts. Moreover, the relocation of houses from flood prone to safer areas is strongly recommended since it will also provide an opportunity to improve construction quality and disaster resilience.

The medium-term needs for disaster recovery are estimated at 74,798 million kip (US$ 8.8 million).

2. Health:

The total estimated value of damage and losses incurred in the **health subsector** amounts to 10.6 billion kip (US$ 1.25 million). Out of this amount, 8.65 billion kip (US$ 1.02 million) represent damages to public health hospitals and health centers, equipment, medicines, furniture and other fixtures. Losses were calculated to reach 1.98 billion kip (US$ 232,941) based on the additional expenses incurred in providing emergency health care to the people and the additional costs to people seeking medical assistance due to the effects of typhoon Ketsana.

Based on the estimated damages, the health sector needs approximately amount to 9,376 billion kip (US$ 1.06 million) in order for the health facilities to restore services to the pre-disaster level.

3. Education:

Typhoon Ketsana had a significant impact on the **education subsector** in all the five provinces of southern Lao PDR. An estimated 266 educational institutions were fully or partially damaged by Typhoon Ketsana. Around 29,000 students were directly affected by the floods.

Total damage is evaluated at 8087 billion kip (US$ 951,691) and total losses are estimated at 829.575 million kip (US$ 97,597).

Cost for damage is calculated on the basis of present value of construction materials for damaged part of the school building and the school equipments and goods such as books, desk and bench, blackboard, windows and doors, school compound, computers, science lab equipments, office chairs, school roofs etc.

The resources needed for the recovery of the education sector to its pre-disaster level are estimated at 32,569 million kip (US$ 3.831 million).

Productive Sectors:

4. Agriculture:

Although data are not complete, significant damage was inflicted by Typhoon Ketsana at the end of October 2009. Damage across all **agricultural sub-sectors** over the affected area totaled 133 billion kip (US$ 15.7 million), with 48% of that amount occurring in Attapeu. Salavan accounted for 27% of agricultural damage, and Savannakhet a further 15%. Crop damage (led by paddy, but with garden crops and tree crops also being important) accounted for almost 60% of total damage, with a further 25% arising from the destruction of irrigation and paddy field infrastructure.

Losses were much lower due to the timing of the typhoon (at the end of the main planting season) and the widespread pattern of planting only a single crop per year. Total losses across the affected area are estimated at Kip 17 billion (USD 2 million) and derive mainly from damage to tree crops, with some additional costs arising from the need to mount a major livestock vaccination campaign.

Medium-term needs are estimated at 127,500 billion kip (US$ 15 million) of which US$ 760,000 for immediate technical assistance.

5. Commerce and Industry

Damages suffered in the **commerce and industry subsector** in the affected provinces are estimated at 31 billion kip (US$ 3.6 million). They mainly stem from damages inflicted by the floods on physical destruction of building structures, equipment, inventories and furniture, while the losses, estimated at 1074 billion kip (US$ 126,376) are the result of disruption of the economic activities, closures of businesses, foregone income and temporary expenses. Most of the damage and losses (32.070 billion kip or US$ 3.765 million) are private in nature; their recovery does not generally fall within the government budget. The assistance needed may include credit extension, debt restructuring or even tax delays, measures that require careful analysis in terms of their potential impact on the budget and the set fiscal targets at the macroeconomic level.

The medium-term resource need for recovery is mainly the relocation of 3 destroyed markets (Xaysetha district, Attapeu) to safer places, with a projected cost of 13,695 billion kip (US$ 1.6 million).

6. Tourism

The **tourism subsector** suffers damages estimated at 4,650 million kip (US$ 547,177) from the floods brought about by typhoon Ketsana. These damages were due to physical damage/destruction to guesthouses, hotels, equipment, furniture and inventories or stocks, among others. Losses from disruption of the economic activities and reduction in tourist arrivals added another 1,961 million kip (US$ 230,764) for a total sum of damage and loss of 6,612 million kip (US$ 777,941).

Most of the damage and loss is private in nature. Government investments in roads, bridges, power will markedly contribute to encourage the tourism industry.

Infrastructure Sectors:

7. Transport

Thyphoon Ketsana resulted in damages to the **transport subsector** in all the five provinces affected. The damages (road and waterways) are estimated at 120.5 billion kip (US$ 14.2 million) and losses at 28 billion kip (US$ 3.3 million). Most damages were to roads and bridges - cutting four districts and many villagers from the rest of the country.

Serious erosion in the watersheds is exacerbating the problem of flash floods which in turn damage the transport infrastructure. As measures of improved risk management, it is recommended that 1 in 100 year safety levels be adopted as a minimum requirement if the structure is of primary importance (for example, along national roads), and 1 in 50 if it is of secondary importance. For bridges, the standards in the future should be 1 in 100 years for the overall bridge structure.

The identified recovery and reconstruction needs for the transport subsector that would enable it to reach pre-disaster levels and to secure access to affected districts are estimated at 120,558 million kip (US$ 14.183 million) of which 40,5 billion kip (US$ 4,8 million) are immediate needs to start repairs of the roads.

8. Telecommunications

A combined total damage and loss of 26220 million kip (US$ 3.1million) has been reported for the **telecommunications subsector**, of which damage to assets accounts for 97% (25,326 million kip or US$ 3.0 million). Almost all the damage is concentrated in Attapeu (99%).

Medium-term needs enabling the sector to reach pre-Ketsana levels amount to 25,326 million kip (US$ 2.979 million).

9. Power (electricity)

Typhoon Ketsana hit the southern provinces very hard, causing destruction to the **power subsector** through damage to transmission lines, distribution lines, and solar home systems in particular in Attapeu, Xekong, Salavan and Savannakhet provinces; power failure resulted and electricity supply was interrupted for some time. In addition, the typhoon also caused damage to a construction worker's

camp of the ongoing Sekaman hydropower dam project in Attapeu (incl. one generator) and to the Huai Ho hydropower dam project in Xekong province (incl. 6 generators).

The damage to the power sector totalled 26,875 million kip (US$ 3.1 million) and losses were estimated at 566 million kip. Included in the damage figures are damages inflicted to the two private hydropower projects (14,750 million kip – US$ 1.73 million) incl. the destruction of 6 generators (US$ 500,000 – 4,250 million kip).

Recovery needs for the power sector (government) to reach pre-disaster levels are estimated at 12,125 million kip (US$ 1.42 million).

10. Water and sanitation

Rural water supply and sanitation are among the most severely affected the **water and sanitation sub-sector** in the four southern provinces (Savannakhet, Salavan, Xekong and Attapeu) by Typhoon Ketsana. The Ministry of Health (MOH) reported damage to 16 gravity fed system (GFS), 189 boreholes, 44 wells, 4,541 latrines and 4 small-town water supply systems. Damage and losses to water supply and sanitation are estimated at 4,413 million kip (US$519,176) and 140 million kip (US$ 16470) respectively. The damage to rural water supply facilities includes the damage of structure, pipe, pumps and taps. The losses were calculated based on additional costs incurred for treating drinking water such as chlorine tablets, extending pipes to a temporally shelters and distribution of drinking water.

Recovery needs (to pre-disaster standards) are estimated at 4,270 million kip (US$ 502,352).

11. Water resources

The damages caused to the **Water Resource subsector** comprise essentially river bank erosion and damaged hydro-metrological stations. The damages (riverbanks) and losses (riverbank gardens used to cultivate various crops) are evaluated at 3213 million kip (US$ 378,000) and those to the hydro-metrological stations (measurement equipment, buildings, etc. damaged) at 897,447,000 kip (US$ 105,582).

The medium-term resource need to reinforce and stabilize urgently about 1 km of the river banks to protect critical structures (bridge piers, etc.) and the enforcement river dyke system (heightening it) to protect urban areas and rural settlements of respectively 5 km and 2 km river dyke on Xekong and Sekaman rivers (at a cost of US$ 70,000 per km) amounts to US$ 2,290,000), while the refection of the damaged hydro-metrological stations requires US$ 105,582.

Recovery needs to fix immediate damages for the Water Resource subsector are estimated at 20,362 million kip (US$ 2.3 million).

IMPORTANT: A proportion of up to 5 % (depending on the sector) for Technical Assistance (TA) is included in the above indicated figures for sector recovery.

Table 2 : Summary of Damage and Losses and Recovery Needs to reach pre-disaster levels by sector (incl. T.A.)

Sector	Sub-Sector	Damage and Losses			Caused to		Recovery needs to bring back the sector to its pre-disaster situation (million kip)		
		Damage	Loss	Total	Public	Private	Immediate needs	Medium term	Total
Social	Housing	69970	3507	73477	2605	70872	n.a.	74,798	74,798
	Health	8650	1982	10632	11556	0	n.a	9376	9376
	Education	8087	829	8916	8916	0	n.a.	32569	32569
	Sub-total	86707	6318	93025	23077	70872	n.a.	116,743	116743
Productive	Agriculture	133018	16985	150003	32725	117278	n.a.	127500	127500
	Commerce & Industry	31000	1075	32075	0	32075	n.a	13695	13695
	Tourism	4651	1961	6612	1551	5062	n.a.	0	0
	Sub-total	168669	20021	188690	34276	154415	n.a.	141195	141195
Infrastructure	Transport	120560	27929	148489	118887	29602	40557	80001	120558
	Communications	25326	894	26220	22820	3400	n.a.	25326	25326
	Electricity	26875	566	27441	12691	14750	n.a.	12125	12125
	Water and sanitation	4413	140	4553	2866	1422	n.a.	4270	4270
	Water Resources	3940	170	4110	2794	850	n.a.	20362	20362
	Sub-total	181114	29699	210813	160058	50024	40557	142084	182641
Total	(Million kip)	**436490**	**56038**	**492528**	**217411**	**275310**	**40557**	**400,022**	**440579**
	US$ (Million)	**51**	**7**	**58**	**26**	**32**	**4.8**	**47.1**	**51.9**

Sector Assessments – Longer- term Reconstruction Needs

The post-disaster damage, loss and needs assessment not only evaluated post-disaster damages and losses and immediate recovery needs to bring the sectors back to where they were; it also tried to assess longer-term needs that the next five-year planning exercise (2011-2015) will have to take into account. These are the needs for structural improvements, reaching higher disaster resilience standards in infrastructure and buildings, as well as consolidation of new human settlements in safer areas.

At this moment in time, longer-term assessments have not been made for all the sectors; there are, however, enough data for certain sectors. Some long term needs have already been identified by sector; all have not been costed yet. Hereafter, a short summary of long-term sector requirements:

Housing sector: The total reconstruction and necessary relocation needs amounting to 17.6 million US$, half of it, given absorption capacity and needed time lag, had been scheduled for the medium term (cf.

Table 1); hence the other half (8.8 million US$) is planned for the longer-term. In addition, longer term needs will also include better disaster preparedness, capacity building for disaster risk reduction, training on data collection, but this has not yet been calculated.

Estimated longer-term cost: 74,798 million kip (US$ 8.8 million)

Health sector : Relocation of two hospitals, one in Xaysetha district (Attapeu) and one in Kaleum district (Xekong province).

Estimated longer-term cost: 9,835 million kip ((US$ 1.1million)

Education sector: Longer term needs include joint development programs with other ministries and agencies to further improve educational institutions in the flood-prone areas; building of emergency shelters for flood recurrence; incorporation of safe building codes into school construction contracts – no costing yet.

Agriculture sector: Cost estimates for the possible longer-term restoration of livelihood will be made on the basis of the medium term support.

Commerce and Industry sector: no long term projections for this sector as it depends on transport, telecommunications and power sector recovery.

Tourism sector: idem

Transport sector: Longer-term needs are directly linked to the improvement of the road network, to upgrading it to paved road standards in the case of national and provincial roads, to gravel road standards for district and rural roads. In order to optimize use of resources, the road management system (RMS) operated by the Public Work and Transport Institute (PTI) will be used as a planning tool.

Estimated longer-term cost: 487,246 million kip (US$ 57.3 million) – see Table 16 for details by provinces (Transport sector).

Telecommunications sector: no longer-term recovery needs assessed

Power sector: Longer term needs include the improvement of assets fixed in a temporary manner and additional budgets for applying better building standards and expanding power grids to resettlements.

Estimated longer-term cost: 37,556 million kip (US$ 4.4 million)

Water and Sanitation sector: Longer term reconstruction needs cover urban and rural water supply as well as latrine building needs and include installation of boreholes, new investments in sanitation, hygiene promotional programs, capacity building for communities in water and sanitation management.

Estimated longer-term costs: 3,100 million kip (US$ 364,705)

Water Resources sector: Longer term needs essentially include needed upgrading of hydro-metrological stations to better serve as early warning systems.

Estimated longer-term cost: 5,516 million kip (US$ 649,000).

Present Estimation of longer-term post-disaster investment needs for the above sectors (up to 5 years): 72.7 million US$.

Disaster Risk Management and Climatic Adaptation in the 5 southern provinces hit by Typhoon Ketsana requires highest attention as we are only at the beginning of effective disaster risk management in the affected provinces. Eight priority activities have been identified with a cost over 2 years of 26,350 million kip (3.1 million US$). This amount is to add to the sector total, which brings total longer-term needs to **644,401 billion kip or US$ 75.7 million.**

Macroeconomic implications

Typhoon Ketsana is expected to have only marginal impacts on the national economy although it would have tangible impacts on local economic activities, especially agriculture and transport infrastructure. Total loss and damage are estimated to be about US$ 58 million (492,528 million kip), while causing a roughly estimated loss of value added of Kips 168 million (US$ 20 million, nominal terms) in 2009, or 0.4 percent of GDP.

The provinces of Attapeu, Xekong and Salavan are expected to bear most of this loss. The trade balance will likely deteriorate mostly due to expected higher imports of reconstruction and consumption materials but increased aid inflows and remittances will partly offset that deficit. The Government has announced an increase in public spending by at least 100 billion kip (about US$ 11.7 million or 0.2 percent of GDP) from its reserve funds to support reconstructions needed for recovery in the 4 most affected provinces. The medium term impact remains to be clarified, which is not possible at this stage given the limitations in data availability.

g. Next steps

This report will be finalized after the Dissemination Workshop to become the Government's reference for post-disaster sector recovery (medium-term needs) and longer-term reconstruction requirements, stemming from the Ketsana Typhoon disaster.

After the Workshop, we will assess the resources available and/or can be mobilized for the implementation of the outlined sector recovery programme. There is a need for strategic implementation plans, distribution mechanism, sector and inter-sector coordination, monitoring activities and finally, a solid financial planning schedule. For many of these tasks, TA is needed, given the sometimes limited national capacity; capacity building is of the highest order. Everything must be in place for the new planting season (June 2010).

There is a great challenge for the people and the Government in facing humanitarian responses and recovery efforts to reach pre-disaster levels in most sectors. The Government wishes to discuss with its partners in development the best way to proceed in addressing, with their help, the immediate humanitarian needs and the sector recovery imperatives as well as the longer-term reconstruction needs.

THE KETSANA DISASTER – SEPTEMBER 29, 2009

Part I : Living with Natural Disasters

The Lao PDR at a glimpse – at the eve of the disaster

The Lao PDR, a land-linked country in Southeast Asia, bordering China to the north, Vietnam to the east, Cambodia to the south and Thailand and Burma to the west and northwest, has a total land area of approximately 236,800 km², and a total population of approximately 6.2 million in 2006, expanding at an average annual rate of 2.2% (2000 to 2006). Mountains, which are found in the north, east and south, account for 80% of the national territory, with the highest peak, Phou Bia, at 2,817 m The remaining 20% of the land mass comprises mostly flat floodplains along the Mekong River.

The Mekong River forms a large part of the western boundary with Thailand, whereas the mountains of the Annamite Chain form most of the eastern border with Vietnam. The climate is tropical and monsoon. There is a distinct rainy season from mid-April to mid-October, followed by a dry season from mid-October to mid-April.

Although much progress has been made in matters of infrastructure and social investments, and today most districts are accessible during the whole year, there is still much to do to link all the country together, especially with disaster-resilient infrastructure.

Subsistence agriculture still accounts for half of the GDP and provides 80% of total employment. Rice dominates agriculture, with about 80% of the arable land area used for growing rice. Slightly more than three quarters of Lao farm households are self-sufficient in rice. Through the development, release and widespread adoption of improved rice varieties, and through economic reforms, production has increased by an annual rate of 5% between 1990 and 2005, and Lao PDR achieved a net balance of rice imports and exports for the first time in 1999. The Lao PDR is considered as having the greatest number of rice varieties in the Greater Mekong Subregion, a biological treasure that is the more and more threatened by the country's fragile ecosystem, itself under great threat today from the on-going climate changes.

Laos is also rich in mineral resources, but imports petroleum and gas. Through its open door policy and liberal investments codes, the Government hopes to continue attracting foreign investment to develop the substantial deposits of coal, gold, bauxite, tin, copper and other valuable metals found in the country. In addition, the country's plentiful water resources and mountainous terrain enable it to produce and export large quantities of hydroelectric energy.

The tourism sector has grown rapidly, from 14,400 tourists visiting Laos in 1990, to 1.1 million in 2005. Annual tourism sector revenues are expected to grow to $250–300 million by 2020.

One of the main characteristics of the Lao PDR is its cultural diversity. The Government recognizes 49 main ethnic groups or categories with over 160 subgroups, making Laos one of the ethnically most diversified countries of the world.

The Government's consistent policy of making Laos, the only land-locked country of ASEAN a *land-linked* country, in the midst of some of the world's fastest growing economies, further enhances its economic development prospects.

Despite the tremendous efforts undertaken, the Lao PDR still remains one of the world's poorer countries. Map 2 shows the poverty concentration of the country in 2008. Compared to Map 3, showing the poorest districts of the country in 2003, one can see that real progress has been achieved in matters of poverty reduction. The country's poorest districts, however, are still to be found in the mountainous areas of its southern provinces. These are also those that are the most fragile from an ecological point of view.

Over the past decade, poverty incidence has declined from an estimated 48% in 1990, 39% in 1997, 32% in 2003, and 28.7% in 2006. The recently completed second national progress report has shown that the Lao PDR is well on track for meeting the key targets especially those on poverty, including halving of poverty population by 2015, increasing food security and gender equality.

The Government efforts and increasing foreign investments have fostered significant economic growth in the country and steady improvements in socioeconomic performance. The annual GDP growth rate accelerated to an average of approximately 7% since 2000, largely attributable to industrial growth led by the hydropower and gold and copper mining sectors.

The consequent pursuit of the National Socioeconomic Development Plan (NSEDP6, 2006-2010), based on the National Growth and Poverty Eradication Strategy, adopted in 2004, has so far yielded important results. Per-capita income has risen substantially in recent years, reaching $740 in 2008 compared with $330 in 2000 and $210 in 1990.

Among the socio-economic growth poles of the Lao PDR, one has to mention, particularly in the context of the Ketsana typhoon, the southern region, around Pakse, which had become a very dynamic city and from whose economic advances the Government encouraged in the hope that they would slowly spread to the mountainous areas, providing them with market opportunities and supplies, and so progressively reduce poverty in those areas.

Ecologically very fragile

The Lao PDR is, ecologically speaking, very fragile, being a flood and drought prone country. Most flooding occurs during May to September, when Monsoon rains accumulate in the upper Mekong river basin. In addition to river basin flooding, flashfloods in the northern mountainous region are also common. The Lao PDR is also susceptible to landslides, river bank erosion, pest infections and fire due to slash and burn agriculture. Recently, for the first time in people's memory, the northern part of Laos experienced signs of earthquakes.

The Lao Government recognizes that achieving *environmental sustainability* has to be the basis for sustainable development and exiting the Group of LDC by 2020. For this reason, the Lao PDR, richly endowed with natural resources, and very conscious about the importance of natural resources to country's socioeconomic development, has currently, as part of its efforts to conserve its biodiversity, 5.3 million ha or 22.6% of the land area under protection, including 20 National Protected Areas (NPAs) and two national corridors that cover almost 3.34 million ha or 14% of the country's land mass.

The Lao PDR also keenly recognizes the high vulnerability of the country to climate change, the anticipated adverse environmental and socioeconomic consequences, especially on the poor and the most vulnerable population, and the need for strengthening the capacity to adapt to climate change and its impacts. In 2008, the Government of the Lao PDR, with support from the Global Environmental Facility (GEF) and United Nations Development Programme (UNDP) and through multi-stakeholder participation, formulated the National Adaptation Plan of Action (NAPA). It is a first programme to address the immediate and urgent needs related to current and projected adverse effects of climate change on key sectors in Lao PDR: i) agriculture; ii) forestry; iii) water resources; and iv) human health.

There has been a marked increase in extreme and frequent floods and droughts over the last three decades in the country. According to data and statistics from the Department of Meteorology and Hydrology (DMH) from 1995 – 2005, drought conditions in recent years have been characterized by higher and irregular increases in temperature. In particular, high temperatures experienced in 1996 triggered the occurrence of drought in specific areas of the country. In 1998, a severe drought occurred during the dry season when the temperature became abnormally high, causing rivers, streams, lakes and ponds to dry up at a faster than normal rate.

