Lao PDR

National Assessment Report on Disaster Risk Reduction (2012)

Linkages between Poverty and Disaster Risk

National Disaster Management Office
Ministry of Labor and Social Welfare

Lao PDR
2012

Disclaimer

The document is based on existing reports as well as evidence based historical data collection and analysis using DesInventar database created at the National Disaster Management Office (NDMO), Lao PDR. Efforts have been made to ensure the accuracy and reliability of the information contained in the document. The document remains open for correction and improvement.

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Last but not least we would like to express our thanks to UNISDR whose financial support to implement this project has been highly appreciated.

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Acronyms

AADMER	ASEAN Agreement on Disaster Management and Emergency Response
ADB	Asian Development Bank
ADPC	Asian Disaster Preparedness Center
CPI	Committee for Planning and Investment
DFID	Department for International Development, UK
DMH	Department of Meteorology and Hydrology
GAR	Global Assessment Report
GoL	Government of Lao PDR
HFA	Hyogo Framework of Action
LDC	Least Developed Countries
LECS	Lao PDR Expenditure and Consumption Survey
LNAR	Lao PDR National Risk Assessment Report on Disaster Risk Reduction
LNLCRDPE	Lao National Leading Committee for Rural Development and Poverty Eradication
LRC	Lao Red Cross Society
MDG	Millennium Development Goal
MEPF	Ministry of Economic Planning and Finance
MLSW	Ministry of Labor and Social Welfare
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry for Planning and Investment
NAPA	National Adaptation Programme of Action to Climate Change
NDMC	National Disaster Management Committee
NDMO	National Disaster Management Office
NDPCC	National Disaster Prevention and Control Committee
NGPES	National Growth and Poverty Eradication Strategy
NSEDP	National Socio-Economic Development Plan
PTI	Public Work and Transport Institute
SPI	Standard Precipitation Index
TWG	Technical Working Group
UNDP	United Nations Development Programme
UNISDR	United Nations International Strategy for Disaster Reduction
UNOPS	United Nations Office for Project Services
UNPFA	United Nations Population Fund
UXO	Unexploded Ordnances

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Background of the Report

The Lao National Assessment report on disaster risk reduction in 2012 is the key output of the implementation of the project "Strengthen Institutional Capacity for Development of Lao National Assessment Report (LAR-2012) on Disaster Risk Reduction in Lao PDR" and it will be the contribution of the Lao Government to the United Nation's Global Assessment Report on Disaster Risk Reduction in 2013 which is prepared by UNISDR. The Lao PDR National Risk Assessment Report on Disaster Risk Reduction (LNAR) has been developed by the National Disaster Management Office (NDMO), Lao PDR, with technical and consultative support of UNISDR as the Lead Coordinator and ADPC who provided the necessary technical support as well as coordination support to the NDMO. To complete the report, NDMO has established a Technical Working Group (TWG) (Annex III.) under the Chairmanship of the Director General of NDMO. The representatives are;

1. National Disaster Management Office
2. Ministry of Planning and Investment
3. Ministry of Agriculture and Forestry
4. Ministry of Public Work and Transportation
5. Ministry of Education and Sport
6. Ministry of Labor Social Welfare
7. Ministry of Public Health

The report uses the DesInventar methodology which has been initiated by UNDP and UNISDR in Lao PDR since 2005. The DesInventar system supports historical data collection over longer periods by using a standardized disaster data template and also provides data analysis support by the integrated DesInventar software. The aim of the NDMO is to use the DesInventar software for the systematic collection, documentation and analysis of data related to disaster losses associated to natural hazards. However, no exhaustive analysis of the disaster data has been carried out yet. The LNAR is the first attempt to

analyze disaster data included in the DesInventar system. Capacities of Lao Government officials have been built focusing on the management of disaster management systems as well as evidence based historic data collection and analysis as a tool for disaster risk assessment.

Objective of the Report

The objective of this report is to present the current status of disaster risks in Lao PDR through a comprehensive assessment of past and existing initiatives by the National and Provincial Governments as well as Development partners. The report tries to establish a relationship between disaster risk and poverty reduction and guide the stakeholder in Lao PDR in mainstreaming disaster risk reduction into poverty reduction strategies and programs. Additionally, the report will be a contribution of the Lao Government to the Global Assessment Report (GAR)-2013 being prepared by UNISDR.

Structure of the Report

The report is structured in 5 chapters. Chapter 1 describes the geographical, economic, and administrative situation of Lao PDR. Furthermore, it provides a short paragraph about disaster management in Lao PDR. Chapter 2 provides a short overview of the national hazard profile. Chapter 3 presents the initial analysis of the DesInventar data. The DesInventar database was implemented in 2010/11 by the Lao PDR government and serves as a computer-based information management system that helps with the "systematic collection, documentation and analysis of data about losses caused by disasters associated to natural hazards" (DesInventar, n.d.). So far no exhaustive analysis of the disaster data has been carried out. Furthermore, existing policies and regulations are presented. Chapter 4 discusses the linkages between disaster risk and poverty using DesInventar data as well as poverty data on different levels. The last chapter, chapter 5, will give conclusions of the analysis and recommendations for the future are given. Furthermore, the importance of Disaster Risk Reduction in the context of Lao PDR is stressed as a means to reach sustainable economic growth and therefore graduate from the status of LDC by 2020.

chapter 1

Introduction

Location and Geography Lao PDR

Lao PDR is a landlocked country covering a territory of 236,800 km^2 in the center of the Southeast Asian peninsula and is surrounded by Myanmar in the North West, Cambodia in the south, China in the north, Thailand in the west and east Viet Nam.

Geographically, Lao PDR is divided into three regions, namely the Northern, Central, and Southern areas. Administratively, however, the country is divided into 17 political entities: 16 provinces ('khoueng'), and 1 municipality (Vientiane). The provinces are divided into districts ('muang') with districts numbers per province ranging from 4 to 15. The districts are further divided in smaller administrative units, namely villages ('baan'). Table 1.2 gives an overview of the administrative units in each province.

Table 1.1 Borders of Lao PDR

Region	Borders with	Length of borders (km)
North	China	505
South	Cambodia	435
East	Viet Nam	2,069
North-West	Myanmar	236
West	Thailand	1,835

Source: ACD, 2012

The topography of Laos is characterized by its mountainous landscape which is dominated by the Annamite Range in the northeast and east and the Luang Prabang Range in the northwest. About two-third of the country is mountainous and thickly forested. Elevations are often above 500 meters and typically characterized by steep terrain, narrow river valleys, and low agricultural potential. Especially the north of Lao PDR is mostly mountainous with mountains reaching heights of more than 2,700 meters (8,860 ft). The highest mountain is the Phou Bia with 2,819 meters which lies in the Annamite Range in Xiengkhuang Province. The only exceptions to the mountainous character of the north of Laos are the plain of Vientiane and the Plain of Jars in the Xiengkhuang Plateau. In the south of the country, more low level areas can be found for example in Savannakhet and

Champasack provinces. These areas are also well suited for crop cultivation and livestock raising. However, in total, only about 20% of the land area of Lao PDR consists of alluvial plains and terraces. In addition, only 4% of the total land area is classified as arable.

Lao PDR is located in tropical areas; the climate is divided into 2 seasons: dry and rainy season. The dry season begins in mid of October and ends mid of May. Due to the northwest monsoon cover in some years, the weather is considerably cold from October to February. Cold weather is experienced for a shorter period, namely from November to January, in the northern parts of Lao PDR, in the Bolaven plateau as well as in the east part of central Lao. From March to April the weather is hot. The lowest average temperature is about 13 to 17 degree Celsius, while the highest average temperature is about 35 to 38 degree Celsius. The yearly average temperature is about 26 to 28 degree Celsius. The monsoon reaching Lao PDR from the southwest of the Indian Ocean and the gulf of Thailand brings rain to Lao PDR. Rainy season ranges from mid May to mid October and especially from July to September Lao PDR sees frequent rainfall. The yearly average rainfall in the whole country is around 1900 to 3500 mm (DMH, 2012).

Table 1.2 Administrative Units of Lao PDR

Province (17)	Number of Districts (143)	Number of Villages (8647)
01 Vientiane Capital	9	491
02 Phongsaly	7	541
03 Luangnamtha	5	355
04 Oudomxay	7	472
05 Bokeo	5	283
06 Luangprabang	12	782
07 Huaphanh	8	720
08 Xayabury	11	448
09 Xiengkhuang	8	512
10 Vientiane	13	518
11 Borikhamxay	7	323
12 Khammuane	9	558
13 Savannakhet	15	1,015
14 Saravane	8	608
15 Sekong	4	230
16 Champasack	10	641
17 Attapeu	5	150

Source: Lao PDR Statistical Bureau, 2010

Population Size and Demographic Indicators

Since 1985, Lao PDR is carrying out population censuses on a regular basis every 10 years. Since 1985, the population size of Laos has tremendously increased. The total population has grown by nearly 80% in 25 years from 3.6 million in 1985 to 6.29 in 2010. Table 1.3 summarizes the basic demographic indicators using data which was gathered during the population censuses in 1995 and 2005. In addition, various estimates from different sources such as the UN Population Yearbook have been gathered to allow a more recent understanding of the situation in Lao PDR.

Economic Development Profile

The Lao PDR continues to develop rapidly and achieves non-income Millennium Development Goals as scheduled by enhancing economic diversification to become less reliant on volatile commodity prices, job creation for a very young population, enhancing governance and institutional capacity, creating a conducive environment for the private sector, and balancing growth with equity and sustainability (ADB, 2012). Between 2008 and 2011, Lao's economic growth even exceeded 7% per year. The economic growth is also reflected in the increase of the GDP in Laos. In 1990, Lao PDR had a GDP per capita of 207.4 US $ and in 2011 the GDP per capita is estimated to increase to 1,281 US. In general, economic growth has reduced official poverty rates from 46% in 1992 to 26% in 2010 indicating the enormous effect of increased economic activity in Laos on the population (World Bank, 2012).

Disaster Management Profile

Lao PDR has experienced increasing intensity and severity of natural hazards (flood, drought and storms) that turned into unprecedented disasters. In addition, small scale but recurrent events cause increasing loss of human lives and loss of property. In recent years, Lao PDR was severely impacted by flood (particularly flash floods) caused by Typhoon Ketsana in 2009 and by the Typhoons Haima and Nokten in 2011. More than hundred thousand people were affected, dozens people were killed and houses and infrastructure were damaged. Every sector was affected by the disasters for instance agriculture, public works and transport, education, health, wash and sanitation, tourism, industry and trade, etc. with estimated cost of more than hundred million US $.

At the same time, the Lao PDR has made good progress and achievements in the implementation of the National Strategic Plan on Disaster Risk Management which is in line with the Hyogo Framework of Action (HFA) and ASEAN Agreement on Disaster Management and Emergency Response (AADMER). Some of its recent achievements are:

- legislation and disaster risk management and reduction mechanism have been improved and developed at national and local levels;
- disaster risk reduction (DRR) has been integrated into the current 7th National Social and Economic Development Plan 2011-2015 in order to ensure every step of development and investment processes are protected from natural disasters and does not create new vulnerability and hazards[2]

2 The urban planning law is e.g. currently being revised to ensure that DRR is incorporated

- the Government of Lao PDR has implemented policy of empowering the local administration at all levels emphasizing that all the government agencies should focus on the macro-management such as strategic planning for development of their respective sectors, drafting the legislations, human resources development last but not least audit, control and inspection to ensure good governance
- disaster preparedness and risk reduction plans have been developed and implemented with active participation of communities
- DRR was gradually integrated into poverty reduction programs, gender and livelihood enhancement activities
- early warning system has been improved through the development of national strategy and standard operating procedure (SOP) on Early Warning → upgrading and setting up of a data collection and monitoring system, improvement of flood and weather monitoring and forecasting, earthquake monitoring, dissemination of flood early warning information
- DRR was integrated into curriculum of upper primary and lower secondary schools → school safety construction guideline was developed and disseminated
- capacity building programs and community based disaster risk reduction have been implemented at the local and community levels, such as community risk

Table 1.3 Demographic and socio-economic indicators of Lao PDR

Indicators	Census Year		
	1995	2005	2011*
Population (in millions)	4.58	5.62	6.59
Population below 15 (in millions)	2.02 (44%)	2.19 (39%)	2.31 (36.7%)
Annual growth rate (in %)	2.4	2.1	1.7
Population density (pop/ sq.km)	19.4	25	n.a.
Sex ratio (males per 100 females)	97.7	99.3	98.0
Total dependency ratio [persons aged (0-14) and 65+ per 100 (15-59) years]	1.1	0.8	n.a.
Urban population ('000)	778	1,517	2,157
Proportion of urban population (%)	17	27	33
Total literacy rate in %	60	73	n.a.
Literacy rate of males in %	74	82	83
Literacy rate of females in %	48	63	63
Crude birth rates (per 1000)	36.6	25.7	25.7
Crude death rates (per 1000)	13.6	9.8	7.9
Infant mortality rates (per 1000 live births)	104	70	57
Maternal mortality rate (per 100,000 live births)	n.a.	405	580
Total fertility rate (children per women)	6.7	3.3	3.06
Life expectancy at birth (years)	51	61	63
Life expectancy at birth for males (years)	50	59	61
Life expectancy at birth for females (years)	52	63	65
Land under cereal production ('000 ha)	n.a.	822	1.090

Source: Ministry of Planning and Investment – Population Census of Lao PDR; World Bank, 2012; WHO, 2012
** Not a census year*

assessment, planning and implementing village disaster reduction plan, raising awareness and education for school children and communities, etc.

- risk mapping and profiling has been conducted at the national level → work will be continued in other provinces with high risk to natural disasters
- disaster data collection, data base and information management system have been improved
- active cooperation and partnership with UN agencies, international development partners, donors, INGOs, ASEAN, etc. in strengthening disaster preparedness and disaster risk reduction, in particular, the implementation of HFA and ADDMER

The Government of Laos (GoL) has set a strong vision for the country to achieve the MDGs, graduate from the LDC status in 2020 and strive towards sustainable development. Reducing vulnerabilities to disaster and climate change to ensure food security improve access to water and sanitation and sustain livelihoods, especially of rural population will be essential for Lao PDR to achieve its ambitious national development goals. Reducing disaster loses and adapt to climate change are mentioned explicitly in the 7th National Socio-Economic Development Plan 2011-2015 (7th NESDP) of Lao PDR. There are ongoing efforts to integrate DRR and CCA into sector policies such as agriculture and forestry, public work and transportation, water resources management and public health. These policies need to be translated into coherent practices, driven by strong political commitments for long-term sustainability vs. short-term economic growth aspirations. This is especially important in the context of resource-led growth in Lao PDR where deforestation, unsustainable management of watersheds and degradation of the ecosystems are driving increasing disaster risks.

The lessons from the 2008 flooding and later the Typhoons Ketsana, Haima and Nokten show the need of a comprehensive risk assessment based on historical data and probabilistic data for potential disaster impacts followed with developing and implementing safer development activities that takes into account hazard and consequent risks. There is an identified knowledge gap in Lao PDR with respect to the multi hazard assessment and demarcation of potential risks from natural disaster, without which it is difficult to effectively implement many developmental programs. A key prerequisite for this is the identification of relevant hazard and the definition of consequent risk.

The National Risk Profile of Lao PDR developed by NDMO with the support of UNDP and ADPC is aimed at hazard assessment and risk assessment. This was done based on broad assessments that included all natural hazards such as earthquake, flooding, landslide, storm, drought, epidemic and UXO. The challenge faced by NDMO was the availability of disaster related data, systematic analysis of the natural hazards and trend analysis of its impacts. However, since the shift in the country away from disaster management, response, and relief towards disaster risk reduction and climate change adaptation, a holistic approach with sustained efforts to reduce the costs of disaster has been adopted. This is to maintain a steady advance towards poverty alleviation and economic growth.

chapter 2

National Risk Profile of Lao PDR

The Lao Government has recognized the increasing trends of disasters in terms of frequency and magnitude. It has expressed its serious concern that disasters have already and will continue to impact the poverty reduction efforts and development gains as well as the achievement of the Millennium Development Goals (MDGs), HFA by 2015 and the graduation from the Least Developed Country's status by 2020[3]. The NDMO has recently developed an extensive National Risk Profile of Lao PDR focusing on hazard assessment which covers the development of a multi-hazard risk map for Lao PDR including a description of the baseline data, and hazard assessment and mapping for earthquakes, floods, drought, landslides, epidemics and diseases, UXO and storms hazards at the national level. The recommendations are segmented into eight sections: policy; institutional mandates and institutional development; hazard, vulnerability and risk assessment; multi-hazard early warning systems; preparedness and response plans; the integration of disaster risk reduction into development planning; community-based disaster risk management; and public awareness, education and training.

