Disaster Risk Reduction in Lao PDR

Status Report 2019

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UN Office for Disaster Risk Reduction

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About this report

The Disaster Risk Reduction (DRR) report provides a snapshot of the latest DRR progress Lao People's Democratic Republic (Lao PDR) has achieved under the four priorities of the Sendai Framework. It also highlights some of the key challenges surrounding the issue of creating coherence among the key global frameworks at the country level; and makes recommendations for strengthening the overall Disaster Risk Management (DRM) governance by government institutions and other stakeholders at national, sub-national, and local levels.

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The findings, interpretations, and conclusions expressed in this document do not necessarily reflect the views of UNDRR or of the United Nations Secretariat, partners, and governments, and are based on the inputs received during consultative meetings, individual interviews, and the literature reviews conducted by the research team. While every effort has been made to ensure the accuracy of the information, the document remains open for any corrections in facts, figures and visuals.

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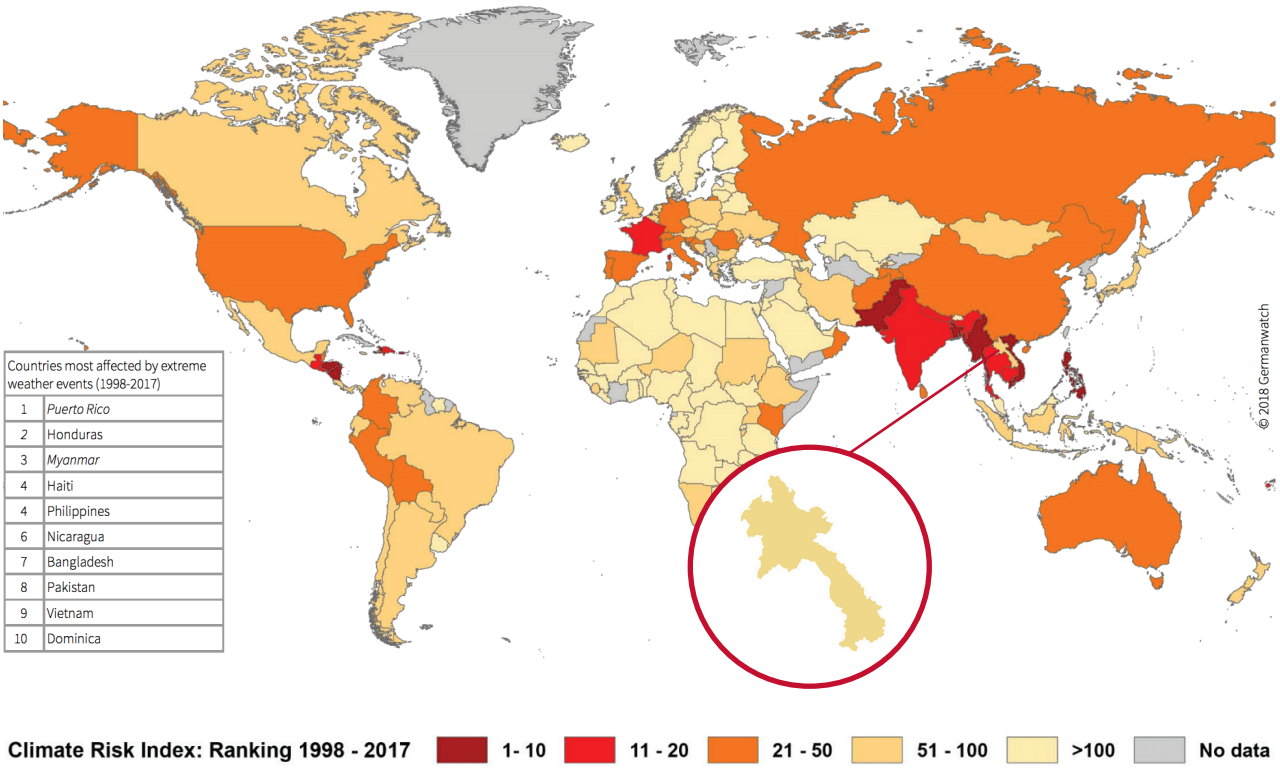

(GermanWatch,2019)

POPULATION 2015	
Total Population	6,492,400
Urban Population	494,252 (32.9 %)
Population Density Per Km^2	27
ECONOMIC INDICATORS 2018	
Gross Domestic Product in Current $US	16.8 billion
GDP Per Capita ($US)	2457
GDP Growth (Annual %)	7.7%
HUMAN DEVELOPMENT	
Human Development Index	0.601
HDI Rank	139
Income Level Category	Lower-middle income

(Lao Statistics Bureau , 2019) (Lao Statistics Bureau, 2018) (JICA, 2018)

Climate Risk Index

–

Rank 89 / Low Risk*

INFORM Risk Index

–

Rank 75 / Medium Risk**

* Climate Risk Index of 2019 analyses the extent to which countries have been affected by weather-related losses between 1998-2017 (GermanWatch, 2019). However, it should be noted that the CRI may not provide an accurate presentation of the future risk due to the fact that it measures data of past events (which may not always be available depending on the country). Thus, for example in the case of Lao PDR, low CRI score does not accurately indicate low climate risk in the future.

** INFORM risk index is a global tool which measures the risk of humanitarian crises and disasters based on 50 indicators assessing hazards, vulnerability and capacity (resources available to mitigate the impact) (INFORM, 2019)

1. Introduction

Lao People's Democratic Republic (Lao PDR) is a landlocked country located in Southeast Asia, bordering Thailand, Viet Nam, Cambodia, Myanmar, and China in the North. The total land area covers approximately 236,800 km^2, comprising a wide range of ecosystems within varying levels of elevation. Due to the mountainous topography, only about 6.2% of the total land area classified as arable (CFE-DM, 2017). The western border largely follows along the Mekong river, which is also central for agricultural production due to the fertility of the river valleys. Administratively Lao PDR is divided into three tiers, first level of which comprises 16 provinces and one municipality which hosts the capital city of Vientiane. The provinces are further sub-divided into 142 districts, which comprise 11,390 villages (Government of Lao PDR, 2014).

Due to the tropical setting, the country is also exposed to a range of hazards, including droughts, floods and storms, costliest of which have taken place after 2009 (GFDRR, 2019). National risk profile of Lao PDR has identified seven major hazards which include the aforementioned, as well as epidemics, earthquakes and unexploded ordinances (UXOs) (NDMC, 2010). Of these, storms and flooding are most frequent occurrences during the monsoon season which runs from May to October, and most notable events include the Typhoon Ketsana in 2009 and Haima in 2011. Localized flooding has been reported in 2013, 2015, 2016 (UNDP, 2018) and most recently in 2018 during storm Son-Tinh. Major rivers such as the Mekong and Sekong flowing through the country contribute to these flood hazards as a significant number of settlements are located on the flood plains. To tackle the emerging threats, the government has incorporated disaster and climate risk management into policies, institutions and national development plans to enhance resilience of various sectors, including in agriculture and environment, housing and transport (GFDRR, 2019), and has strived to mainstream elements of disaster risk reduction and climate change adaptation activities across national development.