In the Northern Lao PDR provinces of Huaphan, Phongsali, Luangnamtha and Luang Prabang, significant flooding has been frequent, having occurred in 1991, 1995, 1996, 2000, 2002, 2005 and 2006. Large floods also occurred in vast areas of the central and southern parts of the country.

A study by the Mekong River Commission has concluded that extreme flood years seem to have been more common after 1986. For example, 9 of the 13 significant or extreme flood years recorded at Kratie occurred in the 20 years since 1987, while only 4 were recorded in the previous 27 years.[1]

When the Ketsana Typhoon struck

The Lao PDR is among the four South East Asian countries affected by Typhoon Ketsana in late September, 2009. More than 180,000 persons were directly affected, and 28 storm-related deaths were deplored. Ketsana Typhoon entered the country with heavy rains in the Annamite Mountains, which caused flash flooding in the upland areas and river overflow in the lowland districts, carrying destruction to houses, roads, bridges, water supply systems, schools and health centres, irrigation and aquaculture infrastructure as well as tens of thousands of ha of arable land, while destroying up to 80,000 buffaloes and other livestock.

In the twelve months preceding the Ketsana Typhoon, the country, and especially it southern part, had already known Typhoon Moracot in August 2009, bringing significant damages to several provinces, and the Kammuri flooding of August 2008 that affected about 200,000 people and damaged 50,000 ha of arable lands.

The floods this year in the Lao PDR signal a clear trend of increased frequency and impact of disasters causing enormous damages and economic losses. Preliminary estimates suggest that nearly 5 per cent of Lao PDR's population were suffering from the recent flooding events, and it is likely that more people will be at risk to floods and other extreme events in the future.

The Ketsana disaster struck the five southern provinces of Attapeu, Salavan, Xekong, Savannakhet, and Champasak, in which 26 districts were affected to various degrees, 18 of them very severely.

Many of the 26 districts affected are among the poorest districts of the country, being food insecure and having high rates of stunting. The disaster struck when household food stocks were at their lowest and farmers preparing for the harvest season. Some of the stricken districts are also the most heavily UXO-affected areas of the country.

Attapeu province is one of the least densely populated areas of Laos (114,300) occupying 10,320 km^2. The National Vulnerability Report (2001) ranks two thirds of Attapeu as most

[1] Please refer also to Part V of the Sector Analysis (Disaster risk management and Climate adaption) to get an overall view of all the initiatives taken since 1995 by the Government, with support from many of its partners in development.

vulnerable, where 45.3 % of the populations are living below the official poverty line. Net school enrolment is among the lowest in the country. Severe flooding occurred in 1997, 2001 and 2008, but no comparison with the 2009 floods.

Salavan province ranks third out of the nine provinces severely handicapped by the presence of UXO. 39.6% of its population lives below the poverty line. Population is 336,600 for 10,691km^2 with a population density of 31 inhabitants per km^2.

Xekong province is the second smallest province (7,665km^2) of the country with the lowest population (83,000) and the lowest population density (11 inhabitants per km^2). Xekong is among the most remote areas of Laos; even some of its largest villages are virtually inaccessible by road for at least half of the year. 44.7% of the total population lives below the poverty line.

Savannakhet province occupies 21,774 km^2 with a population of 824,662 and an average population density of 37. 37.1 % of the population lives below the poverty line. Savannakhet lies in the middle of the East-West corridor linking Thailand and Vietnam.

Champasak province is the third largest province of the Lao PDR (15,415km^2), with a population of 575,600 and a population density of 37. 35.6 % of its population is below the poverty line.

The majority of affected households practice either lowland paddy or upland rice production as a main source of livelihood followed by livestock raising, non-timber forest products collection and cash crop/vegetable production respectively. Out of a total of 245,308 ha of rice cultivation areas (237,552 Ha of lowland and 7,756 Ha upland) 28,475 Ha or 12% have been destroyed in all 5 affected provinces.

To various extends, impacts from the flood could potentially result in aggravating rice shortage, food security and household income generation in the affected villages and hindering progress toward the poverty reduction targets set by the provincial authorities as a whole. The ramifications from these could also lead to increased vulnerability, out-migration of local young labours to the cities and to Thailand, human trafficking, crime and malnutrition especially among children in the affected areas if their needs have not been responded to in a timely and programmatic manner.

Special attention and extensive support would be crucial, especially for the many vulnerable ethnic communities in order to help them rehabilitate their damaged assets and restore their livelihood.

Table 3 shows the 26 affected districts in the 5 provinces.

Table 3 : Affected districts in the 5 Provinces

Attapeu (5 districts affected)	Salavan (8 districts affected)	Xekong (4 districts affected)	Savannakhet (6 districts affected)	Champassak (3 districts affected)
1. Xaysetha	6. Ta Oi	14. Lamarm	18. Sepone	24. Champasak
2. Sanxay	7. Samuoi	15. Thateng	19. Nong	25. Pathoomphone
3. Phouvong	8. Salavan	16. Dakcheung	20. Phine	26. Moonlapamok
4. Sanamxay*	9. Vapy	17. Kaleum	21.Xonbuly	
5. Samakkhixay	10. Toomlarn		22. Thapangthong	
	11. Khongxedone		23. Songkhone	
	12. Klakhonepheng			
	13. Lao Ngram			

Responses to the Ketsana disaster

The Government responded quickly to the news of the catastrophe by dispatching immediately emergency help, in close collaboration with local authorities, and the spontaneous support by many donors. When the Government saw that the relief effort would not be sufficient, the Ministry of Foreign Affairs launched an appeal to the International Community for support.

A Joint Assessment of Impact and Needs arising from the Ketsana Typhoon was undertaken to assess immediate, short-term humanitarian needs. This assessment was done by the National Disaster Management Committee, with the active support by UN-Agencies and International NGOs. This assessment aims at providing humanitarian relief to address the most urgent needs of the population affected.

Almost simultaneously with the short-term assessment, the Government, with the support from the World Bank, ADB, ASEAN, AusAID, GFDRR, FAO and ADPC, undertook a new type of assessment, namely, a damage, loss and needs assessment (DLNA), with a view of evaluating recovery and reconstruction needs.

Part II : Damage, Loss and Needs Assessment

A damage, loss and needs assessment normally intervenes after a disaster has struck. Its purpose is to assess the damages and the losses caused by a disaster in order to evaluate the needs for recovery and reconstruction. A DaLa (damage and loss assessment) typically estimates the value of the destruction to physical assets and the economic losses due to the absence of the damaged or destroyed assets.

Such an exercise was a first for the Government and it was with considerable interest that it was undertaken. Two concerns were important for the Government in undertaking this assessment. First, it was to identify the scope of the investments needed to recover from the Ketsana disaster, meaning, bringing the sectors back to where they were before the disaster, and second, to identify the investments needed in the affected areas so as to ensure that they will be disaster-resilient.

The assessment methodology used provides a satisfactory framework for identifying and quantifying the impact of natural disasters and, thus an initial indicator of recovery and reconstruction requirements.

Conceptual Framework and Methodology

The methodology for a damage and loss assessment (DaLA) was developed originally by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) in the early 1970s. Since then, it has been continuously expanded and updated; in recent years it has been simplified and customized for application in different regions of the world.

The conceptual framework underlying the DaLA methodology is based in the utilization of the system of national accounts of the affected country as a means for valuation of the damage and the losses caused by the disaster. In the simplest terms, the DaLA methodology provides for the estimation of the destruction of assets caused by the natural event that caused the disaster, the changes in the flows of the economy caused by the temporary absence of the destroyed assets, and the modifications in the performance of the affected economy. In addition, it also provides the basis for assessing the negative impact on personal or household income and overall well-being.

The concepts used include ‘damage’, ‘loss’, ‘total disaster impact’.

- Damage is defined as the monetary value of fully or partially destroyed assets. It is initially assumed that assets will be replaced to the same condition – in quantity and quality – that they had prior to the disaster.
- Losses are defined as the changes (losses) in the flows of goods and services that will not be forthcoming in the affected area until the destroyed assets are rebuilt, over the

span of time that elapses from the occurrence of the disaster and the end of the recovery and reconstruction period. Losses include production of goods and services that will not be obtained; higher costs of operation and production, and the cost of the humanitarian assistance activities.

- Total disaster effects are the addition of damage and losses.

The assessment relies on the gathering of *primary data and secondary data*. Primary data are collected through household surveys, and focus on the most visible aspects of the disaster. The surveys included questions on health, education, women and children, food and nutrition, water and sanitation, agriculture, livelihood, housing, emergency measures.

Secondary data are provided by a range of provincial and district offices, UN agencies, national surveys, MDG evaluation and others.

Macro-economic effects are defined as the manner in which the disaster modifies the performance of the main macro-economic aggregates in the affected country or region. These effects arise from the damage and losses caused by the disaster. Macro-economic effects represent a different view of disaster impact – as they describe the impact of the disaster on the functioning of the economy and the resulting macro-economic imbalances – and are therefore not added to the sum of damage and losses to avoid double accounting.

Main macro-economic effects include the impact on the level and growth of the gross domestic product of the country or region affected by the disaster; the modification of the normal pattern and structure of the balance of trade and the balance of payments due to increased imports and lower exports of goods and services arising from the disaster; and the corresponding impact on the fiscal sector that may occur due to lower revenues and higher expenditures of the government due to the disaster.

The post-disaster macro-economic analysis also includes an examination of the impact on gross investment to take into consideration the investments to be made during the reconstruction, the examination of possible inflation stemming from the effects of the disaster, and negative impacts on employment and income at the personal and household or family level.

Objectives of the Damage and Loss Assessment

The assessment of damage and losses after disasters is essential for the estimation of financial needs for recovery and reconstruction. Priorities are defined in terms of the most affected sectors of the economy, geographical areas of the country and population groups to be attended during recovery and reconstruction.

In addition, the assessment enables an estimation of the capacity of the affected government to undertake on its own the different components of the recovery and reconstruction programs, as well as the estimation of requirements of international cooperation when the

domestic capacity is insufficient to meet post-disaster needs. Furthermore, the assessment of damage and losses provides a quantitative basis to monitor progress in the execution of post-disaster programs.

Damage and loss assessments were applied to the social, productive and infrastructure sectors. The social sector includes: *housing, health and education*, while the productive sector comprises includes *agriculture, commerce and industry, and tourism*.

The infrastructure sector has 5 subsectors: transport, *telecommunications, power (electricity), water and sanitation, as well as water resources.*

Intense capacity building was undertaken before the 12 teams went to the affected areas. Detailed questionnaires were used. Sector templates were proposed for each sector. Each sector paper had to be about 10 pages (3-4 pages with the main summary + including annexes) that must contain comprehensive information. Tables, maps and figures can be used, but it is essential to produce a 'damage and loss summary' table.

The assessment exercise proceeded as follows:

- Training of the field team: Asian Disaster Preparedness (ADPC) had provided two days training to 40 participants from different line ministries and development partners before proceeding to the field.
- Orientation to the Provincial Authorities on PDaLNA: The Field Team departed from Vientiane had provided half day orientation to provincial authorities on ECLAC and PDaLNA.
- Data collection: After the orientation, the field team worked along with Provincial Authorities to collect and fill up the data on ECLAC format/questionnaires.
- Field verification: Wherever possible, the field team verified the damage caused by the Ketsana Typhoon.
- Case study: Field verification was accompanied by case studies.
- Rap-up meetings: After each field visit and data fill up, Provincial Authorities were informed about the findings and observations from the field.
- Data entry and analysis: Data collected from the field were entered into an Excel Spread Sheet and analyzed.

- Inter-agency information sharing and verification from the line ministries: Data collected from the field were shared among the agencies such as WB, UN, ADB, and were verified from the concerned ministries for its authenticity.

The Government of the Lao PDR is privileged to present in the following section the findings of the sector assessment of damage, loss and needs.

POST-KETSANA SECTOR ASSESSMENT OF DAMAGE, LOSS AND NEEDS

Part I : Social Sectors

A. The Housing Sector

Pre-Disaster Situation

Prior to the disaster, there were wide ranges of house constructions in the affected area, the result of raising income levels. Most of the houses are permanent and only few are temporary. In the villages, construction materials varied according to wealth. The richest houses were made of brick and mainly located in towns. The middle class houses were made of half brick and half timber. The poor houses mainly were made of timber with zinc or tile roofs. Many wooden houses were raised at 2.5 – 3.0m above the ground. Poorer houses mostly have timber frames with bamboo or thatched walls. Some of the poorer houses, built directly on the ground, were more vulnerable to flood as compared to other types of houses. The poorest houses in the form of huts have some timber frame with thatched roofs and thatched walls. This type of hut can be seen mainly in the rural areas and are mostly located near the farm land.

Bamboo houses

Huts

Wooden houses

Damage and Loss Assessment

Total housing effect that includes both damage and losses is estimated at 73.47 billion kip (US$ 8.6 million) of which damages and losses hold 69.9 billion kips (US$8.2 million) and 3.5 billion kip (US$0.4 millions) respectively (See Figure 1).

The housing damage that occurred due to Typhoon Ketsana can be attributed to a combination of storm and flash flood. A total of 3,178 houses were affected and destroyed at various levels. These include 536 houses in Attapeu Province, 1197 in Xekong, 739 in Salavan, 340 in Savannakhet, and 366 in Champasak Province respectively (see Table 4).

The assessment team went to four provinces in southern part of Laos namely Savannakhet, Salavan, Xekong and Attapeu. Later, Champasak was also added considering the effect of storm and flood on various sectors and the people living in this province. [2]

Most of the damages to the housing sector were concentrated in the districts of Thateng, Kaleum, Lamarm and Dackcheung of Xekong province. Total damages[3] in these districts are estimated at

[2] Figures quoted in Table 4 for Champasak province were provided by the provincial authorities.

36,366,000,000 kip (USD 4.2 million)[4], representing 52 % of the total damage registered in the five provinces (Figure 2). Of the existing total of 15,200 houses in the four affected districts, 1,197 houses were badly affected with 476 houses partially damaged and 721 houses totally destroyed. As many as 721 households (approximately 4,326 people, 6-members/family in average) were without shelter for a significant period of time as they lost their houses completely because of flood and storm.

The second most damaged zone is comprised by the districts of Sanamxay, Samakkhixay, Sanxay, Phouvong and Xaysetha of Attapeu province. Total damages in these districts are estimated at 20,556,000,000 kips (US$ 2.4 million) which represents 29% of the total damage in the five provinces (Figure 2**).** Of the existing total of 21,939 houses in the five affected districts, 536 houses were badly affected with 359 houses partially damaged and 177 houses totally destroyed.

The third most damaged areas are Samuoi and Ta Oi districts of Salavan province. Total damages in these districts are estimated at 7,850,000,000 kips (US$ 1 million), representing 11% of the total damage of the five provinces (Figure 2). Of the existing total of 5457 houses in the two affected districts, 739 houses were badly affected in which 475 houses partially damaged and 264 houses totally destroyed.

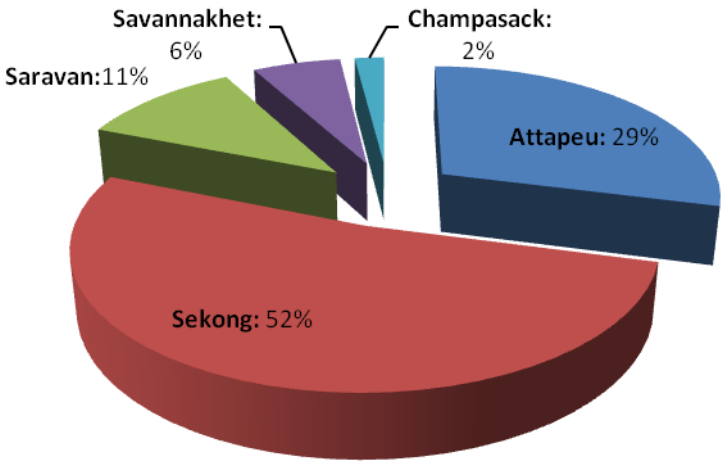
Savannakhet had comparatively less impact from the flood in comparison to the other three provinces. Sepone and Nong districts in Savannakhet had some degree of damages. Total damages to housing in these two districts are estimated at 4,008,000,000 kips (US$ 471,529), representing 6% of the overall damage of the five provinces (Figure 2). Of the existing total 11’309 houses, 340 houses were badly affected, with 308 houses partially damaged and 32 houses totally destroyed.

Champasak was the least affected province compared to the other four provinces in flood affected area. Total damages in Champasak are estimated at 1,190,000,000 kips (US$ 140,000), which represents only 2% of the total damage (Figure 2). Of the 108,568 households in the province, only 366 households were affected partially by the flood.

Figure 1 : Distribution of damages (housing sector) by province

[3] Figures for ‘Total damage’ include damage and losses.

[4] 1 $US = 8500 kip



Of the existing total of 53,905 houses in the 18 affected districts of the five provinces visited, 1984 were partially damaged and 1,194 totally destroyed out of the affected 3178 houses in the area. It appeared clearly that the many houses located near river banks were the most vulnerable ones and thus mainly washed away or totally damaged by the Ketsana typhoon. As many as 2,058 households are in urgent need of temporary shelters for a significant period of time.

Table 4 : Housing sector - Estimated Damages, Losses and Recovery Needs

Provinces	Total number of houses	Houses affected	%	Damage (million kip)	Loss (million kip)	Total (million kips)	Relocation of houses (million kip)	Total need Rebuilding & Relocation
Attapeu	21939	536	2.4	20,556	587	21,143	9,200	30,343
Xekong	15200	1197	7.9	36,366	1,363	37,729	20,080	57,809
Salavan	5457	739	13.5	7,850	750	8,600	29,560	38,160
Savannakhet	11309	340	3	4,008	148	4,156	9,960	14,116
Champasak	108568	366	0.3	1,190	659	1,849	7,320	9,169
Total : million kip	**162473**	**3,178**	**27.1**	**69,970**	**3,507**	**73,,477**	**76,120**	**149,597**
Total in US$				**8,231,765**	**412,588**	**8,644,353**	**8,955,294**	**17,599,647**

All types of houses located near or on river banks were very vulnerable and thus generally completely destroyed or washed away by the flood. Brick houses, mainly located in central towns were much more resistant to the wind, but were affected by the flash flood, but still physically stand or remain after the

flood. The flash flood was by far the most powerful agent of destruction in some areas, especially the houses located near river banks, resulting in total destruction.

Resource Needs

In most of the places visited jointly by representatives from ASEAN, ADB, Ministry of Planning and Investment and the Department of Transport and Public Work, local authorities and affected people reported that during the flood, they had evacuated themselves to higher grounds and stayed there for two to three weeks waiting for assistance.

There was no proper safe area in the provinces visited. The Government made an early warning to all provinces about the typhoon Ketsana but due to limited capacity, many people who live in the rural area could not receive the warning. Some people reported that they did not expect the flood to be very big, therefore they did not prepare well for it. Many families had not brought all their possessions to a safe area. Electricity is not yet available outside urban, i.e., in remote areas. For a few weeks during the flood time, electricity as well as communications were cut off.

In general, people who lost their houses also lost all their belongings such as furniture, kitchen sets, bedding materials, motorbikes, bicycles, radios, TVs, clothes as well as their farming tools.

During the flood, the Government provided some food to the affected people mainly to people who stayed at safe accessible areas. After the flood, the Government brought them back to their villages and provided some housing material support such as zinc for roofing and some basic kitchen sets to the ones who completely lost their houses as a relief. In one of the villages that the team visited, called Keng Luang, in Lamam district in Xekong province, Mrs Tuy, a village chief, reported that there are 27 families badly affected by the flood and all their houses and assets completely lost. Each family needs to look for old pieces of timber which are remaining there after the flood or need to buy new timber to construct their houses. Buying new timbers to construct new houses is beyond the community's capacity as a majority of them have lost their belongings and their jobs as seasonal agricultural laborers, which are their prime source of income.