Introduction

The hazard assessment and hazard mapping at the national level has been carried out for earthquakes, floods, landslides, droughts, UXOs, storms and epidemics (UNDP, 2010). Well-established scientific tools and techniques have been used to assess the hazards and mapping accordingly. For earthquakes, hazard mapping is done for 250-year return periods. For flooding, the most flood-prone rivers and catchments are considered in the flood hazard assessment. The flood hazard mapping presents flood severity in terms of inundation depth and area with respect to 10-year, 25-year, 50-year and 100-year return periods.

3 Statement of the Head of the Lao delegation at the 5th Ministerial Conference on Disaster Risk Reduction, 22 - 25 October 2012, Yogyakarta, Republic of Indonesia.

The landslide hazard mapping is carried out considering rainfall as a triggering factor. Landslide-prone areas are classified as low, moderate and high-prone areas. The drought hazard mapping consisted of an analysis for the whole of Lao PDR using the Standard Precipitation Index (SPI). Drought hazards were classified into moderate, severe and extreme conditions.

Hazard assessment and mapping is conducted for several epidemics and diseases including ten diseases: Acute Bloody Diarrhea, Acute Respiratory Tract Infection, Acute Watery Diarrhea, Dengue Fever, Dengue Hemorrhagic Fever, Food Poisoning, Hepatitis, Malaria, Measles and Typhoid Fever. UXO hazard-prone areas have been mapped based on the National Regulatory Authority database for UXO. The storm mapping is developed based on historical storm data, with a 10-year, 20-year, 30-year and 50-year return period. The hazard assessment reveals that Lao PDR is prone to various geological, hydro-meteorological and human-induced hazards with specific degrees of severity.

Earthquakes

There is limited information available about the seismic activities in Lao PDR. The earthquake hazard maps were developed using MMI scale. The hazard assessment was based on earthquake intensity maps developed by UNOCHA (OCHA, 2011). The results show that one fourth of the area of Lao PDR is located in a high earthquake hazard zone. These areas include Xayabury, Bokeo, Oudomxay, Luangnamtha and Phongsaly provinces. More than 30% of the country is located in a moderate earthquake hazard zone, while 43.62% falls in a low earthquake risk zone. Figure 2.1 shows a map created for the National Risk Profile that shows that different earthquake risk zones. As can be seen there, especially the north part of Lao PDR is prone to earthquakes.

Figure 2.1 Earthquake hazard map of Lao PDR

Source: UNDP, National Risk Profile Lao PDR, 2010

Table 2.1 Distribution of Seismic Hazard Zones in Lao PDR

Earthquake risk	Area in each province		% area covered by earthquake hazard
	Name of province	Area in sq km	
High risk	Xayabury	15,541.07	56.7
	Phongsaly	15,470.98	97.6
	Luangnamtha	9,605.49	100
	Bokeo	6,989.57	94.5
	Oudomxay	11,794.83	100
	Total	59,401.94	25.78
Moderate risk	Vientiane	12,591.74	90.3
	Xiengkhuang	12,715.39	95.9
	Huaphanh	17,522.78	99.9
	Luang Prabang	19,971.56	56.9
	Total	70,511.11	30.6
Low risk	Attapeu	9,551.72	100
	Champasack	14,982.04	100
	Sekong	8,396.82	100
	Saravane	10,163.70	100
	Savannakhet	21,400.51	100
	Khammuane	16,724.40	100
	Borikhamxay	15,711.30	94.7
	Vientiane Mun.	3,586.91	67.9
	Total	100,517.40	43.62

Source: UNDP, National Risk Profile Lao PDR, 2010

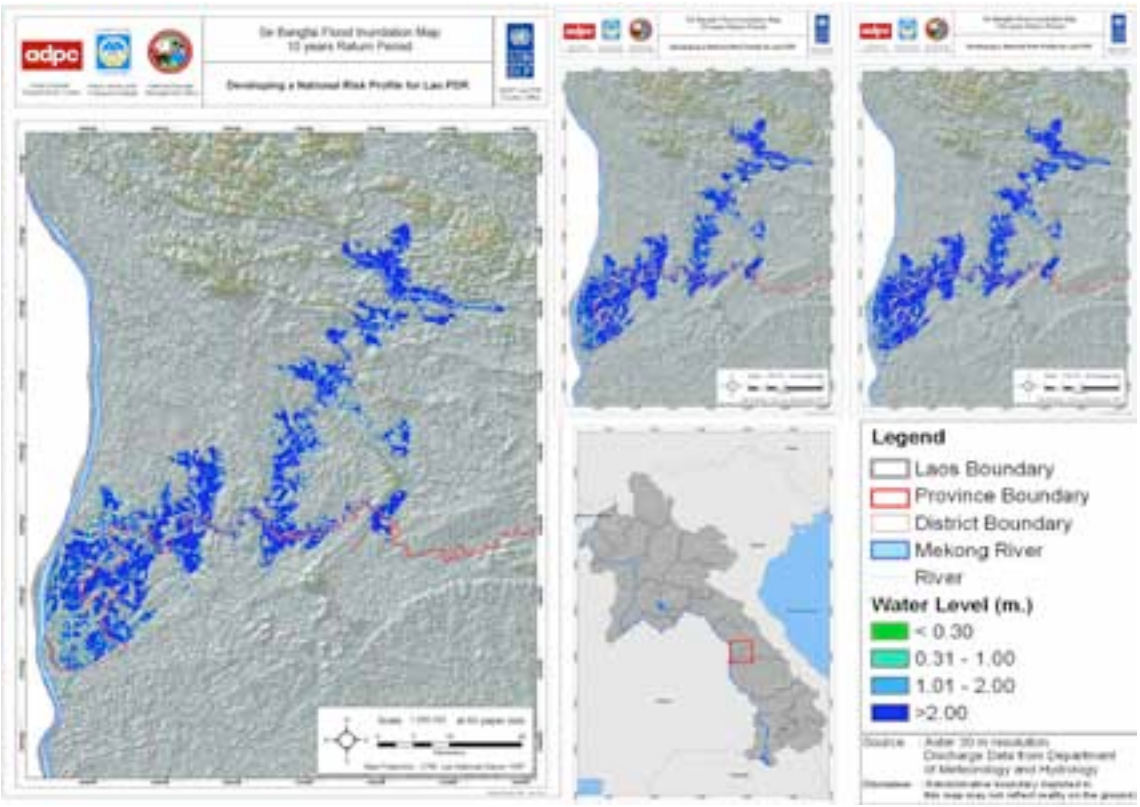
Based on the statistical record of the Department of Meteorology and Hydrology, earthquakes are experienced frequently in the northeast of Lao PDR. There were seven earthquakes with magnitudes 5 to 6.9 Richter scale occurred between 1973 and 2009. In 2009 there were 34 low magnitude earth quakes in 2009 (4 times: 4.0 to 4.9, 15 times: 3.0 to 3.9 and 15 times: 2.0-2.9) Seismic events in North-West part of Laos PDR have become more evident (DMH, 2010). In February 2011 an earth quake with magnitude of 4.7 Richter scale occurred in Xayabury province (Vientiane Times, 25 February 2011). At the end of March 2011, a 6.8 magnitude earth quake in Myanmar, near the border between Myanmar, Thailand and Lao PDR could be felt in northern Lao PDR. While there were 74 people had been killed, 111 injured three hundred and ninety houses, fourteen monasteries and nine government buildings damaged (IBT, March 2011). So far there has not been any record of earthquake damage or casualty in the north of Lao PDR. Most data about earthquakes

in Lao PDR is retrieved from the earthquake center in Unan province, China, while the earthquake information for the earthquakes that happened after 2007 were retrieved from the earthquake centers in Luang Prabang and Lakxao.

Floods

Flood hazard maps were developed for the most flood-prone river basins. Eight rivers were identified and determined for flood hazard and risk assessments in accordance with the past history of flooding as well as in consultation with various flood-related agencies. The rivers identified in the assessment include Nan Ou, Nam Ngum, Nam Ngiap, Nam Xan, Se Bangfai, Xe Banghiang, Xe Don and Xe Kong. Results show that several districts located within these eight river basins are prone to flooding; with different water levels and areas of inundation. The most common cause are structural problems such as insufficient and inadequate protection dykes, poor functioning of water control gates, lack of pumping stations or mobile pumps to drain flood water and insufficient natural drain channels. Furthermore, the ongoing deforestations and land degradation as well as

Figure 2.2 Xe Kong flood inundation for 10, 50 and 100 years return period



Source: UNDP, National Risk Profile Lao PDR, 2010

river straightening works and reclamation of wetlands combined with general poor land use planning increase the risk of disastrous floods.

However, there is also a relation between tropical storms and the occurrence of floods. Examples for that are the tropical Storm "Xangsane" in 2006 which caused severe floods in central and southern Lao PDR, the tropical Storm "Lekima" which hit the country in 2007 and also the tropical Storm "Ketsana" in September 2009. The Typhoon Ketsana affected more than 5 provinces caused an estimated damage of 58 million USD. The severe flood in 2011 caused by Typhoon Haima and Nokten killed 42 people in 12 provinces and severely destroyed houses, crops, schools, hospitals, roads, bridges, electricity polls, extension lines, communication systems, and caused widespread damage to irrigation schemes, aquaculture infrastructure and riverbanks. The total damages were around 200 million USD as estimated by the NDMO (Government of Lao PDR, 2011). Figure 2.2 shows the flood inundation for the Xe Kong river for 10, 50 and 100 years return period indicating the high risk of flooding in this area.

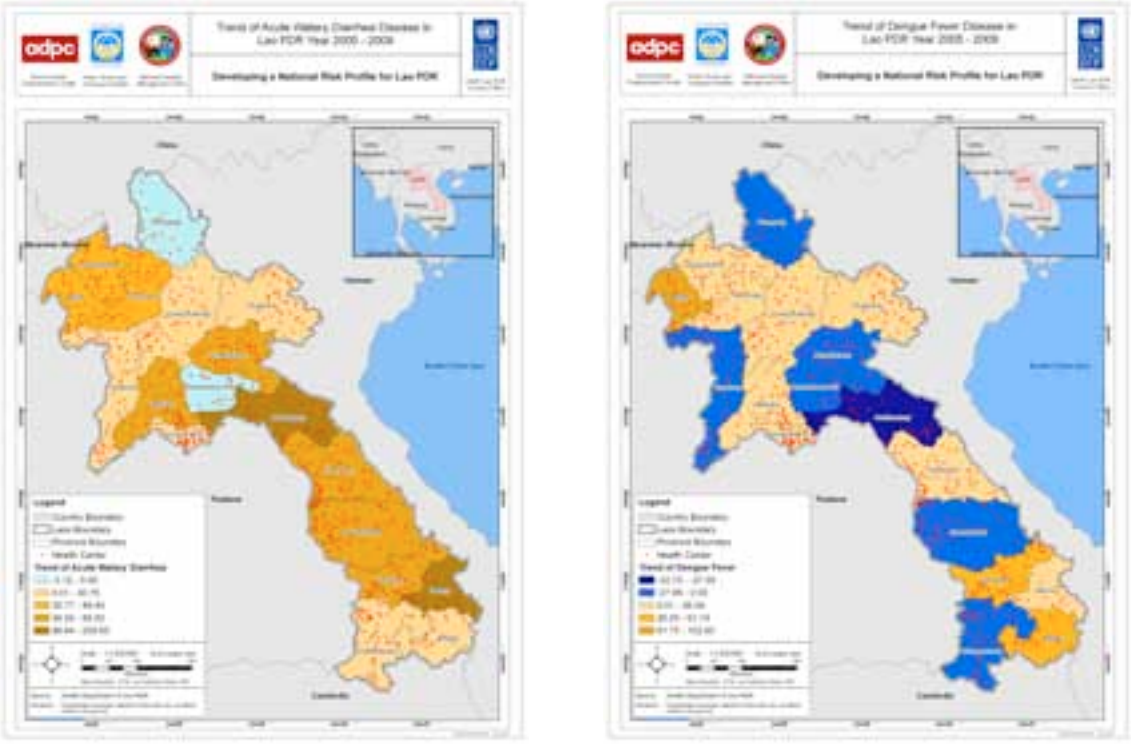
Figure 2.3 Landslide Susceptibility in Lao PDR

Source: UNDP, National Risk Profile Lao PDR, 2010

Landslide

In general, landslides or slope stability is mainly related to weather conditions. Rainfall is the main cause for landslide occurrences therefore most landslides occur during the monsoon season. However, factors such as soil condition and land use affect the occurrence of landslides as well. A large part of the country is located in low to medium landslide susceptibility zones. Only 5.24 % of the country is prone to very high landslide susceptibility. These high susceptibility zones are localized in the southeast and central part of Lao PDR as can be seen in Figure 2.3.

Figure 2.4 Disease susceptibility for Acute Watery Diarrhea and Dengue Fever



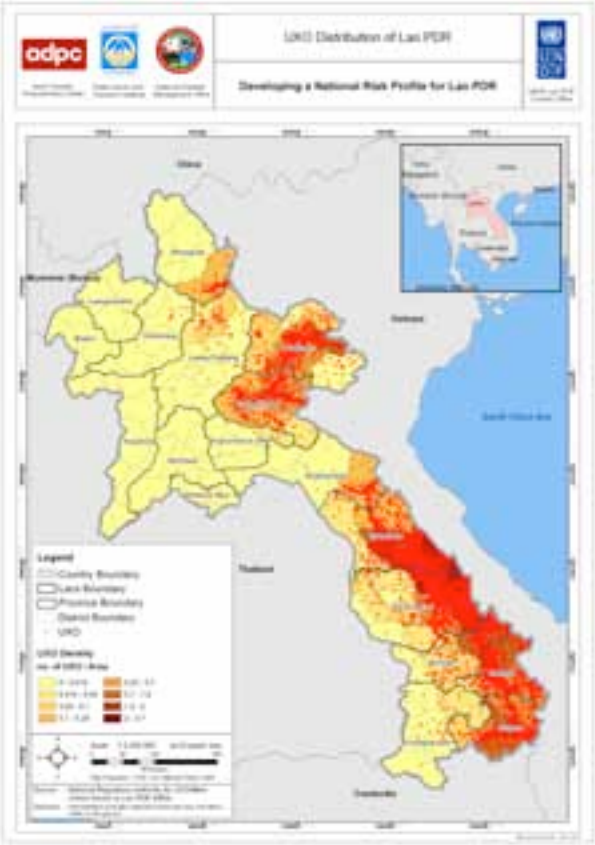
Source: UNDP, National Risk Profile Lao PDR, 2010

Epidemics

Twenty-two major diseases are monitored by the Ministry of Public Health of Lao PDR and regular reports are conducted to control the outbreak of these diseases[4]. The most common diseases are Acute Bloody Diarrhea, Acute Respiratory Tract Infection, Acute Watery Diarrhea, Dengue Fever, Dengue Hemorrhagic Fever, Food Poisoning, Hepatitis, Malaria, Measles and Typhoid Fever. Furthermore, Lao PDR has one of the highest tuberculosis incidence rates in the region with 90 new tuberculosis cases per 100,000 people in 2010 (WHO, 2012). In 2010, ADPC has calculated trends of these 10 diseases to show which provinces where most at risk and whether there was an increase or decrease in the number of cases for each of the 10 diseases. In particular noteworthy is the decrease of malaria cases from 2005-2009. Less cases of malaria were reported in each of the provinces besides two provinces in the south of Lao PDR, 15 Sekong and Attapeu. In general, there

4 These diseases include Acute Flaccid Paralysis, measles, neonatal tetanus, tetanus of all ages, diphtheria, pertussis, dengue fever, dengue hemorrhagic fever, dengue shock syndrome, acute watery diarrhea, acute bloody diarrhea, food poisoning, typhoid fever, anthrax, total hepatitis, meningitis, encephalitis, plague, acute respiratory tract infection, and suspect avian influenza

Figure 2.5 Distribution of UXOs in Lao PDR



Source: UNDP, National Risk Profile Lao PDR, 2010

are several diseases, amongst them dengue fever, which have a decreasing overall trend in the country (UNDP, 2010).

