

Preliminary Results

**LAO PDR
NATIONAL
CLIMATE CHANGE
VULNERABILITY ASSESSMENT**

1. Introduction

The Ministry of Natural Resources and Environment (MoNRE), in collaboration with UN-Habitat Office in Lao People's Democratic Republic (PDR), supports the development of a national-level Climate Change Vulnerability Assessment (NCCVA) in Lao PDR.

The assessment will contribute towards achieving MoNRE's five-year plan and National Assembly targets. The results may be a meaningful input for the development of the 9th Social and Economic Development Plan of Lao PDR, as are expected to build knowledge on the climate vulnerability status in order to identify climate change adaptation opportunities at the national, regional and local levels.

UN-Habitat in Lao PDR had developed of climate vulnerability assessment model. In 2017, it conducted multi-scalar vulnerability assessments of 189 villages distributed in 8 districts of Sekong, Saravane and Attapeu provinces. 3 provincial-level and 8 district-level vulnerability assessments were completed and climate change action plans were developed at the provincial, district and village level, contributing substantially to the improvement of adaptation to climate change in southern Lao. MoNRE has requested UN-Habitat to scale-up the methodology applied in that opportunity, in order to expand the area assessed and collect a higher volume of data in a short period of time.

2. Objectives and Methodology

The purpose of the NCCVA is to respond to the pressing need for the development of better planning and investment strategies that mainstream climate change effects, improving risk management. Thus, the main objective of the NCCVA is to enable national and sub-national authorities in Lao PDR to make informed planning decisions to adapt to climate change. By providing a comprehensive assessment, national and local government capacities, policies and legal frameworks will be strengthened, setting the grounds for further adaptation processes that respond to current and future needs.

The assessment methodology was designed for obtaining quick, reliable and up-to-date information through the analysis of quantitative data. Secondary data, such as annual rainfall, average temperatures and updated shapefiles of infrastructure and services, was provided by MoNRE and analysed by UN-Habitat experts. Results from the Population and Household Census 2015 were also incorporated in the analysis.

In addition, participatory data collection methods were used to obtain village-level primary data through provincial and district level Natural Resources and Environment Offices (PONRE and DONRE), helping capture the main challenges faced by communities. District-level surveys were designed to collect data from all the villages within its jurisdiction, filled by district focal points and collected by the respective PONRE. The information was then digitalized and provided to UN-Habitat in an agreed format.

The results exposed below are preliminary findings of the on-going process and focus on vulnerability to hazards, which could be identified through the data analysis. The second phase of the assessment will entail the validation of results, and will be conducted after defining a representative sample of villages on each district, covering the 18 provinces assessed.

3. Preliminary Results

The survey has explored the occurrence of floods, droughts, landslides and storms during 2019 in Lao PDR. Earthquakes, which are not climate change induced hazards, were also included in the analysis as they contribute to the increase in vulnerabilities. While there is no information on the impacts' intensity, preliminary results show that droughts were the main hazard experienced in human settlements (in 25 per cent of the villages affected), followed closely by floods (20 per cent). The number of people affected by both hazards adds up to 2,852,884, distributed in nearly 4,000 villages across the country (see Table 1 below).

Human settlements in Lao PDR are highly vulnerable: 46% of the villages have been exposed to at least one climate change-related hazard. This represents about 3 million people affected. 47% of the villages in the country have been exposed to at least one hazard (including earthquakes).

Geographical patterns in the distribution of the villages affected can be identified as follows, making more likely the occurrence of a particular hazard in specific areas of the country.¹



Droughts were identified mainly at the north, with higher degrees of concentration in the provinces of Bokeo, where 62 per cent of the villages experienced at least one episode in 2019, Oudomxay, Luangmantha and Luangprabang. On the other end, southern and central Saravane, Champasak and Kammuan Provinces, as well as Vientiane Capital, have registered experiencing droughts in less than 7 per cent of their settlements.



Regarding **floods**, the trend is quite the opposite with southern provinces concentrating the highest figures: nearly half of the villages of Champasak, Attapeu and Sekong Provinces have registered impacts in at least one occasion last year.



Storms and landslides' recurrence is significantly lower compared to other hazards, affecting 15 per cent of the villages (less than a million people) in 2019. In both cases, southern Attapeu and Sekong provinces ranked first and second respectively, according to their number of villages affected. While landslides are reportedly more frequent in the north –presumably due to the mountainous geography of the country- storms do not seem to follow a clear pattern.



Earthquakes have affected only 2 per cent of the villages surveyed, and were located in 6 provinces. Nearly half of the villages affected are part of north-western Luangnampha, Luangprabang and Xayabury Provinces.

While **34 per cent of the villages were affected by a single hazard in 2019**, 13 per cent of the settlements registered being impacted by two or more hazards that year, including earthquakes (Figure 1). The most common hazard combinations are: (i) droughts and landslides; (ii) droughts and floods; and (iii) floods and landslides.

As shown by the darker colours in the multi-hazard map (Figure 2), Attapeu and Champasak, in the south, and Oudomxay, Luangmantha and Luangprabang in the north, concentrated most climate change impacts last year.

	% Villages	N° Villages	People Exposed
Earthquakes	2%	211	177,717
Storms	6%	552	499,190
Landslides	9%	806	500,690
Floods	20%	1704	1,507,897
Droughts	25%	2128	1,344,987

Table 1. People exposed per type of hazard.

Source: UN-Habitat Lao PDR

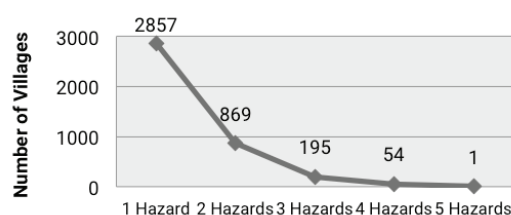


Figure 1. Exposure to hazards.

Source: UN-Habitat Lao PDR

¹ Graphs correspond to the number of villages exposed to a specific hazard divided by the total number of villages within the same province.