<u>Medium-Term Resource Needs</u>

To recover the loss and damage in the 18 districts of the five affected provinces, the following resource needs were identified:

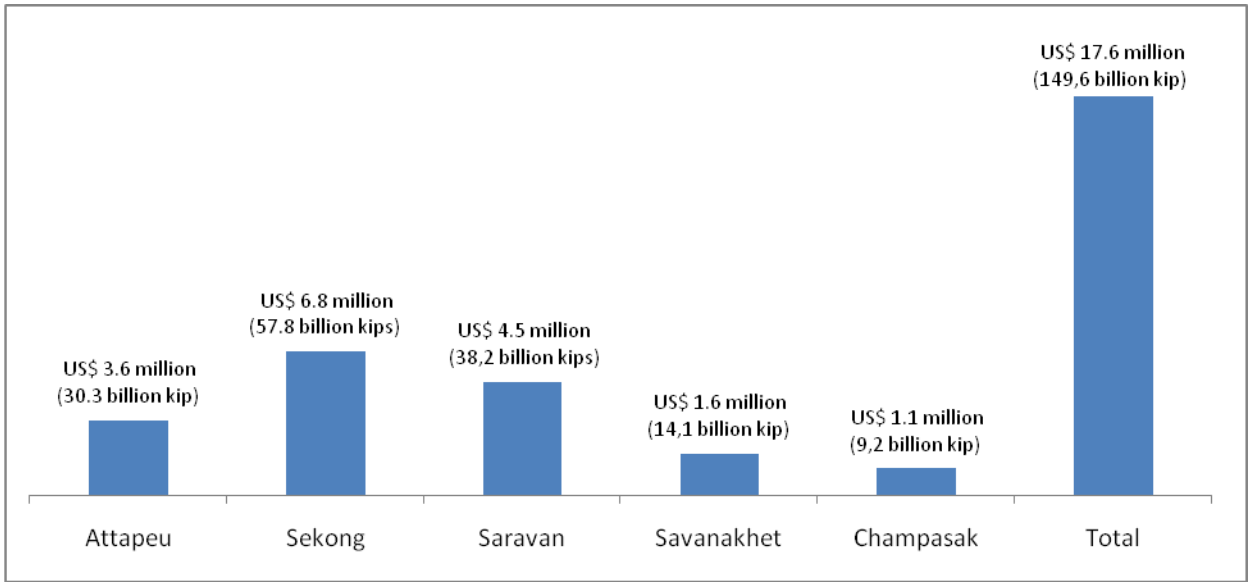
- Assistance and support to people who completely lost their houses to reconstruct/restore 1,194 new houses with an estimated total cost of 39,189,500,000 Kips (US$ 4,610,529). If necessary, the Government will provide new plots of land in a favourable location of the villages or the district so that the risk of future disasters can be reduced (Figure 4).
- Assistance and support to people whose houses were partially damaged to repair 1984 houses, with an estimated total cost of 21,049,000,000 kip (US$ 2,476,353); assistance and support to people to clean their locations and to have temporary shelters with transportation and labour support cost for relocation. The total cost of this was estimated at 8,750,600,000 kip (US$ 1,029,482).

- To provide all basic household assets to replace those lost by each family, at a total cost estimated at 980,900,000 kips (US$ 115,400).
- Total relocation[5] needs for all five provinces are estimated at 76,120 million Kip or US$ 8,955,294.

Restoration, repair and maintenance, temporary housing, replacement of household assets are evaluated at 8.644 million US$ (i.e., the replacement value of damage and losses), while the resettlements of damaged villages to safer places requires 8.9 million US$).

Out of the total of US$ 17.6 million of estimated total needs, Xekong's needs are the highest (US$ 6.8 million), followed by Salavan (US$ 4.5 million), Attapeu (US$ 3.6 million), Savannakhet (US$ 1.6 million) and Champasak (US$ 1.1 million) respectively (Figure 2).

Figure 2 : Distribution of needs (housing sector) by provinces (in kip and US$)



[5] Relocation: To move to or establish entire vulnerable communities in a new, safer place

The Government projects that half of this amount (74,798 million kip or 8.8 million US$) are needed for immediate recovery (medium-term – up to 2 years), while the other half is budgeted for the longer-term, given local capacity and the inevitable time-lag.

Other longer term needs, but which have not yet been 'costed' include:

- Disaster preparedness including early warning and proper safe areas should be developed.
- Capacity building in disaster risk reduction to staff at all level from the national to the village level.
- Using the experience from this assessment, to simplify the assessment form and provide training on data collection to provincial staff as well as village chiefs.

B. Health

Pre-Disaster Situation

The five provinces include some of the most vulnerable and poorest areas in Lao PDR. Malaria and other vector born diseases are endemic in the five flood-affected provinces with the addition of lymphatic *filiariasis* in Attapeu Province. The fertility rate in these provinces, especially the hardest hit Attapeu and Xekong, is higher than national average. About 80% to 90% of pregnant women in these areas deliver at home and only 26.4% of children less than six months of age are exclusively breastfed. Prior to the flooding, about 37.1% of children under-five are underweight and 40.4% stunted, representing chronic malnutrition. Overall, there are approximately 25,500 children under-five and 9,000 pregnant and lactating women in the affected areas who are at risk of becoming moderately or severely malnourished.

Health care is primarily provided for by the Government through hospitals and health centres in the districts and villages. There are only a few private medical clinics although there are many private pharmacies where people can buy medicines and seek first aid advice. Higher level hospitals can provide basic and specialty medical care but they are usually located in the provincial capital. Table 5 below shows the distribution of health facilities.

Table 5 : Distribution of Health Facilities in the four most affected provinces

Province	District Hospitals			Health Centres	
	Number	Average In-patients per day	Average Out-patients per day	Number	Average Patients per day
Attapeu	4	6	53	21	2
Xekong	3	4	34	14	3
Salavan	7	5	83	46	3
Savannakhet	14	4	339	106	3

Government hospitals and health centres provide services for out-patients with an average fee of Kips 20,000 per visit and consultations. In-patients pay approximately 150,000 kip per day of confinement at public hospitals for certain medicines, food, and other laboratory fees. If the patients are from remote areas, transportation cost is also high with a cost of 100,000 kip per person.

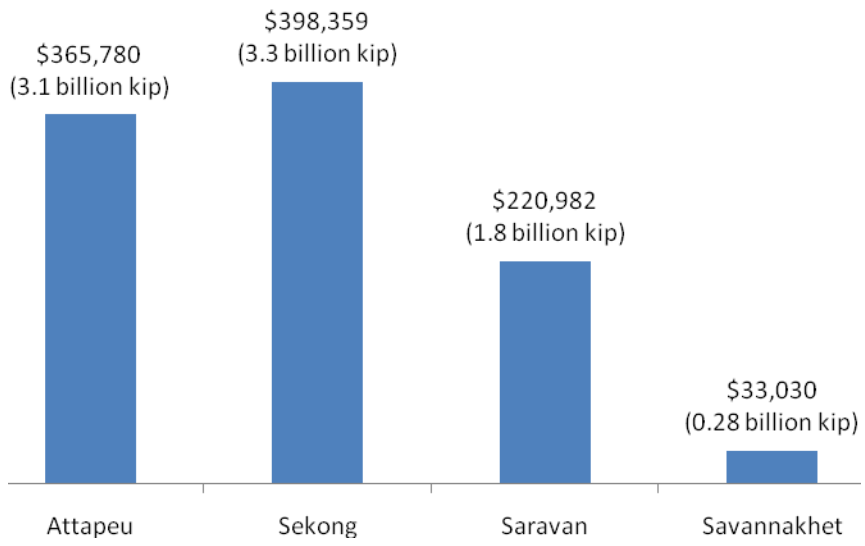
Damage and Loss Assessment

For the damage, loss and need assessment, only four provinces namely; Attapeu, Xekong, Salavan, and Savannakhet, were considered as damage in Champasak seemed to be very low; therefore, this province is not included in the health sector assessment.

Damage

The floods brought about by typhoon Ketsana caused damages to health facilities of 8.65 billion kip (US$ 1.01 million). The damages were inflicted on the physical structures, equipment, medicines, drug kits for the villages and various types of furniture, among others. The flood waters have likewise damaged important documents in the health facilities and brought a large quantity of debris some of which are still to be cleaned up. In total, 6 of 28 hospitals and 33 of 187 health centres were damaged in various degrees. Figure 3 below shows the extent of damages of the health facilities in the provinces in which Xekong had a maximum amount of damages 3.3 billion kips (US$3.9 million) followed by Attapeu 3.1 billion kips (US$ 0.36 million), Salavan 1.8 billion kips (US$ 0.2 million), and Savannakhet 0.28 billion kips(US$ 0.03 million).

Figure 3 : Damage of health facilities by province (in kip and US#)

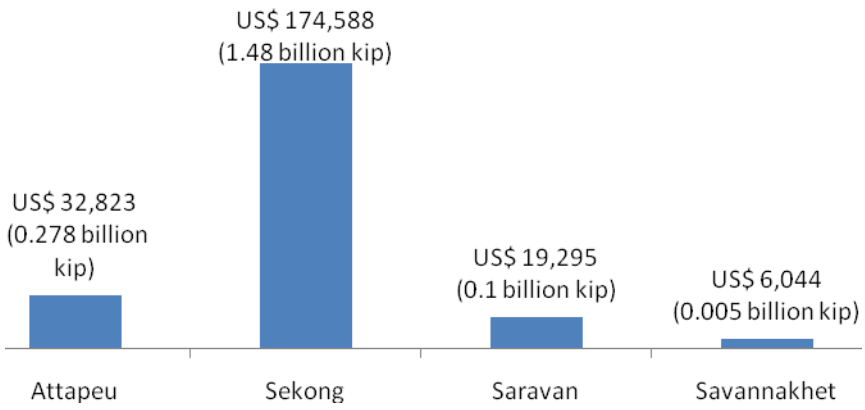


Losses

The losses for the health sector amounted to approximately 1.98 billion kips (US$ 233,221) which stem mostly from added cost of disease control and surveillance, treatment, increased expenses in transportation, in seeking medical care on the part of the people, among others. However, the exact amount of additional costs to the people like reduced productivity, long term disability, increased morbidity, and other longer-term effects of malnutrition is difficult to estimate at present.

Figure 4 shows the losses for the provinces. In terms of losses too, Xekong had maximum losses 1.4 billion kip (US$ 0.1 million) followed by Attapeu 0.278 billion kip (US$ 0.03 million), Salavan 0.1 billion kip (US$ 0.01 million), and Savannakhet 0.005 billion kip (US$ 0.06 million) respectively.

Figure 4 : Losses in health sector by province



In total, damages and losses to the health sector amounted to 10.6 billion kip (US$ 1,251,373).

It was noted that the provinces of Attapeu, Xekong, and Salavan, have recommended their hospitals to be relocated to safer places. The estimated costs involved are:

a) Kips 2.5 billion for Saysetha district hospital in Attapeu;
b) Kips 6.5 billion for Kaleum district hospital in Xekong; and
c) Kips 0.8 billion for the Salavan Health Center in Samouy district.

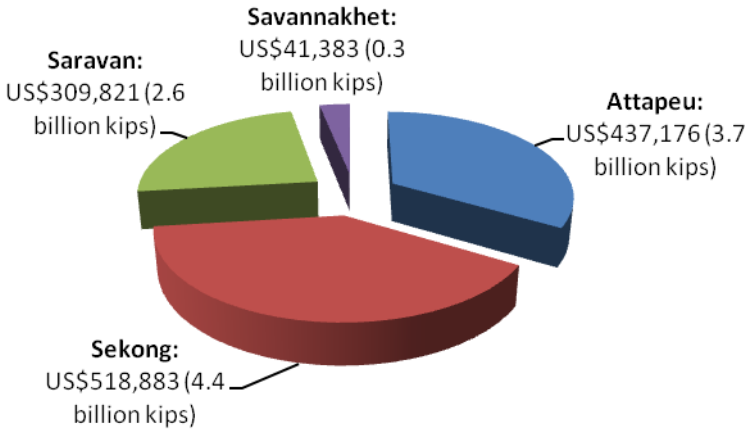
The total amount needed to relocate these hospitals is Kips 9.8 billion (US$ 1.1 million), which has been included in the needs section under longer-term needs.

Needs Assessment

There is a serious threat to the health conditions of the people in the four provinces, especially the poor ones as most of the infrastructure and health facilities are either damaged or absent.

Figure 5 below summarizes the needs of the health sector by province and their estimated costs based on the damages. Xekong has the highest needs of 4.4 billion kips (US$ 518,883) followed by Attapeu 3.7 billion kips (US$ 437,176), Salavan 2.6 billion kips (US$ 309,821), and Savannakhet 0.3 billion kips (US$ 35,294) respectively.

Figure 5 : Distribution of needs in the health sector by province



With houses destroyed, farms and crops devastated and no reliable source of livelihood at present, the following medium term needs of the health sector should be addressed :

1. *Replacement of the drug kits that were damaged in the villages.* The village drug kits are the main component of the health program in the villages. Without the drug kits, the village people will be deprived of their immediate health needs.

2. *Continuous repair of damaged health structures and replacement of vital medicines and supplies in the health facilities particularly those that are needed for emergency treatment*. Reproductive health, maternal and neo-natal health, among others, may be severely affected if health facilities are not restored immediately. Moreover, additional cases of diarrhoea, infections, fever and other similar diseases which are common after disasters may occur, requiring the need for fully operational heath facilities. Should serious illnesses happen, the health facilities must be able to provide at least temporary relief to patients that need treatment from high level medical hospitals outside the Ketsana-affected areas. In addition, if the health facility at the provincial level is not remedied on time, patients will have to take longer trips to avail of the services in the neighbouring provincial hospital in case of severe case management.

3. *Disease control, surveillance and health education. In crowded evacuation areas which are expected to be used for longer periods, environmental vector control measures and health education* will be needed to reduce the outbreak of dengue, malaria, leptospirosis and dermatological problems among other diseases.

4. *Replacement of vital medical equipment.* The health facilities cannot serve the people in these provinces without the necessary equipment. This situation may result in the deterioration of the health conditions of the flood victims and may also cause overcrowding in the nearby hospitals and health centres of nearby provinces.

5. *Restoration of the damaged sources of potable water*. The shortage of clean drinking water, particularly in the remote highlands, will continue to put the people at risk from diseases. Drinking water supply restoration activities can be coordinated with the water supply sector to prevent the further spread of water-borne diseases.

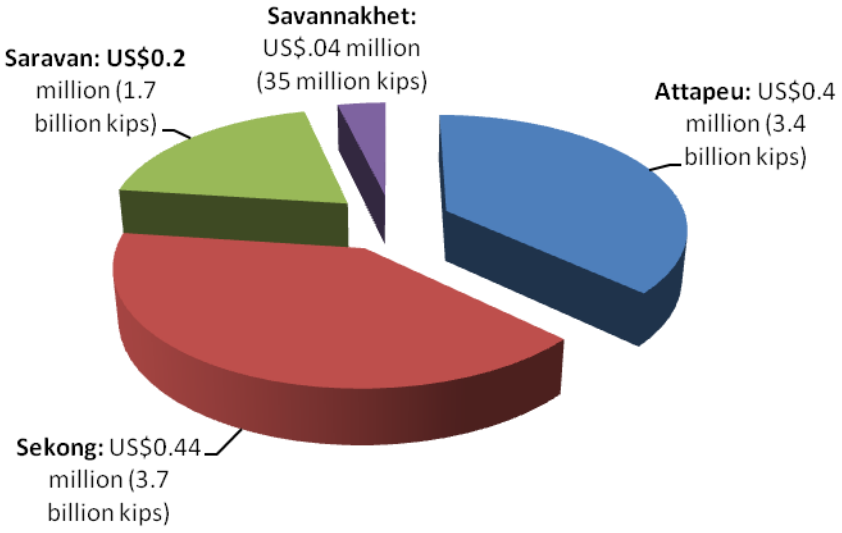
The total estimated medium term recovery and reconstruction needs in the health sector amounts to about 9.376 billion kips (US$ 11 million) including 4.129 billion kip (US$ 0.48 million) to rebuild and repair damaged structures in a more flood-resilient way and about 2.75 billion kip (US$ 0.3 million) to procure damaged medical equipments, 0.39 billion kip (US$ 0.04 million) to procure medicines, 1.3 billion kip (US$ 152,941) to make new furniture, and 0.74 billion kip (US$ 87,058) for disease surveillance and control (see Table 6).

Table 6 : Medium Term Recovery Needs for the Health Sector

Province	Structure	Equipment	Medicines	Furniture	Disease surveillance and control	Total
Attapeu US$	50,706	183,882	24,353	119,059	29,765	407,765
Kip	**431,001,000**	**1,562,997,000**	**207,000,500**	**1,012,001,500**	**253,000,000**	**3,466,000,000**
Xekong US$	206,941	134,353	17,765	39,353	44,000	442,412
Kip	**1,758,998,500**	**1,142,000,500**	**151,002,500**	**334,500,500**	**374,000,000**	**3,760,502,000**
Salavan US$	197,882	5,000	1,411	1,235	6,000	211,528
Kip	**1,681,997,000**	**42,500,000**	**11,993,500**	**10,497,500**	**51,000,000**	**1,797,988,000**
Savannakhet US$	30,353	489	2,588	0	7,953	41,383
Kip	**258,000,500**	**4,156,500**	**21,998,000**	**0**	**67,600,000**	**351,755,000**
Total (US$)	**485,882**	**323,724**	**46,117**	**159,647**	**87,718**	**1,103,088**
Total (Kip)	**4,129,997,000**	**2,751,654,000**	**391,994,500**	**1,356,999,500**	**745,600,000**	**9,376,245,000**

Figure 6 below summarizes the immediate needs of the health sector by province and their estimated costs based on the damages. Xekong has the highest needs of 3.7 billion kip (US$ 0.44 million) followed by Attapeu 3.4 billion kip (US$ 0.4 million), Salavan 1.7 billion kip (US$ 02 million), and Savannakhet 35 million kip (US$ 0.04 million) respectively.

Figure 6 : Distribution of medium term needs in the health sector by province



The assessment of medium term health sector needs covers mainly the reconstruction of damaged facilities, and reestablishment of health services facilities, medical equipment and supplies lost to the flood event. The cost of facilities to be replaced and repaired is based on present market value. Detailed cost estimates will be made at the detailed design stage when local conditions are better determined.

Longer-term needs

The longer-term needs are essentially the relocation of two district hospitals, one in Attapeu (Xaysetha district) and one in Xekong (Kaleum district) as well as of the Health Centre of Samuoy district in Salavan province. As indicated earlier, the total cost estimated for this needed relocation amounts to 9.8 billion kip (US$ 1.1 million).

C. Education Sector

Pre-disaster situation

Distribution of educational institutions in the affected 17 districts

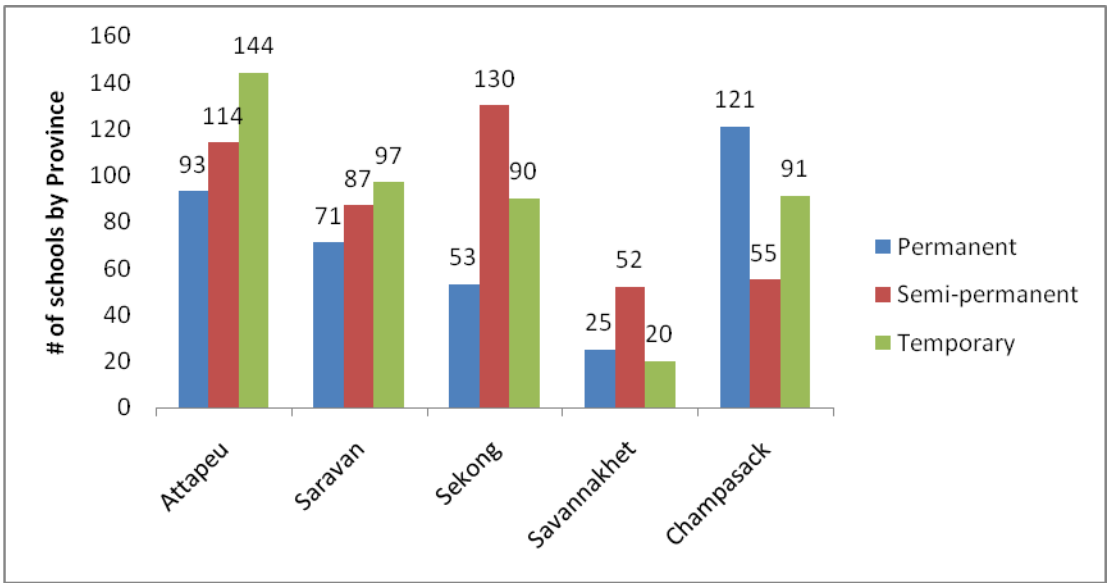
In September 2009, before Ketsana Typhoon struck, there were 1248 learning institutions in 17 affected districts of the five provinces concerned (Attapeu, Salavan, Xekong, Savannakhet, and Champasak) in which 129,589 students were enrolled (see Table 7**).**

Table 7 : Number of institutions and students enrolled before flood in the affected districts

Types of schools	Attapeu		Salavan		Xekong		Savannakhet		Champasak		Total	
	# of schools	# of students	# of schools	# of students	# of schools	# of students	# of schools	# of students	# of schools	# of students	# of schools	# of students
Kinder-garten	10	1388	6	236	10	1169	0	0	41	1646	67	4439
Primary	292	20678	227	24945	239	19387	93	4552	184	23985	1035	93547
Secon-dary	49	6459	20	6969	29	5699	4	1367	40	9169	142	29663
NFE/ College	0	0	0	0	3	703	0	0	0	0	3	703
Vocational training centres	0	0	0	1119	1	118	0	0	0	0	1	1237
Total	351	28525	253	33269	282	27076	97	5919	265	34800	1248	129589

Figure 7 shows that Xekong had the highest number of semi-permanent schools (130) followed by Attapeu (114), Salavan (87), Champasak (55), and Savannakhet (52) while the affected districts in Attapeu had most of the temporary schools (144) followed by those of Salavan (97), Champasak (91), Xekong (90), and Savannakhet (20) respectively. Permanent structures were relatively less frequent in the affected districts, with 121 in Champasak, 93 in Attapeu, 71 in Salavan, 53 in Xekong, and 25 in Savannakhet.