In terms of economy, Lao PDR continues to grow due to abundant local resources and potential. It is still among the least developed countries (LCDs) in the world, but the economy is one of the fastest growing in Southeast Asia, with an average growth rate of 8% over the last decade (Government of Lao PDR, 2014). The growth has been supported by the expanding sectors of electricity, as well as wholesale, retail and trade, among others (Government of Lao PDR, 2018). Economic development has also brought additional benefits such as halved poverty, improved access to education and improved health for many – yet, challenges still remain. Chronic malnutrition is still prevalent, and there are signs of stunting in over 30% of children under five (World Bank, 2019). Also, because the development is heavily reliant on hydropower (electricity exports) and mining activities, diversifying the economy would still be beneficial to guarantee resilience against future shocks due to the vulnerability of the aforementioned sectors to hazards and climate change (ADB, 2019).

Through the sustained growth, Lao PDR aims to graduate beyond the least developed country status by 2024, and it already fills most of the eligibility criteria to be removed from the list. A rank of a lower-middle-income has already been reached as a result of growth, and the share of agriculture in GDP has declined to about 17% following the rapid development of other industries (figure 1). However, agriculture is still a major provider of livelihoods for many in the rural regions (Government of Lao PDR & ILO, 2017).

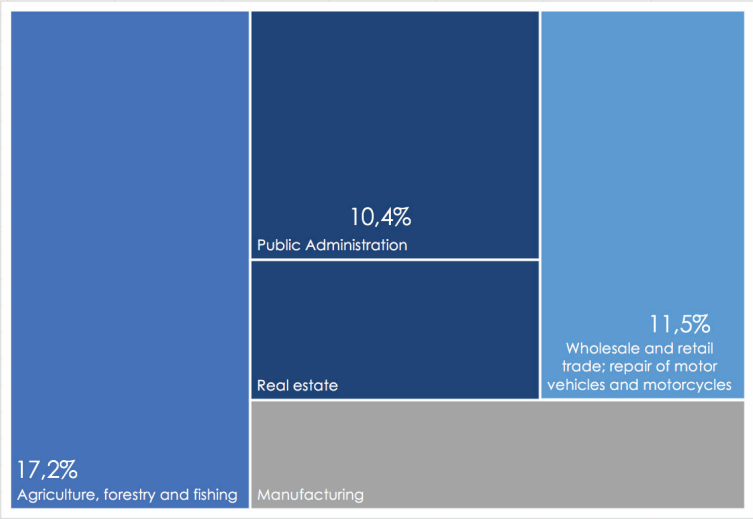

Figure 1. The composition of the GDP of Lao PDR and largest contributing fields of industry in 2017 Lao Statistics Bureau quoted in (ADB, 2017)

1.1 Demographic Characteristics

The most recent population census in 2015 estimated the total population size at 6.49 million people, 32.9% of whom reside in urban areas (Government of Lao PDR, 2015). The average national population density was 27 people per km^2, and 209 in the capital Vientiane. Also, it should be noted that majority of the people inhabiting rural regions rely on subsistence agriculture – indeed, agricultural activities employed 72% of the total all working age population in 2015 (Government of Lao PDR, 2014; Government of Lao PDR, 2015).

The population itself is youngest in the ASEAN region, with 32% aged 14 years or younger, and with a working age population accounting for 64% of the total population. Thus, Lao PDR is set to benefit from a demographic dividend where savings from reduced social services may increase investments in economic development – but only if the availability of opportunities and education are matched with the needs of the work force (Government of Lao PDR & ILO, 2017). Also, it should be noted that informal sectors are still large providers of livelihoods in Lao PDR. 1.5 million people were estimated to be engaged in the informal employment. However, even the formally employed populations may be outside the reach of social protection services. In 2017, only 16.6% of them were covered by social protection schemes (Government of Lao PDR, 2018).

Gender gaps have also been narrowing down in Lao PDR, but women are still facing challenges in attaining secondary education. However, the number of children aged 6-16 attending primary education has improved significantly with no notable differences in gender - 80.6% of boys and 78.7% of girls attended primary education in 2015 (Government of Lao PDR, 2015). Yet, in 2015, only 79% of women were literate as opposed to 90% of the males, and early marriages are leading to higher dropout rates of women, which is one of the obstacles for attaining secondary qualifications (Government of Lao PDR & ILO, 2017).

In terms of overall human development, Lao PDR has made significant improvements over the past two decades, and the country has met the Millennium Development Goal of reducing poverty by half to 23% and raised the overall literacy to 83% (Ministry of Planning and Investment & UNDP, 2017). Infant and maternal mortality rates have dropped as well – however, poverty reduction and human development still remain uneven across different regions and among ethnic groups. Poverty is often concentrated in remote and rural areas, inhabited by ethnic communities, and the HDI values range from 0.771 in Vientiane to 0.286 in Khammuane province (Ministry of Planning and Investment & UNDP, 2017). Spatial distribution of inequality and poverty is still threatening the development and hinders the process of graduating from the LDC status.

1.2 Economic Impact of Disasters

Unlike many of its neighbors, Lao PDR has not often been susceptible to disasters of catastrophic scale due to its landlocked position amongst countries, low seismic activity and distance from the ocean. For example, typhoons rarely impact the country with their full potential as they lose momentum while traveling inland, and the mountainous topography further protects the country along the Viet Nam border. However, the past decade has had some notable events which have impacted not only the economy, but also lives and livelihoods of people.

In 2009 the typhoon Ketsana caused damages of US$ 94.2 million dollars after hitting southern parts of Lao PDR. The typhoon severely damaged roads, irrigation networks and public infrastructure (ReliefWeb, 2009), and affected more than 180,000 people and nearly 30,000 households. It was stated that the event had the potential to severely set back economic development especially in the most hardly hit districts (Government of Lao PDR, 2009). Furthermore, disruption of agriculture was – and remains – detrimental to livelihoods due to the fact that it is among the largest providers of employment, and disrupted transportation infrastructure endangers the national economy because road access is crucial for a landlocked country. The event also killed an estimated of 80 000 buffaloes and other livestock (Government of Lao PDR, 2009), which are considered as important safety nets for lower income farming households (Government of Lao PDR, 2014). Loss of animals and farming equipment may push large portions of the population into poverty (figure 2).

Two years later, the country was affected by the Typhoon Haima in 2011, which affected nearly 90,000 people in 36 districts across four provinces, and caused an estimated combined damages and losses of US$ 66 million (Government of the Lao PDR, 2011). Transport sector suffered 60% of all the damages and 47% of the losses, while agriculture bore 15 % in damages and 41 %in future losses (Government of the Lao PDR, 2011).