Unexploded Ordinances

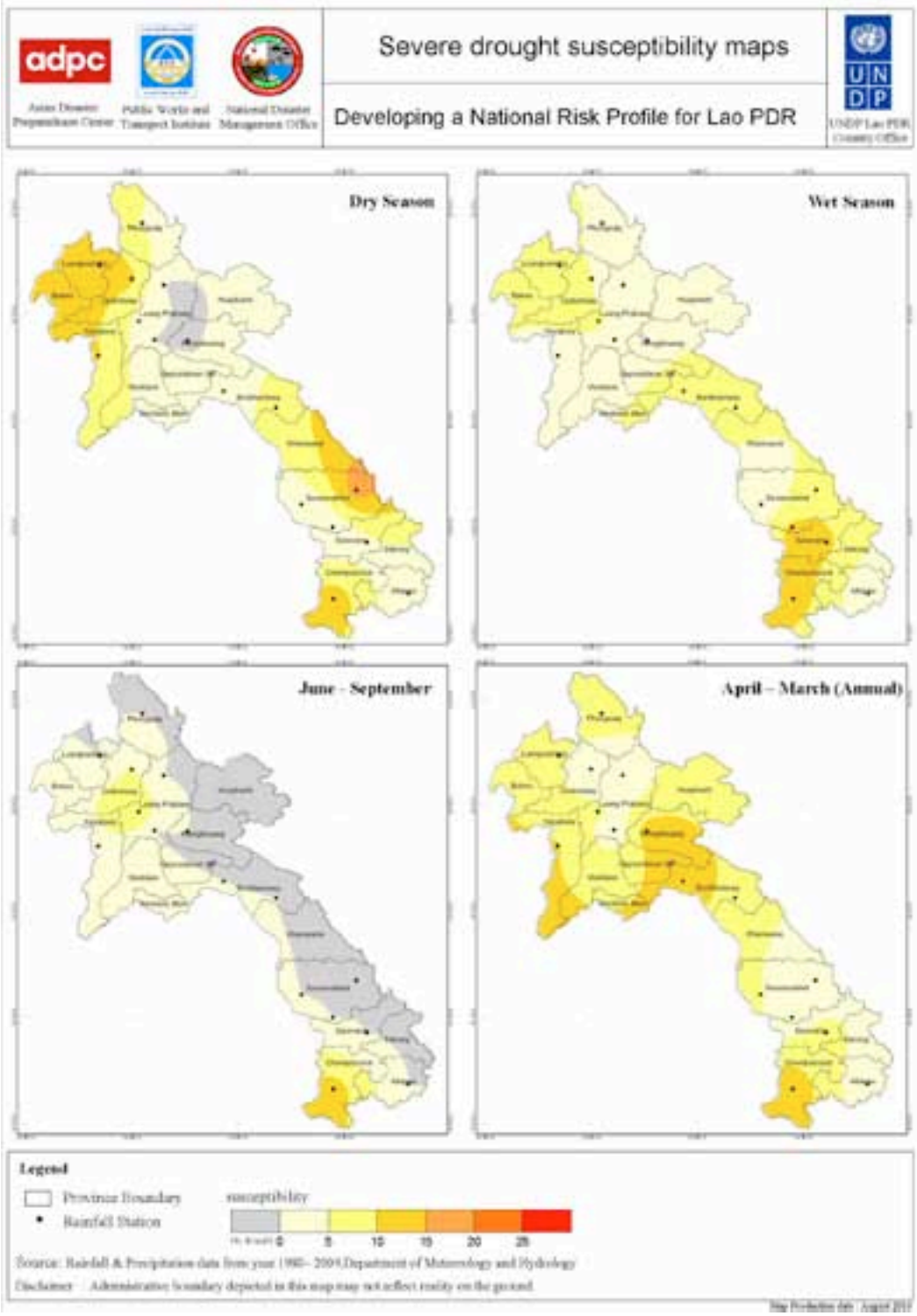
Several districts of Khammuane and Savannakhet province have a very high density of UXOs ranging from 2 – 4 UXOs per square kilometer. Several other districts in Huaphanh, Xiengkhuang, Saravane, 15 Sekong and Attapeu were also identified as areas with a high density of UXOs.

Drought

Due to the limited availability of data, only climatological data from 1993 to 2008 was considered for the drought assessment. SPI was used for drought analysis at different time scales. It was found that droughts of all categories occur in Lao PDR in all four durations. Moderate drought frequently occurs in all the durations but severe and extreme droughts are less common; except for severe drought in the dry season which has occurred many times. Drought was relatively more frequent in the first and third 5-year periods of analysis, with a lull in between. Probability of occurrence of drought of any category is found to be highest (27%) in Phalan in the dry season. It is also found to be high (25-27%) in Phiengluang. It should be noted that both the stations contain only about one decade of data and as a result of this lack of data availability amongst stations, it was difficult to make conclusive statements on drought-prone areas. In Lao PDR, southern parts of the central region, northern parts of the central region and southern parts of the northern region appear as drought susceptible areas in both dry and wet seasons.

A study conducted by the World Food Programme reveals that about 46 % of the rural population is vulnerable to drought. Most households vulnerable to drought live in the provinces of Khammouane, Savannakhet, Vientiane, Saravanh, Champasack and Sayaboury (WFP, 2006).

Figure 2.6 Severe drought susceptibility map

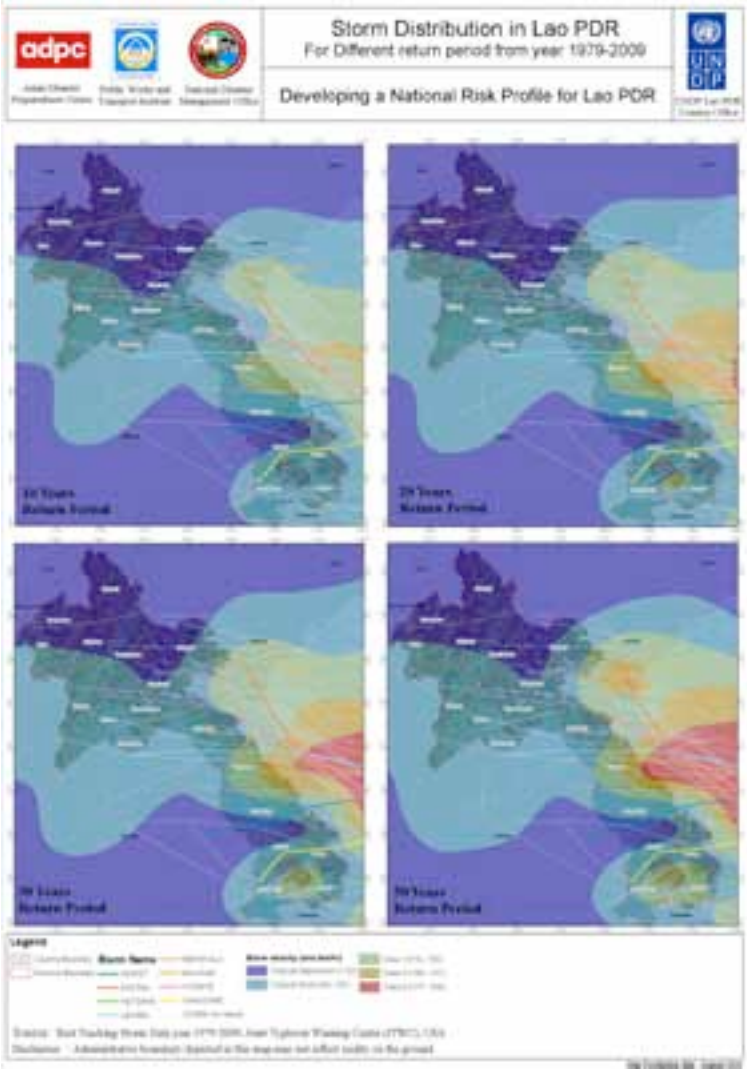


Source: UNDP, National Risk Profile Lao PDR, 2010

Storm

Storm hazard assessments were carried out for four storm return periods (10, 20, 30 and 50 years). The assessment analyzed areas covered in various provinces with regards to storms. Findings show that the Khammuane province is the most vulnerable province in the country. For 50 years return period, a class 3 (178 – 209 km/hr) storm is expected to hit parts of Khammuane province. Refer to Figure 2.7 for more details. The hazard assessment was based on the collection of relevant authentic data from various focal departments and agencies. For assessment purposes, well established technical methodologies were used and further validated by the focal departments.

Figure 2.7 Storm distribution in Lao PDR for different return period from 1979 to 2009



Source: UNDP, National Risk Profile Lao PDR, 2010

chapter 3

Initial Analysis of Disasters in Lao PDR using DesInventar

Introduction

The DesInventar database was originally developed in Latin America by the LA RED network in 1994. It is a computer-based information management system that helps with the "systematic collection, documentation and analysis of data about losses caused by disasters associated to natural hazards" (DesInventar, n.d.). Therefore, it can be used to analyze disaster trends as well as disaster impacts leading to better-informed prevention, mitigation and preparedness measures. Lao PDR started to implement the DesInventar in 2010/2011 with organizational support of the Asian Disaster Preparedness Center (ADPC) and monetary support of the United Nations Office for Project Services (UNOPS). The database is currently updated and the goal is to include disaster data from 1970 until now. While the database is still in its developing phase, the data needs to be analyzed with caution. Some provinces did not gather as much information as others which could give the expressions that some of the provinces/districts experienced less disaster than others, even though that is not the case in reality. The Government of Lao PDR and especially the National Disaster Management Office of Lao PDR will continue their work on the DesInventar in the coming years to ensure that the database can be used as a reliable information tool in the near future.

Natural hazards are classified in this analysis in five different groups: Biological hazards (caused by the exposure of living organisms to germs and toxic substances), climatological hazards (caused by long-lived/meso to macro scale processes), geophysical hazards (events originating from solid earth), hydrological hazards (events caused by deviations in the normal water cycle and/or overflow of bodies of water caused by wind set-up) and meteorological hazards (events caused by short-lived/small to meso scale atmospheric processes). In addition, a group of man-made hazards has been included in the analysis to ensure that hazards such as UXO are accounted for as well.

The DesInventar database of Lao PDR includes currently information about the following hazards: epidemics, plagues, fires, forest fires, floods, flash floods, storms, thunderstorms, windstorms, rains, cold waves and droughts and etc. For the initial analysis, these available hazards have been allocated to the different hazard groups. Unfortunately, there is not yet information available about earthquakes and landslides in the DesInventar database, which means that the impact of geophysical hazards on Lao PDR could not be studied more thoroughly.

Overall Disaster Analysis

The overall analysis is based on Lao PDR as a whole without differentiating between the different geographical units. This analysis will be based on the real data existed within DesInventar database at the moment. As can be seen in Table 3.1, fires are the most frequently reported disaster on a national level. Epidemics caused the death of the highest number of people in total; however, accidents are reported as deadliest incident in the case of Lao PDR. In agreement with other available analyses is that floods affected the highest number of people in total and floods are also associated with the highest overall costs in the last years as well as the highest costs per event.

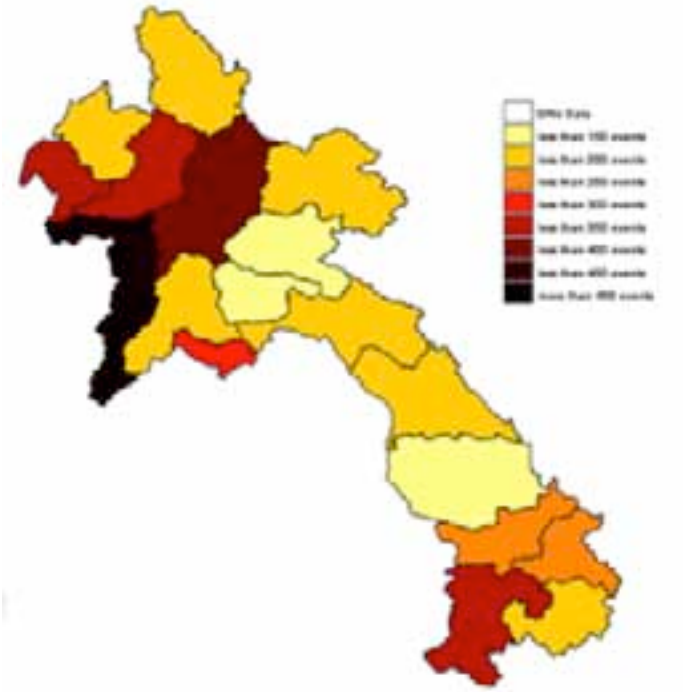
Table 3.1 Hazard Profile of Lao PDR

		# of Events	Killed	Total Affected	Losses in Kip
Biological	Epidemic	90	186	8.080	2,083,209,750
	Plague	59	-	199,805	3,110,414,000
Climatological	Forest Fire	12	-	677	687,086,000
	Cold Wave	9	-	670	224,150,000
	Drought	150	-	487,763	25,748,505,640
Hydro-Meteorological	Flood	1,205	113	3,496,846	4,111,115,514,955
	Flash Flood	32	2	2,269	21,496,081,010
	Rain	60	2	2,625	113,769,056,300
	Storm	693	38	550,415	2,495,688,775,878
	Thunderstorm	10	1	248	193,553,000
	Wind Storm	14	-	3,259	2,119,813,508
Man-Made	Fire	1,548	38	44,887	212,771,569,759

Source: DesInventar Data Lao PDR 2012 (1992 – 2012)

Taking into account the geographical distribution of disaster events in Lao PDR, Xayabury reported a remarkable number of events exceeding 450. Savannakhet and Xiengkhuang have reported the lowest number of events with less than 150 events in total. Further information about the geographical distribution of disasters can be found in Figure 3.1.

Figure 3.1 Distribution of hazard events in Lao PDR



Source: DesInventar Data Lao PDR 2012 (1992 – 2012)

Hazard Risk and Disaster Impact

Biological Hazards

Epidemics

Epidemics are defined as "disease attacking many individuals in a same community during short terms (days, weeks, months maximum), such as cholera, typhoid, bubonic plague, etc." (DesInventar, n.d.).

Only 10 out of 17 provinces experienced an epidemic according to DesInventar which means that epidemics are not among the most common hazards in Lao PDR. The district Phongsaly (Phongsaly province) reported the highest number of events; the number of affected people however remained considerably low. Furthermore, only Xayabury reported lost cattle associated with epidemics (170 in total).

Plagues

DesInventar defines plagues as "proliferation of insects or animal pests affecting communities, agriculture, cattle or stored perishable goods; for example, rats, locusts, African bees, etc." (DesInventar, n.d.).

As can be seen in Table 3.3, According to data existed in DesInventar database, only 11 provinces experienced plagues in the last 15 years. Plagues are associated with high number of affected and also with high damages in crops.