Figure 7: Distribution of schools in affected districts by structure



In Laos, providing free education to its citizen is the state's responsibility. Therefore, number of private schools and other private educational institutions were very limited in flood affected provinces. Most of these institutions were subsidized by the state.

Post-disaster situation

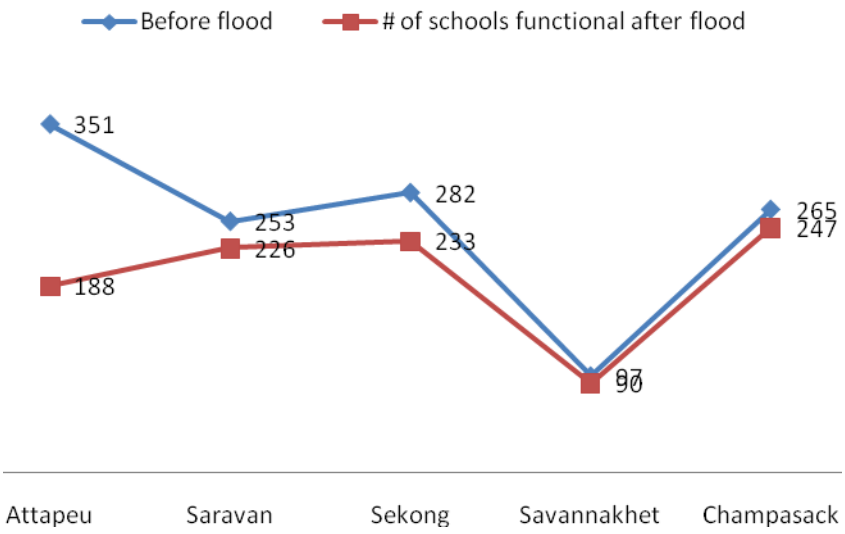
The number of educational institutions and student's enrolment has not changed even after the flood as the District Education Bureau (DEB) and Provincial Education Services (PES) continued school education arranging temporary schools in safer places.[6] In some cases, schools were closed at least for two weeks, but education started after debris and mud had been cleared from the school compounds and the classes.

Damage and Loss Assessment

Out of a total of 1248 schools (cf. Table 8), 266 schools were affected to various degrees by the flood. In Attapeu Province, 188 schools remained functional (out of 351) after the passage of the typhoon, 226 in Salavan (out of 253), 233 in Xekong (out of 282), 90 in Savannakhet (out of 97) and 247 in Champasak (out of 266) (see Figure 9).

[6] However, several schools, although affected by the flood, could continue to function almost normally.

Figure 8 : Impact of Typhon Ketsana on educational institutions



According to Table 7, Attapeu Province had the highest number of school damaged (163) followed by Xekong (49), Salavan (27), Champasak (20) and Savannakhet (7). Semi-permanent schools were the most affected (118) followed by temporary schools (102), and permanent ones (46). Inappropriate building materials, weak 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, badly chosen school locations are some of the underlying causes for the damages inflicted on semi-permanent and temporary schools.

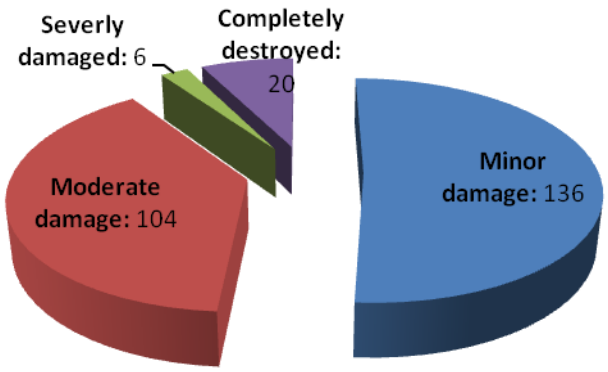
Table 8 : Number of schools affected by the flooding

Province	Permanent schools		Semi-permanent school		Temporary schools		Total number of damaged schools
	Pre-disaster	Post-disaster (affected)	Pre-disaster	Post-disaster (affected)	Pre-disaster	Post-disaster (affected)	
Attapeu	93	35	114	61	144	67	163
Salavan	71	0	87	15	97	12	27
Xekong	53	7	130	22	90	20	49
Savannakhet	25	1	52	3	20	3	7
Chamapsack	121	3	55	17	91	0	20
Total	**363**	**46**	**438**	**118**	**442**	**102**	**266**

Magnitude of damage

Of a total of 266 damaged schools, 136 schools had minor damage (<20% of construction costs), 104 school had moderate damage (between 20-50%), 20 were severely affected (between 50-100%) and 20 schools were completely destroyed (Cf. Fig 9).

Figure 9: Magnitude of damage

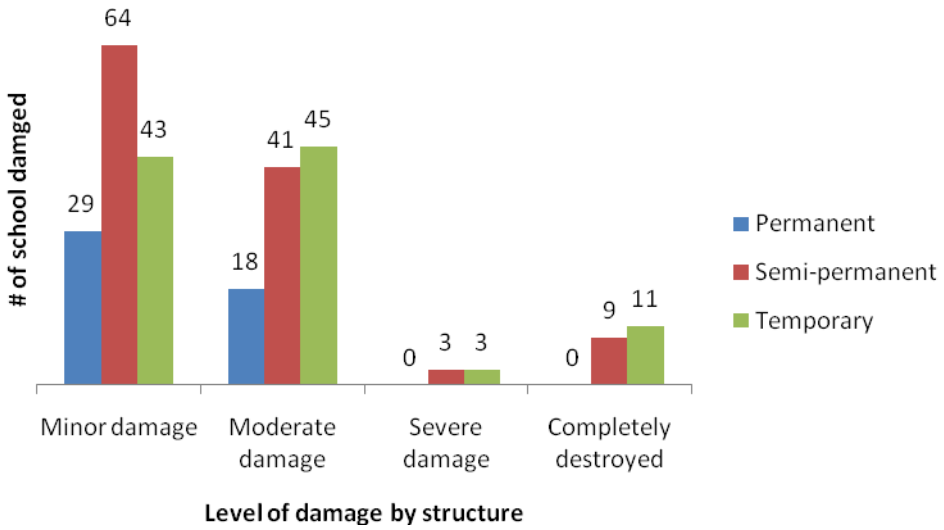


Distribution of damages to building structure

With regard to the building structure, 29 permanent, 64 semi-permanent, and 43 temporary schools had minor damages, while 18 permanent, 41 semi-permanent, 45 temporary schools suffered moderate damage. Most of the permanent schools were flood resistant; therefore, they had very less damage in comparison with the semi-permanent and temporary schools. Three semi-permanent schools were severely affected in Xekong and Savannakhet Provinces.

Nine semi-permanent and eleven temporary schools were completely destroyed by the typhoon in Salavan and Xekong (Figure 10).

Figure 10 : Distribution of damage by building structure



When on September 29, 2009, suddenly, a strong storm came with heavy rainfall, immediately entire roads and villages were covered by one to two meters of water which flooded everything including school buildings, health centres, houses, food stuffs and livestock except some permanent buildings and animals like buffaloes. Most of the affected school buildings in rural villages were made of wooden flakes roofed with galvanized sheets and wooden pillars. Even concrete school walls and fences were damaged by the flood. Benches, blackboards, bookracks, computers and education materials in science labs were washed away within a couple of hours of heavy rainfall and wind.

Only twenty nine primary schools in Salavan and thirteen in Xekong that were built as temporary schools, could, after the flooding, continue to function. In many cases, schools were closed at least for two weeks in all five provinces to clean the debris and to erect temporary schools.

Damages and losses caused by the flood had already been denied children of their access to education. After the typhoon, partially restored school facilities enabled children to return to classes, and contributed to overcoming their trauma by providing a child-friendly environment where they could meet their peers. Government, private sector organizations, NGOs and international donors provided support to repair and erecting temporary schools. The Ministry of Education delivered textbooks and some educational materials to schools in affected areas, while NGOs and international partners supported government efforts to reopen educational establishments or set up temporary learning spaces with a minimum set of educational inputs.

Preliminary Needs Assessments

It is expected that 20 schools need to be rebuilt, namely those which were fully destroyed. 266 schools need to be repaired to various degrees. The District Education Bureaux (DEB) plan to relocate 20 schools in safer places and to build 42 temporary schools as semi-permanent schools. In some communities, district and provincial authorities have already established arrangements for schools to resume classes.

Permanent buildings have maintained their building integrity; the priority thus will be given to reconstruct affected schools by adopting proper design standards. The rebuilding of a large number of schools offers an excellent opportunity to build well engineered, multi-story buildings that can also serve as emergency shelters during natural disasters and other emergencies. Field surveys carried out in October 2009 indicate that the educational sector's damage can be estimated at 8.09 billion kip (US$ 951,691), while losses are estimated at 0.8 billion kip (US$ 97,597) and the resource need at 32.5 billion kip (US$ 3,831,865) (Table 9).

Table 9 : Summary of damages, losses and needs (million kip + total in US$)

	Attapeu	Salavan	Xekong	Savannakhet	Champasak	Total (million kip)	Total (US$)
Total damage	1,800.3	3,572.2	1,545.9	1,021.4	149.7	8,089.4	951,691
Total loss	-	490.4	339.2	-	-	829.6	97,597
Total need	**3,300.3**	**18,827.2**	**9,272.3**	**1,021.4**	**149.7**	**32,570.8**	**3,831,865**

Medium-term measures:

The Government will ensure that the newly built and repaired educational institutions adhere to proper building standards in order to avoid any future damage and losses. Many of the schools buildings, particularly those of temporary and semi-permanent structures, could not have withstood wind and flood even of a lower magnitude. Damages at this scale must be prevented in the future. A large-scale program of building reconstruction to make new 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 while constructing new buildings. Similarly, the Government will prepare school contingency & emergency planning for the evacuation in case of emergency. This implies a medium term plan for the formation and mobilization 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.

Table 10 shows that the Government will relocate 33 schools to safer places (Attapeu 3, Salavan 11, and Xekong 19), which requires 11.6 billion kips (US$1.3 million). Similarly, as a medium term recovery and reconstruction plan, 266 schools (Attapeu 163, Salavan 28, Xekong 49, Savannakhet 7 and Champasak 19) require repair and maintenance to various degrees, which requires 5.9 billion kips (US$0.7 million).

Table 10 : Summary of medium term needs by provinces, number of schools and cost of reconstruction (education) (in million of kip)

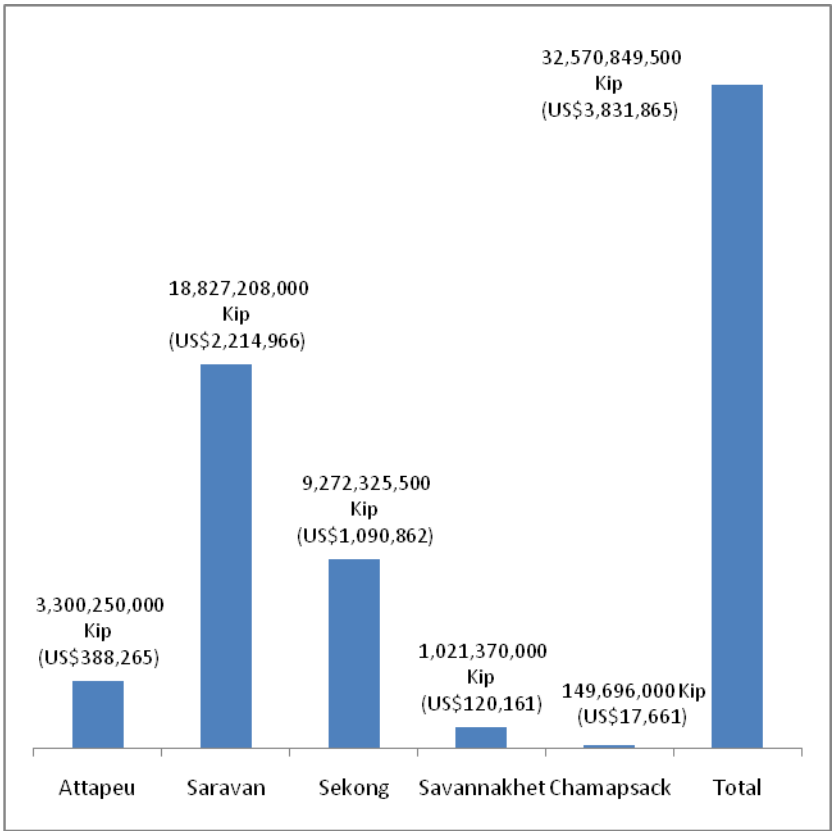
Need	Attapeu (# of schools)		Salavan (# of schools)		Xekong (# of schools)		Savannakhet (# of schools)		Champasak (# of schools)		Total (# of schools)	
School relocation	3	1,500,	11	4,960	19	5,184	-	-	-	-	33	11,644
Repair and maintenance	163	1,266.0	28	3,164.3	49	506.3	7	996.0	19	47.4	266	5,980
School equipments		534.3		408.0		1,039.5		25.4	-	102.3	-	5,980
Renovation of temporary schools*	0	-	29	10,295	13	2,542.5	-	-	-	-	42	12,837
Total (million kip) (million US$)	**166**	**3,300 0.4**	**68**	**18,827 2.2**	**81**	**9,272 1.1**	**7**	**1,021 0.1**	**19**	**150 0.02**	**341**	**32,571 3.8**

*(Into semi-permanent school)

A majority of the schools affected by flood have lost their school equipments such as computers, science lab equipments, blackboards, furniture, and bookracks that need to be replaced with new ones. Therefore, to address this requirement, the Government will need 5.9 billion kips (US$0.7 million). In addition, 42 temporary schools from five provinces need to be transformed into semi-permanent schools considering their vulnerability to the flood in the flat land and landslide in the hills, which requires an additional budget of 12.8 billion kips (US$1.5 million) (see Table 9 for details). In total, the needs are estimated at 32,570,849,500 kips (US$3,831,865) to be able to address the various school/education needs in the five flood affected provinces.

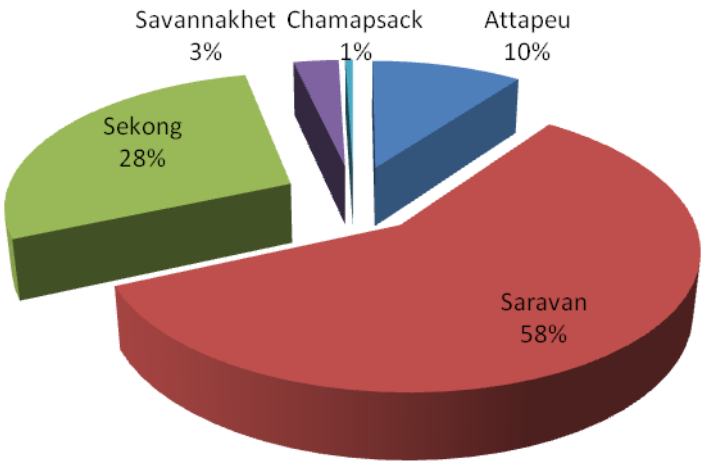
Figure 11 shows that Salavan has the highest needs of an amount of 18.8 billion kips for recovery and reconstruction, followed by Xekong (9.2 billion kips), Attapeu (3.3 billion kips), Savannakhet (1.02 billion kips) and Champasak (0.14 billion kips) respectively.

Figure 11 : Need for recovery and reconstruction by province



From the total need, Salavan requires the highest level of resources (58%), followed by Xekong (28%), Attapeu (10%), Salavan (3%) and Champasak (1%) (see Figure 12).

Figure 12 : Distribution of resource need requirements in the education sector by province by percentage



Longer-term Measures: In the longer term, the Ministry of Education will undertake a joint development program in collaboration with other ministries and agencies to further improve educational institutions in the flood-affected areas. With a view to improve the security of lives, programs will be developed to establish academic building with emergency shelters for possible flood recurrence or any other forms of disasters in the high risk zones (HRZs) 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.

A Typical Case Study:

A Case study finding from the field, Xekong Province, October 26th, 2009.

A Lavy woman sharing her flood-

Pakpun village in Lamarm district is settled by 42 households of Lavy ethnic minorities. Majority of the residents in the village cannot speak the national Lao language and have their own dialect and traditions. Fishing in the Xekong River followed by slash and burn farming system are the common livelihood options available to this community. Typhoon Ketsana on September 29, 2009 tore through not only their houses, but also through their hearts and minds. It destroyed all their livelihood setups and has made them even more vulnerable physically, socially and economically.

Mr. Bounnam, Head of the village and Mr. Sengthong, a school teacher recalls the doomsday: “A big rainfall along with strong storm, swept away entire village including their school building, food items, utensils, clothes, and livestock except some buffaloes”.

The Government had constructed a primary school in a nearby village, where 60 children including 31 girls had enrolled. The typhoon swept away the entire school building including books, furniture, and black board. The school closed for two weeks. Later, with the help of the Government, CARE International and WWF, a temporary school was built with three rooms using local materials. The school latrine built with proper building materials (high resistant and resilience) remained intact (Please see picture).

People interacted in the village:

- Mr. Bounnam, Head of Village
- Mr. Sengthong, Local Teacher
- Mr. Xieng, Villager
- Mr. Yery, Villager
- Mr. Boualai, Representative from District Education Office
- Mr. Bountiem, Representative from District Education Office

Lavy people want to move to the new place: Early government interventions rescued the villagers and provided food, clothes and utensils. This has enabled them to live in the same village once the flood water receded. However, due to frequent incidents and high risks from the Xekong River, the villagers do not want to stay in the village anymore. They have identified a new place to live which is two kilometres away from their original village, where they have also identified a place to construct new school building. Government has thus committed them to move but they seemed worried particularly for their livelihood options and their children's future in a new place. They urge the Government and the development partners to help them relocate in a safer place, securing longer term livelihoods.

Part II : Productive sectors

A. Agriculture

Pre-Disaster Situation

The five provinces in Southern Lao PDR affected by Typhoon Ketsana comprise 42 districts. Of these, 26 were affected by the Typhoon and are covered by this assessment. The 26 districts contained over 268,000 ha of seasonal crops: 88% of this was paddy with 3% comprising upland rice and the remainder garden crops (small areas of mixed vegetables, cassava and similar products). A further 4,400 ha of permanent crops were also cultivated. Over 50% of permanent crops are made up of rubber, with timber species (primarily teak) accounting for a further 31%, although there are also small areas of fruit trees, bananas and resin bearing trees. There were an estimated 680,000 buffalo and cattle, and a further 9 million other livestock (of which almost 90% was poultry but pigs and goats were also present in significant numbers). The 26 districts contained almost 10,000 fish ponds, covering over 1,000 ha, as well as a few hundred fish tanks and cages. Some 55,000 ha (40%) of the total paddy in the area was grown under 670 lowland irrigated schemes, primarily in Savannakhet (54%, Champasak (21%) and Salavan (20%). The remaining paddy area (found in both highland and lowland areas) is rain-fed.

Except where irrigation permits more than one crop per year, most agricultural production within the area does not enter the commercial marketing system, being consumed instead primarily on-farm or traded within the community. Little income is therefore earned by most households. This, combined with the absence of any significant legume crop or the regular consumption of meat (livestock is kept primarily as a capital reserve for emergencies), suggests strongly that the diet in most rural households is very restricted. In fact, Salavan and Xekong were among the most food deficit provinces of the country and 11 of the 26 assessed districts were already classified by the Government as being among the 47 highest priority districts (poorest districts) for support in the country, due to poverty and limited infrastructure.

Post-disaster Situation

Damage and Losses

Damage Assessment

Except where irrigation infrastructure is in place (approximately one third of planted area) only a single rice crop – paddy or upland – is grown per year within the area. As the typhoon struck close to the main harvest season, much of its impact occurred as damage: damage to crops close to harvest, death or disappearance of livestock, and damage to aquaculture and irrigation infrastructure.

Damage occurred in two forms. In the highland areas close to the Vietnam border, most damage arose from flash flooding along mountain rivers, washing away crops close to the banks. However, the greatest damage was suffered in lowland areas of Attapeu Province, as a result of it being the furthest down river, and hence experiencing widespread flooding from all the Mekong tributaries rising in the upland border area. Some 44% of all crop damage by area (total and partial) or 4.5% of the area planted in the district, occurred in Attapeu, equivalent to almost 50% of total crop damage by value. Next most

affected was Salavan Province with 27% of total crop damage by area (only 1% of the planted area on the province) or 25% of total crop damage by value. Total crop damage across the five provinces is estimated at 33,000 ha, or Kip 80 billion (USD 9.4 million).