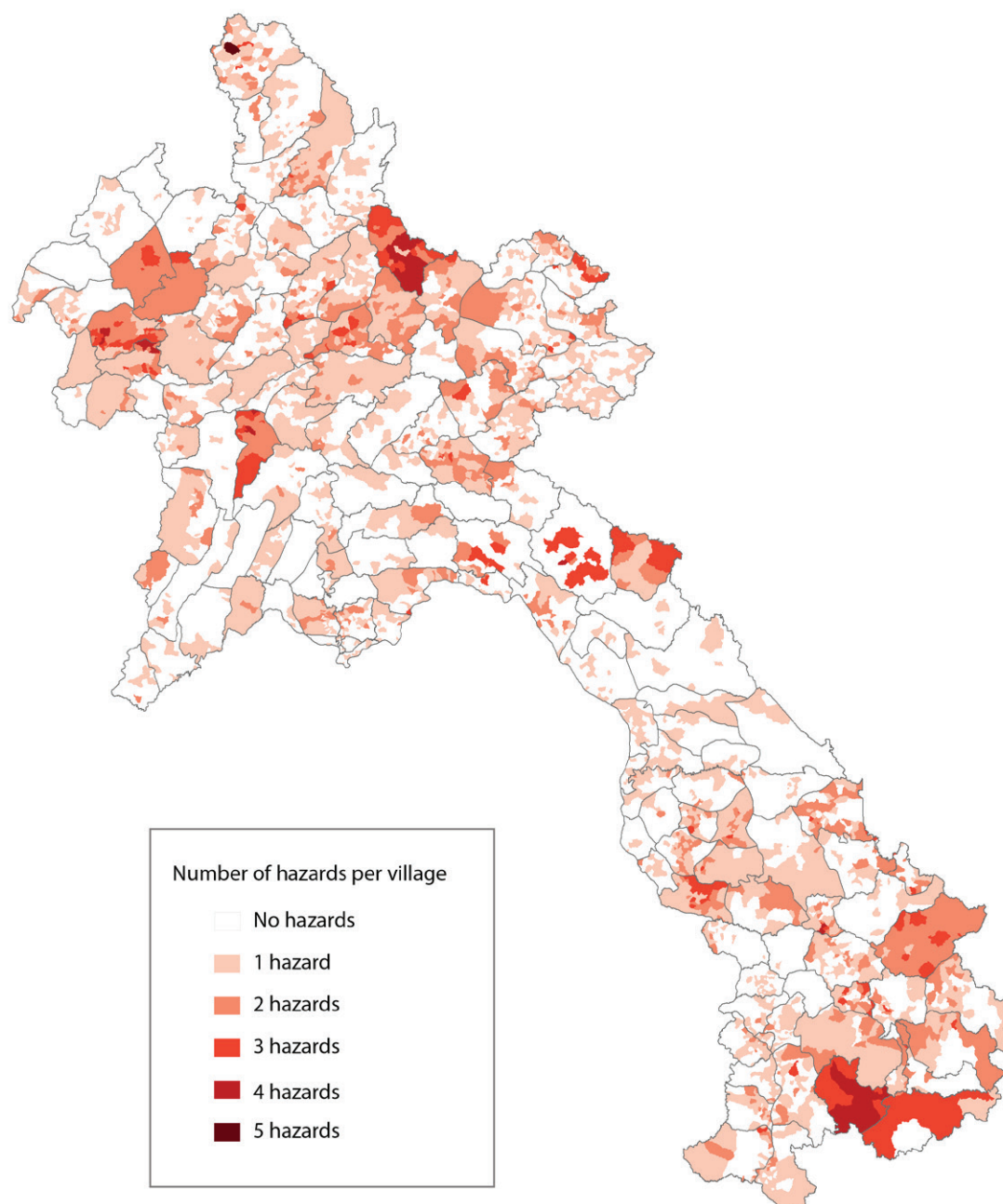


Figure 2. Multihazard Map.

Source: UN-Habitat Lao PDR

4. Preliminary Recommendations

General recommendations:

- 1) Undertake nation-wide risk analysis to assess a) level of hazard, incorporating both probabilities of occurrence and the anticipated potential damages; b) vulnerability (e.g. exposure and coping capacity) in the disaster-prone areas and; c) risk (estimated on annual basis) to inform the mitigation and response plan.
- 2) Establish easily accessible dataset: invest in the collection of data using satellite image, GPS and zoning map to establish comprehensive information systems that are easily accessible at each level of planning (e.g. states, municipalities, water basin authorities, etc.). Data should also include community records and media accounts of historical events, their impacts, and climate projections produced by government agencies, university researchers and relevant stakeholders, along with a set of best practice principles and guidance.
- 3) Develop a national disaster risk management action plan, which defines the strategies and priorities for flood risk management, for example; promote investment, capacity building and training at all levels, ensuring cooperation between national agencies and ministries as well as with regional organisations.
- 4) Set aside national expenditure to support natural disaster risk management: add requirements to support, for example, floods or landslides risk assessment in the existing climate change management programs, conduct cost-benefit analysis and plan a specific natural disaster risk management and response.
- 5) Strengthen financial protection against natural disasters to increase the financial resilience of vulnerable provinces/cities by establishing new – or scaling up existing – risk financing instruments, including insurance and other market-based instruments.
- 6) Establish a taskforce unit on specific natural disaster: define mitigation measures, monitor annual occurrence, establish national and local preparedness plans, train provincial and district staff, and implement simple, low-cost solutions.
- 7) Establish early warning systems to ensure hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enable individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events.
- 8) Conduct awareness raising at ministries, educational institutions and others (e.g. public information meetings and/or consultation workshops) to inform both the policymakers and general public, including children, on existing risks and what to do in a crisis. Where possible, launch simulation exercises of a specific event (e.g. floods, landslides) to involve the local population, recommend behaviours and good practices in case of crisis by making them face a specific situation.
- 9) Promote resilient infrastructure and development of resilient cities by investing in resilient and sustainable transport systems, infrastructure, water resources and housings, for example, in order to avoid infrastructure disruptions and wide-ranging socio-economic costs for institutions and households in the event of natural disasters.