In 2018, the country was affected by three consecutive disasters; the storm Son-Tinh, which breached Xe pien-Xe Nam Noy hydropower saddle dam causing flash flooding, followed by the storm Bebinca in August (Government of Lao PDR, 2018). Over 600,000 people in 90 districts were affected by the events, and the damages and losses reached US$ 371.1 million. The dam breach in Attapeu province alone caused almost 10 % of the total economic impacts (Government of Lao PDR, 2018). Again, agriculture suffered the most (57% of the total losses), and transport bore most damages (65.6 % of overall damages and 40% of all losses). The GDP decreased by

2.01%, which corresponds to 9.6% of Lao PDR's annual budget. Growth of agriculture and related activities decreased by 0.9%, industry growth by 3.7%, and the volume of electricity exports were down from 19.8% to 7.2% in 2018 (ADB, 2019). The effects will likely carry on to 2020, which illustrates the vast damaging potential that hazards in the region have.

1.3 Social Impact of Disasters

The Typhoon Ketsana in 2009 travelled inland through the southeast coast, where poverty incidence has been higher than the national average (Government of Lao PDR, 2009). Many of the 26 affected districts were among the poorest in the country and are closest to potential typhoon paths with high levels of food insecurity, lower school enrolment rates and high numbers of disabled due to the high prevalence of UXOs in the region (Government of Lao PDR, 2009).

Thus, and despite the government's rapid action, the event further increased the existing inequalities and severely endangered livelihoods of low-income households and farmer families in regions where crops, equipment, infrastructure and housing were destroyed.

During the typhoon Haima in 2011, the government managed to mobilize resources, relief and assistance rapidly to guarantee effective emergency response. However, it was recognized that such large-scale events affecting the country (especially poorer provinces) may impair the graduation from the LDC status (Government of the Lao PDR, 2011), even if the past disasters have not impaired the economy in the long-term. Major events have threatened human development, access to education and healthcare, and pushed people further into poverty due to major losses of livelihoods (Government of the Lao PDR, 2011).

Such impacts were evident again during the 2018 flooding; among the rural population, 14.2% were estimated to suffer from the disaster-related food insecurity, and 70% of the indebted households were forced to increase their loans to secure their production (Government of Lao PDR, 2018). Loss of livelihoods resulted in domestic migration (especially of women), increased the risk of trafficking of children and the prevalence of psychosocial suffering, and caused an outbreak of diarrheal diseases, respiratory infections, dengue and typhoid fever as well as skin diseases in many of the affected regions (Government of Lao PDR, 2018). The event also affected some 65,000 workers in the informal sector, and they are increasingly vulnerable in times of adversity due to lack of social safety nets or as they operate outside the social protection systems. Finally, gender-based violence was also expected to increase in temporary shelters among flood-affected women, especially those with ethnic background as they may lack the benefit of protective laws safeguarding women's rights, or as they may lack access to services (Government of Lao PDR, 2018)

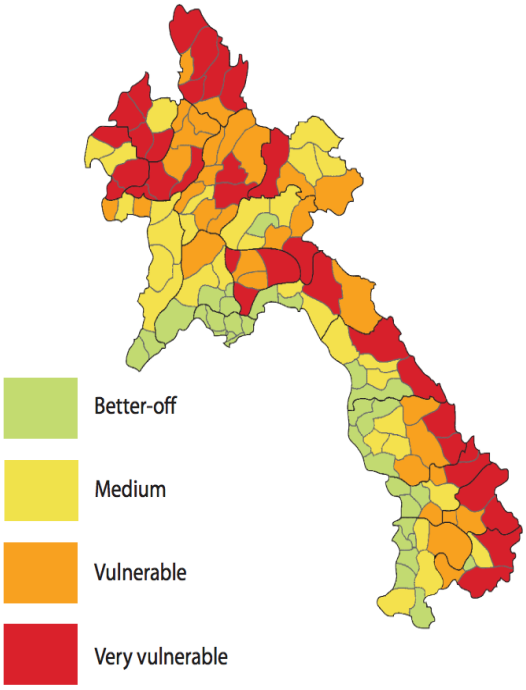

Figure 2. Regional distribution of the vulnerability to poverty in 2009 by district (Government of Lao PDR, 2009)

2. Disaster Risk Profile

2.1 Hazards and Climate Change

National risk profile of Lao PDR has identified seven major hazards which include storms, flooding droughts, as well as epidemics, earthquakes, landslides and unexploded ordinances (UXOs) (NDMC, 2010). One fourth of the area of Lao PDR is considered to be a high-risk zone for earthquakes, and more than 30% of the country is located in a moderate earthquake hazard zone (NDMC, 2010). However, no significant earthquake-related disasters have been reported in the past (JICA, 2015).

While the mountainous regions separating Lao PDR and Viet Nam often protect the country from typhoon impacts, heavy rain, flooding and associated landslides still have the potential to result in losses of lives, property and production (Government of Lao PDR, 2014). Hydrometeorological hazards form the greatest risk to the people, livelihoods, infrastructure and economy as flooding is common on the eight river basins across the country. Most vulnerable areas of the country are the low-lying flood plains along the Mekong River and its major tributaries in the central and southern parts of Lao PDR (Government of the Lao PDR, 2011). Also, and often correlating with high precipitation, landslides threaten approximately 5.24% of the country in the southeast and central part of the country due to steep topography and soil conditions (NDMC, 2010).

Droughts are also a significant risk in Lao PDR as they have the potential to impact hydrological cycles, and because they impact biodiversity, human health, hydroelectric power generation, and may lead to increased pollution, forced migration and increased prevalence of diseases (Miyan, 2015). The impacts of droughts are projected to be significantly worse in the southern parts of the country (Ministry of Natural Resources and Environment & WFP, 2016).

Spread of diseases is also a risk to livestock and people in the aftermath of flooding events. Outbreaks of diseases such as acute diarrheal diseases, respiratory infections, dengue fever, hepatitis, malaria, typhoid fever and measles are prevalent in the country (NDMO, 2012). Furthermore, incidence of tuberculosis has been highest in the region (NDMO, 2012), and the prevalence of the disease may actually be twice as high (reaching 595 per 100,000) than previously estimated (Law, et al., 2015).

However, Due to the high spatial and regional variability of hazards and climate risks, the impacts on people and communities are not universal. According to the report by Ministry of Natural Resources and Environment and the UN World Food Programme, the resilience of people to climate and disasters is affected by their wealth, access to land, livelihood opportunities, poverty rates, climate sensitivity of income sources and by climatic trends of the region, lack of which contribute to increasing vulnerabilities (figure 3).