Livestock damage (including limited destruction of pens and shelters) was also highest in Attapeu, which lost over 50,000 head (2,600 head of buffalo and cattle). Damage was less in other provinces. Total damage for all affected districts was nearly 80,000 animals (4,000 head of large stock) with a value of Kip 15.3 billion (US$ 1.8 million). Although aquaculture losses were highest in percentage terms also in Attapeu (accounting for 72% of pond area), Savannakhet Province had the greatest loss in absolute terms, due to its much more extensive aquaculture infrastructure (121 ha lost). In total, aquaculture losses (including both fish and infrastructure) amounted to 177 ha or Kip 5.2 billion (US$ 612,000). Irrigation infrastructure damage figures are only available in combination with damage to paddy bunds and related structures, but total 2,771 ha or 32.7 billion kip (US$ 3.9 million). Again, the greatest damage was suffered by Attapeu (1,355 ha).

Damage across all agricultural sub-sectors over the entire affected area totalled Kip 133 billion (US$ 15.7 million), with 48% of that incurred in Attapeu. Salavan accounted for 27% of agricultural damage, and Savannakhet a further 15%. Crop damage (led by paddy, but with garden crops and tree crops also important) accounted for almost 60% of total damage, with a further 25% arising from the destruction of irrigation and paddy field infrastructure.

Loss Assessment

The primary impact of the typhoon as already mentioned, occurred in the form of damage. However, losses are expected to arise from several sources. Firstly, irrigated paddy would have been planted for a second season in December, and some proportion of this area may not be fit for planting due to infrastructure damage, although quantifying this proportion is difficult. Secondly, garden crops are grown year round and particularly in the highland areas many gardens have been swept away. Some natural compensation for this loss may result from the river mud deposited by these floods in other highland areas, permitting gardens to be readily re-established on these areas. Again, this benefit is difficult to quantify. Thirdly, long term effects will be felt on the areas of permanent crops damaged by the typhoon. The extent of the impact will depend upon whether trees have simply been exposed to flooding (setting back their growth, but not killing them) or whether the tree was actually swept away or broken, as well as by the average degree of maturity of the affected trees. Future losses from damage to permanent crops are a major element in crop losses. Fourthly, previous experience has taught that an extensive vaccination and animal health campaign must be launched to prevent the emergence of disease among livestock. Finally, aquaculture activities cannot be resumed until ponds are repaired and tanks rebuilt. The scale of losses here is limited, however, by the apparent low profitability of aquaculture in some provinces.

Total losses across the affected area are estimated at 16.6 billion kip (US$ 2 million). Losses are greatest in Savannakhet (55% of total), due to extensive aquaculture operations in the province. Attapeu suffered the second highest level of losses (22%), primarily with respect to rubber and other tree crops.

Crops account for the greatest proportion of losses (56%), with livestock related losses second in importance (32%). There are no irrigation losses, as these are accounted for under crops.

Preliminary Recommendations of Needs

A preliminary estimation of needs is presented in the accompanying table (Table 11), disaggregated into medium term (approximately 12 months and completed shortly after the end of the current five year development period), and long term (five years, corresponding to the next development planning period). The estimation of the needs to compensate rural inhabitants and related agencies for all damage and losses suffered as a result of the typhoon points to more than 150 billion kip (US$ 17.5 million).

Several important elements should be noted in relation to meeting agricultural sector needs, particularly in the medium term. In order to avoid greatly increased losses to farmers, it is critical that assistance (including seed, tools, repair of infrastructure) is in place prior to the next main planting season (June 2010). If this deadline is missed, production level for the 2010 crop year can be expected to be greatly reduced in the affected areas. Secondly, the damage to roads caused by Typhoon Ketsana will render reaching rural communities more difficult than it already was. This assessment team had great difficulties in reaching highland areas in particular. If roads are not rendered usable for trucks before June 2010, only partial distribution will be possible.

Finally, the distribution mechanism at community level is crucial. The Government is giving this problem considerable attention. Several options are presently under study, e.g., the use of the Village Development Committees (VDCs), mass organizations like the Lao Women's Union or the Poverty Reduction Fund (PRF) to identify and contact the families which suffered damage. To avoid inappropriate allocation of supplies and materials and impose too considerable a burden on the agricultural extension officers operating at field level (particularly if road repairs are still outstanding), support and supervision of the distribution mechanism will also require much support.

The overall cost of the medium term needs assessment depends largely upon the extent of compensation for damage and loss included in the agricultural recovery project. For recovery (up to 2 years) needs in the agricultural sector have been estimated at approximately US$ 15 million), including provision of seeds and tools, replacement of livestock, compensation for damaged and lost crops and repair of infrastructure.

Immediate technical assistance needs have provisionally been estimated at 660-720,000 US$ for 12 months.

The estimated amount for recovery in the agricultural sector (15 million US$) is less than the estimated damage, but this amounts corresponds to the present management capacity. Longer-term needs, including the rest of recovery needs, will be estimated at a later stage.

Table 11: Medium and Long Term Recovery Needs

Action/Investment	Description/Scale	Notes
Medium Term 12 Mos (April 2010 - Mar 2011)		
Starter Pack Distribution	Seeds, inputs, hand tools. Primarily rice (paddy and upland) and vegetables	Must be ready for rainy season planting (June 2010).Partially accounted for in damage data.
Repair of Fish Ponds, Irrigation and Paddy Field Infrastructure	Ponds, tanks and channels	Accounted for in data. Recommended that only materials and supervision by supplied, with labour provided by beneficiaries
Animal Health Campaign	Equipment, vaccines and field costs	Incremental to existing efforts
Animal Restocking	Buffalo, cattle, pigs, poultry, fish	Accounted for in damage estimates
Risk Assessment	Evaluation of potential approaches to risk reduction in agricultural production	
Long Term Project Preparation	Formulation of successor project and creation of local fund management capacity	
Long Term 5 Yrs (Mar 2011 - Mar 2015)		
Crop Diversification	Farmer Field Schools (FFS), demonstrations, training of extension staff	Fruit and fodder trees, legumes, cash crops
Reforestation	Erosion control, riverbank protection, watershed planting	
Village Infrastructure	Grain storage, flood control, water harvesting	
Enterprise Revolving Fund	Loan funds for irrigation, diversification, small enterprise (e.g. tree nursery, rice milling, honey, fish farming)	Funds for both activities to be channeled trough local VDC, and to include support to local capacity
Market Linkage	Support for development of market linkages	Training, market identification, information

The long term recovery and development of the agricultural sector is provisionally assumed to have a duration of five years, coinciding largely with the next 5-year Plan. The strategy for this longer term support consists in improving the productivity, diversity and resistance to natural disaster damage of agricultural production within the typhoon affected area. In order to achieve this, the Government gives considerable attention to such elements as:

- crop diversification - especially to products such as legumes, fruit trees and aquaculture which would improve dietary status, have a ready sales potential and which could potentially be established away from flood prone areas;
- erosion control and environmental protection - through reforestation, better protection of river banks and the establishment of fuel wood lots;
- expanded irrigation infrastructure, where water sources are available, to increase productivity and provide increased protection against drought;

- improved village level infrastructure to permit better storage of agricultural products; flood protection for villages and water harvesting for drought periods;

To implement such measures the Government plans to allocate a considerable proportion of its resources to three themes: technical assistance; farmer and rural household education, and the financing of promising new activities and is studying the possibility to establish local investments funds.

No cost estimates can at this time be prepared for the long term recovery project until considerably more design work has been undertaken.

B. Commerce and Industry

Pre-disaster situation

With regard to Commerce and Industry, there are four provinces affected by Typhoon Ketsana: Savannakhet, Salavan, Xekong an Attapeu, with a combined number of 32 districts, enjoying a thriving business sector ranging from the informal sector, household level production to trading, wood processing factory, rice mill, drinking water and ice factories, brick-making, etc. In Salavan, business/enterprise registration in FY 2008-2009 reached 1,976 with an aggregate investment value of 188,898,937,423 kip (US$ 22.2 million) and US$ $6,694,621 foreign component while in Attapeu there are 399 registered businesses with an aggregate investment of 129,379,931,911 kip (US$ 15.2 million).

Post-Disaster Situation

Damages

Savannakhet is located far from the core impact area of Ketsana, thus the damage is not severe in some districts like Nong and Sepone which are remote areas with few large businesses. However, some losses were suffered by hotels, guest houses and restaurants. In Salavan, Road No. 15 A was not passable and hampered the economic activities, among others, of the people and adversely affected exports to Vietnam via Dalai. Initial data revealed that significant declines in exports and imports were registered at the Salavan and Xekong provinces by the end of October 2009 after the typhoon disaster of late September 2009, although it is not determined at present how much of the difference can be attributed to the floods brought about by Ketsana.

Damages to the commerce and industry sector are mostly on structures, equipment, stocks or inventories and furniture, among others. In Savannakhet the floods damaged the Savanvaly company in the amount of about 694,507,950 Kip while the Daoheung Duty Free Group reported damages of about 2,413,522,530 Kip. This totals to approximately Kips 3.1 billion.

In Xekong, the total damages reported in the industry and commerce sector of the 4 districts of Lamarm, Kaleum, Dakcheung, and Thateng reached to an approximate amount of 19.7 billion Kip.

The province of Attapeu, especially in the districts of Samakkhixay, Xaysetha and Sanamxay, suffered damages amounting to 8.2 billion kips. Included here are more than 100 hundred businesses like handicrafts, wood processing factories, drinking water and ice factories, brick and pottery making, and rice mills, among others.

Losses

Losses from businesses were due to foregone income of the businesses and their employees. Various businesses closed for several days and some stopped operations for even more than a month. This situation brought losses both to the businesses and their employees.

Table 12 summarizes estimated damages and losses of the commerce and industry sector.

Table 12 : Estimated damage and losses for four provinces (Commerce and industry sector)

Province	Damages		Losses	
	Kip	US$	Kips (Millions)	US$
Savannakhet	3.1 billion	364,706	39.5	4,647
Salavan	Nil		Nil	
Xekong	19.7 billion	2,317,647	51.2	6,023
Attapeu	8.2 billion	964,706	983.5	115,705
TOTAL	31 billion	3,647,059	1,074.2	126,376

It is noted that the relocation of 3 markets in Xaysetha District – Attapeu province – (Viengxay village market, Kaeng Mak Kheua Village Market and Hadsan Village market) amounting to 13,695,000,000 Kip has been strongly recommended during the field visit.

Needs

Most of the damages in the sector are private in nature, their reconstruction does not generally fall within the budget of the Government. The assistance that may be needed from the government is in terms of credit extension, debt restructuring or even tax holidays. But these measures must be subjected to a careful analysis since they will all have impacts on the budget and fiscal targets of the government on the macro level.

C. Tourism

Pre-disaster situation

The four provinces affected by Ketsana have a combined number of 32 districts with a vibrant tourism sector. Most of the tourists visit the historical, cultural and natural sites within these areas. Tourists visiting one province normally go and visit the other neighbouring provinces. Hotels and guest houses are the usual places of stay in these areas. Table 13 shows the number of hotels and guest houses in the four provinces.

Table 13 : Hotels and Guesthouses by province

Province	Hotels		Guest Houses	
	Number	Number of Rooms	Number	Number of Rooms
Savanakhet	17	800	97	1,509
Salavan	3	65	27	319
Xekong	3	58	17	133
Attapeu	5	143	14	173

Post-Disaster Situation

Damages

The damage in Savannakhet is low, compared to the other provinces. Out of the 17 hotels, only 2 were slightly affected (with a total of 55 rooms). Guesthouses and restaurants likewise were slightly affected with minimal impacts. No damages were reported on the natural, historical and cultural sites in the province. In Salavan, the damages to tourism due to the typhoon are also very minimal since the typhoons just passed over the place.

However, in Xekong province, hotels, restaurants and other tourism-related structures were severely affected, with an estimated damage of about 3,630 million kips (US$ 427,058), including structure and stocked goods.

In Attapeu province, damage to properties, hotels and guest houses amounted to 1,021 million kip (US$ 120,118). This amount includes government/provincial tourism properties, with a damage estimated to reach 133.4 million kip (US$ 15,694).

Losses

Losses in the tourism sector were mostly foregone income of tour operators and other tourism-related businesses and the lost income of the workers in the sector due to the stoppage of business operations brought about by Ketsana Typhoon. In Savannakhet, about 60% of the rooms of the hotels and guest

houses are normally occupied by tourists and visitors. After the disaster, tourists visited only Sepone district, reducing overall hotel and guest house occupancy to about 30%. Revenues from tourism in Salavan were reduced by an estimated 30% for a month due to Ketsana. The floods caused the reduction of 805 tourists or visitors from the expected arrivals. In Xekong, 30 trees fell down due to the typhoon. These trees blocked the road to Faed Falls, a tourist site, and required the hiring of people to clean up the area, causing additional expenditures.

Table 14 shows the combined damages and losses of the tourism sector due to Ketsana Typhoon, amounting to Kips 6,610 million (US$ 777,941 million).

Table 14 : Summary of damage and losses in the tourism sector

Province	Damages (Million Kip)		Losses (Million Kip)		Total (Million Kip)	
	Kip	US$	Kip	US$	Kip	US$
Savannakhet	-	-	316	37,176	316	37,176
Salavan	-	-	483	56,824	483	56,824
Xekong	3,630	427,059	499.5	58,823	4,130	485,882
Attapeu	1,021	120,118	662.5	77,941	1,680	198,059
TOTAL	4,651	547,177	1,961	230,764	6,610	777,941

Needs

The damages and losses incurred by the tourism sector are basically private in nature except for the reported damages to the tourism office. No tourism sites and areas were reported to have been seriously damaged which would have pointed to a long-term loss of tourist arrivals and revenues. The needs of the tourism sector coincide with the needs identified of other sectors, especially those involved in the rehabilitation of roads, restoration of water supply and electricity. The recovery of the tourism sector will depend heavily on the expediency of the reconstruction of such facilities. Tourists may not be expected to visit these provinces/districts if the roads are rough, the water unsafe and the electrical power unstable.

Although the tourism-related businesses are private in ownership, they may need assistance from the Government through extension of credit assistance for business recovery or the restructuring of debt repayments for those who have loans from Government banks; even tax breaks could be considered. However, the needs for credit or debt restructuring in the tourism sector are not determined at the moment. This will be the subject of further analysis by the Government.

Part III : Infrastructure Sectors

A. Transport

Situation Prior to disaster

Road subsector

Road is the pre-dominant mode of transport, serving nearly 90 percent of total domestic transport, and carries tremendous economic weight in the movement of goods and persons. A total length of road network in the affected region is 12076 km, 13 % of which, mainly national road, are paved roads, 37% are gravel roads and 55% are earth roads. The earth roads, particularly district and rural roads, are not built with engineering standards, and are thus difficult to access during rainy season. Road network varies from province to province, with largest network in Savannakhet and the smallest in Xekong, as shown in the Table 15 below.

Table 15 : Total length of road network in the five affected provinces (km)

Province	National road	Provincial road	District road	Rural road	Urban	Total
Attapeu	359.9	189.1	60	388.1	89.4	1986.5
Xekong	201.6	188.4	281.2	237.2	53.86	962.2
Salavanh	428.8	189.3	345.9	1314.5	73.75	2352.2
Champasak	448	558	228	1523	142	2899
Savannakhet	604	693.5	242.2	2243	94.2	3876.9
Total	2042.3	1818.3	1339.3	5705.8	453.2	12076.8

Source: DPWT of Attapeu, Xekong, Savannakhet,Salavan, and Champasak.

The road network has been classified based on its functionality. National roads are the roads connecting Vientiane capital to provincial centres and international border checking points, while provincial roads connect provincial centres with district centres, district roads connect district centres to clusters of villages ('Kumban') and rural roads connect clusters of villages to villages and to farms. The Ministry of Public Works and Transport (MPWT) is responsible for managing the Lao Road network; there is an increase in delegating responsibility in implementation of road planning, contract management for road construction and maintenance to its provincial branches: the Departments of Public Works and Transport (DPWT) for provincial roads, and to district branches, for district and rural roads.

The transportation relies on a large number of operators from the private sector.

Inland waterways

Inland waterways are other important modes of transport, especially for people living along Xekong and Sekaman rivers.

Xekong river, with a total length of 272 km, is the main river that people in Xekong and Attapeu provinces use for navigation, originated in Xekong and passing through Attapeu before flowing into the Mekong in Cambodia. Sekaman river, with total length of 80 km, serves for the transportation of people living in the villages along the river in Attapeu province.

The navigation is constrained by the size of vessels and navigation channels, particularly during the dry season; thus only small boats equipped with engine are being used. Xekong river has a transport capacity of 500 kg during dry season and 3000 kg during rainy season.

Safety is an issue for people travelling by boat during the rainy season because of strong current often caused by flash flood.

In Xekong, there is a ferry port used for vehicles crossing to the other side of the river to connect to the road to Dakcheung. Likewise in Attapeu, there is also a ferry port used for vehicles crossing from Samakkhixay to Phouvong district.

Damage and losses

Damage to Roads:

Typhoon Ketsana severely hit the five southern provinces, causing serious damage and losses to the transport sector, cutting off two districts in Xekong province (Kaleum and Dakcheung) and two (Samuoi and Ta-Oi) in Salavan province, leaving many villagers in vulnerable conditions without access to food, water, and medicine. A proportion of 15% of the total road networks in the five provinces were fully or partially damaged, as shown in Table 16 below.

In Attapeu, several sections of paved road No 18 B, which is the main route connecting Attapeu and Vietnam, were damaged due to a landslide and settlement of the road embankment. Road 18A connecting Samakkixay with Sanamxay and Champasak has also been damaged by the flooding, with one wooden bridge broken. Furthermore, damages to 12 other bridges along province, district and rural roads were also reported. In total, 23% of the total road network in the province has been damaged, the majority of which being rural roads.

Table 16 : Cost of damage to the transport sector

Roads	Attapeu		Xekong		Salavan		Savannakhet		Champasak		Total	
	Km	Million Kip	Km	Million Kip	Km	Million Kip	Km	Million Kip	Km	Million Kip	KM	Million Kip
National roads	178	9751	70	5774	138	8700	-	-	18	1360	404	25585
Provincial Roads	14	3757	150	7554	24	1550	151.5	4664	23	806	362.5	18331.8
District roads	18	2133	45	2511	152	6281	16	849	43	2243	274	14018
Rural roads	212	15518	87	6360	270	14591	147.5	6179.2	51.1	3572	767.6	46220.2
Urban roads	31	5068	-	-	2.3	180	-	-	1	81.8	34.3	5329.8
Bridges	0.237	1531	0.316	203	0.312	1799	0.216	458.5	0.042	810	1.123	4801.5
Total	453	37758	352	22403	586.3	33101	315	12152	136.1	8873	1843.5	114287.4
% of provincial road network (cf. Table 15)	22.8		36.6		24.9		8.1		4.7		15.2	
% of total Damage	33.0		19.6		29.0		10.6		7.8		100.0	

Source: DPWT in Attapeu, Xekong, Salavan, Champsack and Savannakhet

A proportion of 36% of road network in Xekong were destroyed, leaving Dakcheung and Kaleum districts, with a total population of 18439 and 12789 respectively, cut off from the rest of the province. In addition, 4 steel bridges and 20 wooden bridges with a total length of 316 m were damaged.

In Salavan, 25% of its total road network are affected, including damage to National Road 15 A connecting Salavan to Vietnam, leaving Samuoi and Ta Oi districts disconnected, which can only be reached through an alternative road that passes through Savannakhet and Vietnam, adding 400 km. Another main national road damaged is National Road 15 B connecting Salavan to Napong at NRoad 13 south, serving dense populated areas, causing difficulty in movement of goods and passengers. The transportation of goods to Napong has to go through Pakse, adding another 270km. Furthermore, damage also occurred to 422 km of district and rural roads and to 20 bridges.

Savannakhet had already experienced damage to the road network caused by Morakot depression just one month before Ketsana Typhoon. The damage caused by Morakot has widely spread through entire provinces with a total length of 584 km affected, which required an additional budget of 8 billion kip for maintenance. This report captures only damages related to Ketsana, which occurring in four districts namely Sepone, Nong, Songkhone, and Vilabuly, with a total length of 315 km of damaged roads, representing 8% of the total road network in the province.

Champasak's road network was less affected, with 4% of its road network affected; most of damage occurred on district and rural roads.

The damage inflicted on the road sector mainly involved caved-in areas, undermining of embankments, and roadway slippage, mud and fallen trees on the roadways, cracks, cut-off roads, eroded roads and alluvial deposits.

The damage to the road structures can be summarized as follows: destruction of bridges, erosion of bridge embankments, destruction of culverts, submerged aprons, undermining of bridge abutments.