A: Recommendations for flood risk mitigation, management and protection:

- 1) Produce an accurate national flood map based on a) hydrology or how much water will flow in a certain flood event, using stream-gage records or other means to make the projections; 2) cross sections of the floodplain to calculate a hydraulic model on how high the flood level will get with certain amount of water in the stream; and (3) a topographic map of the land in and adjacent to the river or coast (including underwater profile) to accurately calculate the flood level and to show the buildings and ground that will be inundated when that level of flooding occurs.
- 2) Establish the national flood management committee that coordinates and resolves issues related to planning, funding, constructing, and maintaining flood risk management and ecosystem restoration projects, while maintaining active liaison with relevant agencies.
- 3) Establish Flood Risk Management Program (FRMP) to focus on the policies and programs toward reducing overall flood risk. This include the appropriate use and resiliency of structures such as levees and flood walls, as well as promoting alternatives (e.g. land acquisition, flood proofing, etc.) to reduce the risk of loss of life, long-term economic damages to the public and private sector, and improve the natural environment.
- 4) Establish national flood insurance programmes and/or invest in flood risk financing that would offer support to the affected population recover quickly after a flood. Studies indicate that the countries with broad insurance coverage for disaster risks (for example, most of OECD countries) tend to have limited economic disruption as a result of disaster events.
- 5) Institute land use planning and zoning tools. National government and local municipalities can institute zoning laws in their comprehensive plans in order to prevent development of residential and commercial properties in flood-prone areas, which can further restrict where buildings can be constructed, and if these buildings must be flood-proofed.
- 6) Adapt the methods to structurally control floodwater such as the following:
 - Flood-walls: usually constructed out of materials such as concrete or steel in order to control the flow of flood waters and prevent the flooding;
 - Levees: an embankment constructed by engineers out of organic materials such as earth and stone in order to prevent the flooding from a free-flowing body of water in a specific location such as a residential community;
 - Fills: an area of land dug out usually behind a levee in order to capture excess flood waters and prevent flood damage to human structures;
 - Dams: can produce hydroelectricity as well as regulate water levels by opening and closing the retaining doors;
 - Reservoirs: slow down the flow of the river downstream and can also be used for fresh water for a community as well as a preserve for fish and wildlife;
 - Reducing bed roughness: smoothes the bed of the river that allows for the river to flow faster and reduces the likelihood of a flood;
 - Alternating stream channels: similar to reducing the riverbed's roughness, it additionally creates a V in the river bottom, thereby deepening, as well as increasing the speed of the river, and reducing the risk of flooding because the water flows away from the floodplain areas quicker; and
 - Flood-proofing: involves raising the foundation of the building, berms, flood walls, and/or sealant in order to prevent or reduce the damages inflicted from flood waters.

B: Recommendations for landslide risk mitigation, management and protection:

1) Conduct detailed landslide mapping and surveys to identify the problem. This include mapping of upstream and side periphery zones of the landslide, downstream of the landslide, the sedimentation zone, and main landslides, in addition to some measurements to specify the distance, profile, plan, and cross section. Based on these, the common problems can be identified such as slope cutting, over saturation and excess weight to provide appropriate response.

2) Once issues are identified, some construction techniques to prevent landslides can be as follows:

- Land use improvement: includes conservation plantation, grass plantation, on-farm conservation, agro-forestry, safe water drainage, and runoff harvesting ponds or dams in the catchment;
- Drainage management: prevents runoff from flowing into landslides and to drain the excess water from landslides through surface and subsurface drainage management;
- Surface erosion control: includes grass or tree sapling planting, jute netting, mulching, wattling, and brush layering;
- Erosion control in rills: include fascine, contour grass planting, rip-rap, and palisade (wide rills);
- Erosion control in gullies: include palisade (small gullies), and check dams made of brushwood, stone, boulders, gabions, masonry, or concrete;
- Slope failure due to slope cutting or steep slope: includes crib walls of bamboo, poles, or concrete, retaining or toe walls of stone, gabion, masonry, or concrete. Anchoring may be used in a deep-seated landslide to bolt the rock bed;
- Slope failure due to heavy load on slope upstream of landslide: includes excavation to remove rock and soil from the head of a landslide to reduce the driving force, and filling rock at the toe of the landslide to increase resistance against movement;
- Slope failure due to toe cutting by stream/river: includes revetment, spurs, or a riprap toe wall to prevent cutting by the stream or river; and
- Protection of the landslide area from biotic interference: different species can be used in soil conservation to protect the vulnerable areas.

C: Recommendations for drought risk mitigation, management and protection:

1) Set up national policies to promote drought resilience in accordance with community-based policies and practices, encouraging practices that reduce vulnerability to drought such as tree planting and sustainable irrigation systems. This should also take into consideration of other long-term planning and policies related to agriculture, water, food security, and hazard planning and the broader governance and policy on disaster risk management such as the Sendai Framework for Disaster Risk Reduction 2015-2030.

2) Identify drought risk, assess the impact and establish early warning systems: these include hazard risk assessment, monitoring and analysis, vulnerability and capability analysis, assessments of possible impacts, and the development of early warning and communication systems.

5. Provincial Vulnerability Profiles

* The following infographics are work in progress and intend to summarize relevant information that is key for developing a vulnerability profile of each of the provinces in Lao PDR.

Nº1 VIENTIANE CAPITAL

Vientiane Capital province is the capital of Lao PDR. It is located in the western side of the country, bordering Thailand to the south. It has an area of 3,640 square kilometres divided into 11 small districts. With a total population of 819,466 people, Vientiane Capital is the smallest province with the highest population within the country. Vientiane Capital also can be considered the largest city in Lao PDR. The analysis shows that floods are the main climate change-related hazard in the province, affecting, over four times the people affected by storms, the second major threat in the area. The most affected villages are concentrated in Xaythany and Naxaithong districts, in the centre of the province. Storms mainly impact southern Hadxaifong and little areas of Mayparkngum district. Adaptive capacity levels are high, since primary DRR resources are in place.