Comparison of the two biological hazards

Table 3.2 Impacts of Epidemics on Lao PDR

Province	No of Events	Deaths	ffected	Lost Cattle	Losses in Kip
01 Vientiane Mun.	3	0	0	0	461,435,000
02 Phongsaly	12	3	2,576	0	3,958,000
03 Luangnamtha	4	0	0	0	83,384,550
04 Oudomxay	4	0	0	0	6,000,000
07 Huaphanh	1	0	0	0	0
08 Xayabury	26	164	1,098	170	1,292,570,000
14 Saravane	17	0	75	0	0
15 Sekong	4	7	1,133	0	235,862,200
16 Champasack	19	12	3,198	0	0
Total	90	186	8,080	170	2,083,209,750

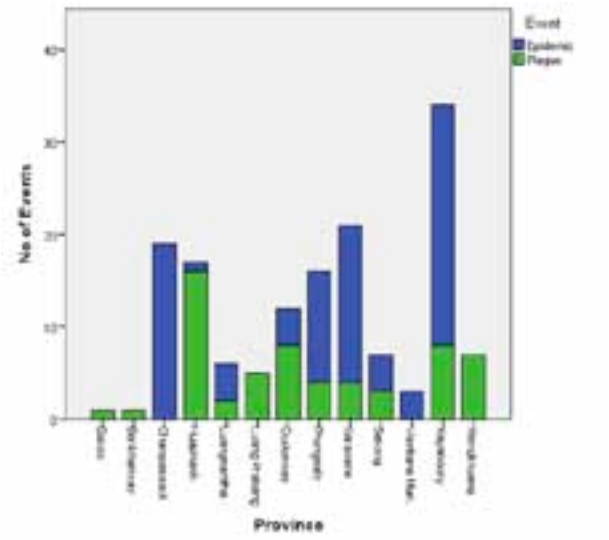
Source: DesInventar Data 2012 (1992-2011)

Table 3.3 Impact of Plagues on the different Provinces

Province	No of Events	Affected	Lost Cattle	Damages in crops Ha.	Losses in Kip
02 Phongsaly	4	7,758	0	264	870,478,000
03 Luangnamtha	2	4,508	0	0	0
04 Oudomxay	8	111,201	0	17,380	0
05 Bokeo	1	6,350	0	0	0
06 Luang Prabang	5	13,819	0	0	0
07 Huaphanh	16	27,343	0	890	5,940,000
08 Xayabury	8	18,830	0	4,144	727,236,000
09 Xiengkhuang	7	2,908	0	1,616	0
11 Borikhamxay	1	0	0	106	1,000,560,000
14 Saravane	4	0	0	0	0
15 Sekong	3	7,088	0	582	506,200,000
Total	59	199,805	0	24,982	3,110,414,000

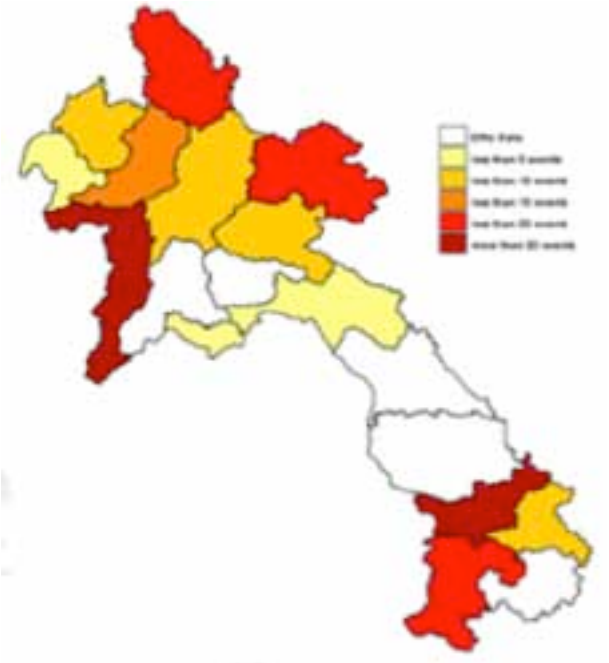
Source: DesInventar Data 2012 (1997 – 2012)

Figure 3.2 Overview of Events in the Different Provinces



Source: Own analysis based on DesInventar Data 2012

Figure 3.3 Distribution of Biological Hazard Events in Lao PDR



Source: DesInventar Data 2012

Biological hazards are not among the most common hazards in Lao PDR. Only 13 provinces of Lao PDR reported any biological hazards and most reported only occasional events. With regard to epidemics, the district Phongsaly (Phongsaly province) reported a very high number of events. However, the number of affected people remained considerably low. In comparison to that, plagues affect a high number of people (98.2% of the total number of affected people by biological hazards). Surprisingly, no lost cattle have been reported in association with plagues; however, Xayabury reported 170 lost cattle associated with epidemics. According to the DesInventar data, Xayabury is most prone to biological hazards, mostly caused by the high number of reported epidemics in that province. Please refer to Figure 3.2 for a more detailed overview of biological hazard events. This graph shows that most provinces experienced epidemics as well as plagues, and most provinces experienced more epidemics than plagues.

Table 3.4 shows that plagues did not cause a single death but they did affect significantly more people than epidemics. Furthermore, economic losses are higher for plagues which could be related to the huge damage in crops caused by plagues.

Climatological Hazards

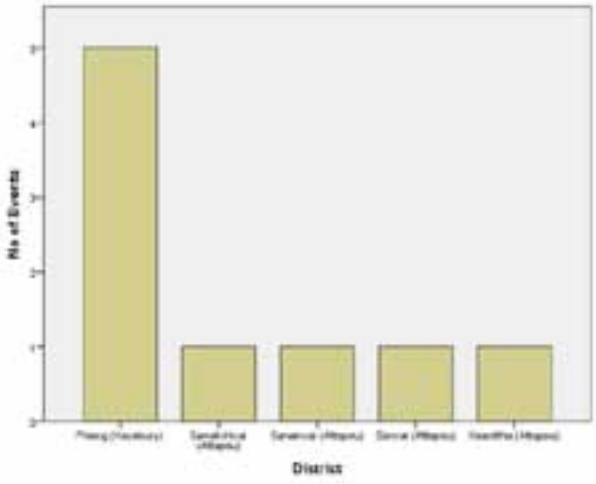
Cold Wave

Cold waves are defined as a "drop of atmospheric average temperature well above the averages of a region, with effects on human populations, crops,

properties and services" (DesInventar, n.d.).

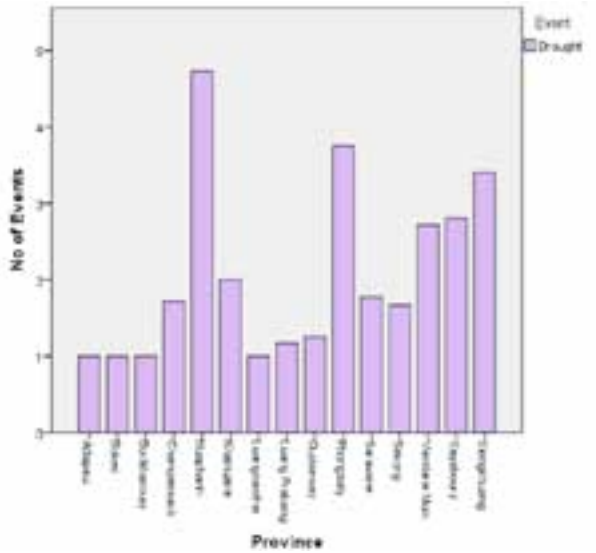
Since the climate change in the world, some years in Lao PDR was cooler than usual, but the cold wave data are not well documented. Under DesInventar only two provinces (Xayabury and Attapeu) reported cold waves and in general, cold waves are not associated with severe impacts. As can be seen in Table 3.5, there were only 9 events reported in total, and these events were not associated with a high number of affected or high losses. Furthermore, more than half of all events were reported by a single district, Phiang in Xayabury, as can be seen in Figure 3.4, indicating that cold waves are not a major hazard for Lao PDR on a national level.

Figure 3.4 Number of Events in the Different Districts



Source: DesInventar Data 2012 (2001-2011)

Figure 3.5 Number of Drought Events Experienced by the Different Provinces



Source: DesInventar 2012 (1996 – 2012)

Drought

Drought is "unusually dry seasons, without rain or with rain deficit and as a whole, these are long periods (months, years, and even decades) typical in limited continental areas or on regional scales" (DesInventar, n.d.).

Particularly all parts of Lao PDR has experienced with drought, due to the data collection from some provinces have some limitations. The DesInventar database shows that most of the provinces reported drought events. However, only Vientiane and Savannakhet did not report a single event, but it doesn't mean there are not drought events. Figure 3.5 presents that Huaphanh and Phongsaly were most prone to droughts compare to other provinces reported. However, the total number of droughts is still considerably low compared to other hazards.

Forest fire

Forest fires include all open-air fires in rural areas, natural and artificial forests, plains or similar. In general, forest fires are no frequent hazard in Lao PDR. Only 6 provinces reported

Table 3.4 Comparison between Epidemics and Plagues

Event	No of Events	Deaths	Affected	Lost Cattle	Damages in crops Ha.	Losses in Kip
Epidemic	90	186	8,080	170	0	2,083,209,750
Plague	59	0	199,805	0	24,983	3,110,414,000
Total	149	186	207,885	170	24,983	5,193,623,750

Source: DesInventar Data 2012

Table 3.5 Overview of Impacts of Cold Waves on the Provinces in Lao PDR

Province	No of Events	Affected	Deaths	Lost Cattle	Losses in Kip
08 Xayabury	5	265	0	0	10,000,000
17 Attapeu	4	405	0	0	214,150,000
Total	9	670	0	0	224,150,000

Source: DesInventar Data 2012 (2001-2011)

Table 3.6 Overview of the Impact of Droughts on the Different Province

Province	No of Events	Affected	Damages in crops Ha.	Losses in Kip
01 Vientiane Mun.	6	1,255	0	0
02 Phongsaly	18	27,053	1,232	697,470
03 Luangnamtha	1	3,131	0	0
04 Oudomxay	8	30,460	566	0
05 Bokeo	3	0	2,048	0
06 Luang Prabang	12	25,634	0	418,500,000
07 Huaphanh	29	79,131	2,878	120,000,000
08 Xayabury	10	1,745	1,628	735,360,170
09 Xiengkhuang	10	19,639	11,324	10,541,180,000
11 Borikhamxay	2	881	620	0
12 Khammuane	3	0	2,227	297,200,000
14 Saravane	13	5,840	675,847	0
15 Sekong	6	23,386	72	6,336,103,000
16 Champasack	14	265,537	37,818	6,252,810,000
17 Attapeu	15	4,071	0	104,655,000
Total	150	502,751	736,260	25,748,505,640

Source: DesInventar 2012 (1996 – 2012)

any forest fires and besides in district Xai (Oudomxay province) all districts only reported single events. The worst incident was the forest fire in Phongsaly (Samphan district) on 26 September 2009 where 204 people got injured and additional 400 got affected.

Table 3.7 Impact of Forest Fire on the Different Districts

Province	District	No of Events	Affected	Houses Damaged	Damaged Crops in Ha	Losses in Kip
01 Vientiane Mun.	Sangthong	1	0	0	260	0
02 Phongsaly	Samphan	1	675	0	0	0
04 Oudomxay	Beng	1	0	0	0	0
	Nga	1	0	0	0	0
	Xai	3	0	0	0	0
06 Luang Prabang	Louangphrabang	1	0	0	0	38,971,000
	Pak-Ou	1	0	0	0	88,840,000
08 Xayabury	Xaignabouri	1	0	0	0	529,930,000
	Xaisathen	1	0	0	0	26,000,000
11 Borikhamxay	Borikhan	1	2	1	0	3,345,000
Total		13	677	1	260	687,086,000

Source: DesInventar 2012 (2000 – 2010)

Conclusion Climatological Hazards

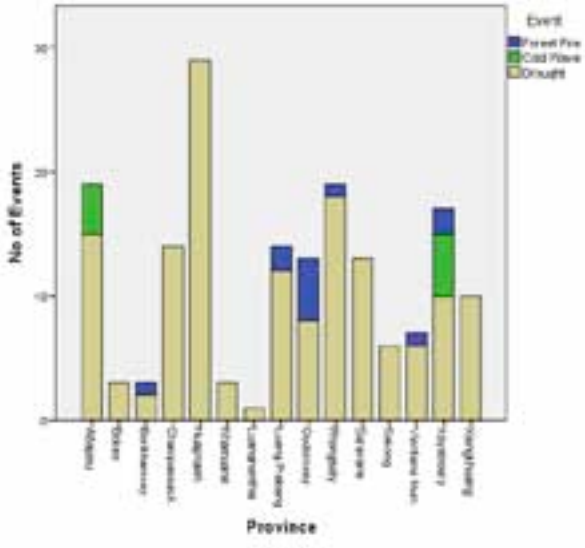
In conclusion, it can be said that droughts are by far the most frequently reported climatological hazard in Lao PDR (86.9% of the reported climatological hazards). Droughts have also the most serious consequences → a single drought event affects more people,

Table 3.8 Comparison of the Impact of the Different Climatological Hazards

Event	No of Events	Affected	Death	Houses Destroyed	Houses Damaged	Damaged Crops	Losses in Kip
Forest Fire	12	677	0	0	1	130	687,086,000
Cold Wave	9	670	0	32	0	0	224,150,000
Drought	150	487,763	0	6,074	69	736,261	25,748,505,640
Total	171	489,110	0	6,106	70	736,391	26,659,741,640

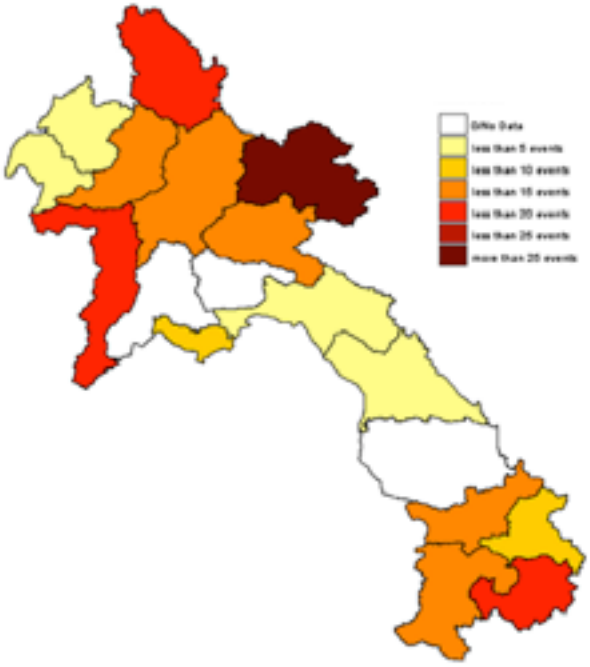
Source: DesInventar 2012

Figure 3.6 Overview of the number of different climatological events per province



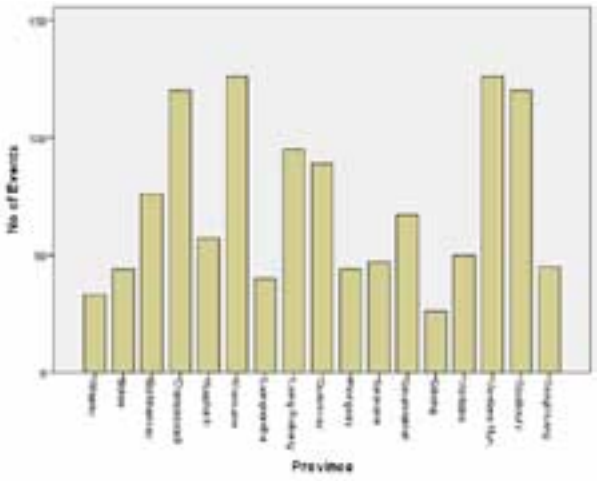
Source: DesInventar 2012

Figure 3.7 Distribution of climatological hazards in Lao PDR



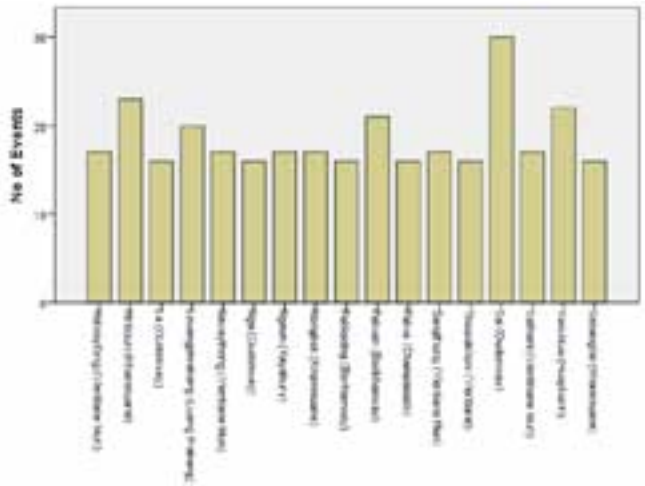
Source: DesInventar 2012

Figure 3.8 Overview of Number of Flood Events per Province



Source: DesInventar 2012 (1994 – 2012)

Figure 3.9 Most affected districts (more than 15 reported flood events)



Source: DesInventar 2012 (1994 – 2012)

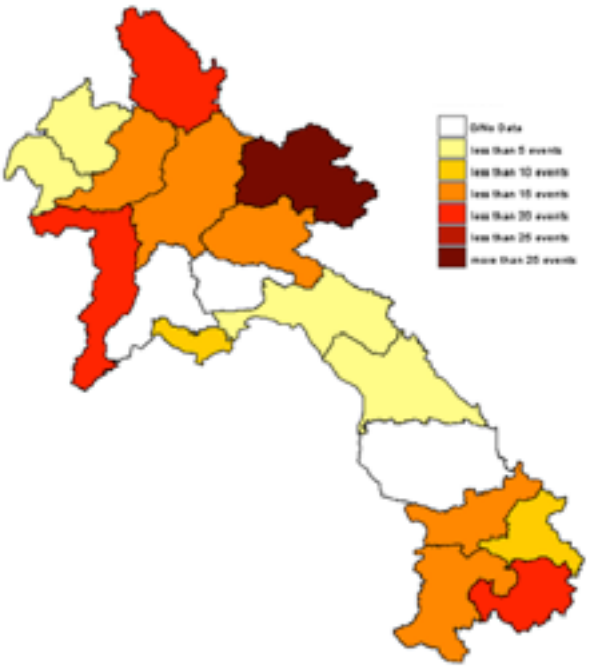
destroys and damages more houses as well as crops and roads, and results in the highest losses compared to a single forest fire or a single cold wave (refer to Table 3.8 for more detailed information). As can be seen in the Figure 3.6 underneath, most provinces are not affected by forest fires and/or cold waves but nearly all of the 17 provinces are affected by droughts (no data for Vientiane and Savannakhet). Luangnamtha has a very low number of reported climatological hazards.