Losses to roads

Losses to the transport sector due to the damages include higher transportation costs, reducing volume of goods and passengers transported, thereby reducing truck and bus operators' revenues. As a result of deteriorated road conditions, travelers have to spend more time on the road and face higher vehicle operating costs. In some cases, road users have to use alternative roads with are much longer

(sometimes several hundreds of km), for example, for Road 15 B in Salavan the users have to use Road 20 to Pakse before going to Napong. Similarly, to go to Ta Oi district in Salavan and Dakcheung in Xekong, the users have to go by road via Vietnam.

Damage to the Inland waterways:

Two Ports for ferry crossing, each in Xekong and Attapeu, have been damaged due to flash flood, causing ramp and river bank protection near the port damaged. A large number of small boats that local people use for commuting within the province have also been damaged.

It was very difficult to estimate losses in this sector because of the lack of baseline data at the regional level and the absence of much up-to-date data at the national level. The costs of construction in the estimates do not take into account the amount of time needed to find financing, nor of the procedures needed for obtaining it. Based on these assumptions, losses in the transport sector are estimated at 28 billion kip (US$ 3.3 million).

Table 17 summarizes damage and loss to the transport sector both for the road network and the inland waterways, as well as estimated effects on the Balance of Payments and the Fiscal sector.

Table 17 : Damage and Losses -Transport sector (million kip)

Subsector, Component	*Disaster Effects*			*Caused to*		*Effects on*	
	Damage	*Losses*	*Total*	*Public domain*	*Private sector*	*BOP* (import)*	*Fiscal Sector***
Road network in Attapeu	*37758.0*	*6528.0*	*44286.0*	*37758.0*	*9974.3*	*22654.8*	*37758.0*
Road network in Xekong	*22402.9*	*4864.0*	*27266.9*	*22402.9*	*4864.0*	*13441.7*	*22402.9*
Road network in Salavan	*33101.0*	*9009.7*	*42110.7*	*33101.0*	*9009.7*	*19860.6*	*33101.0*
Road network in Champasak	*8873.5*	*2100.0*	*10973.5*	*8873.5*	*2100.0*	*5324.1*	*8873.5*
Road network in Savannakhet	*12152.0*	*4036.1*	*16188.1*	*12152.0*	*4036.1*	*7291.2*	*12152.0*
Inlandwaterways in Attapeu	*830.0*	*150.0*	*980.0*	*750.0*	*230.0*	*498.0*	*750.0*
Inland waterways in Xekong	*5443.0*	*1241.0*	*6683.0*	*3850.0*	*2833.0*	*3265.8*	*3850.0*
Total in million kip	*120560.4*	*27928.8*	*148488.2*	*118887.4*	*33047.1*	*72336.2*	*118887.4*
Total in US@ (million)	*14.2*	*3.3*	*17.5*	*14.0*	*3.9*	*8.5*	*14.0*

* Higher imports ** Unexpected expenditures

Estimated Macroeconomic Impact

For the transport sector in particular, the damage has 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 shrunk as a result of production losses in the regions affected by the damage, especially agriculture products such as rice, coffee, and other crops.

In addition, sector employment and income suffered a substantial decline, especially during the time when roads were cut off. This was the case in flooded villages where rice does not produce its grain and livestock does not exist.

Finally, a drop in production occurred in almost all the flooded villages, due to a temporary decline in the labour force and the destruction of arable land. The decline in the labour force is partly the result of the fact that the population focused its efforts on the reconstruction of housing and the repair of road infrastructure.

The estimated impact on the fiscal sector amounts to 118. 8 billion kip (US$ 14 million).

Socioeconomic impact

In general, the socioeconomic impact of the damage was felt mostly during the time when roads were cut off, except in the case of villages that remained isolated for several weeks after the typhoon.

In four districts: Samuoi, Ta Oi in Salavan and Dakcheung and Kaleum in Xekong, for example, access has been cut off since the beginning of October. From a socioeconomic perspective, the main problem for this area and other flooded districts and villages is the sand deposited in the rice fields and other farm fields.

Since the disaster, road access to these districts is nearly impossible. In other districts where the road network has been partially damaged, the movement of staple goods and passenger towards the village and local products away from the village has been significantly reduced and consumed more time.

Risk management - road infrastructure

Every year, Lao PDR is prone to typhoons. The negative impact of such calamities, intensified by the climate change which the planet now faces, is growing greater and greater. As a result, actions must be undertaken to minimize the harmful effects of such disasters. In the case of the transport sector, the infrastructure needs to be strengthened. To that end, the measures described below are to be implemented.

Road infrastructure

In general, the recommended safety level for all infrastructures must be:

- 1 flood in 100 years if the structure is of primary importance (for example, along national roads)
- 1 flood in 50 years if the structure is of secondary importance (provincial roads).

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

A large portion of the eroded material is transported by rivers. The sediments carried by rivers result in sand deposits and/or flooding along the watercourse. The recommendation in this case is to implement a program of intensified tracking of the sedimentation process in order to measure the form of the riverbed and regularly check its level after each flood, analyze the size of the deposit and its composition based on samples, monitor surface runoff deposits, and measure deposit concentrations at certain monitoring stations during floods. The data will then be used for morphological studies which have the ultimate objective of forecasting future developments of the sedimentation process. These forecasts will then be used to estimate any adjustments that need to be made.

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

A study of the local river morphology is recommended to ensure optimal design of the actions described.

Recovery and reconstruction needs

Needs identified on the basis of losses will focus on resumption of the population's normal activities. This means emergency interventions to quickly restore traffic flow (treatment of problem areas that obstruct traffic on road systems, removal of earth and rocks from roads, reconstruction of collapsed bridges and fixing the ferry ports, etc.) will greatly diminish these losses. Thus, a reduction in the burdensome travel times caused by losses will be achieved through gradual improvements in the stricken areas.

Given the urgency of repairing the roads and the huge amounts of resources needed for the restoration of the road networks to their normal condition, the recovery plan should be divided into three phases: (i) emergency maintenance, (ii) periodic maintenance and rehabilitation, (iii) improvement of the road network.

(i)Emergency maintenance includes: fixing the damaged bridges of a total length of 1123 m; carrying out emergency maintenance of critical sections of the road network; and repairing the ferry ports, so that the traffic flow can be restored to normal conditions and that emergency support can reach the victim.

(ii) Periodic maintenance and rehabilitation: conventional approach to be applied, following MPWT's maintenance procedures, which could require up to two years for the implementation.

(iii) Improvement: With an approach aiming at providing better roads, the transport infrastructure needs to be improved with better standards than the ones prevailing presently, so that it can stand against future floods.

As a core road network, national roads and provincial roads should be improved to paved road standard. District and rural roads should be improved to gravel road standards. To optimize use of resources, it is highly recommended that needs should be prioritized using the road management system (RMS) operated by the Public Work and Transport Institute (PTI) of the Ministry of Public Works. For local roads, the Provincial road maintenance management system (PROMMS) should be applied. The estimates for road improvements are based on standard prices regarding the proposed standards and the total length of damaged roads, minus the sections that had already been earmarked by provinces, including Road 15A in Salavan and Road 16 B from Xekong to Dakcheung district in Xekong province.

The estimation of the long term need for paved national roads is based on the cost to improve 10% of total length of damaged section through raising its profile and improving erosion protection. As for the sections of damaged national roads with gravel and earth surface, it is highly recommended to upgrade them to seal roads, at an average cost of 100,000 US$ per kilometre. With regard to provincial roads, the longer-term needs are estimated for the upgrading of 70% of the damaged sections of provincial roads from gravel and earth to seal road, at a unit price of 75,000 US$ per kilometre. 50% of damaged sections of district and rural road must be improved to gravel road standards, at a unit price of US$

30,000 and US$ 20,000 respectively. In particular, 70 % of the damaged bridges must urgently be improved to higher standards.

The details of recovery and reconstruction needs are summarized in Table 18.

Table 18: Recovery and reconstruction (transport sector) (in million kip)

	Emergency	Medium	Long-term	Total
Sub-sector				
Road network in Attapeu	11327.40	26430.60	120678.1	158436.1
Road network in Xekong	6720.87	15682.03	99322.5	121725.4
Road network in Salavan	9930.30	23170.70	134228.6	167329.6
Road network in Champasak	3645.60	8506.40	37980.5	50132.5
Road network in Savannakhet	2662.02	6211.38	95036.4	103909.8
Inland waterways in Attapeu	829.00	-	-	829.00
Inland waterways in Xekong	5442.50	-	-	5442.5
Total in million kip	40557.69	80001.11	487246.1	**607804.9**
Total in US$ (million)	**4.77**	**9.41**	**57.3**	**71.5**

The capacity of the Department of Public Work and Transport (DPWT) at provincial level in managing the reconstruction and local contractors has been markedly improved over the last many years through implementation of donor funded road projects and training. The provinces have thus now the capacity to manage the maintenance and rehabilitation of the roads damaged. However, there is a need to provide technical assistance to the provinces in implementing the recovery and reconstruction plan, so that quality aspect of the works can be ensured.

Even under normal circumstances, the country has experienced shortages of funds to finance the maintenance of its road network. As such, financial support from development partners is crucial to fix the damage and to improve 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, of which information and awareness plays an important part.

Other measures to be taken are listed below:

- establish an emergency budget
- implement a rapid and effective communication system
- enforce disaster resistant standards in construction activities
- follow up, if necessary, on earlier studies (particularly hydrological and geotechnical studies) so as to have sustainable technical options
- draw lessons from earlier technical solutions (both effective and ineffective solutions)
- step up construction oversight
- establish a simplified procedure for initiating interventions.

B. Telecommunications

Pre-disaster situation

Telecommunication is Laos PDR is expanding rapidly, particularly the mobile cellular phones, with an estimated 1.478 million mobile cellular phones as of 2007. When fixed-line and mobile cellular phones are combined, it is estimated that that every one in four person in Lao PDR has a phone subscription. The country has multiple telephone providers with four companies, namely, Lao Telecommunications, (LTC), Enterprise of Telecommunications Lao, Tigo and Starphone providing telephone services to the provinces affected by Ketsana Typhoon.

Damage and Loss

Only three out of the five southern provinces hit by the Ketsana Typhoon have been affected, namely the provinces of Attapeu, Salavan and Xekong. The damage to the telecom sector is heavily concentrated in Attapeu province – 99 per cent of all damages registered (Table 19). All four telecom companies have reported damage, with Lao Telecommunications (LTC) reporting the highest damage: 12261 million kip (corresponding to about 50% of the damage registered in this province) and a loss of 716 million kip (corresponding to about 90% of all the losses in the province).

Damages have been caused to the GSM base (11), microweb (3), rural phone systems (3) and several generators. The losses in the telecom sector are mainly due to losses in revenue. About two thirds of the losses (600 million kip) can be attributed to losses in revenues.

Table 19 : Summary of damage and loss to the telecom sector (in million kip)

Subsector, Component	Disaster Effects			Ownership by Sector		Effects on	
	Damage	Losses	Total	Public	Private	BOP*	Fiscal Sector**
Attapeu	25171	715.4	25886.4	22486	3400	15532	22486
Champasak	-	-	-	-	-	-	-
Salavan	133	118	251	251	-	151	118
Savannakhet	-	-	-	-	-	-	-
Xekong	22	61	83	83	-	50	61
TOTAL (million kip)	25326	894	26220	22820	3400	15733	22665
TOTAL (US$ million)	2.98	0.11	3.08	2.68	0.40	1.85	2.67

* Lower exports; higher imports ** Lower tax revenues; unexpected expenditures

Table 20 : Recovery and reconstruction needs for the telecom sector (million kip)

Provinces	Medium Term Recovery and Reconstruction Needs
Attapeu	25171
Champasak	-
Salavan	133
Savnakhet	-
Xekong	22
TOTAL (Million kip)	25,326
TOTAL (US$ million)	2.9

Needs

A medium term need of 25326 million kip (US$ 3 million) has been projected for the telecom sector (Table 20) to replace the destroyed material (Fibre optic cables, connectors, generator, BTS, rural phone systems, etc.)

C. Power

Pre-disaster Situation

Over the last decade, the Lao PDR has made significant progress on electrification of its households. Currently, 65% of total households in the country have been electrified. Connection rate in five provinces has also been significantly achieved, with 78% in Champasak, 66% in Savannakhet, 58% in Salavan, 43% in Xekong and 31% in Attapeu. The region is characterized as rich in natural resources with high potential for hydropower generation and mining. Feasibility studies for construction of a number of hydropower dams have been conducted.

Post-disaster Situation

The five Southern provinces – Attapeu, Xekong, Salavan, Savannakhet, Champasak – were severely hit by Typhoon Ketsana, causing destruction to some parts of the transmission lines, distribution lines, and solar home systems. The supply of electricity was disrupted for some time, in some areas up to several weeks. In addition, the typhoon also caused damage to the construction worker's camp of the Sekaman hydropower dam (Attapeu province).

Damage and loss assessment

Following the disaster, members of the EDL technical staff located in the affected provinces as well as from neighbouring provinces were sent out to assess and to fix the damage, using spare parts and equipment from stock.

In Attapeu, the power system in three districts namely Samakkhixai, Phouvong, and Xaysetha was affected, with 3482 m of 22 KV gridline, 800 m of 0.4 KV line and 1685 electricity meters damaged. In addition, two construction camps working on the Sekaman hydropower dam were also destroyed.

In Xekong, damage to the power sector occurred in three districts namely Dakcheung, Lamarm, and Kaleum, including 15 electricity poles (12 m high), 6384 m of 22 KV transmission line, 2388 m of 0.4 KV distribution line, 112 electricity meters, 35 units of solar home systems, and 240 units of SHS accessories. Furthermore, the typhoon caused damage to the Houyhor hydropower dam.

The damage to the power sector in Salavan province occurred in five districts, namely Lakhonepheng, Kongxedone, Lao Ngarm, Ta Oi, and Samuoi, including 19 electricity poles (12 m high), 4 electricity poles (8 m high), 300m of 22 KV transmission line and 100m of 0.4 KV distribution line.

In Savannakhet, only two districts: Sepone and Nong, were affected through damage done to 100 electricity meters.

Furthermore, the typhoon also caused losses to the sector through losses in revenue of EDL due to the fact that electricity supply was cut off and addition cost had to be incurred through temporary arrangements by using generators.

Damage, loss and need assessment for recovery and reconstruction

The total amount of damage and losses in the electricity sector was estimated at 12690.6 million kip (US$ 1.5 million). Of this total, 12124.16 million kip refer to value of damage to physical assets and 566.47 million kip represent the losses in revenue. The detail of damage and losses to the power sector can be summarized as follows (Table 21).

Table 21 : Electricity Sector - Estimated Damage, Losses and Needs

Provinces	Disaster Effects			Ownership by Sector		Effects on		Needs
	Damage	Losses	Total	Public	Private	BOP *	Fiscal Sector**	
Attapeu	10454	105.76	10560	10560	0	8363	10560	35225
Champasak	-	-	-	-	-	-	-	
Salavan	108.1	28.1	136	136	-	86	136	5948
Savannakhet	27	0.3	27	27	-	22	27	27
Xekong	1535.8	432	1968	1968	-	1229	1968	17481
TOTAL(million kip)	12125	566	12691	12691	0	9700	12691	58681
TOTAL (US$ million)	1.4	0.1	1.5	1.5	0.0	1.1	1.5	6.9

* Lower exports; higher imports ** Lower tax revenues; unexpected expenditures

Recommendations and longer-term needs:

Some of the damaged asset had been fixed in temporary manner, which need to be improved so that it can stand against further typhoons or other calamities.

In connection with one of the housing sector's reconstruction priorities, namely, applying higher standards to building constructions as well as moving some villages to safer places, additional budgets will be needed to expand the power grids to the new places. These will be calculated once moving plans are defined and being implemented.

D. Water and Sanitation

Pre-disaster Situation:

Most of affected typhoon areas in the four provinces visited are rural and remote villages which are among the poorest districts in the country. Similar to many parts of rural and remote areas of the country, the coverage rate of access to clean drinking water and improved sanitation in rural areas is 38% and 49% respectively. The main sources of drinking water for people in these areas are natural streams, wells, boreholes and GFS. Only 7 out of 15 affected district centres have small scale-piped water supply schemes. Such small supplies serve only a fraction of population. The assessment also identifies that some drinking water sources were not functioning even before the typhoon, especially boreholes. Waterborne disease was a major public health issue. During 2008 there was an outbreak of diarrhea in Xekong province. Sanitation coverage is quite low and a majority of people is practicing open defecation. Pit latrines are the most common facilities. The low use of latrines is due to low awareness and traditional behaviour regarding hygiene and sanitation among the various ethnic groups.

Post-disaster Situation

Water supply and sanitation - damage and loss assessment

Most of damage on drinking water sources (natural streams, wells, boreholes and GFS) was concentrated in rural and remote villages, particularly the villages situated along Xekong river. In many rural communities, the drinking water sources were contaminated by saline water, debris and arsenic which were brought by the flood water and penetrated into tubes and wells. The common type of damages to drinking water facilities are structural damage, broken pipes and taps, pumps and power outages. There is only a small number of drinking water facilities that have become unusable or are completely broken down (Table 22).

During the assessment, the data on latrines were given by Nam Saat district and provincial staff. The assessment also confirms that there is only a small fraction of toilets that were severely damaged and thus unusable. About 4.7 percent of the total number of toilets were destroyed by the typhoon Ketsana. Many toilets have been blocked with mud and require cleaning to bring them back into a usable condition. Poor coverage of access to improved drinking water, toilets and hygiene practices in the worst affected typhoon areas has put people's health at great risk, particularly young children. In this connection, it is essential that the affected villages be provided with access to quality drinking water and information in order to promote sanitation and hygiene practices that avoid illnesses from waterborne disease. Tables 23-25 show the number of damaged drinking water facilities by type and by provinces.

Table 22 : Number of drinking water sources and toilets affected

Provinces	Water Supply	Wells	Gravity Fed System	Boreholes	Toilets
Savannakhet	1	33	0	34	161
Salavan	2	6	7	98	726
Xekong	3	0	7	14	1,576
Attapeu	1	5	2	43	2,083
TOTAL	7	44	16	189	4,546

The loss in the water supply and sanitation sector was calculated based on the loss of generated revenue on an urban water supply scheme in Samakkhixay district, Attapeu province. In addition, the loss to rural water supply was estimated by additional expenses for villagers to purchase drinking water as well as the cost of acquiring chlorine to treat drinking water.

Table 23 : Damage and losses in water supply and sanitation

Damage and losses (Million Kip)							
Subsector components	**Disaster Effects**			**Ownership by Sector**		**Effects on**	
	Damage	**Losses**	**Total**	**Public**	**Private**	**BOP**	**Fiscal Sector**
Urban Water Supply systems	724	14	738	738			

Rural Water Supply	1,837	116	1,953	1,953			
Latrines	1,592	5	1,597	175	1,422		
Total	**4,153**	**135**		**2,866**	**1,422**		

Table 24 : Damage and losses in water supply in rural and urban areas by provinces (million kip)

	Water supply in rural and urban areas (million kip)	
Provinces	Damage	Losses
Attapeu	684	14
Savanakhet	168	17
Salavan	716	104
Xekong	993	
Total	**2,561**	**135**

Table 25 : Damage and losses regarding sanitation, by provinces

Provinces	Damage	Losses
Attapeu	256	
Savannakhet	81	
Salavan	183	5
Xekong	1,072	
Total	**1,592**	**5**

Needs Assessment

Thyphoon Ketsana has exacerbated the existing poor condition of water and sanitation in this worst affected region. Poor quality and limited access to drinking water facilities are a major concern. Sanitation is not considered a priority among villagers as people tend to focus first on their basic immediate needs such as rebuilding shelters and water and ensuring food security. Poor sanitation and hygiene practice would expose villagers to diarrheal disease, typhoid and hepatitis. Recovery and reconstruction needs to reach pre-disaster levels summarized in Table 26.

Table 26 : Recovery and reconstruction needs (water and sanitation sector)

Recovery and Reconstruction (million kip and US$ Million) (Water and sanitation sector)		
Subsectors	**Medium Term Recovery and Reconstruction Needs (Million Kip)**	**Long Term Recovery and Reconstruction Needs (Million Kip)**
Urban Water Supply System	738	
Rural Water Supply	1,935	2,600
Latrines	1,597	500
Total	**4,270**	**3,100**

The recommendations based on the assessment include:

1. In areas where surface water sources are the only option for drinking water, rehabilitation and reconstruction of appropriate water supply facilities are required.
2. Rehabilitation of water options is necessary to ensure it is properly functioning.

3. In places where contamination of groundwater can be treated, the most appropriate and suitable water treatment technologies need to be installed.
4. Sanitation and hygiene awareness promotion activities need to be introduced.

The areas for medium-term (up to 2 years) reconstruction have been identified as follows:

- Installation of boreholes and shallow/deep tube wells are needed in the worst affected areas where safe groundwater can be detected;
- Installation of new latrines to improve sanitation;
- Hygiene promotional program for communities;
- Capacity building of the community and local government agencies in terms of water and sanitation to cope with the crisis and emergency response period during natural disasters.