POPULATION

819,466 total

45.8% female

IMPACTED AREAS

Floods



22%

Droughts



7%



Storms



6%

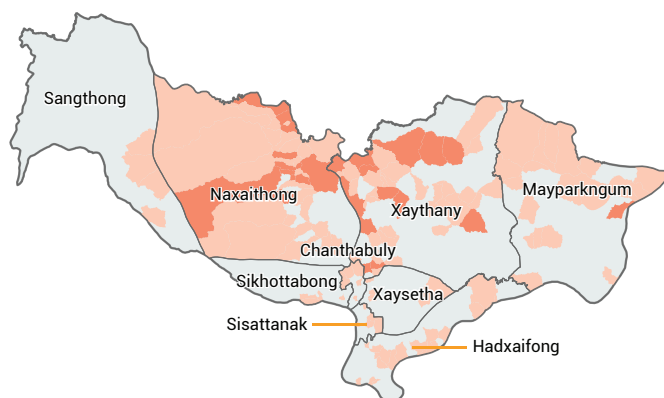
Landslides



3%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	197,312
Droughts	40,592
Landslides	28,303
Storms	43,733

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº2 PHONGSALY

Phongsaly province is located in the northmost of Lao PDR, bordering Vietnam to the east and China to the north. Predominantly mountainous, the province has an area of 15,513 square kilometres, which is divided into 7 districts, and a total population of 177,429 people. The analysis shows that the province is impacted by climate change related hazards, especially by droughts that affect 34 per cent of the villages. Nhot ou is the most vulnerable district as it is exposed to a greater number of threats (especially Karng village, in the northwest of the district, which is highly affected by all types of hazards), while villages in Samphanh district are widely affected by droughts. Storms and droughts also hit some areas of Phongsaly district, and both floods and landslides coincidentally affect villages of Boon neua district. Adaptive capacity levels are high, since most primary DRR resources –except for evacuation centres– are in place.



POPULATION

177,429 total

48.4% female

IMPACTED AREAS

Floods



5%



Droughts



34%



Storms



6%



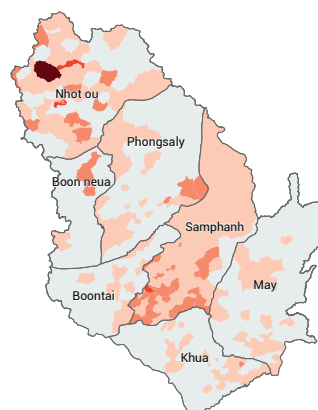
Landslides



4%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	15,182
Droughts	57,065
Landslides	7,263
Storms	14,223

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	No
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº3 LUANGNAMTHA

Luangnamtha province is located in northern Lao PDR, bordering Myanmar to the northwest and China to the northeast. The province has an area of 9,498 square kilometres, which is divided into 5 districts, with a total population of 174,477 people. The analysis shows that the province is moderately impacted by climate change related hazards, with 4 out of 5 districts (38 per cent of the villages) reportedly experiencing droughts and 2 out of 5 districts (32 per cent of the villages) experiencing earthquakes. The highest number of villages impacted by earthquakes within Lao PDR are in Luangnamth, totalling 116 villages. Nalae and Viengpoukha district are greatly affected by both droughts and earthquakes, while Long and Namtha district are affected to less extent. Viengpoukha is the only district affected by floods, while landslides are also reported in few villages of Nalae, Namtha districts. Adaptive capacity levels are moderate, since no DRR plan has been developed for this province.



POPULATION

174,477 total

50.7% female

IMPACTED AREAS

Floods



1%



Droughts



38%



Storms



1%



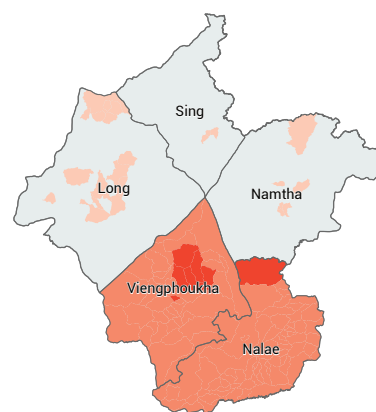
Landslides



1%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	2,669
Droughts	55,774
Landslides	2,425
Storms	2,539

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	No
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº4 OUDOMXAY

Oudomxay province is located in northern Lao PDR, bordering China to the north. The province has an area of 12,079 square kilometres, which is divided into 7 districts. With a total population of 308,898 people, Oudomxay is highly exposed to climate change hazards, as over half of its population was reportedly hit by droughts. While all districts are vulnerable to this hazard, the highest number of affected villages are concentrated in Hoon district. Villages in northern Namor and southern Pakbeng district are exposed to a greater number of threats, including floods, storms and landslides. The mountainous southeast of Beng district, in the centre of the province, is also highly vulnerable to floods and storms. Adaptive capacity levels are moderate, since the province lacks a master plan and evacuation centres.



POPULATION

308,898 total

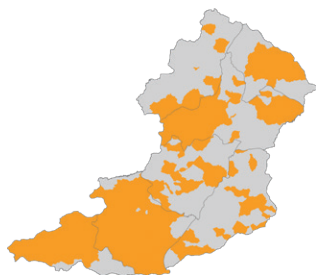
49.9% female

IMPACTED AREAS

Floods



Droughts



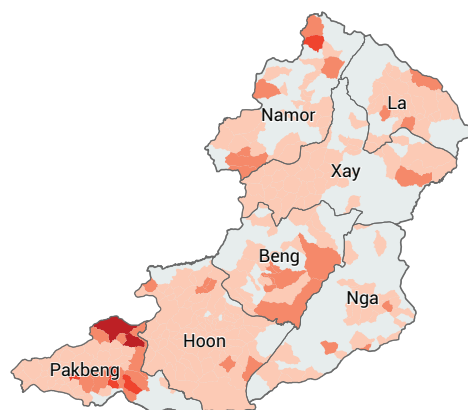
Storms



Landslides



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	22,572
Droughts	168,963
Landslides	14,495
Storms	20,320