Hydro-Meteorological Hazards

Flood

As mentioned in the introduction of this chapter, floods are the most frequently experienced natural hazards in Lao PDR. Based on the data available on DesInventar database it can be concluded, that floods are the most detailed documented hazards in Lao PDR. Floods affected a very high number of people (nearly 3.5 million people have been reported to be affected by floods). Floods are also associated with high numbers of damaged and destroyed houses, stressing the high impact floods have on Lao PDR. The provinces mostly affected by flood are located in central and southern part of Lao PDR such as Vientiane Capital, Vientiane province, Borikhamxay, Khammuane, Savannakhet, Saravane, Champasack, Sekong and Attapeu provinces.

Figure 3.10 Distribution of flood events in Lao PDR



Source: DesInventar 2012 (1994 – 2012)

Table 3.9a Overview of the Impact of Floods on Lao PDR

Province	No of Events	Affected	Deaths	Houses Destroyed	Houses Damaged	Losses in Kip
01 Vientiane Mun.	126	347,549	12	145	13,203	2,303,468,583,001
02 Phongsaly	44	55,846	1	30	108	542,809,351,700
03 Luangnamtha	40	60,725	0	1,369	13	17,394,266,400
04 Oudomxay	89	82,007	2	119	656	86,227,761,020
05Bokeo	44	42,651	0	11	106	40,382,531,930
06 Luang Prabang	95	23,327	11	38	112	11,625,514,400
07 Huaphanh	57	350,944	6	28	4,581	4,549,943,990
08 Xayabury	120	35,656	33	1,776	1,286	140,864,951,548
09 Xiengkhuang	45	3,538	6	94	1	7,990,152,000
10 Vientiane	50	75,948	4	92	4,256	2,622,337,860
11 Borikhamxay	76	332,410	5	10,688	796	51,132,082,097
12 Khammuane	126	1,089,765	5	0	1,906	56,241,239,624
13 Savannakhet	67	366,842	4	39	24,165	3,624,720,000
14 Saravane	47	190,917	2	176	78	1,148,560,844
15 Sekong	26	27,224	18	766	4,049	637,776,280,981
16 Champasack	120	338,351	4	16	385	202,024,213,560
17 Attapeu	33	73,146	0	69	222	1,233,024,000
Total	1,205	3,496,846	115	15,456	55,923	4,111,115,514,955

Table 3.9 Overview of the Impact of Floods on Lao PDR

A DesInventar data analysis focusing on the most affected districts (more than 15 flood events) showed that the most affect district is Xai (Oudomxay province) with 30 reported events. However, the impact of these flood events was less severe than in other districts with considerably less events.

Flash Floods

Flash floods are relatively common in the province located in the northern part of Lao PDR: Phongsaly, Oudomxay, Luangnamtha, Bokeo, Xayabury, Luang Prabang, Huaphanh and Xiengkhuang (DMH, 2012). According to DesInventar, Flash floods were only reported in Bokeo, Huaphanh, Luang Prabang, Phongsaly, Vientiane, Xayabury and Xiengkhuang. However, even though flash floods are not a frequent disaster, they still affect a huge amount of people. There impact on houses and crops, however, is less severe. When analyzing the impact of floods on the different districts, Thathom district in Xiengkhuang

Table 3.9b Overview of the Impact of Floods on Lao PDR (continued)

Province	Damages in crops Ha.	Education centers	Hospitals	Lost Cattle	Damages in roads Mts
01 Vientiane Mun.	479,707.22	0	2	696	18,497
02 Phongsaly	1,009.47	2	0	68	939
03 Luangnamtha	4	0	2	0	182.9
04 Oudomxay	82,519.13	7	0	50	0
05 Bokeo	538.18	0	0	124	0
06 Luang Prabang	20,564.44	0	0	109	28.35
07 Huaphanh	43,718.76	0	0	18	0
08 Xayabury	320,764,383.8	45,000,012	1	142	2,217,549,171
09 Xiengkhuang	1,415.94	2	2	63	0
10 Vientiane	24,285	16	0	276	0
11 Borikhamxay	47,629.831	57	0	457	90.35
12 Khammuane	788,053.99	116	0	8,544	420
13 Savannakhet	28,618.54	0	0	7	33
14 Saravane	32,266.15	66	10	0	0
15 Sekong	397.6	0	0	636	0
16 Champasack	51,052.252	4	0	166	178
17 Attapeu	611.15	0	0	0	0
Total	322,366,775.5	45,000,282	17	11,356	2,217,569.540

Source: DesInventar 2012 (1994 – 2012)

and Vangvieng in Vientiane are indentified as the districts with the highest number of events (4 each). Due to a lack of information reported from Luangnamtha and Oudomxay, these two provinces are not included in table 3.10.

Table 3.10 Impact of Flash Floods on the Different Provinces

Province	No of Events	Affected	Death	Houses Destroyed	Houses Damaged	Damaged Crops Ha.	Losses in Kip
02 Phongsaly	7	647	0	0	0	641	14,942,490,000
05 Bokeo	1	92	0	0	0	0	125,084,000
06 Luang Prabang	4	60	0	9	0	0	826,012,500
07 Huaphanh	2	627	0	0	0	0,30	70,000,000
08 Xayabury	5	433	2	11	8	47	178,825,064
09 Xiengkhuang	10	0	0	0	0	142	4,683,449,446
10 Vientiane	3	410	0	0	65	0	670,220,000

Table 3.11 Impact of Rain on the Provinces of Lao PDR

Province	No of Event	Affected	Death	Houses Destroyed	Education
02 Phongsaly	10	0	0	0	3
03 Luangnamtha	32	0	0	0	0
04 Oudomxay	1	31	2	0	0
06 Luang Prabang	1	11	0	0	0
07 Huaphanh	1	2,488	0	0	0
08 Xayabury	2	11	0	1	0
09 Xiengkhuang	7	0	0	0	0
10 Vientiane	5	21	0	2	0
15 Sekong	1	63	0	15	0
Total	60	2,625	6	18	3

Source: DesInventar 2012 (1996 – 2011)

Table 3.12 Impact of Storms on the Provinces in Lao PDR

Province	No of Events	Affected	Death	Houses Destroyed	Houses Damaged	Education
01 Vientiane Mun.	24	1,917	0	1	0	0
02 Phongsaly	47	2,762	0	36	0	61
03 Luangnamtha	35	6,307	0	43	0	0
04 Oudomxay	22	1,824	1	1	0	3
05 Bokeo	40	13,188	0	614	640	1
06 Luang Prabang	47	2,752	0	122	70	2
07 Huaphanh	13	5,470	0	0	7	1
08 Xayabury	102	5,612	8	137	1,327	108,660,518
09 Xiengkhuang	38	3,326	16	0	0	1
10 Vientiane	24	305	0	5	0	0
11 Borikhamxay	45	15,015	0	49	114	0
12 Khammuane	16	123,172	0	28	29,464	3
13 Savannakhet	30	111,580	2	102	17,447	0
14 Saravane	88	62,074	2	327	0	0
15 Sekong	43	131,335	4	243	424	38
16 Champasack	66	63,344	4	142	73	22
17 Attapeu	13	432	1	19	22	2
Total	693	550,415	38	1,869	49,588	108,660,652

Source: DesInventar 2012 (1993 – 2012)

	Damaged Roads	Damaged Crops	Losses in Kip
	0	808	21,800,000
	322	0	1,888,634,300
	0	0	0
	0	0	22,149,000
	0	106	895,310,000
	0	0	102,004,700,000
	4,000	0	2,172,193,000
	0	0	6,751,870,000
	0	0	12,400,000
	4,322	914	113,769,056,300

	Hospital	Lost Cattle	Damaged Crops in Ha.	Damaged Roads in Mts..	Losses in Kip
	0	12	0	0	23,658,021,500
	0	1	0	318	16,231,999,000
	1	0	0	0	2,229,650,500
	0	0	0	302	4,690,157,000
	0	0	0	0	7,323,652,500
	0	0	0	421	22,847,698,000
	0	0	644	435	5,816,298,270
	1	0	2	0	3,396,547,150
	0	0	0	1,672	104,327,053,220
	0	0	0	0	95,126,805,000
	0	8	312	0	2,123,893,876,432
	14	0	0	0	124,603,440
	5	0	0	69	20,155,653,000
	0	10,696	262,973	0	7,959,916,622
	11	1,169	1,522	10,480	52,195,747,035
	0	28	0	0	5,609,648,210
	0	0	0	0	101,449,000
	32	11,914	265,453	13,697	2,495,688,775,878

Table 3.13 Impact of storms on the most affected districts in Lao PDR (more than 10 events reported)

Province	District	No of Events	No of Deaths	No of Affected	No of Houses Destroyed	No of Houses Damaged
02 Phongsaly	Gnot-Ou	20	0	2,097	36	0
03 Luangnamtha	Sing	13	0	1,274	27	0
05 Bokeo	Houayxay	15	0	602	0	158
	Pha-Oudom	11	0	8,606	408	278
08 Xayabury	Kenthao	17	0	1,446	23	347
	Paklai	13	1	1,060	65	207
	Xianghon	13	6	28	20	0
11 Borikhamxay	Pakkading	14	0	3,657	2	0
	Pakxan	11	0	2,173	9	30
14 Saravane	Khongxedon	11	0	11,892	66	0
	Lakhonpheng	11	0	1,679	8	0
	Saravan	14	0	17,578	46	0
	Ta-Oy	15	2	5,867	81	0
	Vapi	11	0	7,184	25	0
15 Sekong	Lamam	16	0	60,389	2	298
	Thateng	12	0	8,330	161	0
16 Champasack	Xanasomboun	11	0	2,439	7	2
Total		228	9	136,301	986	1,320

Source: DesInventar 2012 (1993 – 2012)

Total	32	2.269	2	20	73	830	21,496,081,010

Source: DesInventar Data 2012 (1994 – 2012)

Rain

According to DesInventar, rain also belongs to the less frequent experienced disasters. Only half of the provinces in Lao PDR reported any disastrous rain events and more than 50% of all reported rains were experienced in Luangnamtha. However, even though Luangnamtha experienced the highest number of events, the impacts of these events were considerably low (see Table 3.11). Most of the events that have been reported in Luangnamtha can be accounted to the districts Long and Nale which were the worst hit

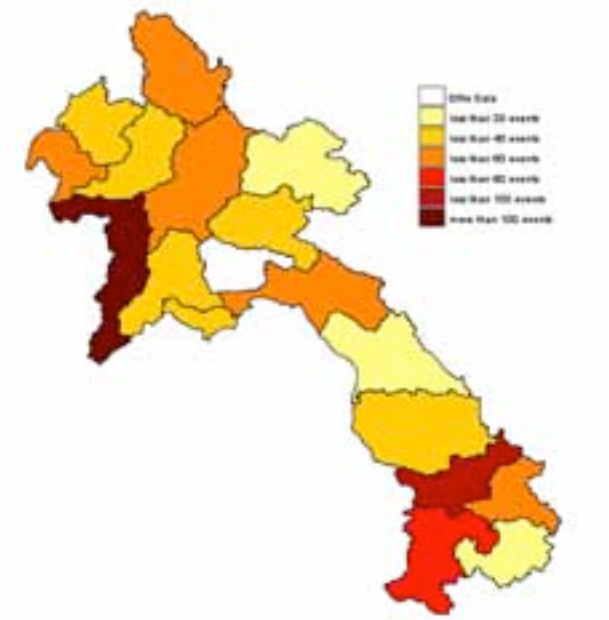
	No of Education Centers Affected	No of Hospitals Affected	No of Lost Cattle	Damaged Road in Mts.	Damages in Crops in Ha.	Losses in Kip
	38	0	1	0	0	343,760,000
	0	0	0	0	0	692,630,000
	0	0	0	0	0	1,605,056,500
	1	0	0	0	0	4,688,991,500
	4	0	0	0	0	536,317,250
	0	0	0	0	1.5	584,323,850
	0	0	0	0	0	275,507,500
	0	0	0	0	0	2,091,380,000,000
	0	0	0	0	0	9,157,932,508
	0	0	1,571	0	16,788	50,660
	0	0	0	0	0	835,474,800
	0	0	520	0	0	167,430,332
	0	0	3,593	0	114,237	6,932,498,543
	0	0	2	0	12,024	4,229
	5	5	1,087	9,800	618.66	14,614,952,478
	8	0	0	232	0	6,311,658,000
	2	0	0	0	0	1,354,091,800
	58	5	6,774	10,032	143,669.16	2,139,480,679,950

district with 13 and 11 cases respectively. Another surprising finding is the high number of affected people in Huaphanh. Huaphanh reported only a single event, the number of affected however, accounts for more than other provinces reported the event.

Storm /tropical storm (Typhoon)

Storm is defined as "rain accompanied by strong winds and/or electric discharges (lightning)" (DesInventar, n.d.). Tropical storms on the other hand are defined as storm/ typhoon which establishes itself in the Pacific Ocean and reaches land. There are on average 2 to 3 tropical storms in Lao PDR per year. However, tropical storms hitting China or Vietnam can cause heavy rainfall in parts of Lao PDR. Furthermore, they can cause floods as well as flash floods and landslides especially in the northern part of Lao. At the end of rainy season in 2009 typhoon Ketsana hit the southern part of Lao PDR causing server damages in 3 provinces in the south, namely Saravane, Sekong and Attapeu (DMH, 2012).

Figure 3.11 Distribution of storm events in Lao PDR



Source: DesInventar 2012 (1993 – 2012)

According to DesInventar database, all provinces experienced storms, however not all the provinces experienced a high number of storms within the last 20 years. Storms are associated with a high number of destroyed roads as can be seen in Table 3.12. As can be seen in Table 3.13, several provinces are especially prone to storms.

Thunderstorms

Thunderstorms are defined as "occurrence of atmospheric static discharges (lightning) with effects on people, cattle, domestic properties, infrastructure (power networks, for example, causing blackouts), and the environment". Therefore, thunderstorms are different from "storms", as thunderstorms are not accompanied by rain and gusty winds. The key differentiator is that damage is caused explicitly by lightning (DesInventar, n.d.).

In Lao PDR, only five different districts reported thunderstorms. The two districts in Sekong have experienced significantly more thunderstorms than all other districts. According to the DesInventar analysis, thunderstorms do not affect a lot of people but they do cause considerably high monetary losses and damaged/destroyed houses.