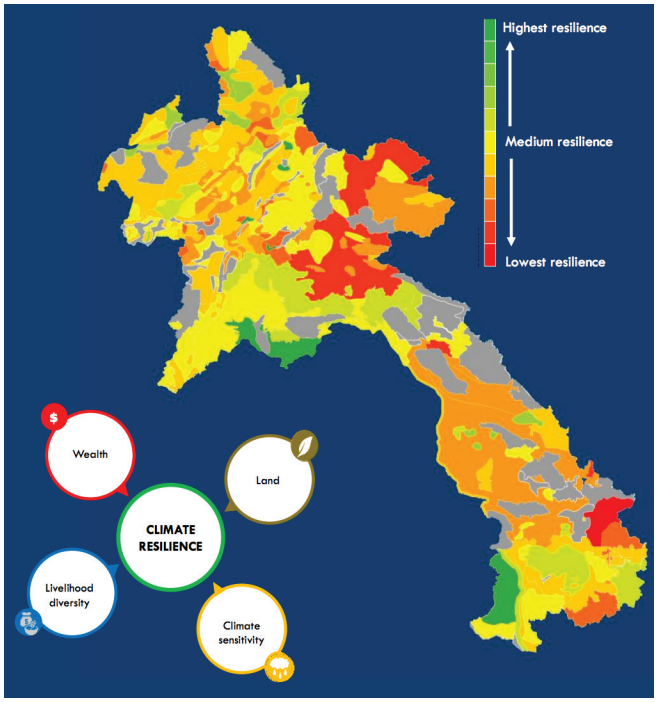

Figure 3. Resilience map of Lao PDR (Ministry of Natural Resources and Environment & WFP, 2016)

In terms of climate change, the estimated projections for temperature rise is an increase of 1 to 2 ° degrees, and precipitation is likely to increase by 10 to 30 % (Government of the Lao PDR, 2011). However, the country has not been considered to be a significant contributor to the on-going change, rather quite the contrary; the widespread forests are important carbon sinks in the region. Yet, Lao PDR is expected to be among the most heavily affected by climate change (Government of Lao PDR, 2010).

Increase in annual rainfall has been estimated to reach 7% in the region, and the frequency and intensity of weather extremes are projected to grow as well. Water availability is likely to be affected, which would disturb biodiversity and crop production, and poses the greatest risk to poorest demographics due to their reliance on agriculture and the environment (Government of Lao PDR, 2010). Key vulnerabilities to climate in Lao PDR have been identified to be agriculture (and food security) as well as forestry management, which is an important element of climate risk reduction (UNDP, 2019).

It is important to note that rice is the foundation of the agricultural production, accounting for 85% of the total output and contributes to the agricultural GDP by 39%(CCAFS, 2019). Thus, extreme hydrometeorological events affecting paddy fields may have detrimental impacts on food security and livelihoods especially in the rural areas, and Lao PDR has experienced prolonged shortfalls of rice production annually. Already, an estimated 46% of the rural populations are at risk of facing food insecurity (CCAFS, 2019). Hence, variations in regional weather patterns and in the climate may severely affect agricultural production and threaten the economic development as increasing numbers of people could potentially end up being at risk of poverty and malnutrition. The economy is also expected to be affected by increasing climate risks due to current contribution of natural resources such as animal husbandry, forestry, agriculture and fisheries which all rely on appropriate temperature and rainfall (Ministry of Natural Resources and Environment , 2014). Hydropower and rain-fed cultivation are also increasingly vulnerable to droughts and extreme weather, and their operation may be severely obstructed by change in the regional hydrological cycles.

2.2 Exposure

Mekong and Sekong river basins are prone to regular flooding, effects of which are exacerbated by deforestation and land degradation due to agricultural practices (UNESCO, 2015). Such large scale hydrometeorological disasters threaten infrastructure and access to remote regions; for example, in the aftermath of Typhoon Ketsana in 2009, the worst affected areas were not accessible for up to three weeks due to flooding and destroyed infrastructure, in areas where affected populations were already poor and in most need of support (GFDRR, UNDP & EU, 2014). Also, the upland communities are still disproportionately exposed to external shocks, including storms and droughts because said regions lag behind in terms of connectivity and infrastructure, access to sanitation and safe water (Castella, et al., 2018).

While the water supply coverage has been increasing at a rapid rate (83.9% of the population have access to improved sources of water), the quality of water is still an issue. 86.3% of the sources tested in the Social Indicator Survey were found to be positive for E.Coli due to fecal contamination, and open defecation is relatively common in the rural areas (Lao Statistics Bureau, 2018). Not only does the contamination risk the safety of available water resources, but open defecation also creates a significant health risk during flooding or at evacuation sites where contaminated water may carry various diarrheal diseases.

Exposure to other diseases (including tuberculosis, malaria and dengue) is also prevalent especially in the rural regions, areas where concentrations of humans are high and often in the aftermath of flooding. Although Lao PDR has reduced malaria incidence by 50% since 2000, more than 260,000 cases were still reported in 2015 (Marcombe, et al., 2017). At the time of writing, dengue incidence during the year 2019 have already reached 1,752 cases, a number which is significantly higher than it has been during the same period of time in previous five years (WHO, 2019).

2.3 Socio-economic Vulnerability

Disasters impacts are often most severe on the poorest demographics. For example, the 2018 flooding impacted household economies as an estimated of 70% of people already in debt had to increase their loans due to lost property and assets (Government of Lao PDR, 2018). Alongside economic impacts, the ripple effects of disasters on the poor often manifest themselves in various ways, such as in forced migration, dropping out of education, worsened food security, loss of employment opportunities, increased prostitution among other negative impacts. Women are also often disproportionately affected among the poor demographics due to traditional practices and systems which might prevent land ownership, for example (Mann & Luangkhot, 2008), and thus reduce opportunities available for women to support themselves (or their families) financially. The disparities in access to education, health and infrastructure along unequal distribution of poverty between the rural and urban regions result in an increased vulnerability of people in hard-to-reach areas. However, despite the fact that poverty and vulnerability are interlinked, it is too simplistic to assume that all the poor suffer in disasters. The correlation between vulnerability and poverty exists but it is not absolute. There are dimensions related to class, ethnicity, community structure and decision making which all contribute to people's vulnerabilities, and thus there is no one straightforward method for vulnerability reduction (ADPC, 2012). However, one factor is likely to increase the vulnerability of the poor significantly; lack of alternative livelihood options (figure 4).

Finally, some children are also disproportionately vulnerable to disasters in Lao PDR. Little progress has been made in terms of the birth registration process during the past five years; only one in ten mothers know how to register births to authorities (Lao Statistics Bureau, 2018). Thus, a group of unregistered children who are out of reach of social protection systems, and the undocumented, have little to no methods for proving legitimacy if something happens to their families during disasters.

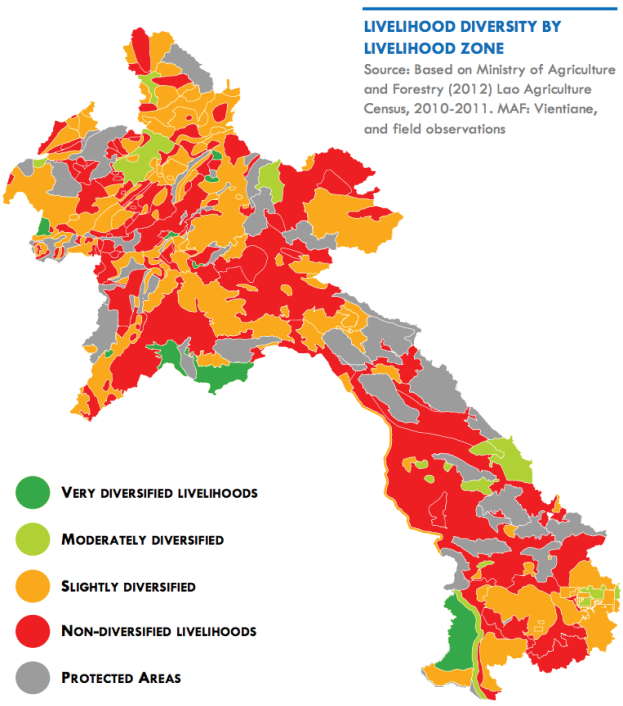

Figure 4. Livelihood diversity by livelihood zone (Ministry of Natural Resources and Environment & WFP, 2016)