ADAPTIVE CAPACITY

Provincial Master Plan	No
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	No
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº5 BOKEO

Bokeo province is located in the northwest of Lao PDR, bordered by Thailand in the west and Myanmar in the north. Predominantly mountainous, it has a total area of 6,812 square kilometres, which is divided into 5 districts, and a total population of 179,243 people. The analysis shows that the southern areas of the province are highly impacted by climate change related hazards, with 4 out of 5 districts (63 per cent of the villages) reportedly experiencing droughts. These, as well as floods, storms and landslides mainly affect villages in Pha oudom district. Droughts also hit a high proportion of villages in Paktha district, villages in Tonpheung district and some at the west of Huoixai district, which are also affected by storms to a lesser extent. Adaptive capacity levels are moderate, since primary DRR resources, such as EWS and DRR plan, are not in place



POPULATION

179,243 total

50.1% female

IMPACTED AREAS

Floods



10%



Droughts



63%



Storms



16%



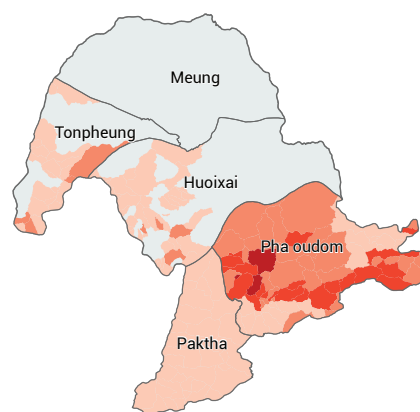
Landslides



12%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	16,097
Droughts	104,658
Landslides	17,117
Storms	39,048

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	No
Disaster Risk Reduction Plan	No
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº6 LUANGPRABANG

Luangprabang province is located in northern Lao PDR, bordering Vietnam to the northeast. Predominantly mountainous, the province has an area of 19,949 square kilometres, which is divided into 12 districts. With a total population of 431,889 people, Luangprabang is the second largest and fourth most populated province in Lao PDR. The analysis shows that the province is highly impacted by climate change related hazards, with 11 out of 12 districts (56 per cent of the villages, nearly 193 thousand people) experiencing droughts. Phontong district, northeast of the province, is the most exposed area, experiencing floods, droughts, storms and, to a lesser extent, landslides. The southern tip is also highly exposed, with all 51 villages in Nan district experiencing both droughts and earthquakes, a high number of which are also affected by landslides. While Viengkham and Pak xeng districts are highly vulnerable to droughts and landslides, Phonxay district is mostly affected by droughts and floods. Adaptive capacity levels are high, since primary DRR resources are in place.



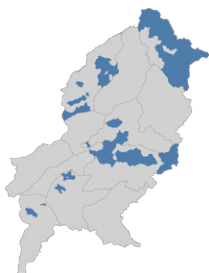
POPULATION

431,889 total

49.1% female

IMPACTED AREAS

Floods



Droughts



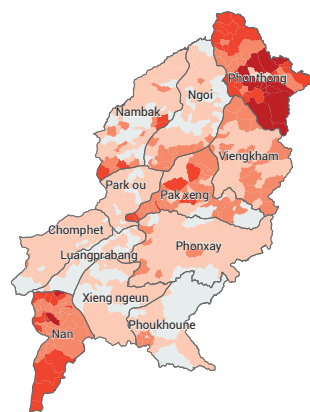
Storms



Landslides



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	63,553
Droughts	192,829
Landslides	77,181
Storms	24,345

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº7 HUAPHANH

Huaphanh province is located in the northeast of Lao PDR, bordering Vietnam to the east. Predominantly mountainous, the province has an area of 17,193 square kilometres, which is divided into 10 districts with a population of 289,393 people. The analysis shows that the province is moderately affected by climate change related hazards. Droughts are the main hazard identified and, together with landslides, and floods, affect a high proportion of the villages in Sone, Sopbao and Xamneua districts. Huameuang and Viengxay districts, at the south and east respectively, are highly affected by floods and landslides; while the northern district of Xiengkhor is highly affected by droughts and also landslides. Villages in Kuane district, at the south, are mostly hit by droughts. Adaptive capacity levels are high, since most primary DRR resources are in place.



POPULATION

289,393 total

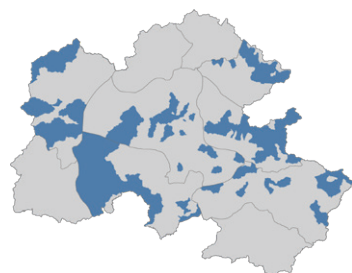
47.9% female

IMPACTED AREAS

Floods



16%



Droughts



21%



Storms



1%



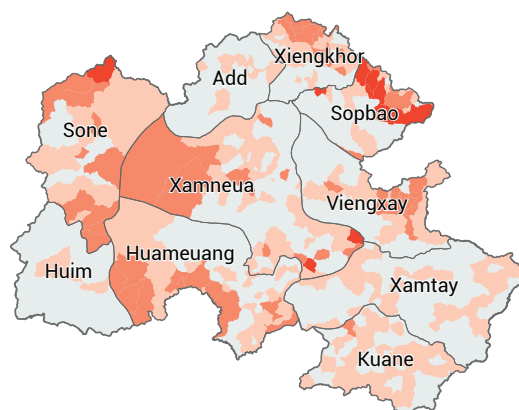
Landslides



17%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	41,449
Droughts	63,704
Landslides	47,747
Storms	4,512

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	No
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº8 XAYABURY

Xayaburi province is located in the westmost part of Lao PDR, bordering Thailand to the west. It has an area of 15,538 square kilometres divided into 11 districts, and a total population of 381,376 people. The analysis shows that the province is moderately impacted by climate change related hazards, with droughts affecting about 90,000 people in 4 districts, (namely Xienghone, Phiang, Parklai and Thongmyxay), followed by storms, distributed across the province. The highest percentage of villages affected by floods are in Thongmyxay district, the most vulnerable district of the province, as it is also hit by droughts and storms. Additionally, villages in northern Hongsa and neighboring Xaysathan district were affected by earthquakes in 2019. Adaptive capacity levels are high, since primary DRR resources are in place.