To mitigate recurrent storm damage (from typhoons and floods) and the potential spread of waterborne diseases, a long-term program is required focusing, among other things, on safe water supply and sanitation facilities.

Solid Waste subsector - Damage and Loss

Ketsana caused damage to the Solid Waste Treatment Plant serving a population of over 11100 of Samakkhixay district, the capital of Attapeu province. The Urban and Housing Development Authority estimates a total damage of about 260 million kip (US$ 30,600) regarding access road, waste water ponds, and drainage system. Significant environmental pollution has occurred in the district as increased debris resulting from the floods and regular loads of solid waste could not be collected and disposed, given the carrying capacity of the only existing transportation truck. The medium term need is to repair the facility (costing US$ 30,600). The Authority has also identified the need for an additional waste disposal truck, a truck to transport septic material, and a water truck for the cleaning of roads amounting to 892.5 Million Kip. No loss in revenue or increased operational cost has been reported.

Tables 27 and 28 summarize damages and losses (Table 27) and estimated medium and longer-term costs for recovery and consolidation (Table 28).

Table 27 : Damage and loss in solid waste subsector

Subsector, Component	Disaster Effects			Ownership by Sector		Effects on	
	Damage	Losses	Total	Public	Private	BOP*	Fiscal Sector**
Solid Waste management (Attapeu)	260	-	260	260	-	156	260

* Higher imports **Unexpected expenditures

Reconstruction needs (Solid Waste subsector)

Table 28 : Cost of Reconstruction of Solid Waste Treatment Plant

Recovery and Reconstruction of Solid Waste Treatment Plant (million kip)		
Subsector	Medium Term Reconstruction Needs	Long Term Reconstruction Needs
Solid Waste Treatment Plant (Attapeu)	1152.5	-

E. Water Resources

The damages caused to the Water Resource sector comprise: (a) river bank erosion, and (b) the damages done to the hydro-metrological stations.

River Bank Erosion

The typhoon Ketsana has caused serious erosion on the river banks due to the surged water flow. The damages are noteworthy in Xekong and Sekaman Rivers. While there is no detailed survey yet carried out in time for this Report, preliminary observation indicates that approximately 30 percent of the river bank for both Xekong River (272 kilometer) and Sekaman River (80 kilometer) have been damaged with 2.5 meters of erosion on each side, on average. While there are some damages in other small rivers (mainly tributaries to these two rivers), these damages are considered to be negligible and therefore are not considered here.

Damage and loss

The riverbank gardens are used to cultivate various agriculture crops mainly for cash crops such as maize and tobacco. The eroded river banks have now been permanently lost, as there is no possibility for reclaiming them. In estimating the damages and losses, however, the market value of the equivalent land with adequate access to water (8500 kip for 1 m^2) has been used as a proxy value. It should be noted that intangible externalities such as environment and flood mitigation would probably make the damages higher, but these externalities are not included in this exercise. The damage is thus estimated in a conservative manner.

Recovery Needs

Although reinforcing the entire eroded area may be physically and economically justifiable, it is first absolutely necessary to reduce future risks for the major disaster. For this, immediate recovery efforts are have highest priority:

- Reinforcement of the Critical Section of the Xekong and Sekaman Rivers on about 1 kilometre of the river banks to protect critical structures (e.g. temples, bridge piers)
- Reinforcement of the river dyke (heightening) to protect urban areas. The first estimate suggests that 5 kilometres and 2 kilometre river dyke enforcement is needed for both rivers, respectively. The unit price for such reinforcement (mainly using gabions) is estimated at US$70,000 per kilometre.

Table 29 summarizes damage and loss regarding river banks reinforcements, while Table 30 presents the estimated cost for river bank protection and reinforcements.

Table 29 : Estimated damages and losses regarding riverbanks of Xekong and Sekaman Rivers

Riverbanks affected	Xekong	Sekaman (Attapeu)
Total Length (m)	272,000	80,000
Total length of eroded section m (30%)	51,600	24,000
Total area eroded (m^2)	258,000	120,000
Unit cost kip/m^2 *	8,500	8,500
Damage (million kip)	2193.0	1020.0
Damage US$	258,000	120,000

*Average market value per m^2

Table 30 : Estimated Resource Needs for River Bank Protection (US$)

	Meters	Unit price	Cost
Seman River Bank Protection	500	1,800	900,000
Sekaman River Bank Protection	500	1,800	900,000
Attapeu Dyke Protection	5,000	70	350,000
Xekong Dyke Protection	2,000	70	140,000
Total			2,290,000

Hydro-metrological Stations

Due to the surged water flow in the Sesan and Sekaman Rivers, and strong winds, considerable damages have been made in a few hydrometrological stations in Attapeu, Savanaketh and Xekong provinces. No damage data were yet available in Xekong and Champasak provinces at the time of the assessment, and therefore there are none included in this report.

The total damages for these three provinces are estimated at approximately US$105,000, Damages includes: measurement equipment for river flow, temperature, computers as well as buildings of the hydrometrological station. In the future, it is also considered that these stations may need to be upgraded to be able to serve better as early warning system. The cost for such upgrading is estimated at US$ 649,000 in total. Table 31 summarizes the damages and needs for the hydro-metrological stations, while Table 32 presents medium and longer-term reconstruction needs.

Table 31 : Damage, losses and needs regarding hydro-metrological stations

Damage and losses (in US$)							
Subsector, Component	**Disaster Effects**			**Ownership by Sector**		**Effects on**	
	Damage	**Losses**	**Total**	**Public**	**Private**	**BOP***	**Fiscal Sector****
Attapeu	67,206	-	67,206	67,206	-	67,206	67,206
Savannakhet	17,200	-	17,200	17,200	-	17,200	17,200
Xekong	21,176		21,176	21,176	-	21,176	21,176
Salavan	-	-	-	-	-	-	-
Champasak	-	-	-	-	-	-	-
Total	105,582	-	105,582	105,582	-	105,582	105,582

Table 32 : Longer-term needs for upgrading hydro-metrological stations

Recovery and Reconstruction (US$)		
Subsector	**Medium Term Recovery Needs**	**Long Term Recovery and Reconstruction Needs**
Attapeu	67,206.00	565,000.00
Savannakhet	17,200.00	-
Xekong	21,176.00	84,000.00
Salavan		-
Champasak		-
TOTAL	105,582.00	649,000.00

***

Table 33 presents the overall results for all sectors in terms of damage, loss for both the public and private sector as well as medium (immediate recovery) and longer term needs, and macro economic implications.

Sector	Sub-Sector	Damage and Loss , million Kip							Needs, million Kip			
		Damage	Loss	Total	Ownership		Macro effects		Immediate needs	Medium term	Long term	Total
					Public	Private	BOP	Fiscal				
Social	Housing	69970	3507	73477	2605	70872	27988	15216	n.a.	74798	74798	149596
	Health	8650	1982	10632	11556	0	5744	4622	n.a.	9376	9835	19211
	Education	8087	829	8916	8916	0	3235	3566	n.a.	32569	0	32569
	Sub-total	86707	6318	93025	23077	70872	36967	23405	n.a.	116743	84633	201376
Productive	Agriculture	133018	16985	150003	32725	117278	53207	36546	n.a.	127500	0	170000
	Commerce & Industry	31000	1075	32075	0	32075	18600	6415	n.a.	13695	0	13695
	Tourism	4651	1961	6612	1551	5062	2791	1633	n.a.	0	0	0
	Sub-total	168669	20021	188690	34276	154415	74598	44593	n.a.	141195	0	183695
Infrastructure	Transport	120560	27929	148489	118887	29602	72336	118967	40557	80001	487246	607804
	Communications	25326	894	26220	22820	3400	20261	15639	n.a.	25326	0	25326
	Electricity	26875	566	27441	12691	14750	9700	12691	n.a.	12125	37556	49681
	Water and sanitation	4413	140	4553	2866	1422	2572.8	2396.9	n.a.	4270	3100	7370
	Water Resources	3940	170	4110	2794	850	1846	5	n.a.	20362	5516	25878
	Sub-total	181114	29699	210813	160058	50024	106716	149699	40557	142084	618051	716059
Total	(Million kip)	436490	56038	492528	217411	275310	218281	217697	40557	400022	618051	1408200
	US$ (Million)	51	7	58	26	32	26	26	**4.8**	**47.1**	**72.7**	**124.6**

Table 33 : Summary of Damage, Loss and Total Needs

Part IV : Macroeconomic Impact of Ketsana : A preliminary assessment

Pre-Disaster Situation

The Lao People's Democratic Republic has recorded strong socio-economic progress over the past years. The Gross Domestic Product (GDP) has been growing steadily at an average rate of 6.7 percent per annum from 2000 to 2008, recently driven by strong performance of natural resource sectors. Poverty has declined from 33 percent in 2002/03 to around a quarter of population in 2007/08 (preliminary estimates). Tables 34 and 35 show some pre-disaster economic indicators.

Table 34 : Socio-Economic Indicators of Lao PDR (% variation - unless otherwise indicated)

Indicator	2005	2006	2007	2008	2009 Projection
GDP	7.1	8.5	7.6	7.3	6.4
Agriculture		2.6	7	3.5	2.3
Industry		11.4	9.2	2.4	4.6
Services		8.2	9.0	9.3	4.4
BOP (% of GDP)	1.5	0.2	1.8	3.2	0.2
Inflation (annual average)	7.2	6.8	4.5	7.6	1.0
GNI per capita (adjusted, US$)	470	540	640	740	873

Source: WB

Table 35 : GDP Sector Shares (2008 and Pre-disaster 2009 Estimates)

Sector	Value				Share in GDP (%)	
	2008		2009		2008	2009
	Kip (trillion)	US$ (Million)	Kip (trillion)	US$ (Million)		
Agriculture, Forestry and Fisheries	15.6	1805	16.6	1952	33	31.7
of which Fisheries	1.6	188	1.8	204	3.9	3.7
Manufacturing	4.2	484	4.2	498	10.1	10
Construction	2.0	191	2.2	185	4.8	5
Mining	5.3	619.2	5.4	626.3	8.1	10.1
Energy (electricity, water and gas)	1.1	131	1.2	138	3.2	3.1
Services	16.6	1936.5	17.6	2044.8	40.7	40
Transport	2.18	252	2.18	257	5.3	5

Source: WB

Post-Disaster: Macroeconomic Impact of Ketsana

1 - Gross Domestic Product

The loss of GDP is roughly estimated at 0.4 percent, or about US$ 20 million. Agriculture and transportation bear most of the damages and losses, with value added losses estimated at 45 billion kip (US$ 5.3 million) each. Preliminary estimates also suggest that most of the GDP losses originate from Attapeu (40 percent), Xekong (25 percent) and Salavan (20 percent) where most of the impact on productive sectors is recorded.

Significant effects on local economic activities are estimated at the province level. The extent of impacts are greatest in Attapeu, where GDP loss is estimated to 8 percent compared to pre-disaster, or a real decline in GDP of about 2 percent in 2009. Xekong's loss in GDP is estimated to about 10 percent compared to pre-disaster, which corresponds to a reduction of about 4 percent in real terms in 2009 compared to 2008. This might be because of the most severe impacts on housing, businesses and exports in the province. Other provinces, however, are projected to face positive but slower growth compared to 2008 level.

The impact on national consumption is expected to be small. In the absence of provincial income data, provincial consumption (survey based) may be used as a rough proxy to estimate the impact on national income. The most affected provinces, Salavan, Xekong and Attapeu, contribute an estimated 1 to 4 percent to national consumption, thereby limiting the overall impact on the national economy.

2 - Balance of Payments (BOP)

The impact of Ketsana on the national trade balance is expected to be limited. In 2008, the country exported a total of Kips 12.3 billion (US$ 1,422 millions) and imported Kips 20.2 Billion (US$ 2,336 million) worth of merchandise (Tables 36 and 37)**:**

- **Exports: The impact on exports at the national level is expected to be only marginal,** as the most affected provinces, Salavan and Xekong, contribute less than 1 percent to total commodity exports. However, the provincial trade deficits are expected to worsen, particularly for Xekong.
- **Imports: An increase in provincial imports is expected through higher imports for food, medicines and other essential goods in the short-medium term**. Food may be imported from neighbouring provinces in the immediate-short term. Larger construction materials and equipment imports including for basic infrastructure and irrigation are expected in the medium term. Based on the assessment imports are estimated to increase by US$ 26 million.

The current account deficit may worsen because of the decline in tourism receipts by roughly US$ 0.3 million. However, possible increase in remittances and aid inflows are expected to support the local economy recovery and somewhat offset the deficit in the trade balance. The net effect is however

uncertain at this stage, due to data limitations. Medium and longer-term imports needed to address post-Ketsana recovery and reconstruction needs are estimated at 26 million US$ (see Table 33).

Table 36 : Value of Exports in 2008 and the 2009 Projections (million US$)

Item	2008	Pre-disaster projection - 2009
Agriculture	124.9	111.6
Manufacturing (excl mining and hydropower)	464.9	442.3
Natural resource (mining and hydropower)	832	750
Total exports	1422	1304

Table 37 : Value of Imports in 2008 and 2009 Projections (million US$)

Item	2008	Pre-disaster projection - 2009
Energy	535	379
Consumption goods (excl. transport and energy)	465	489
transport and energy	351	278
Capital goods	1289	1102
Raw materials (garments and others)	231	207
Total	2336	2076

Source: Data from MoIC and WB staff estimates

3 - Fiscal Target and Budget Allocation

Based on the assessment made in this report, the total public expenditure requirements for relief, recovery, and medium- to long-term recovery are estimated to reach at least 217 billion kip (US$ 26 million or about 0.4 percent of GDP).

While the shortfall at the provincial level in local revenue might be non negligible, the national impact is expected to be limited, but estimating the revenue loss is a challenge at this stage. The impact on national revenue collection depends on (i) the province contribution to national revenues and (ii) the extent of the shortfall in the province due to Ketsana (see Table 38 for Total and Provincial Revenue).

The distribution of damages and losses to businesses has been greatest in Xekong and Attapeu, which contribute less than a percentage point to national revenues. Out of five provinces, Savannaket and Champasak accounts for a higher proportion of total public revenue with 12 and 5 percent respectively, but by contrast, the impact on the tax base has been more limited. As a result, the total impact on public revenues is expected to be small.

Table 38 : **Provincial and National Government Revenue**

	2007/08	
	Million Kip	%
Total Revenue	6,617,473	100.0%
Savannakhet	182,375	2.8%
Salavan	35,765	0.5%
Champasak	143,209	2.2%
Xekong	15,825	0.2%
Attapeu	32,199	0.5%

Source: MOF

Public expenditures in affected areas are expected to increase significantly in order to mitigate the impact of the typhoon. For instance, it was reported that more than 30 billion kip is needed to repair irrigation systems in 3 affected provinces. Also, the Government has committed to rehabilitate basic infrastructure in the provinces. . The National assembly recently approved the use of 100 billion kip from the reserve fund for FY09/10 for recovery efforts in 3 affected provinces, Attapeu (50 billion kip), Salavan (25 billion kip) and Xekong (25 billion kip). As a result, public expenditures are expected to increase by 1-2 percent compared to the plan (0.2-0.4 percent of GDP) in 2009/10. Increased expenditure on health, education and transportation to Salavan, Xekong and Attapeu is expected as most public services are affected.

As a result, the total public deficit is expected to increase in 2009/10 from 4.5 percent of GDP (initial projection) to 4.7-4.9 percent. This takes into account both the overall expected improvements in revenue collection due to the centralization of revenues and higher than expected expenditures due to Ketsana reconstruction costs

The banking sector may contribute to the recovery by extending credit using as much as possible market mechanisms to avoid distorting local markets. Some banks have already taken initiatives on credit extension aiming to help restore the livelihood of the affected farmers. Nagnobay Bank has provided initial loans of 9 billion kip to the affected farmers. These credits are aimed at helping to recover agricultural production such as animal husbandry, replanting crops, etc.

4 - Inflation

Inflation in the affected provinces may increase. The expected supply shortage in the short-term and pressure on retail and construction good prices through transport costs will add pressure on the projected trend in rise of overall inflation in the south of the country, and expected rise in fuel prices. The national inflation rate is expected to increase next year after significantly falling in 2009 as a result of the drop in energy and food prices. This annual average inflation sharply dropped from 7.6 percent in 2008 to just 1 percent in 2009. In the Southern region, annual CPI change has shown a gradual upward trend and stood at 3 percent as of Oct 2009.

Part V : Disaster Risk Management, Climate Adaptation in the Aftermath of Ketsana Typhoon

The assessment exercise of damage, loss and needs – (PDNA : Post-disaster Needs Assessment) – undertaken in the wake of Ketsana Typhoon, was 'a first' for the Government. It stemmed from the Government's desire to ensure that, beyond the immediate humanitarian interventions to secure people's life and food security, its medium-term post-disaster interventions will lead to sustainable socio-economic recovery to pre-disaster levels in the affected communities, districts and provinces. The principle of 'building back better' (i.e., disaster-resilient) will guide all infrastructure investments and thus providing sustainable livelihood activities and a much higher level of disaster preparedness.

The strengthening of the capacities of Government and communities over the longer-term to improve disaster risk reduction in planning and implementation is of high priority to the Government. The multiplication of natural disasters in recent years in an area – central and southern Laos – already disaster-prone (flooding and droughts) points to the effects of climate change. Recently, in the northern region of Laos, totally unprecedented signs of earthquakes have been noticed, much to the population disarray. This is just to stress some of the major reasons which led the Government to identify disaster preparedness, environmental protection, disaster-resilient investments, disaster mitigation as one of the 5 top priorities in the next 5-year Socio-economic Development Plan (2011-2015).

The Government considers the post-Ketsana damage, loss and needs assessment as the starting point towards improved national mastership in the area of disaster preparedness and Disaster Risk Management (DRM) and, obviously, its capacity to correctly assess damages, losses and needs.

The Government of the Lao PDR has taken significant steps in the area of disaster risk management in view of creating the conditions enabling to constantly improve disaster preparedness and to further adapt to climate changes. Various national institutions are making great efforts to expand their roles from disaster managers to proactive disaster risk reduction planners. For this purpose, the Government has adopted a Strategic Plan on Disaster Risk Management (SPDRM) in 2003.

The Government is very pleased and grateful to acknowledge the many partners in development who are actively supporting the Lao PDR in the field of DRM. By managing its disaster risks more systematically, the Government of the Lao PDR aims at adapting to climate change effects, preserving development gains, reducing poverty and improving the living standards of the rural population. In this way, the national development goal of graduating out of the status as a Least Developed Country can be achieved.

The major natural disasters the Lao PDR faces are floods and droughts

Most flooding in Laos PDR occurs during May to September when Monsoon rains accumulate in the upper Mekong river basin. In addition to river basin flooding, flash floods in the northern mountainous region are also common. It is estimated that the south and central regions, where about two thirds of the country's population live, face on an average of 1.5 serious floods or droughts every year. Lao PDR is

also susceptible to landslides, pest infestations and fire due to slash and burn agriculture. The areas that are most at risks from floods are those located along the Mekong River and its main tributaries whereas the areas in the upland in the north and a few southern provinces like Savannakhet, a province affected by Typhoon Ketsana, and Khammouan are more prone to droughts.

Before Ketsana, Typhoon Morocot in August 2009 had made significant damages to several Southern provinces. Just a year before the floods in August 2008 had affected about 204,000 people, damaged an estimated 50,000 Ha of arable land and caused a damage and loss of over US$ 9 million.

Climate change vulnerability and adaptation

The Lao PDR joined the global communities in combating climate change issues by ratifying the United Nations Framework Convention on Climate Change (UNFCCC) on 4 January 1995 and the Kyoto Protocol in 6 January 2003. As a developing country, the Lao PDR does not have any greenhouse gas reduction obligations. The First National Communication was completed in 2000 and the Second National Communication is being prepared and planned to be completed in 2011. The Department of Environment (DoE) within the Water Resources and Environment Agency (WREA) has been appointed as UNFCCC and GEF national focal points for the Lao PDR. The National Adaptation Program of Action (NAPA) was released in 2009 and includes a list of 45 national adaptation priority projects in the areas of water resources, forestry, agriculture and public health.

A new Country Partnership Strategy is currently under preparation to align with the Government's next Five Year Plan. Environment, Climate Change and Disaster Management will become a priority area in the new strategy.

Although the Lao PDR is considered a net carbon sink in the region, due to its low population and a limited number of polluting industries as well as to its remaining high percentage of forest cover, as a low income country, however, and an agricultural based economy, the Lao PDR is also categorized as one of the most vulnerable countries to future climate change impacts in Southeast Asia, especially in the form of droughts, floods that will cause landslides, river bank erosion, and reduced food security as well as impacts on natural habitats and ecosystems.