Table 3.14 Impacts of Thunderstorms on Districts in Lao PDR

Province	District	No of Events	Affected	Death	Houses Destroyed	Houses Damaged	Losses in Kip
05 Bokeo	PhaOudom	1	30	0	0	0	0
06 Luangprabang	Nan	4	60	0	0	0	122.000.000
08 Xayabury	Xianghon	1	26	0	0	0	28.913.000
15 Sekong	Dakchung	2	6	0	1	1	18.420.000
	Thateng	2	126	1	15	15	24.400.000
Total		10	248	1	16	16	193.733.000

Source: DesInventar 2012 (2006-2012)

Wind Storms

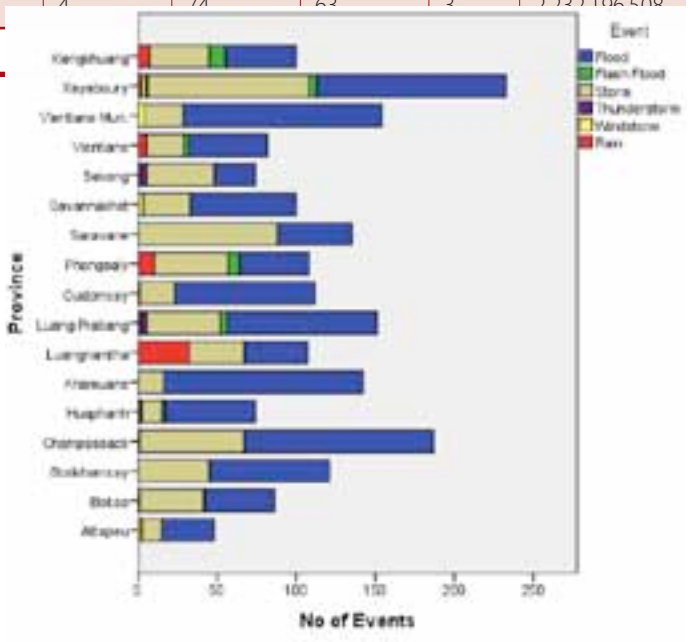
Wind storms mostly happen between March to April and at the beginning of rainy season. DesInventar data indicates only 14 districts that reported disastrous wind storms within the last 4 years. However, all events were single events and only Xaisathen (Xayabury province) reported more than a single windstorm. According to the data available, wind storms are associated with considerably high losses.

Table 3.15 Impact of Wind Storms on the Districts in Lao PDR

Province	District	No of Events	Affected	Houses Destroyed	Houses Damaged	Damaged Crops	Lost Cattle	Losses in Kip
01 Vientiane Mun.	Pak-Ngum	1	40	0	0	0	0	31,964,000
	Sangthong	1	135	0	0	0	0	44,611,000
	Sikhottabong	1	5	0	0	0	0	25,000,000
	Xaithani	1	0	0	0	0	0	858,125,000
07 Huaphanh	Houamuang	1	2,488	0	0	63	3	895,310,000
08 Xayabury	Xaisathen	3	129	0	0	0	0	40,680,000
13 Savannakhet	Atsaphon	1	0	0	0	0	0	0
	Songkhon	1	426	0	73	0	0	175,446,508
	Thapangthong	1	0	0	0	0	0	25,400,000
16 Champasack	Khong	1	8	0	1	0	0	124,870,000
17 Attapeu	Sanxai	1	19	3	0	0	0	3,610,000
	Xaisettha	1	9	1	0	0	0	7,180,000
Total		14	3,259	4	74	63	3	2,232,196,508

Source: DesInventar 2012 (2008 -2012)

Figure 3.12 Comparison of the number of different hydro-meteorological hazards per province

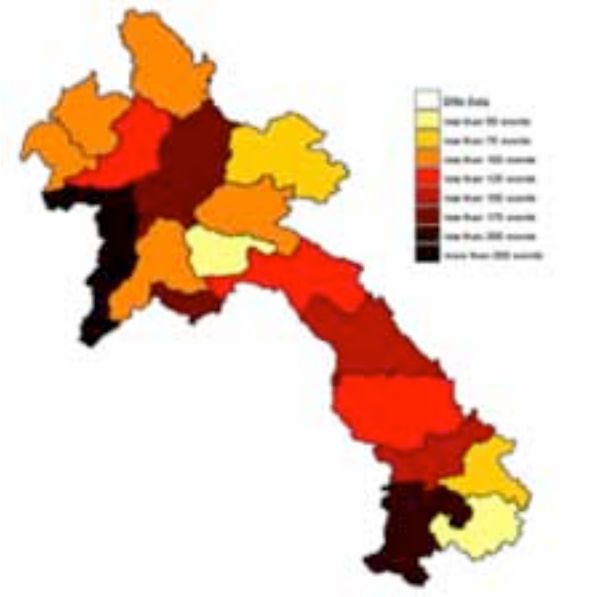


Source: Own analysis based on DesInventar Data 2012

Conclusion Hydro-Meteorological Hazards

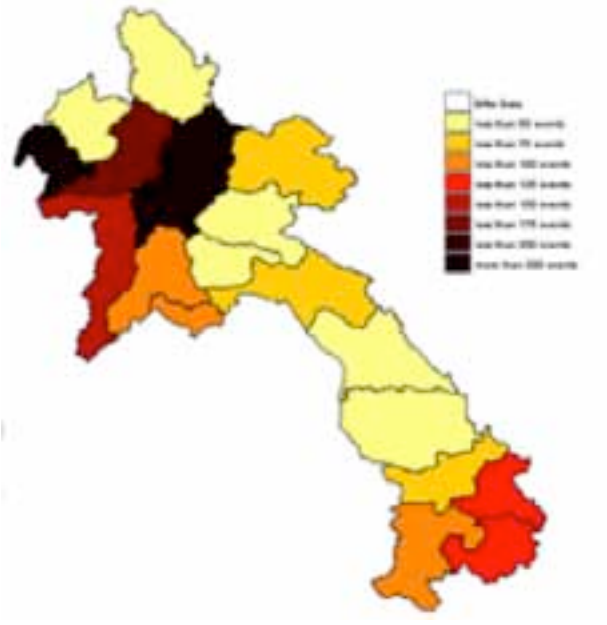
Hydro-meteorological hazards are the most frequent hazards in Lao PDR. Besides, they are associated with severe impacts such as high number of affected people and severe damage to houses and public buildings. The exact data can be found in Table 3.16. Xayabury reported the highest number of hydro-meteorological disaster with 233 events in the last 15 years. Figure 3.13 shows the geographical distribution of hydro-meteorological disasters in Lao PDR. The map indicates that especially the south

Figure 3.13 Distribution of hydro-meteorological events in Lao PDR



Source: Own analysis based on DesInventar Data 2012

Figure 3.14 Distribution of Fire Events in Lao PDR



Source: DesInventar 2012 (1990 -2012)

Table 3.16 Impact of Hydro-Meteorological Disaster on the Different Provinces

Province	No of Event	No of Deaths	No of Affected	
01 Vientiane Mun.	154	12	349,646	
02 Phongsaly	108	1	59,255	
03 Luangnamtha	107	0	67,032	
04 Oudomxay	112	5	83,862	
05 Bokeo	86	0	55,961	
06 Luang Prabang	151	11	26,210	
07 Huaphanh	74	6	362,017	
08 Xayabury	233	43	41,867	
09 Xiengkhuang	100	22	6,864	
10 Vientiane	82	4	76,684	
11 Borikhamxay	121	5	347,425	
12 Khammuane	142	5	1,212,937	
13 Savannakhet	100	6	478,848	
14 Saravane	135	4	252,991	
15 Sekong	74	23	158,754	
16 Champasack	187	8	401,703	
17 Attapeu	48	1	73,606	
Total	2014	156	4,055,662	

Source: DesInventar Data 2012

part of Lao PDR is prone to this kind of disaster as most of the provinces in the south experienced at least 150 events in the last years.

Floods are found to be the most frequently reported hydro-meteorological hazards in Lao PDR. Besides, floods affect the highest amount of people and they are also the costliest hydro-meteorological hazard. The hazards with the least severe consequences associated are thunderstorms. Furthermore, only floods and storms are experienced by all 17

	No of Houses Destroyed	No of Houses Damaged	No of Lost Cattle	No of Education Centers Affected	No of Hospitals Affected	Damaged Road in Mts.	Damages in Crops in Ha.	Losses in Kip
	146	13,203	708	0	2	18,497	479,707	2,328,087,896,001
	66	108	69	66	0	1,257	2,458	574,005,470,700
	1,412	13	0	0	3	505	4	21,512,551,200
	120	656	50	10	0	302	82,519	90,917,918,020
	625	746	124	1	0	0	538	47,831,268,430
	169	182	109	2	0	450	20,564	35,443,373,900
	28	4,588	21	1	0	435	44,532	12,226,862,260
	1,925	2,621	142	153,660,530	2	2,217,549,171	21,432	246,514,616,763
	94	1	63	3	2	5,672	1,558	119,172,847,666
	99	4,354	276	8	0	0	24,295	105,171,232,860
	10,737	910	465	57	0	90	47,942	2,175,025,565,529
	28	31,370	8,544	119	14	420	788,054	56,365,843.064
	141	41,685	7	0	5	102	28,619	23,981,219,508
	503	78	10,696	66	10	0	295,239	9,108,477,466
	1,040	4,489	1,805	38	11	10,480	1,920	690,026,649,035
	158	459	194	26	0	178	51,052	207,646,348,770
	92	244	0	2	0	0	611	1,345,263,000
	17,383	105,707	23,273	399	49	2,217,587,559	1,891,044	6,744,383,404,172

provinces; flash floods, thunderstorms, windstorms and rains are only experienced by a few provinces in Lao PDR.

Man-Made Hazards

Fire

Fires are the most frequently reported hazard followed by floods. Again, all provinces reported incidents of fire with Sekong being the province with the highest number of

Table 3.17 Impact of Fires on Lao PDR

Province	No of Events	Affected	Death	Houses Destroyed	
01 Vientiane Mun.	97	1,676	0	1	
02 Phongsaly	22	1,417	0	36	
03 Luangnamtha	48	3,717	1	75	
04 Oudomxay	164	4,497	5	173	
05 Bokeo	218	8,897	5	99	
06 Luang Prabang	215	3,721	2	335	
07 Huaphanh	61	3,255	5	22	
08 Xayabury	147	2,044	5	199	
09 Xiengkhuang	33	4,510	10	10	
10 Vientiane	95	671	0	56	
11 Borikhamxay	69	1,214	0	93	
12 Khammuane	11	335	0	6	
13 Savannakhet	3	167	0	15	
14 Saravane	50	1,314	5	31	
15 Sekong	121	4,531	0	252	
16 Champasack	92	1,571	0	19	
17 Attapeu	102	1,350	0	175	
Total	1,548	47,206	37	1,517	

Source: DesInventar 2012 (1990 -2012)

fires. However, the number of affected people is moderate with on average 30 people being affected by each single fire event.

Existing National Disaster Management Strategies in Lao PDR

National Disaster Management Plan 2012-2015

The National Disaster Management Plan (2012 – 2015) follows the Hyogo Framework for Action (HFA) as the overall framework to guide the response of stakeholders in addressing the impact of disasters. The document emphasises the importance of strengthening sub-

	Houses Damaged	Educational Centre	Hospitals	Damaged Crops	Losses in Kip
	22	0	0	0	30,593,842,642
	0	2	0	0	7,005,449,000
	0	0	0	0	21,291,010,237
	95	1	0	0	9,543,521,050
	189	3	0	88,794	7,283,573,539
	36	4	0	0	21,872,235,217
	75	11	0	0	11,819,189,000
	150	4	0	0	4,476,424,800
	0	0	1	0	1,652,633,000
	0	0	0	0	3,155,342,875
	2	0	1	0	5,668,948,024
	1	0	0	0	121,374,600
	6	0	0	0	2,319,664,024
	0	0	0	76,730	33,980,942,464
	130	1	0	0	8,106,334,387
	42	0	0	0	42,760,651,800
	4	0	0	0	1,120,433,100
	742	26	2	165,524	212,771,569,759

national capacities, particularly at the provincial and community level to fully support the government priority of poverty reduction as elaborated in national development plans and policies. At the national level, the Government has assigned a National Disaster Management Committee, composed of Minister's and senior representatives of Government bodies and chaired by the Vice Prime Minister, to institute a framework for disaster risk management. The framework developed by the Government of the Lao PDR is appropriately structured to identify and address the threats of hazards at the village, district, provincial, municipal and national levels of society. The following objectives of the National Disaster Management Plan stress the commitment of Lao PDR to disaster risk reduction:

- Align the strategic direction of disaster management programs with national priorities and international commitments.
- Articulate the vision and goals for disaster management
- Outline the strategic direction and priorities to guide the design and implementation of disaster management policies and programs.

- Create a cohesive and well-coordinated programming framework incorporating government, non-government and private sector.
- Ensure that disaster management has a comprehensive and all-hazards focus comprising disaster risk reduction and emergency response.
- Illustrate to other ministries, NGOs, civil society and the private sector how their work can contribute to the achievements of the strategic goals and government vision on disaster management.

National Adaptation Programme of Action to Climate Change

As mentioned before, Lao PDR is susceptible to the impacts of climate change especially from floods and droughts (severe adverse impacts on livelihoods and in particular, the livelihoods of the poorest and most vulnerable groups with the lowest adaptive capacity). The main objective of the NAPA is therefore to develop a country-driven program to address immediate and urgent needs related to current and projected adverse effects of climate change in key sectors. The key sectors for action identified by Lao PDR are agriculture, forestry, water and water resources, and human health. The NAPA is cross-cutting and includes issues already embedded in national development policies and strategies such as the National Growth Poverty Eradication Strategy (NGPES) as well as the Sixth National Socio-Economic Development Plan (NSEDP) from 2006-2010. The preparation of the NAPA is a significant contribution in terms of successful adaptation to climate change. It has been developed based on the urgent need for adapting to climate change and identifying measures that minimize the adverse impacts of climate change (flood and drought), based on past lessons learnt, the experiences of different sectors of Lao PDR, and an analysis of available technical information.

Example activities under the NAPA are: cooperation projects between the Lao National Mekong Committee, French NGOs and the National Disaster Management Office to prepare for flooding by providing communication equipment, computers and setting

chapter 4

Linking Poverty Reduction and DRR

up water level measurement gauges at the community level in Champasack District of Champasack Province, projects to minimize risks associated with drought have also been supported by Concern Worldwide and are operating in Khammuane and Savannakhet Provinces; whereas Australian Oxfam is working in Saravane.

Introduction

Poverty reduction has been one of the main objectives of development programs in many developing countries for the last several decades. Over the years, the very definition of poverty has evolved from just looking at people's income to taking a more holistic view of their well-being. This has led to increased emphasis on better integration of poverty reduction programs with other sectoral issues such as environmental management, gender development and public health.

In the recent decades the disaster management sector has also seen a paradigm shift. Disasters are no longer seen as extreme events created entirely by natural forces but as manifestations of unresolved problems of development. Therefore disaster management practices have evolved from largely a top-down relief and response approach to a more inter-sectoral risk management approach.

However, there are not many examples of systematic convergence of the two approaches and long-term integration of poverty reduction programs with disaster management, although there are enough of empirical evidences of the close nexus between disaster and poverty, particularly in the developing countries.

Disasters are not caused by natural hazards only; it is the vulnerabilities of people and their assets that transform hazards into disasters. Poverty is the worst and the generic

form of all vulnerabilities. Poor people are often located in unsafe areas, their shelters are generally not constructed with safe designs and materials, and they do not always have the access to early warnings and the means to quickly move to safer place.

Therefore it is the poor people everywhere and especially in the developing countries that have always suffered the most in disasters. Successive slow onset disasters like drought create famine like conditions forcing the poor people to migrate in search of new livelihood. Various studies have documented how poor people have been further impoverished by disasters and how poor families rising above the conditions of poverty due to various poverty alleviation initiatives have again sunk below the poverty line after disasters.

While it is clear that the poor are often the most affected in a disaster, it is too simplistic to assume that there is always a direct and absolute correlation between poverty and vulnerability. All the poor may not suffer in disasters nor is it only the poor who suffer; the impact of hazards may well be a factor in creating newly impoverished people. Poverty, as an indicator of lack of access to resources and income opportunities, is only one of the several dimensions of vulnerability; there are also other dimensions such as class, ethnicity, community structure, community decision making processes and political issues that determine poor people's vulnerability. A poor community may be economically vulnerable but at the same time may have social, cultural and political capacities to cope with disasters, which can be effectively utilized in designing risk reduction programmed for the poor.