POPULATION

381,376 total

49.6% female

IMPACTED AREAS

Floods



3%



Droughts



21%



Storms



13%



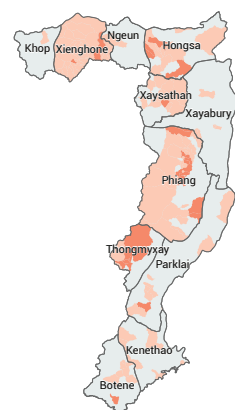
Landslides



0%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	15,081
Droughts	90,009
Landslides	0
Storms	61,221

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº9 XIENGKHUANG

Xiengkhuang province is located at the centre of Lao PDR, bordering Vietnam to the east. Predominantly mountainous, it has an area of 12,922 square kilometres divided into 7 districts with a total population of 244,684 people. The analysis shows that the province is moderately impacted by climate change related hazards, with droughts affecting nearly a fifth of the population at the centre of the province, mainly in Khoune district. While few villages in the north of Kham and Khoune districts are affected by multiple hazards, such as floods, storms and landslides, other villages within the district face different hazard combinations, such as droughts and landslides, or landslides and floods. Eastern Pek, Pakhay, Phoukoud and Morkmay districts are significantly less vulnerable than the rest of the areas. Adaptive capacity levels are high, since primary DRR resources are in place.



POPULATION

244,684 total

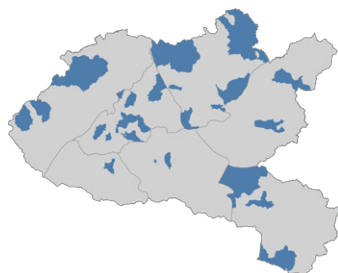
48.6% female

IMPACTED AREAS

Floods



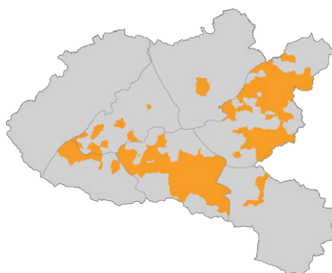
13%



Droughts



25%



Storms



2%



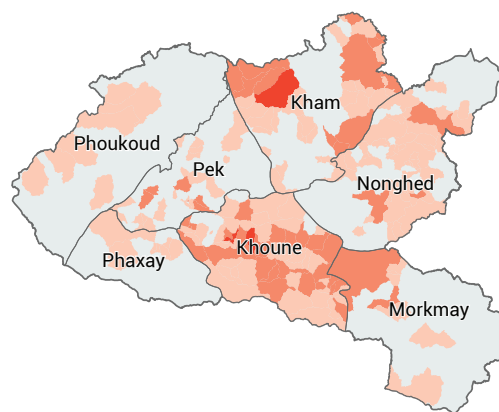
Landslides



16%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	32,180
Droughts	50,832
Landslides	35,110
Storms	7,189

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº10 VIENTIANE

Vientiane province is located in the centre-west of Lao PDR, bordering Thailand to the southwest. It has an area of 12,513 square kilometres divided into 11 districts with a total population of 419,090 people. The analysis shows that the province is moderately impacted by climate change related hazards. Landslides are predominant in mountainous Vang Vieng and Kasy districts. The latter is the only district that is also affected by floods and storms. All the villages in Keo oudom and Meun districts, and a high proportion of those in Feuung district are affected by droughts. Adaptive capacity levels are low, since primary DRR resources, such as early warning system, evacuation centres and weather monitoring stations are not in place.



POPULATION

419,090 total

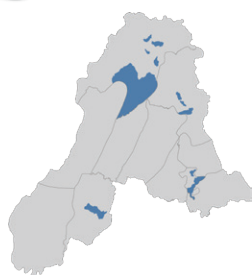
48.0% female

IMPACTED AREAS

Floods



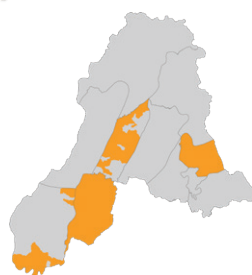
4%



Droughts



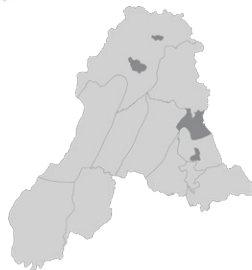
20%



Storms



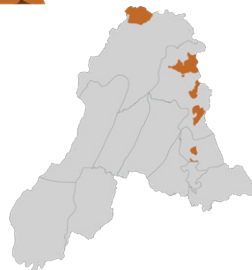
2%



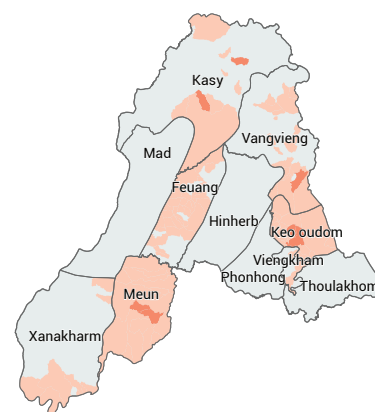
Landslides



3%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	18,724
Droughts	96,771
Landslides	12,086
Storms	9,069

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	No
Disaster Risk Reduction Plan	Yes
Evacuation Center	No
Weather Monitoring Station	No
Water Level Monitoring Station	Yes

Nº11 BORIKHAMXAY

Borikhamxay province is located in central Lao PDR, bordering Vietnam to the east and Thailand to the west. The province has an area of 15,384 square kilometres, which is divided into 7 districts, and a total population of 273,691 people. The analysis shows that the province is impacted by climate change related hazards, especially in mountainous areas, with nearly a quarter of the total population being exposed to droughts. Villages in Xaychamphone, Viengthong, Bolikahn and Thapabath districts, at the north, report a greater number of threats, while Pakxane, Pakkading and Khamkeuth districts are affected to a lesser extent. Landslides mainly occur in high lands of the eastern district of Xaychamphone and western Thapabath. Adaptive capacity levels are high, since primary DRR resources are in place.