2.4 Physical Vulnerability

While the mining industry has been an important contributor to the national economy, and even when it has a great potential in the future to support the economic development, some of the activities have had a negative impact on the environment. This is especially the case regarding small and medium scale mining activities, as the industry is not strictly monitored below the national level (Keovilignavong, 2019). As a result, land degradation is an issue in Laos, but it is also prevalent in areas which have intensive farming and (sometimes illegal) logging activities. By 2010, 84% of the land was considered at least moderately degraded, but due to the lack of comprehensive environmental assessments, the drivers behind the degradation remain disputed (Lestrelin, 2010). One of the reasons has been linked to the rapidly increasing market opportunities to increase household incomes, which in turn contributes to degradation due to lack of adequate enforcement of regulations in terms of local crop management (Vongvisouk, et al., 2016). The government and local officials should include local communities in the land use planning processes to identify the extent to which communities could be guided or regulated without endangering their livelihoods (Simo, et al., 2018). Furthermore, community involvement is important to identify areas where poor quality housing and lack of infrastructure gnaws the resilience of poor communities against climate and disaster risks, as it may contribute to contamination of water resources, increased vulnerability and land degradation. The agricultural sector is increasingly vulnerable to climate and extreme weather due to adverse weather which affects rain-fed crop production. The hydropower facilities (of which the electricity sector is reliant on) are also vulnerable to droughts and extreme precipitation (Ministry

of Natural Resources and Environment , 2014). This was evident in 2018, when the Xe pien-Xe Nam Noy saddle dam breached as a result of heavy rainfall, causing catastrophic flash-flooding.

2.5 Future of Disaster Risks in Lao PDR

While Lao PDR has an abundance of water resources, there is a continuously increasing demand for water supply. There are already parts of the country (particularly in the southern plains) where surface water cannot meet the needs for irrigation, and any discontinuities in the natural hydrological cycle are likely to pose severe threats to communities and the agriculture industry as a result of climate change in the future (Somphone & Xayviliya, 2017). Intensive use of groundwater is likely to dry out shallow wells and the rice production may be reduced by up to 10% by mid-century (Somphone & Xayviliya, 2017), which indicates that increased efforts to mitigate climate change impacts on agriculture are required to safeguard development in the long-term.

Climate change is also expected to affect food security due to loss of agricultural production as mentioned earlier in this chapter. Malnutrition, especially that of the children, may become increasingly prevalent, and infectious diseases may increase due to increased flooding, lack of safe water and sanitation in a scenario where safe water availability is significantly reduced (Donesavanh, 2018). The government has also taken significant steps towards addressing climate change and disaster risks by aiming to increase the national forest cover which acts as a carbon sink, to prevent land degradation and by mitigating the impacts of flooding. However, illegal logging, growth of agricultural production and major economic changes are all threatening the forest policy implementation if left unmanaged through adequate policy reinforcement (Keomany, 2018).

3. Disaster Risk Reduction and Climate Action Interventions

Besides the various developmental challenges, Lao PDR has been facing recurrent hydro-meteorological hazards and extreme climate events that deepen poverty, food insecurity, as well as the socio-economic vulnerability of the people by many (especially in rural and remote areas). This reaffirms the need for comprehensive DRM. Disaster and climate hazards and their devastating impacts, as explored in the previous section, are catalytic factors which have driven the DRM momentum during the past decade. Considerable efforts put in the DRM domain have demonstrated country's commitment, aligned with the Hyogo Framework for Action (HFA), and its successor - the Sendai Framework for Disaster Risk Reduction (SFDRR). This section captures highlights of the country's experience, major development and current status of DRM in Lao PDR and discusses the implementation challenges as well as priorities for the years to come.

3.1 Sendai Framework for Disaster Risk Reduction

1. Understanding Disaster Risk. The National Risk Profile of Lao PDR was developed in 2010 to provide a comprehensive profile of the natural hazards and overall impacts on Lao PDR. It features maps of all hazard prone areas (based on historic disaster events), analysis and assessment of exposure, vulnerability and risks to people, property, and affected sectors including critical facilities, infrastructure and economic activities. The risk profile has been extensively used to identify the risk priorities to guide national disaster risk reduction strategies (NDMO, 2010).

Provincial Risk Profile and hazard maps have also been developed for the provinces of Saravanh, Sekong and Attapeu under the Operationalizing National Strategic Plan on Disaster Management (OSPDM) Project 2010-2012. Lao PDR National Assessment Report on Disaster Risk Reduction 2012 features disaster risk profile of the country, based on an initial analysis of DesInventar data to establish relationship between disasters and poverty, and includes a guide on mainstreaming DRR as part of poverty reduction. The DesInventar methodology, initiated by UNDP and UNISDR in Lao PDR since 2005, has evolved into an operational system for collecting historical disaster data, including loss database covering longer periods of time (NDMO, 2012). However, the Desinventar database has not been regularly updated (DDMCC, 2015). As the country has moved towards up-scaled DRR interventions across key development sectors, there is a need for a comprehensive database and quantifiable risk information for conducting sector specific risk assessments.

The current lack of baseline data for hazard, exposure and vulnerability analysis is noted as a critical gap. Various initiatives to institutionalize disaster data and information management systems have been carried out to improve quality, quantity and accessibility of datasets applicable for risk assessment and other DRM purposes. These include the GeoNode Risk Atlas web platform for geospatial data, providing line agencies access to quantifiable disaster risk data for developing risk-sensitive infrastructure, utilizing satellite imagery and related geospatial decision-support tools for DRM, such as satellite-generated geospatial products provided by SERVIR Mekong, and the country's attempts to develop georeferenced disaster risk management (Geo-DRM) information.

Also, while recognizing the needs and critical information gaps for sectoral planners, more hazard inventories and risk assessment products with sector-specific exposure and vulnerabilities datasets and in-depth risk information have been developed in the past. These include a landslide inventory map, and critical national and provincial vulnerable routes, which serve as support tools for Ministry of Public Works and Transport when conducting risk analyses (ADPC, 2016).

Limited technical knowhow, facilities and human resources to generate accurate, timely and usable climate forecasts, products and information are considered a hindrance to the operation of the National Meteorological and Hydrological Services (NMHSs), which impedes risk assessment process as well as early warning capacity. To address such gaps, the Department of Meteorological and Hydrology (DMH) has undergone institutional capacity strengthening with support by the World Bank and WMO to meet growing demands of required quantity, quality and variety of weather and environmental services now that the country is facing more adverse impacts of changing climate.