Therefore there are no straightforward solutions for reducing the risks of the poor. Multi-dimensional approaches and innovative institutional arrangements are required to mainstream disaster risk reduction for poverty alleviation.

However, the Asia Pacific Disaster Report 2012, which was launched recently, has clearly established a linkage between disaster losses and people who largely pay for these losses. For example, after the 2009 Typhoon Ketsana in Lao PDR, which caused damages of USD 540 million, 55% of the losses were borne by small and marginal farmers. In the Philippines, the same Typhoon caused damages of USD 4.3 billion, and 90% of the losses were borne by poor urban households. In Pakistan, the 2010 floods caused USD 9.7 billion in losses, with 70% borne by poor households, and small and marginal farmers (UNESCAP & UNISDR, 2012).

The question on disaster losses and who pays for them also highlight the issue that economic and social vulnerabilities are closely linked. And disaster impacts are bidirectional in terms of aggravating economic and social vulnerability. It is of concern that as economies falter, it is these very social protection measures that come under threat, and even abolition, as countries are forced to balance budgets and reduce fiscal expenditures, thus increasing further, vulnerabilities to disasters and many other exogenous shocks.

Table 4.1 Matrix of Poverty, Inequality, Poverty Intensity and Poverty Gaps in Society

Region	Average Household Consumption/ month		Poverty Head Count		Poverty Gap		Poverty Intensity		Inequality (GINI Index)	
	2002/ 2003	2007/ 2008	2002/ 2003	2007/ 2008	2002/ 2003	2007/ 2008	2002/ 2003	2007/ 2008	2002/ 2003	2007/ 2008
Lao PDR	1,089.40	2,170.70	33.50	27.60	8.00	6.50	2.80	2.30	32.60	35.40
Urban	1,703.00	2,950.20	19.70	17.40	4.10	3.40	1.30	1.10	34.80	36.30
Rural	854.30	1,826.10	37.70	31.70	9.20	7.70	3.20	2.80	30.30	33.40
North	762.50	1,258.60	37.90	32.50	9.40	7.70	3.30	2.70	30.70	35.20
Central	1,236.70	2,389.10	35.40	29.80	7.10	6.90	2.60	2.50	31.00	34.00
South	909.30	1,948.00	32.60	22.80	7.60	5.60	2.50	2.10	31.40	32.20

Source: LECS 3 & LECS 4

Table 4.2 Poverty rates in the different regions

Region	Area	2002/03	2007/08
Northern Region	Total	37.9%	32.5%
	Urban areas	30.6%	14.6%
	Rural areas	39.1%	36.5%
	Xayabury	25%	15.7%
	Huaphanh		50.5%
Central Region	Total	35.4%	29.8%
	Urban areas	20.1%	22.2%
	Rural areas	39.0%	33.5%
	Borikhamxay	28.7%	21.5%
	Khammuane	33.7%	31.4%
Southern region	Total	32.6%	22.8%
	Urban areas	12.8%	11.3%
	Rural areas	35.5%	25.5%
	Champasack	18.4%	10%
	Sekong		51.8%
Vientiane Municipality	Total	16.7%	15.2%

Source: MPI, 2011 - Seventh NSEDP

Facts and Figures: Poverty in Lao PDR

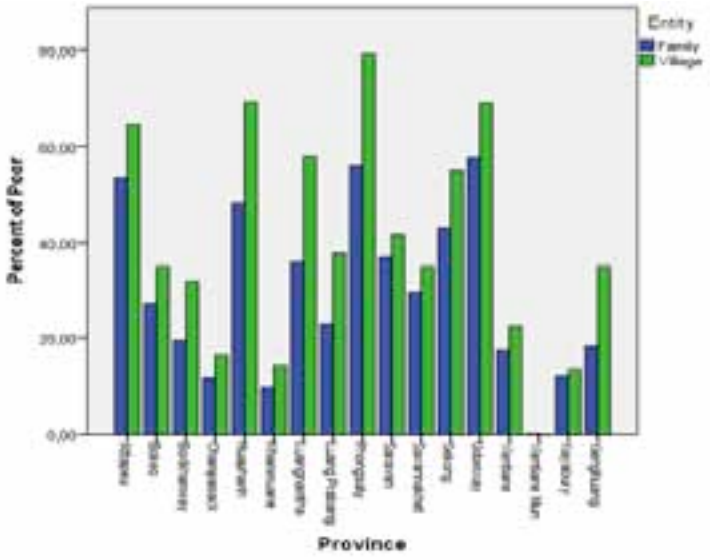
The most common indicator for monetary poverty is the poverty headcount. Lao PDR experienced a steady decline in the poverty headcount between 1992/93 to 2002/2003 at all levels (national, provincial and regional). Data about ownership also shows that the overall poverty situation in Lao PDR is less severe than several years ago. While in 2002/3 only 1% of the population owned a mobile phone, this number increased to 21% in 2007/08. A similar increased could be found for the ownership of tractors (7% vs. 23%) and ownership of motorbikes (7% in 2002/03 vs. 35% in 2007/08) (MPI, 2004 – LECS 3 & MPI, 2009 – LECS 4).

An additional indicator for monetary poverty is the poverty ratio as well as the poverty gap. The national poverty gap declined from 8% in 2002-2003 to 6.5% in 2007-2008, showing that the overall reduction in poverty did also reduce the depth of poverty in several cases. However, as can be seen in the table underneath, poverty rates as well as poverty intensity vary widely among the different regions.

Poverty figures in Lao PDR are highly related to different aspects such as: region, closeness to borders, altitude, and ethnicity. With regard to the different regions, it has been found that the Northern region has the highest poverty rates (32.5% in 2007/08) compared to Vientiane Municipality with the lowest poverty rates (15.2% in 2007/08).

However, even within the regions huge difference can be found between rural and urban areas. Areas close to the Vietnam border are also more prone to poverty. According to the report on the achievement of the implementation of NSEDP 2006-2010, the poverty rate at the border areas shared with Vietnam

Figure 4.1 Percentage of poor in the different provinces



Source: Lao National Leading Committee for Rural Development and Poverty Eradication, 2011

is 54.5%, while in the Mekong River border areas the poverty rate is as low as 16.1%. However, even at the eastern border area, poverty rate are lower than in the inland. Another aspect that influences poverty patterns is the altitude. Upland areas have a poverty rate of almost 43%, and make up 39% of the poor, while lowland areas only have a poverty rate of 20.4% (MPI, 2008). Altitude is also closely linked to ethnicity in the Lao PDR context. The Hmong-Lu Mien people who are found in the uplands and high mountains in the north have a considerably high poverty rate of 43.7, while the Lao-Tai people mainly living in the lowlands have a poverty rate of 18.4% (MPI, 2008). However, poverty patterns are not only linked to the different aspects mentioned above (region, altitude, ethnicity) but also depend on the combination of these which makes it difficult to identify populations particular at risk as several aspects plays a role.

Table 4.3 Matrix combining altitude with ethnicity and rural/urban areas

	Urban			Rural			Total		
	Lao Tai	Non-Lao Tai	Total	Lao Tai	Non-Lao Tai	Total	Lao Tai	Non-Lao Tai	Total
Lowlands									
Poverty headcount (%)	15.85	36.98	17.19	28.42	55.07	33.62	23.83	52.56	28.18
Poverty gap (%)	3.15	6.85	3.38	5.70	15.46	7.61	4.77	14.27	6.12
Poverty severity (%)	0.96	1.83	1.01	1.64	5.83	2.45	1.39	5.27	1.98
Midlands									
Poverty headcount (%)	27.29	62.59	37.73	28.11	49.44	36.24	27.96	51.13	36.48
Poverty gap (%)	5.94	16.90	9.18	7.79	13.15	9.83	7.46	13.63	9.73
Poverty severity (%)	1.78	6.17	3.08	3.35	4.60	3.83	3.07	4.80	3.71
Highlands									
Poverty headcount (%)	12.78	18.39	14.37	30.27	50.01	45.17	28.33	49.51	43.91
Poverty gap (%)	2.32	2.04	2.24	7.35	12.79	11.45	6.79	12.62	11.08
Poverty severity (%)	0.76	0.47	0.68	2.64	4.52	4.06	2.43	4.46	3.92
Total									
Poverty headcount (%)	16.84	43.79	19.58	28.60	51.13	37.71	24.97	50.62	33.56
Poverty gap (%)	3.39	9.83	4.04	6.33	13.50	9.22	5.42	13.24	8.04
Poverty severity (%)	1.03	3.21	1.25	2.10	4.85	3.22	1.77	4.74	2.77

Source: LECS 3

State of Education

Education is very important to reach the MDGs 1 and 2. Furthermore, education and poverty are highly interlinked and should be considered together. Education spending in Lao PDR is among the lowest in the region and account for 11% of the state budget. In 2002, Lao PDR had a relatively low literacy rate (77% for men, 61% for women), however, the quality and quantity of education in Lap PDR has been recently expanded. Especially in rural remote areas new schools have been constructed and schools, vocational training centers and community education center have been repaired and improved. The number of primary schools has for example been increased from 8,192 schools in 2000 to 8,968 schools in 2010 (MPI, 2011 - Seventh NSEDP). At the same time, the enrolment rate could be increased considerably. While the enrolment rate in primary school has been 79% in 2000, it could be increased to 92.7% by 2010.

State of Health and Nutrition

With regard to health and nutrition, progress has been made in the last years with regard to several of the indicators. Even though Lao PDR is still below regional average regarding most health indicators, it is likely that this status is going to be changed in the coming years. Life expectancy in Lao PDR is currently 64.7 years and is slightly lower for male than for female (62.7 and 67.7 respectively). Furthermore, a lot of the indicators are also linked to the area studied. When comparing the data for births attended by skilled health personnel, it is obvious that the medical support is less accessible in rural areas. In rural areas skilled personnel have attended only 11% of all births, while the same figure is 68% in urban areas (WHO, 2012).

Existing National Disaster Management and Poverty Reduction Policies in Lao PDR

National Growth and Poverty Eradication Strategy (NGPES)

The NGPES is the strategic framework under which all of the Government's future growth and poverty eradication programmes will be developed and implemented. The strategy is a result of a process that has started in 1996 when the 6th Party Congress defined the long-term development objective as freeing the country from the status of least-developed country (LDC) by 2020. The NGPES is designed to accelerate the positive trend in reducing poverty in the Lao PDR while emphasizing the promotion of sustainable growth, coupled with continuous social progress and equity. Furthermore, the strategy stresses the Lao PDR government's commitment to sound macroeconomic policies to sustain growth. The

three mains of the NGPES are: (i) fostering economic growth with equity; (ii) developing and modernizing Lao P.D.R.'s social and economic infrastructure; and (iii) enhancing human resource development (IFM & IDA, 2004).

The Seventh National Socio-Economic Development Plan (2011-2015)

The Seventh National Socio-Economic Development Plan (2011 – 2015) (NSEDP) serves as the means to implement the Resolution of the Ninth Party Congress as well as the Socio-Economic Development Strategy with the goal to transform the country into a modern and industrial society. The NSEDP supports the graduation of Lao PDR from the Least-Developed Country (LDC) status by 2020, and creates opportunities for strengthened regional and international co-operation. Part of the long term goal of the country is the implementation of its policy of national development, achieve economic growth of at least 8% annually, reduce poverty, achieve the Millennium Development Goals by 2015 and construct basic infrastructure for industrialization and modernization in the times to come. The main targets and directions of the Five-Year Social-Economic Development Plan are as follows:

1. Ensure continuation of national economic growth with security, peace and stability, and ensure GDP growth rate of at least 8% annually and GDP per capita to be at least USD 1,700.
2. Achieve the Millennium Development Goals by 2015, and adopt appropriate technology, skills and create favorable conditions for graduating the country from LDC by 2020.
3. Ensure the sustainability of development by emphasizing economic development with, cultural and social progress, preserving natural resources and protecting the environment using DRR and CCA.
4. Ensure political stability, peace and an orderly society.

2010 MDG Acceleration Framework

The 2010 MDG Acceleration Framework builds on the findings and recommendations of the MDG Progress Report, the Mid-term Review of the 6th Plan, as well as consultations with various experts and officials of the Government of Lao PDR. The Framework builds on innovative initiatives and approaches to poverty reduction that has shown proven results internationally and locally and can be scaled up in Lao PDR. In order to reach the MDGs, six priority areas have been identified:

- Expanding the reach of the enabling infrastructure for MDG achievement
- Sustainable practices for improved food security and environmental sustainability
- Universal access to basic education and gender equity
- Women's equal participation and empowerment
- Improved maternal and child health
- Safe water supply and improved sanitation for all rural areas and small towns

Poverty and Disaster Linkages in Lao PDR

As pointed out in the introduction of chapter 4, there is various empirical evidence that poverty and disaster risk are influencing each other. In order to be able to estimated the impact of poverty and disaster risk on each other in the context of Lao PDR, an analysis of poverty and disaster data has been carried out. The analysis is based on two different sets of data. On the one hand, disaster data at provincial and district level has been used based on the DesInventar data. The following indicators have been used to define disaster:

I. No of hazard events (total per province and total per district)
II. No of affected people
III. No of deaths
IV. No of affected houses (destroyed and damaged)
V. Damaged Crops in Ha.
VI. Losses in Kip

The poverty data is based on the results of survey on poverty and development (LNLCRDPE, 2011) and the following indicators have been used:

I. province level:
    1. Percentage of poor families/villages/districts
    2. Percentage of developed families/villages/districts
II. district level:
    1. Percentage of poor families/villages/Districts
    2. Percentage of developed families/villages/Districts
    3. Percentage of villages with no or with primary school more than 1 walking hour away
    4. Percentage of villages with no or with health centre more than 2 walking hours away
    5. Percentage of villages without access to clean water
    6. Percentage of villages without all weather road access

The choice of the indicators for poverty is based on the definition of poverty in Lao PDR (LNLCRDPE, 2009). According to this document individual poverty is based on monthly per capita income regardless gender, age and taking the national currency as the measurement unit with the national average of 192,000 kip/month/person. A household is defined as poor when the household has an average monthly per capita income below

the individuals' poverty criteria. Any village that lacks of the following conditions for development is considered a poor village:

- 51% or more of the households within the village are considered as poor
- no primary school, next school is more than one walking hour away
- no health care net such as drug revolving fund, drug store: nearest health centre or hospital is more than two walking hours away
- no clean water available
- no all-weather road access

A district is considered as poor when it has more than 51% of poor villages.

Constraints of the Analysis

As mentioned before, the DesInventar database is still in its development phase. Therefore, some of the provinces and/or districts gathered less data than others which could influence the analysis of linkages between poverty and disaster in the Lao PDR context.

Poverty and Disaster Risk at Province Level

As a first step in analyzing the relationship between poverty and hazards, we look at the correlations among the different hazard impact indicators and poverty indicators using aggregate province level data. The results of the correlation analysis are presented in Table 4.4. As expected are the different poverty indicators (percentage of poor families/ villages/district) positively and significantly associated with each other. The same holds for the development indicators (percentage of developed families and villages).

It is found that the number of events if significantly positive related to the percentage of developed villages. There is a possible explanation for this result: Developed villages are probably more likely to report disaster as they have more means to do so. However, that does not necessarily mean that there are actually more disaster events in the developed villages.

A second finding is that the percentage of poor villages is negatively related to all disaster indicators (the more poor districts there are in one province the less disasters have been reported, the lower the number of affected and death and the lower the number of affected houses, the lower the losses and the lower the area of damaged crops). This finding could partly be influenced by the fact that poor districts are probably more rural which means that there are less houses in total and therefore less affected houses. Furthermore, it is likely that poor districts have less things of high value that could be destroyed during a natural hazard which means that they experience lower monetary losses. However, there is no information about social and/or psychological impact of disasters on the different villages included in the analysis. It could be that poor villages are more likely to suffer more/longer from the consequences of a natural hazard, even though the actual losses are less severe for them.

The third major finding is that the percentage of developed villages is positively correlated with all disaster indicators besides number of affected and number of houses affected. The higher the percentage of developed villages in each province, the higher the number of events in general, the higher the number of deaths and the higher the number of destroyed crops (significant correlation) and the higher the monetary losses (not significant).