POPULATION

273,691 total

48.7% female

IMPACTED AREAS

Floods

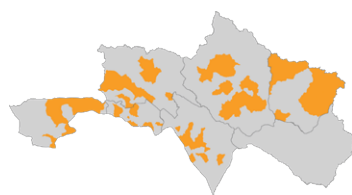
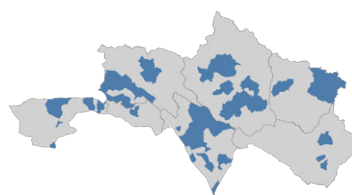


22%

Droughts



26%



Storms

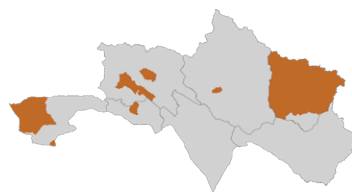


5%

Landslides



10%



MULTI-HAZARD MAP



PEOPLE AFFECTED

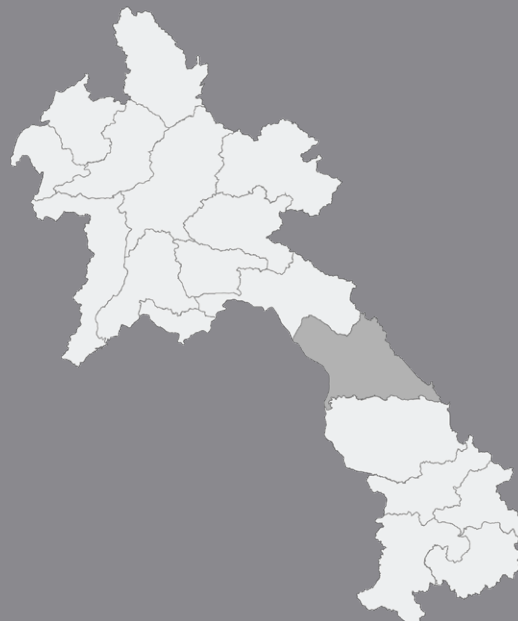
Floods	65,802
Droughts	71,230
Landslides	20,540
Storms	14,264

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

N°12 KHAMOUANE

Khammouane province is located in central Lao PDR, bordering Vietnam to the east and Thailand to the west. The province has an area of 16,735 square kilometres, which is divided into 10 districts with a total population of 390,664 people. The analysis shows that the province is slightly affected by climate change related hazards, with about 27 per cent of the villages (over 100,000 inhabitants) within the province reportedly affected by floods, mainly in lowlands. Villages in the central districts of Nhommalath and Thakhek and southern Xebangfay are exposed to a greater extent, while Bualapha, Hinboon, and Kounkham districts are less exposed. Adaptive capacity levels are high, since primary DRR resources are in place.



POPULATION

390,664 total

50.5% female

IMPACTED AREAS

Floods

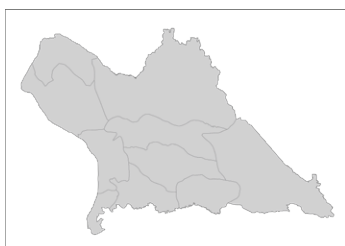
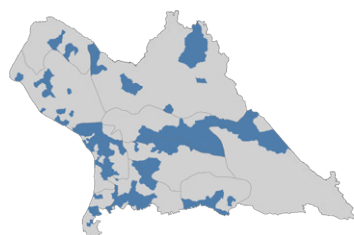


27%

Droughts



0%



Storms

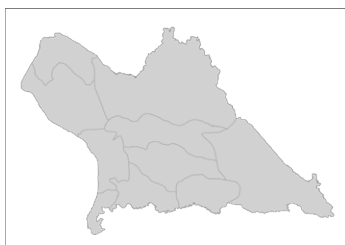


0%

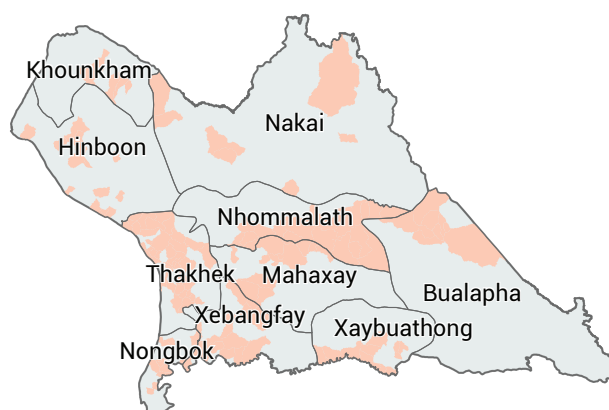
Landslides



0%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	111,985
Droughts	0
Landslides	0
Storms	0

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

N°13 SAVANNAKHET

Savannakhet province is located in southern Lao PDR, bordering Vietnam to the east and Thailand to the west. Predominantly flat, it has an area of 21,290 square kilometres, which is divided into 15 districts. With a total population of 962,373 people, Savannakhet is the largest and most populated province in Lao PDR. The analysis shows that the province is impacted by climate change related hazards, with 14 out of 15 districts (36 per cent of the villages) and a over third of its population affected by floods. Villages in Sepone district, at the east, and Songkhone, and Thapangthong districts, at the south, are the most vulnerable as they register floods, droughts, storms and landslides. While Sepone, Xonbuly and Phine districts are largely hit by floods, All the villages in Songkhone and Phalanxay have been affected by droughts. Adaptive capacity levels are high, since primary DRR resources are in place.