Priority 2. Strengthening Disaster Risk Governance to Manage Disaster Risk. In the past Lao PDR's DRM had a primary focus on response and relief, to meet basic needs of affected population. Efforts have been steered towards more proactive, holistic and risk reduction-oriented approaches, with the establishment of National Disaster Management Committee (NDMC) in 1999, which serves as an inter-agency committee for DRM from national to local level, focused on the whole of DRM cycle (Government of Lao PDR, 1999). The NDMO was also established under the decree as the Secretariat to the NDMC. In 2011, NDMC was renamed to National Disaster Prevention and Control Committee (NDPCC), with Deputy Prime Minister, Minister of National Defense as chair (NDMO, 2012).

DRM structures have also been established at sub-national level in provinces, districts and at the villages, which form a multi-tier risk governance for emergency management. The system comprises of Provincial Disaster prevention and control committees (PDPCCs), District Disaster prevention and control committees (DDPCCs), and Village Disaster Prevention and Control Committees (VDPCCs), or Village Disaster Prevention Units (VDPU). The composition of Village Disaster Preparedness Unit (VDPU) as a smallest unit for DRM and front liners for response includes representatives of community-based organization (CBOs), traditional leaders, religious organizations and extension workers (Oxfam, 2012).

DRM policies and the institutional framework have undergone adjustments and reallocation of roles and responsibilities. From 2013-2018, DRM functions were transferred to a newly-created Department of Disaster Management and Climate Change, under the Ministry of Natural Resources and Environment (MoNRE), while the role of Ministry of Labor and Social Welfare (MLSW) was limited to response and relief. During this period, as a national secretariat for NDPCC, DDMC was tasked with overall data compilation and assessment for reporting to the NDPCC on timely basis for its decision, supervision and action (DDMCC, 2015). Recently, at national level, DRM mandates are reassigned to Ministry of Labour and Social Welfare (MLSW) (Abbott, 2018).

First concrete step for comprehensive DRR planning was the Disaster Management Country Strategy, which is a long term, phased master plan for DRR. Based on evaluation of experience and lesson learned of NDMC and MLSW, the strategy outlines its goals, and implementation approaches for 2005, 2010 and 2020, including the budget for operations. To roll out the strategy, continued support has been provided since 2010 to develop and implement action plans. Line ministries also play significant roles in DRM. Analysis of public expenditures from Fiscal year 2010/2011 until 2013/2014 indicates that DRM related expenditure accounted for an average of 5.6%of total combined ministry and provincial budgets. Ministry of Public Works and Transport had the largest share of DRM expenditure, accounting around half of all DRM-related, followed by Ministry of Agriculture and Forestry, accounting for 18.4% of the total DRM expenditure, and the Ministry of Natural Resources and Environment with 2.4% (Abbott, 2018).

IMPLEMENTATION	POLICY	SCOPE	PURPOSE
NATIONAL DISASTER MANAGEMENT COMMITTEE (NDMC)	The Prime Minister's Decree No 158 (1999)	National	To create a comprehensive disaster management institution with authority reaching from the national level to villages, with set goals up to 2020
NATIONAL DISASTER PREVENTION AND CONTROL COMMITTEE	Prime Minister's Decree No. 373 (2011)	National	Re-establishing the National Disaster Prevention and Control Committee (NDPCC) and NDRMP to serve as a foundation for multi-sectoral DRM in the country.
NATIONAL DISASTER MANAGEMENT OFFICE	Periodical Strategic Plan on Disaster Risk Management (2003-2005/2005-2010/2010-2020)	National, Provinces, Districts	Articulates a DRM strategy, direction and priority actions based on lessons learned in the past.
THE GOVERNMENT OF LAO PDR, RELEVANT SECTORS	Strategy on Climate Change of the Lao PDR (2010)	National, Provinces, Districts	Outlines the objectives and direction for addressing climate change in Lao PDR across sectors, in consideration of SDGs and CCA.
DEPARTMENT OF DISASTER MANAGEMENT AND CLIMATE CHANGE (DDMCC)	Prime Minister's Decree 220 (2013)	National	Establishes the Department of Disaster Management and Climate Change under the ministry of Natural Resources and Environment.
NATIONAL DISASTER MANAGEMENT OFFICE	Inter-Agency Contingency Plan (IACP) (2013/2014)	National, Provinces, Districts, NGOs	Supporting the government in guaranteeing effective and timely emergency response by defining roles and providing guidelines for coordination.

Table 1. National disaster and climate risk reduction policies, plans and legislation in Lao PDR.

Priority 3. Investing in Disaster Risk Reduction for Resilience. Striving towards safer and resilient development interventions and public investment, the Ministry of Planning and Investment, with the World Bank's support, has made climate change and disaster risk considerations mandatory in the public investment review process since 2017 (GFDRR, 2019). This has evolved from various attempts to achieve substantial integration of disaster and climate risk considerations into development decision-making and sectoral planning. From 2012-2016, Ministry of Planning and Investment, Ministry of Public Works and Transport, and the Ministry of Agriculture and Forestry have initiated demonstrative projects on risk-sensitive planning and investment in irrigation sector and the landslide mitigation in road infrastructures, as well as piloting the use of DRR inclusive appraisal criteria for development projects, and policy guidelines for risk-inclusive Lao PDR's 8th National Socio-Economic Development Plan (NSEDP) 2016–2020 that governs physical and social infrastructure investment of the country (ADPC, 2016).

Because 80% of people's livelihoods are associated with agriculture, disaster and climate resilient initiatives in agricultural sector have received greater attention in the past years. Since 2003, an interactive DRRM stakeholder consultation process has been initiated by MAF leading to the development of Plan of Action for Disaster Risk Reduction and Management in Agriculture (2014-2016). The plan consolidates identified needs, priorities and specific actions to enhance DRRM integration into the agricultural sector and sectoral investment plan and envisaged complementarities between agricultural development, DRR and CCA (Ministry of Agriculture and Forestry, 2014). Ministry of Agriculture and Forestry (MAF), through the National Agriculture and Forestry Research Institute of Laos (NAFRI) implemented the project on Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts (2010-2016), focusing on minimizing food insecurity and vulnerability to extreme climate events, especially flood and drought (Global Environment Facility, 2016).

Given the budget constraints, investing in resilience in Lao PDR has been made possible by financial assistance from major donors such as ADB, the World Bank, GFDRR and multi-donor trust fund as well as INGOs. In 2017, funding of $30 million was granted by the World Bank to implement the Lao PDR Southeast Asia Disaster Risk Management (DRM) Project, a massive investment on ex-ante DRR in a comprehensive manner focusing on flood risks, including integrated urban flood risk management, resilient urban planning, and financial planning for disaster resilience (World Bank, 2017). Major investments have also been allocated for developing a functional national level water resources management system, with a focus on sustainable management of hydropower, irrigation, and water supply resources, reduction of flood and drought risks associated with climate change under the Mekong Integrated Water Resources Management (MIWRM) Project (ReliefWeb, 2017).

Road network susceptibility to climate risk and recurrent impacts of landslides on road infrastructures are among major hindrances to the transportation sector in Lao PDR. DRR-inclusive road sector development has started with up-scaled activities in the past (with Ministry of Public Works and Transport as the main executing agency), including Mainstreaming Disaster and Climate Risk Management into Investment Decisions (2011-2016), and Lao Road Sector Project 2 (2016-2022). They aim towards establishing a construction standard, spot improvements and mandate periodical maintenance, hence easing the pressure on the budget and efficient road asset management practices at national and provincial level (Nordic Development Fund, 2016).