The lack of evidence between poverty indicators and disaster indicators could be caused by the highly aggregate nature of province level data. Disasters seldom affect whole provinces and they also cross province boundaries. A correlation analysis on district level is therefore more relevant.

Poverty and Disaster Risk at District Level

In the district on district level, several additional poverty indicators have been included to make the analysis more relevant. The following indicators have been used as poverty indicators:

1. Percentage of poor families/villages
2. Percentage of developed families/villages
3. Percentage of villages with primary school more than 1 walking hour away
4. Percentage of villages with health centre more than 2 walking hours away
5. Percentage of villages without access to clean water
6. Percentage of villages without all weather road access

As expected, the percentage of poor families/villages is positive correlated with all the other poverty indicators. Districts with a high percentage of poor families/villages are significantly more likely to have a primary school which is more than 1 walking hour away, a health centre which is more than 2 walking hours away, more villages without access to clean water and more villages without an all weather road access. However, when it comes to the linkage between disaster risk and poverty, it was again found that the percentage of poor families/villages is negatively correlated with all disaster indicators which support the idea that less data gathering has been carried out in poorer districts/villages.

Another finding is that villages without primary school have reported significant higher numbers of death and monetary losses and villages without health centre reported significantly higher numbers of death. It could therefore be possible that even though there has not yet been found a direct link between poverty and disaster risk in the context of Lao PDR that poverty does influence the risk of a high disaster impact via other factors such as lack of health centres etc. The data shows that poor villages are less likely to have a health centre or primary schools and less primary schools and health centres are related to higher number of deaths and monetary losses. It could be concluded, that poor villages are therefore more likely to experience these negative effects of disasters.

Table 4.4 Correlation of poverty and disaster indicators on provincial level

	1	2	3
1. Percentage of Poor Families	1		
2. Percentage of Poor Villages	,637**	1	
3. Percentage of Poor Districts	,287	,785**	1
4. Percentage of Developed Families	-,744**	-,570*	-,434
5. Percentage of Developed Villages	-,472	-,471	-,285
6. No of Events	-,155	-,342	-,121
7. No of Affected	-,170	-,318	-,320
8. No of Deaths	-,285	-,359	-,313
9. No of Houses Affected	-,164	-,326	-,356
10. Losses in Kip	,424	-,119	-,285
11. Damages in Crops in Ha.	-,274	-,355	-,296

*** correlation is significant at the 0,01 level (2-tailed)*
** correlation is significant at the 0,05 level (2-tailed)*

Table 4.5 Correlation of poverty and disaster indicators on district level

	1	2	3	4
1. Percentage of Poor Families	1			
2. Percentage of Poor Villages	,882**	1		
3. Percentage of developed families	-,626**	-,595**	1	
4. Percentage of Developed Villages	-,452**	-,494**	,593**	1
5. Next Primary School > 1 walking hour away	,304	,380*	-,299	-,289
6. Next Health Center > 2 walking hours away	,377*	,492**	-,337*	-,265
7. No clean water available	,458**	,539**	-,223*	-,154
8. No all weather road access	,509**	,712**	-,415**	-,463**
9. No of Events	-,099	-,264**	,113	,168
10. No of Affected	-,126	,035	-,062	-,009
11. No of Deaths	-,076	-,129	,206*	,204*
12. No of Houses Affected	-,142	-,058	-,118	-,074
13. Losses in Kip	-,088	-,009	,162	,312**
14. Damages in Crops in Ha.	-,047	-,116	,123	,043

*** correlation is significant at the 0,01 level (2-tailed)*
** correlation is significant at the 0,05 level (2-tailed)*

	4	5	6	7	8	9	10	11
	1							
	,657**	1						
	,273	,553*	1					
	-,231	-,067	-,225	1				
	,390	,624**	,660**	-,189	1			
	-,096	-,092	-,373	,666**	-,082	1		
	-,110	,259	,010	,044	-,048	,098	1	
	,360	,638**	,650**	-,181	,992**	-,057	-,054	1

	5	6	7	8	9	10	11	12	13	14
	1									
	,873**	1								
	,441**	,442**	1							
	,392*	,435**	,418**	1						
	-,061	-,188	-,097	-,175	1					
	-,010	-,082	,030	,066	,067	1				
	,497**	,555**	-,031	,023	,230**	-,067	1			
	-,023	-,129	-,100	-,044	-,102	,501**	-,057	1		
	,501**	-,027	,005	,007	,129	,093	-,022	,016	1	
	,180	,061	,069	-,038	,140	-,046	,812**	-,033	-,017	1

Disaster Risk Reduction to Support Poverty Reduction in Lao PDR

There is considerable evidence that there is a link between poverty and disaster risk. This linkage has been stressed in several publications of the last years as for example by the UNDP in their report "Reducing Disaster Risk: A Challenge for Development" (2004) and by the DFID in their paper "Reducing the Risk of Disaster – Helping to Achieve Sustainable Poverty Reduction in a Vulnerable World" (2006). However, even though it seems to be clear that there is an interaction between poverty and disaster risk, the exact way of interaction is not yet conclusive. Lao PDR has already recognized the importance of DRR for poverty reduction. The 7th NSEDP is a good example of the commitment of the government of Lao PDR to use disaster risk reduction measures as a means to alleviate poverty. The document stresses the importance of DRR for poverty reduction as can be seen in the following examples taken from the 7th NSEDP.

One of the goals of the NSEDP is to "secure the country from losses due to natural disasters, such as controlling forest fires, drought, flood, erosion of rivers, and denuding of mountains". Furthermore, it expresses the commitment of the Lao PDR government to DRR activities such as:

- effort will be made to take precautionary steps to mitigate the impact of catastrophes like floods, bank erosions, droughts, and fire
- capacity and participation of entities regarded central and active points in disaster management will be strengthen
- early warning systems will be established and the number of meteorology and hydrology stations in risk areas will be increased
- disaster risk reduction strategy and adaptation to climate change will be integrated into sector development plans
- disaster education will be integrated into normal school curriculum and school construction needs to take into account natural hazard risk

The 7th NSEDP shows that Lao PDR is on a good way to systematically integrate disaster risk reduction into development plans to reach sustainable economic growth. The development of the DesInventar database in Lao PDR is another example of the strong interest of the Lao PDR government to analyze the actual impacts of disasters on Lao PDR in a systematic way.

chapter 5

Conclusion and Recommendations

Over the last 3 decades, the Lao PDR has experienced economic growth resulting amongst other in a poverty reduction. However, disasters have continued to occur in higher frequency and greater magnitude resulting in great losses to human lives, properties, socio-economic gain and the environment. All the disasters are likely to have impacted the growth of socio-economic development, setback the achievements of MDG, and hindered the effort of poverty reduction and livelihood activities. Especially in the case of Lao PDR, this negative effect on the economy is disastrous. The recent 7th Asia-Europe Parliamentary Partnership Meeting (ASEP) held in Vientiane emphasized the importance of integrating disaster risk reduction and disaster management aspects in development and poverty reduction strategies. The ASEP Parliamentarians noted that hundreds of millions of poor people in Asia are extremely vulnerable to natural hazards which pose a risk to development. It is widely accepted among ASEP partners that collaborative action is needed to mitigate the effect of disasters on development efforts. The Lao PDR National Assessment Report (LNAR) for Disaster Risk Reduction is an attempt to create more awareness on the overall disaster risks in the country and the impact of the disaster risk on poverty. The importance of disaster risk reduction for Lao PDR when it comes to economic growth and especially the graduation from LDC status is also stressed by the UNDP. In a recent publication of the UNDP, disaster risk reduction/ disaster risk management is mentioned as an essential step to meet the third criterion for LCD graduation namely the economic vulnerability index (UNDP, 2012).

The recommendations can be divided in two parts. The first set of recommendations deals with the DesInventar database, while the other set of recommendations is more related to the long term development and general issues related to disaster management.

1. Improvement of DesInventar Database. The on-going efforts of Lao PDR to establish a national disaster loss database have been appreciated widely for its ownership by the National Government as well as involvement of provincial authorities. It provides basic data on last 30 years of disasters that help in analyzing disaster trends and help in making investments decision in disaster prevention measures by the national and local governments. The data will also help to perform cost-benefit analysis of disaster risk reduction. However, it is of utmost importance to a) improve the data collection further with regard to disastrous events in the past as well as b) keep the database up-to-date by including data of ongoing events on a regular basis.

2. Inclusion of Low Profile Hazards. Attention should be paid to natural hazards that are not yet disastrous. In the last years, several earthquakes have been reported in the north part of Lao PDR in areas that are not yet inhabited by huge amount of people. However, these kinds of natural hazards could be disastrous in the future, and should already be included in the DesInventar database nowadays.

3. Systematic Data Gathering. In addition to the general improvement of the DesInventar database, systematic ways to gather disaster data at district and village level should be put in place. So far, most of the information on village and district level is based on secondary literature. Gathering of first hand information in a timely manner would tremendously improve the quality of the database.

4. Institutional Strengthening for Comprehensive Risk Assessment. The preliminary analysis using the current database shows that the disasters resulting from natural hazards in Lao PDR are characterized by high numbers of affected people as well as severe economic consequences (e.g. high number of houses destroyed; high economic losses in general). Especially for already vulnerable groups, disasters pose therefore a severe risk for development. However, there is a need to improve the existing capacities for comprehensive risk assessment to ensure that data available is analyzed in the right way and can be used to inform policy development.

5. Capacity Building for Probabilistic Risk Assessment. Provincial authorities are using standardized templates for the collection of disaster data. However, especially with regard to probabilistic risk assessment, there is need to institutionalize standardized systems within the key ministries. NDMO is requested to adapt the globally accepted tool called CAPRA which is an information platform to enhance decision-making in risk management across various sectors, such as emergency management, sectoral planning, public investment and the financial sectors. Through the application of probabilistic risk assessment principles to threats like floods, typhoon, earthquakes, tsunamis and landslides, CAPRA allows to measure and compare different types of risks, and to develop sector-specific applications for risk management.

6. Mainstreaming Disaster Risk Reduction into Poverty Reduction Strategies in Lao PDR. The initial analysis of disaster and poverty data in Lao PDR showed that there is a linkage between disaster risk and poverty. About 73% of the Lao population still lives in rural area and the majority of the rural communities rely on agriculture for their livelihoods. These communities are very vulnerable to natural hazards and poverty reduction in these areas is therefore closely linked to disaster risk. Mainstreaming disaster risk reduction into poverty reduction programs and strategies is therefore of utmost importance. Poverty reduction programs and strategies should include risk reduction aspects such as awareness raising, capacity building and local level risk financing.

Annex

I. Agreement on the Establishment of the TWG

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity.

Ministry of LSW

No. 2090/LSW
Vientiane Capital, Date 13/7/2012

Decree on
Establishment of
Technical Working Group

Based on:

- Agreement on approval to implement the project on "**Strengthen Institutional Capacity for Development of Lao National Assessment Report (LAR-2012) on Disaster Risk Reduction in Lao PDR**" No. 003626, Dated 13 June 2012.
- Agreement of Ministries concerned on the establishment of Technical Working Group (TWG)
- Work plan on the implementation of the project "**Strengthen Institutional Capacity for Development of Lao National Assessment Report (LAR-2012) on Disaster Risk Reduction in Lao PDR**"

Ministry of Labour and Social Welfare,
Vice president of NDPCC Agreed:

Article1: establish Technical Working Group (TWG) to collect disaster data in the whole country and participate in implementation of the "**Strengthen Institutional Capacity for Development of Lao National Assessment Report (LAR-2012) on Disaster Risk Reduction in Lao PDR**" detail as following:

1. Mr. Sompang Sirisak	Office of Ministry of Public Work and Transport
2. Dr. Daovilay Banchongphanith	Ministry of Public Health
3. Mr. Intong Bounmany	Ministry of Planning and Investment, National Statistical Center, Social Statistic Division
4. Ms. Malaythip Virabouda	Center for Statistics and Information, Ministry of Agriculture and Forestry
5. Ms. Souksamay Inthavongsa	Ministry of Education and Sport
6. Mr. Southanou Bouthphomvihan	Statistic division, MLSW
7. Ms. Vilaykhone Keobounthan	Welfare and Development Division, MLSW
8. Ms. Bouasy Thammasack	Data Information Unit, NDMO
9. Ms. Vimala Khounthalangsy	Data Information Unit, NDMO
10. Mr. Phonesavanh	Data Information Unit, NDMO

Article2: TOR of TWG

1. Review, comment and update standard format for data collection
2. Help in improving of disaster data at national and provincial level
3. Facilitation in the process, procedure of data collection to make the data collection format become the standard
4. Help NDMO to assess disaster risk, collect historical data at national and local level and help NDMO to manage and analyze disaster data
5. Coordinate with departments and concerned organizations related to disaster risk assessment and analysis
6. Participate in project implementation especially in consultation meetings, TWG meetings, report the results of assessment and provide necessary guidance in development of LNAR-2012 which is in line with the Global Assessment Report 2013
7. Present results of project implementation to NDPCC

Article3: Agencies, Ministries, departments, sectors, locals and every person who have been assigned have to know and effectively implement this agreement.

Article4: This agreement becomes effective upon signature.

Ministry of Labour and Social Welfare
Vice Chairman of NDPCC

II. List of Participants Attending Data Collection at Provincial Level

No.	Names	Provinces
1.	Ms. Oudaphone Sorsavanh	Xiengkhuang
2.	Mr. Xeuly Nortoualy	Luang Prabang
3.	Ms. Somphet Sengdala	Oudomxay
4.	Mr. Xaykengya Leuangvanna	Luangnamtha
5.	Mr. Phousy Lathanaphak	Bokeo
6.	Mr. Thongsavanh Livongkham	Phongsaly
7.	Mr. Souksavanh Louangyikhammatha	Huaphanh
8.	Mr. Bouthong Phimmachak	Vientiane
9.	Mr. Lathanongxay Vongkeo	Khammuane
10.	Mr. Soulideth Hiembouathong	Savannakhet
11.	Mr. Lamphone Thammavongkham	Champasack
12.	Mr. Phayvanh Phanthavong	Sekong
13.	Mr. Khamsouk Phommatham	Saravane
14.	Mr. Vikasan Syxanon	Attapeu
15.	Mr. Isoon Soukvilay	Vientiane Capital
16.	Mr. Kethsakoun Souksamlai	Borikhamxay

III. List of Participants Engaged in the Revision of LNAR-2012

1.	Dr. Daravone Kittiphanh	Ministry of Education and Sport
2.	Mr. Fongsamout Khamvalvongsa	Ministry of Planning and Investment
3.	Mr. Vanhdy Doungmala	Department of Meteorology- Hydrology, MONRE
4.	Mr. Phosavanh Thammavongxay	Department of Social Welfare, MLSW
5.	Mr. Viengxay Xayxanaphone	Ministry of National Defense
6.	Mr. Sengphaangkhane	MONRE
7.	Mr. Souphandone Voravong	MONRE
8.	Mr. Somphanh Vithaya	Department of Meteorology and Hydrology, Ministry of Natural Resources and Environment
9.	Mr. Kalakoth Vongsouthi	Ministry of Agriculture and Forestry
10.	Mr. Kaisone Thanthathep	Department of Meteorology- Hydrology, MONRE
11.	Mr. Bounyong Phommachak	LRC
12.	Ms. Toumkham Kanlaya	Ministry of Education and Sport
13.	Mr. Phetvixay Kaseumsouk	Department of Industry , Ministry of Industry and Commerce
14.	Mr. Oudom Vanthanouvong	Lao National Radio, Ministry of Information and Culture and Tourism
15.	Mr. Chanthavong	Mass Media, Ministry of Information, Culture and Tourism
16.	Mr. Bandith Soulayakham	DOT, MPWT
17.	Mr. Soulisack Simmanotai	Department of Fire Prevention and Protection Police, Ministry of Public Security

IV. Team for Data Entry and DesInventar Database Updating

1.	Ms. Bouasy Thammasack	Data Information Unit, NDMO
2.	Ms. Vimala Khounthalangsy	Data Information Unit, NDMO
3.	Mr. Phonesavanh Xaysompheng	Data Information Unit, NDMO
4.	Ms. Thitiphon Sinsupan	ADPC
5.	Ms. Somvath Keokhamphoui	ADPC

V. Team for Report Writing

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