Given the perspective of significant changes in the regional mean temperature and rainfall, the Lao PDR will face considerable more challenges on the natural resource availability, especially water and forest resources that are the major drivers of the Lao economy and sustain rural community livelihoods. For this reason, the Government gives highest priority to climate change adaptation and disaster preparedness.

In this context, the Government wishes to inform its partners in development on the status of disaster risk management in the country by presenting the following summary, based on the Lao PDR Country disaster risk management programme.[7]

[7] Prepared by the NDMO, line ministries, with the support from the Global Facility for Disaster Reduction and Recovery/World Bank and several other donors.

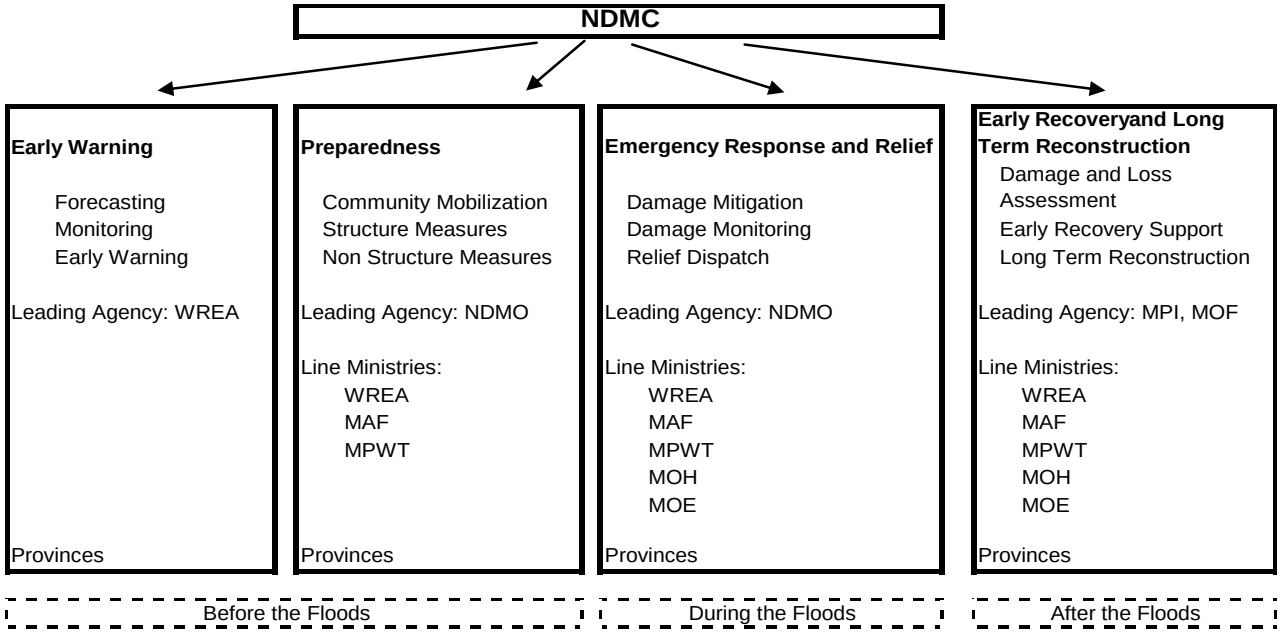
Disaster Risk Management - Priorities

Priority[8] 1: Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation

- The National Disaster Management Committee (NDMC) is an inter-ministerial committee that has the responsibility for developing policies and coordinating DRM activities in the country. The NDMC was established through a prime ministerial Decree No. 158/PM in August 1999. The National Disaster Management Office (NDMO) is the secretariat of NDMC and is located in the Ministry of Labour and Social Welfare (MLSW). Roles and responsibilities of the NDMO and each member of NDMC have been defined by the internal MLSW decree No. 097/MLSW of June 2000. Under this decree, disaster management committees are established at the Provincial, District and Village levels.
- As a result of the directions given by the NDMC, the Provincial Disaster Management Committees (PDMC) are now chaired by the provincial governor instead of the vice-governor which gives them more authority to act on DRM issues. Also, more and more line departments are being represented in the PDMCs.
- The NDMC is currently represented by several important sectors such as health, education, public works, transport, etc. A proposal is under consideration for expanding the membership of the NDMC to include additional important sectors such as energy and mining, planning and investment, water resources and environment, science and technology and agencies such as the Lao PDR Women Union, and the Lao Youth Union.
- A Ministry of Labour and Social Welfare decree (1139/MLSW) of April 2003 defined the Strategic Plan on Disaster Risk Management (SPDRM) corresponding to three different periods 2003-2005, 2005-2010 and 2010–2020.) The SPDRM emphasizes sustainable development through DRR, risk reduction through environmental protection, more preparedness than relief. The Strategic Plan also aims to share the disaster risk management responsibility between the various communities and the government.
- Disaster risk management is integrated into the Lao PDR's Sixth National Socio Economic Development Plan NESDP (2006-2010) and the National Growth & Poverty Eradication Strategy (NGPES). The United Nations Development Assistance Framework lists DRM as a key area for cooperation and one of the critical components of poverty reduction framework.
- National Disaster Management Office, with UNDP support, is planning to prepare a Strategic National Action Plan for DRM by 2010. The draft is planned for December 2009. The Action Plan will focus on getting more ownership by various sector ministries in advancing DRM in the country.

[8] The priorities follow those of the *Hyogo framework for Action (2005-2015): Building the Resilience of Nations and Communities to Disasters*, adopted by 168 countries.

Figure 13: Structure and responsibilities of the NDMC



Priority 2: Identify, assess and monitor disaster risks and enhance early warning

- Risk mapping is still limited to selected districts, funded under various donor projects; there is not yet a comprehensive country-wide risk mapping.
- The Department of Meteorology and Hydrology (Ministry of Agriculture and Forestry) is the main agency that produces the early warning information and disseminates to disaster management organizations, mainly to the National Disaster Management Office (NDMO). The NDMO then sends this information to the local disaster management organizations to take appropriate actions and disseminate early warnings to communities at risk.
- When disaster occurs, information from the local level to the national level is still slow. The capacity and the resources available with the local Disaster Management Committees for data collection and dissemination is still very weak.
- The Flood Vulnerability Assessment and Mapping Project (FVAMP) of the Mekong River Commission (MRC) is working to provide flood vulnerability indices to better manage flood and drought indices.
- Hazard, Vulnerability and Capacity Assessment is being carried out under Lao Red Cross project 'Community Based Disaster Preparedness Program (2007–2011) in 5 flood and drought prone villages in Khammouan and Savannakhet province.
- The World Bank's GFDRR pipeline project will fund risk mapping in two to three provinces.

Priority 3: Use knoweldge, innovation and education to build a culture of safety and resilience at all levels

- A comprehensive disaster information management system is still lacking. The National Disaster Management Office is responsible to carry out the function but it lacks human and information management capacities. A project with Save the Children Australia and Asian Disaster Preparedness Center (ADPC) aims to strengthen the information management system, currently being piloted in Xaignabouli province.
- Phase II of the Mainstreaming DRR in the Education Sector in Lao PDR project between the Ministry of Education (MOE), NDMO, Asian Disaster Preparedness Centre, ADCP, and UNDP (with support from ECHO), is taking up further activities to mainstream disaster risk reduction in the education sector such as supporting institutionalization of the disaster risk reduction module of phase I in the national curriculum and in the teachers training system; pilot testing of disaster risk reduction teaching aid materials in six schools; developing a framework curriculum plan to aid in the future integration of disaster risk reduction in the Lao PDR and identifying specific opportunities for integrating hazard resilience school construction features in one pipeline project.
- A comprehensive national action plan for disaster resilient school systems is still lacking. The following needs were identified by Ministry of Environment: building more trainers at all levels; sensitizing (for better understanding of DRR) high ranking officials in the ministry, heads of local education departments, head of schools and primary school children; experience sharing with other countries; and expansion of curriculum across all technical sectors.
- Under the Laos-Australia NGO Cooperation Agreement (LANGCOCA), a project Tools for Disaster Risk Assessments (TDRA) is being conducted by NDMO and Save the Children Australia with the support of ADPC. The project will support the development of a risk assessment system for use in Xaignabouli district and will support the provincial and district capacities in hazard and risk identification, assessment, and financing.
- The Government has not yet in place a specific disaster risk management public awareness and education programme. However, activities under several donor programmes such as (i) the Flood Preparedness Project (ADPC-MRC) (ii) The Mainstreaming project in the Education Sector (ADPC) and (iii) the DRR Project (Oxfam/Save the Children Australia) have awareness and education programmes.

Priority 4: Reduce the underlying risk factors

- Most recently, the Government has approved the National Action Plan for Adaptation (NAPA) for Climate Change. The NAPA has identified 45 priority project proposals to implement adaptation activities in four main sectors: agriculture, forestry, water and water resources, and public health. 12 of these projects have been prioritized as first priority while the remaining 33 are secondary priority. The NDMO and the Climate Change Office will work closely together to advance the DRR components of the NAPA.
- Some limited efforts in the agriculture sector such as river embankment, protection of dams, seed stocking during floods, maintenance and rehabilitation of irrigation canals have been carried out.
- JICA is supporting the update of the Urban Development Master Plan for the Vientiane Capital which has a component of improving building codes. Similarly, Component 5 of the Mekong

River Commission project on Flood Mitigation and Management Program has a land management component.

- Capacity building for Damage and Loss Assessment is being carried out by the National Disaster Management Office and Ministry of Planning and Investment (MPI) with support from the World Bank. This capacity building effort aims to prepare a cadre of local experts for damage and loss assessment who can be readily deployed in the event of a major natural disaster.
- The World Bank, through the GFDRR support is working with the NDMO, the Ministry of Planning and Investment as well as with the Water Resources and Environment Agency (WREA) to institutionalise DRM in multiple ways, by helping assess the current institutional and legal framework for the NDMO and strengthen the country's Early Warning Systems by updating the hydrological stations in the high priority basins.

Priority 5: Strengthen disaster preparedness for effective response at all levels

- Practically, there is a very limited budget for disaster risk management or recovery activities. Funds are mobilized from the national and local budgets in the event of a disaster. One billion kip, about US$ 120,000 through the Ministry of Labour and Social Welfare (MLSW) for emergency response per year is earmarked by the Government. The Government does not have a national disaster relief reserve fund that provides funding for emergency response and recovery activities when a disaster strikes. Some departments have their own funds albeit limited, such as agriculture (seed, water pump repair), public works (road repair), social welfare and labour (relief) etc.
- The Department of Social Welfare compiles data from provincial departments regarding the loss/damage and need for assistance. It then makes request to the Minister for use of funds.
- The NDMO is still inadequately mandated (resource-poor) and its mandate for risk reduction is yet well understood by other line ministries.
- The NDMC has not yet a contingency plan for natural disaster events. However, every year, the NDMC meets prior to the disaster season, collects preparedness plans from the line ministries. The NDMC notifies the Provincial Disaster Management Committees suggesting them to prepare response plans. Some provinces do well; those provinces without disaster history have difficulty in planning. Planning capacities are still poor; there is an urgent need to strengthen the process. Information from line ministries may or may not become available in a timely fashion. There is need to have better intra governmental cooperation and inter agency-cooperation.
- There is a need for a uniform methodology for making post disaster damage and needs assessments for consistency and coming up with nationally agreed upon damage and loss figures. Also, there is also a need to have a disaster information centre at NDMO.

The Government is also pleased to present here the already important engagement of its partners in development in helping strengthening the Lao PDR's DRR capacities.

Regional Initiatives

1. The ARPDM (ASEAN Regional Program on Disaster Management (2004-2010) and subsequent AADMER (ASEAN Agreement on Disaster Management and Emergency Response) signed by member states in 2005, Standard Operating Procedure for Regional

Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Response Operations (SASOP).

2. The Regional Consultative Committee on Disaster Management (RCC) RCC Program on Mainstreaming Disaster Risk Reduction into Development (MDRD) Phase I (2004-2007) and Phase II (2008-2012). The Lao PDR is an active member.
3. ASEAN, UNISDR and WB have signed a Memorandum of Cooperation (2009-2014) for disaster risk management in the region.
4. A Memorandum of Understanding (2009) has been signed between Asian Disaster Preparedness Center (ADPC), and World Bank, has set sets forth the framework for a collaborative alliance between the two organizations. The Asian Disaster Preparedness Center (ADPC) is a regional non-profit resource center based in Bangkok, with substantial experience in implementing disaster risk management projects in countries of the region including the Lao PDR.
5. Mekong River Commission: Created as an intergovernmental body by the countries of the Mekong Basin, the MRC is supporting member countries in the following five areas: Flood Management and Mitigation programme, including Establishment of Regional Flood Management and Mitigation Centre (RFMMC); Structural Measures and Flood Proofing; Enhancing Cooperation in Trans-boundary Flood Issues; Flood Emergency Management Strengthening; and Land Management.

Donors/IFIs

- The Laos-Australia NGO Cooperation Agreement (LANGOCA), a consortium between Australian NGOs and the Lao government, funded by AusAid is strengthening community level preparedness and response to natural disasters. LANGOCA works closely with the National Disaster Management Office.
- The National Disaster Management Office, with UNDP support, is planning to prepare a Strategic National Action Plan for DRM by 2010. A first draft should be ready before the end of December 2009. The Action Plan will focus on getting more ownership by various sector ministries in advancing DRM in the country. UNDP is also working with NDMO to enhance capacity at all levels of government disaster management for preparedness, response and rehabilitation.
- The Lao National Mekong Commission, Asian Disaster Preparedness Center and National Disaster Management Office are continuing to prepare and improve Flood Preparedness Plans for Khammouane and Savannakhet province with financial support from the Gesellschaft für Technische Zusammenarbeit (GTZ) and ECHO.
- Emergency Relief for the 2008 Floods has been provided by most major UN Agencies (FAO, WHO, UNICEF) as well as I-NGOs and bilateral donors (ECHO, USAID, Japan, Singapore, Sweden, Canada and Germany).
- The Mekong River Commission (MRC) is currently implementing a Flood Mitigation and Management Programme (FMMP) with the support from Japan and Denmark. The Asian Development Bank is preparing a TA for a flood management project.
- A Priority Investment Plan was developed for mainstreaming disaster risk reduction into Agriculture sector by NDMO and Ministry of Agriculture with technical support from ADPC and GTZ.
- The Japanese International Cooperation Agency (JICA) is supporting pilot works in riverbank protection in Vientiane Municipality.

- Most recently, the World Bank started working with the NDMO, Water Resources and Environment Administration (WREA) and Ministry of Planning and Investment (MPI) to support the operationalization of the Strategic Plan for Disaster Risk Management (SPDRM). This includes the funding of a $1 million project assisting the Government to design an implementation plan for its disaster risk management strategy and to strengthen the hydromet, early warning and river basin management. It is also helping strengthen the Government's capacity in carrying out damage, loss and needs assessment (DALNA) to measure the impact of natural disasters and subsequent resource needs for recovery.

The Government's principles regarding DRM engagement in the affected provinces

The Government fully adheres to the following principles guiding the overall disaster risk management activities for the affected provinces, but also for the Lao PDR in general. These are:

1. Strengthen the overall capacity of national, provincial and district disaster management committees in such a way as to enable them to effectively lead comprehensive disaster risk management combining both ex-ante measures as well as an effective disaster response.
2. Continue to strengthen the partnership between Ministry of Planning and Investment as a strategic means to integrate DRM and CCA in sectoral investment plans and provincial Economic and Social Development Plans.
3. Encourage better institutional coordination between MPI and NDMO for disaster risk management activities.
4. Continue to build on the momentum created by the Typhoon Ketsana PDNA in order to strengthen the national capacity in conducting post-disaster damage, loss and needs assessment.
5. Work towards making each development sector (education, health, transport, and infrastructure) disaster-resilient.
6. Focus on flood and drought risk management that is directly linked to people, livelihoods and rural poverty.
7. Advance priorities as set out in the Strategic PDM and the DRR components of the National Adaptation Plan of Action (NAPA)
8. Promote partnerships with organizations with regional expertise such as ASEAN, ADPC and MRC on disaster risk management;
9. Harmonize donor efforts and prepare broader donor engagement framework for disaster risk management.
10. In the context of the Ketsana reconstruction and recovery efforts, give priority to the most affected provinces of Attapeu, Salavan and Xekong and the most damaged sectors, namely, agriculture, transport and housing.

Priority Disaster Risk Management Needs (2010-2012) in the Affected Provinces

The Government has defined eight priority activities for effective disaster risk management in the affected provinces. These activities include building DRM capacity in the disaster management offices, understanding better existing and emerging disaster risks, strengthening existing technical standards and design specifications in different sectors, mainstreaming DRM in key sectors, assessing opportunities for disaster risk financing, strengthening early warning systems, creating in-country

capacity for conducting post-disaster needs assessment, and preparing flood preparedness plans for flood prone districts.

The cost of the suggested activities for the next three years (2010-2012) in the 5 affected provinces is estimated at 3.1 million US$ (sector components being counted under respective sectors).

A full integration of disaster risk management into all development sectors is a sustained process that will require many years, and investments at a much higher level.

Table 39: Priority Disaster Risk Management in the 5 affected provinces (2010-2012)

Priority Needs	Indicative Need (US$)	Priority Area(s)
1. *Build DRM capacity of disaster management offices at all levels*: Focused capacity building of PDMOs and DDMOs so as to help them move from their role of disaster managers to both risk and disaster managers. This includes building local capacities for making disaster risk reduction a strategic priority in provincial and sector development plans; risk identification and assessment; risk mitigation, and emergency preparedness.	500,000	1
2. *Understand existing and emerging disaster risks better:* -Identify and assess flood and drought risks and vulnerability at the lowest administrative level as possible -Identify and assess emerging risks and vulnerability for urban centers such as in provincial capitals.	500,000 50,000	2
3. *Strengthen existing technical standards and design specifications* in different sectors and make them responsive to disasters (transport, school, hospitals).	National level (500,000)	4
4. Develop DRM components within Sector Wide Approach (SWAp) in Education, Health and Transport Sector.	National Level	1-5
5. Issue paper on disaster risk financing (agriculture insurance, private sector participation, etc.)	National Level	

	(50,000)	4
6. *Strengthen Early Warning Systems* -Support WREA for the hardware component of early warning, that is, provide accurate and reliable hydro-metrological data through scientific measurement of weather data. -Support PDMOs and DDMOs for effectively communicating weather information including possibilities of flooding, drought etc.	Included in water resources sector estimates Included in Item 1	4
7. *Create in country capacity and system for conducting post disaster needs assessment*. As part of the Ketsana assessment, national and provincial officers representing 12 sectors have been trained in carrying out damage and loss assessments. With adequate refresher training, this pool of trainees can effectively be employed in the event of any natural disaster in the future.	Included in item 1	5
8. *Prepare flood preparedness* plans for flood prone districts	1,500,000	5
Total Indicative Needs	3,100,000	

Part VI : Next Steps

After the Dissemination Workshop to be organized to discuss the findings of the PDNA and the responses from the Lao PDR's partners in development regarding the recovery and reconstruction needs in the wake of the Ketsana disaster, the Government envisages to proceed as follows.

- 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 resources, for emergency aid and recovery needs
- Put into place a co-ordination 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 districts and/or sectors
- Identify 'district leads' for coordination of preparation of recovery projects, implementation efforts, coherence in proceeding, while ensuring synergy and optimal results
- 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.), discussions will be held from the second half of 2010 on with our partners in development to identify available resources for the implementation of the VIIth National Socio-economic Development Plan (2011-2015).

There should be a "district-lead" in order to ensure co-ordination and monitoring, in close collaboration with the district and provincial authorities. Such a lead could be assumed by district sector departments, under the guidance from provincial sector services. The Poverty Reduction Fund (PRF), working closely with all villages in several districts, could also be an efficient lead, in close cooperation with local authorities, and reporting to them, to the NDMC and the concerned donors.

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 damaged (road access, irrigation schemes) and the availability of agricultural input need to be accomplished before the next planting season (dry-crop cultivation starting from early 2010, and rain-fed crop cultivation, starting in June 2010) calls for special attention.

In terms of housing and social infrastructure (water supply schemes, schools and health centers), the provision of basic construction materials (roofs, bolts/nails, cements, etc.) will be essential. For transport, technical supervision teams consisting of engineers in partnership with the district DPWT will have to be mobilized to support the villagers for house and rural road rehabilitation. The private sector incl. construction firms, will have to be mobilized to undertake the civil work especially for larger and more technically complex schemes such roads and bridges, irrigation, hospitals and water supply systems. To enhance opportunities for income generation, a labour based approach for maintenance, repairing and rehabilitation of damaged structure should be encouraged. This must be done on the basis of cost-efficient project planning.

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 through technical assistance.

Technical assistance is therefore an essential asset for emergency, recovery and reconstruction. Technical assistance is also urgently needed for helping the Government in co-ordination, financial planning, project preparation and monitoring.

Finally, the Government considers the further development and scaling up of the disaster preparedness programme to strengthen national and local capacity to manage and cope with future natural disasters as all-important.

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