Priority 4. Enhancing disaster preparedness for effective response to "Build Back Better" in recovery, rehabilitation and reconstruction. Due to the reoccurring flooding, heavy rains, and landslides, high priority has been given for establishing effective early warning system in Lao PDR. Developing and establishing early warning and information dissemination system in all of 142 districts by 2010 was indicated as a priority in the Strategic Plan on Disaster Risk Management. Later on, to implement the plan, the process of Operationalization of Strategic Plan for Disaster Management (OSPDM) began in 2010, in which strengthening the multi-hazard early warning system with integrated science, institutional and social aspects is one of key components. A consultation process for drafting of National Early Warning Strategy has started since 2012, aiming to bridge information gaps between responsible agencies and community level (NDMO, 2012).

The Early Warning Standard Operating Procedures (SOPs), 2017 were developed to provide a concise list of major tasks to be executed by concerned agencies responsible for early warning. This combines the elements of technology-based hazard monitoring and weather forecasts, by the Department of Meteorology and Hydrology (DMH), through its National Early Warning Centre (NEWC), early warning dissemination through multi-tier mechanisms facilitated by each respective DRM agency – the NDMC, Provincial Disaster Management Committees and Office (PDMC), District Disaster Management Committees and Offices (DDMC), and response actions of the government functionaries and community. Continued effort to enhance technical capacity and people-centered early warning is underway to develop a fully functioning and systematic early warning system for all major hazards (The Government of Lao PDR, 2017).

Warning dissemination through mobile phone directly to individual users is considered as complementary options for wider and timely dissemination of warning messages. The initiative is supported by four private companies; Lao Telecom, ETL, UNITEL and Beeline. The SMS warning through mobile message is expected to reach over 200,000 subscribers in Vientiane and the target pilot provinces of Attapeu, Bolikhamxay and Saravan.

In terms of emergency response, the system was in early stages of development when the country was hard hit by the extensive flooding in July-August 2008. In response to the incident, a multi-agency mechanism was formed in early August and started performing response operations and coordination, resulting in an effective response in Vientiane (WMO & UNESCAP, 2013). Strengthening disaster preparedness and response capacity, articulated in the National Strategic Plan and DRM Action Plans, has undergone further improvement in recent years through the IASC process aiming to improve role clarity, inter-agency capacity, coordination mechanisms, and operating procedures for responsible government agencies and other emergency response actors.

To build back better, Post-Disaster Needs Assessments have been habitually conducted to identify most urgent needs and development priorities jointly with other stakeholders. Also, methodologies to estimate sectoral damage and losses, as well as corresponding needs have been developed and adapted to local requirements for Lao PDR since 2012, with Khammouane province as the pilot area. This involved developing SoP for PDNA, designing templates for sectoral data collection, forming provincial PDNA teams and capacity building (ADPC, 2014).

4. Coherence with Sustainable Development Goals & the Paris Climate Agreement

Because of the high exposure to extreme weather and climate change, disaster and climate-resilient development have become a unified entity to be achieved in Lao PDR. Synergies between DRR, climate change adaptation and sustainable development are clearly articulated in different policy and planning frameworks. The convergence of the three domains are also reflected in the institutions and in their interventions.

DRR had been integrated into the 7th National Social and Economic Development Plan 2011-2015 to ascertain that development and investment processes are protected from natural disasters and do not exacerbate or create new risk. The sector in which DRR was considered highly relevant and mainstreaming DRR in policies has evolved over the past many years are agriculture and forestry, public work and transportation, water resources management and public health. Moreover, progressive integration of DRR elements into poverty reduction programs, gender and livelihood enhancement activities had started before 2012 (NDMO, 2012).

In 2009, the government undertook the National Adaptation Programme Of Action to Climate Change (NAPA) project with plans to establish an early warning system for priority flood prone areas in Lao PDR aiming to also improve and expand meteorology, hydrological networks and weather monitoring systems.

The key sectors for action identified by Lao PDR are agriculture, forestry, water and water resources, and human health. The NAPA is crosscutting 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.

Sectoral Aim	Policies with Linkages to Sendai Framework for Disaster Risk Reduction	Policies with Linkages to Sustainable Development Goals	Policies with Linkages to the Paris Climate Agreement or Environment
National Development	8th Five-year National Socio-Economic Development Plan (2016-2020)	Strategy on Climate Change of the Lao PDR (2010)	Strategy on Climate Change of the Lao PDR (2010) National Socio-Economic Development Plan (2010-2015)
Environmental Protection	Forestry Strategy (up to 2020)	Decree on Environmental and Social Impact Assessment (revised in 2015) Environmental Protection Law No 02-99 (1999)	Forestry Strategy (up to 2020) National Strategy on Climate Change of the Lao PDR (2010)

Sectoral Aim	Policies with Linkages to Sendai Framework for Disaster Risk Reduction	Policies with Linkages to Sustainable Development Goals	Policies with Linkages to the Paris Climate Agreement or Environment
Disaster and Climate Risk Reduction	National Strategic Plan for Disaster Risk Reduction (2010-2020) 8th Five-year National Socio-Economic Development Plan (2016-2020)	8th Five-year National Socio-Economic Development Plan (2016-2020) Agricultural Master Plan (2011-2015)	National Adaptation Plan of Action (2009) 8th Five-year National Socio-Economic Development Plan (2016-2020) National Strategic Plan for Disaster Risk Reduction (2010-2020)
Vulnerability Reduction	National Policy on Social Protection (2013)	Law on Development and Protection of Women (2004) National Growth and Poverty Eradication Strategy Law on Preventing and Combatting Violence against Women and Children (2014)	National Environment Strategy (up to 2020) Plan of Action for Disaster Risk Reduction and Management in Agriculture (2014-2016)
Urban Development	Urban Planning Law (1999) Land Use Law (1996)	Policy on Sustainable Hydropower Development	National Environment Strategy (up to 2020)

Table 2. Synergies between the national policies, plans and frameworks by sector

5. Issues in Implementation of the DRR and Climate Policy

There are challenges which must be overcome to achieve full operationalization of DRR interventions. DRR lagging behind in recent years is partly due to transient DRR institutional set up and issues on DRR roles and responsibilities at national level transferred from NDMO to DDMCC, under Ministry of Natural Resources and Environment (MONRE) in 2013. While this denotes country's attempt to increase synergies of disaster and climate efforts into a single government functionary, due to different operational challenges, DRR mandate was shifted back to NDMO. Such unstable formation of DRR institutions has led to issues in inter-agency coordination among concerned DRM government agencies and non-government counterparts.

Lao PDR has also encountered serious budget deficits to sustain DRR work. Under-funding is noted as a challenge for DMH to ensure quality and continuation of its services due to lacks of financial capacity to maintain observation stations, obtain modern modellings, as well as provide attractive benefit to sustain competent human resources (DMH, 2017). Furthermore, while recurrent disaster emergency situation calls for more proactive preparedness, timely early warning and effective response, the system remains ad hoc and focuses on meeting immediate needs and asset replacement (Ministry of Agriculture and Forestry, 2014).

Lack of sectoral base line data, such as livelihood related information has hampered PDNA process. Translating PDNA findings to recommendations and optimizing use of PDNA for decision-making for timely and effective recovery strategies and planning is still to be improved. There is also a lack of systematic documentation of emergency response operations. More strategic capacity building interventions at national, provincial and district level alike are needed to ensure DRR interventions with external technical support could further roll out with strong internal capacity lying within the government. Thus, managing financial resources sustainably should be a compulsory element within development partnerships from funding agencies and the government for long term DRR strategic development.

6. Stakeholder Analysis

A wide range of stakeholders have been instrumental for DRR progress in Lao PDR. DRM stakeholders with long term engagement and specific technical expertise include UNDP on PDNA and climate change adaptation, World Bank on mainstreaming DRR into development and risk financing, WMO on meteorological and hydrological services, Save the Children on Child-led DRR and DRR in Educations, ADPC on risk assessment and DRM institutional capacity strengthening, Oxfam on community vulnerability reduction and empowerment, and the French Red Cross on Community-based DRR. Joint initiatives on DRR have been financed with funding from major donors such as DIPECHO, Australian Department of Foreign Affairs and Trade (DFAT), World Bank and ADB for critical infrastructure development, LDCF and co-finance mechanism including Green Climate Fund, GFDRR.

For emergency response, the Humanitarian Country Team comprising Heads of UN humanitarian agencies (including UNICEF, WFP, UN-Habitat, UNOCHA) and Heads of key INGOs working in disaster management field have significant role to play in coordinating international humanitarian response operation and through the Inter Agency Standing Committee, as well as in flash appeal to be decided in coordination with the government. At the provincial level, INGOs, Red Cross and UN agencies with presence at respective affected province, will provide substantial support to coordination and implementation of the common rapid need assessment upon request by the Provincial Disaster Prevention and Control Committees (PDPCC) (Humanitarian Country Team, 2018).

Lao PDR has also worked closely with regional and sub-regional platforms and that support advancing the country's DRR and promoting regional synergies including Mekong River Commission, ASEAN Agreement on Disaster Management and Emergency Response (AADMER), AHA Center, ESCAP/WMO Typhoon Committee, and Southeast Asia Disaster Risk Insurance Facility (SEADRIF). Bi-lateral partnerships with neighboring countries (especially Thailand and Vietnam) on transboundary risk management, emergency response, weather forecast and early warning has become significant support to DRM systems in Lao PDR.

Strengthening grass root level DRR through CBDRM processes is considered to be a key element of DRR interventions in Lao PDR. CBDRM based approaches have a long history in the country, and have evolved into a more solid, technically-sound process built upon many years of collective experiences of CBDRM- focused agencies. These include CARE, OXFAM, Save the Children, and the French/Lao Red Cross as the lead. Inclusive

participation, gender and age approaches in CBDRM, continued CBDRM capacity development for local authorities, and community empowerment will broaden and deepen roles of villagers in local DRR.

7. Future Priorities

7.1 Challenges

As the pace of climate change increases, countries across the globe will have to increase funding and efforts to adequately mitigate the climate change impacts and to avoid the worst-case scenarios. Sustaining agriculture and wellbeing of people in Lao PDR will form challenges by mid-century unless adequate mitigation strategies for water scarcity and agricultural production are identified.

While the country is pursuing green economic growth, Lao PDR also has aimed to ensure that development interventions and profit-oriented activities will not increase pressure on land, water, environment, and Lao PDR's bountiful natural resources. However, limiting trade- off between development gains and DRR and climate resilience is anticipated as key challenge for the years to come. While this seems to be contradicting with the land concession policy to increase economic competitiveness, a more strategic way to control and monitor development from disaster risk perspective has to be formulated and strictly applied with tools such as land use zoning, spatial planning, EIA, Integrated Strategic Environmental Assessment (ISEA) as well as sustainable resource management.

Optimizing ecosystem services for DRR remains unexplored. Untapped potential of ecological functions for flood and drought risk reduction could be given more attention. Government has a unique role to play in facilitating consultative and people-participatory process combining technically–sound practices with local wisdom and way of life for the utmost benefit of immediate communities and vulnerable populations.

7.2 Priority Areas of Work

Despite experiencing less hazards compared to other countries in the region, demographic vulnerability in Lao PDR in terms of social-economic aspects, interlinked with remoteness and limited access to basic services, pose immense challenges for poverty reduction and substantial progress in risk reduction. Enhancing synergies and mutual benefit of SDGs and SFDRR interventions and outcomes are a critical area to be pursued. Drawing upon experience of Ministry of Planning and Investment (MPI) and line ministries, blending DRR into sectoral development projects and programs and into rural development schemes could be further promoted as an effective method to reduce multi-faceted vulnerabilities, and to enhance sectoral performance by minimizing potential disaster effects on sectoral investments and reduce reallocation of development budget for disaster response and recovery.

Supporting the collection, analysis and management of disaster and climate related data should be among the highest priorities, given the fact that baseline data for hazards, exposure and vulnerabilities is currently lacking. Furthermore, while some disaster

information management systems are in place, the data is not always available to sub-national level planners and the private sector, which could benefit from in-depth sectoral risk information. Also, supporting the collection and disaggregation of SADD data (as mandated by the SFDRR) to further understand vulnerabilities in the context of Lao PDR is required. Local capacities should be enhanced to guarantee that even the smaller and recurrent disasters are measured and considered as a part of risk assessments.

Localization of the DRR and CR agenda should also be extended from mere data collection and response phases to disaster preparedness and recovery as well. Local organizations, authorities and communities often have the best contextualized understanding of the local needs and gaps and can provide invaluable support to risk reduction activities by providing their contribution to avoid top-down approaches. Furthermore, local operators are usually the first to respond to a disaster – thus, their capacity and capability to maintain operations and support in their communities should be enforced rapidly, especially in a context such as Lao PDR, characterized by remoteness and inaccessible regions.

Community-participatory risk management could be extended further to bridge community action with that of the government and fill capacity gaps of local authorities at village, district and provincial levels. Potential role of community would also be beneficial to be explored further to support operationalization of DRR at the local levels especially to enhance community engagement in preparedness and response (Abbott, 2018). Governance system should aim to create an official platform for effective community-level early warning and networks and local resilience building upon CBDRM process, aligned with national and provincial system and strategy, which should include community-driven resource management, and sustainable area development with integrated elements of DRR.

Additionally, while striving towards poverty reduction, a wide range of socio-economic development priorities are to be addressed to increase the quality of life, especially in the rural areas. Agricultural modernization and commercialization, transportation connectivity, food security, improving basic services delivery, sustainable and optimal use of natural resources and improved livelihoods for rural farmers, are among key interventions contributing to end poverty. Exploring options for risk transfers, social protection mechanisms and alternative livelihood options are important due to the fact that any income of households which is reliant on the environment is likely to suffer as a result of climate change. Significant investments should be directed not only to improving the physical infrastructure, but also towards the efforts to reduce poverty, and to protect those vulnerable to poverty from external shocks.

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