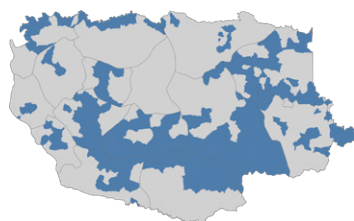
POPULATION

962,373 total

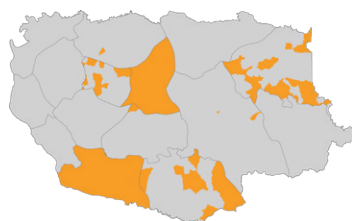
50.7% female

IMPACTED AREAS

Floods



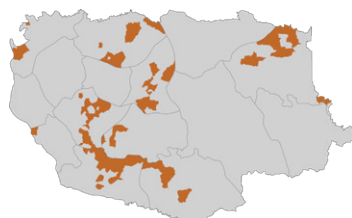
Droughts



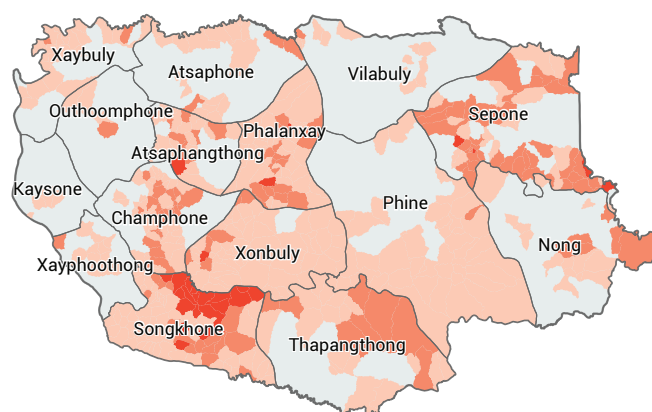
Storms



Landslides



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	344,953
Droughts	201,217
Landslides	97,908
Storms	56,092

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

N°14 SARAVANE

Saravane province is located in southern Lao PDR, bordering Vietnam to the east and Thailand to the west. The province has an area of 10,108 square kilometres, which is divided into 8 districts, and a total population of 396,963 people. The analysis shows that the province is moderately impacted by climate change related hazards, with nearly a quarter of its population being affected by floods. While all hazards hit villages in Toomlarn district, at the north of the province, Samuoi and Saravane districts are also exposed to floods and storms. Floods, presumably because of the geographical characteristics of the area, affect more than half of villages in Khongxedone district, which is a quite flat watershed that receives water from higher land. Landslides and droughts are rare across this province. Adaptive capacity levels are high, since primary DRR resources are in place.



POPULATION

396,963 total

51.4% female

IMPACTED AREAS

Floods

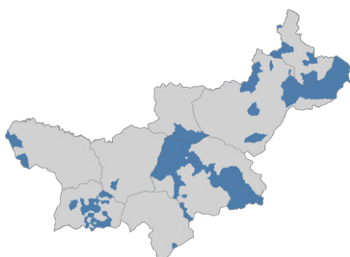


23%

Droughts



3%



Storms



10%

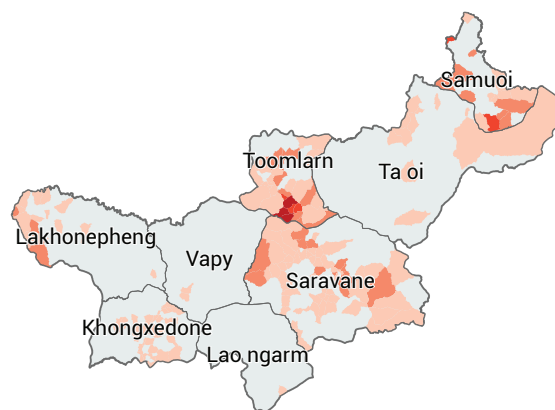
Landslides



5%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	102,394
Droughts	13,844
Landslides	16,070
Storms	54,192

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

N°15 SEKONG

Sekong province is located in southern Lao PDR, bordering Vietnam to the east. The province has an area of 8,285 square kilometres, which is divided into 4 districts. A total population of 113,170 people makes Sekong the second least populated province in Lao PDR. The analysis shows that the province is highly impacted by climate change related hazards, with floods and landslides being the main threat registered within the province. While droughts mostly affect villages in Thateng district, this area is also vulnerable to floods and storms. Villages in Kaleum district, in the north, and Dakcheung, in the southeast, are highly affected by floods, storms and landslides. Lamarm district only registers floods on its western area. Adaptive capacity levels are low, since primary DRR resources, such as DRR plan, evacuation centres and provincial Master Plan are not in place.



POPULATION

113,170 total

50.1% female

IMPACTED AREAS

Floods



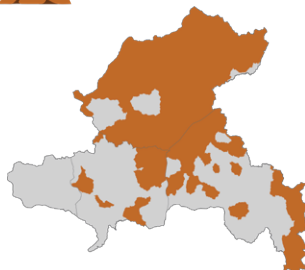
Droughts



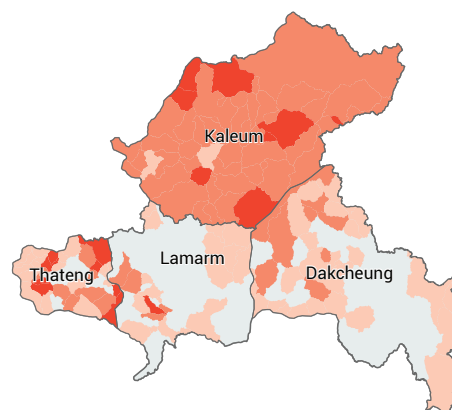
Storms



Landslides



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	44,622
Droughts	25,819
Landslides	30,512
Storms	32,981

ADAPTIVE CAPACITY

Provincial Master Plan	No
Early Warning System	Yes
Disaster Risk Reduction Plan	No
Evacuation Center	No
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº16 CHAMPASACK

Champasack province is located in the southmost of Lao PDR, bordering Cambodia to the south and Thailand to the west. The province has an area of 14,895 square kilometres, which is divided into 10 districts. With a population of 694,023, Champasack is the third most populated province in Lao PDR. The analysis shows that the province is highly impacted by climate change related hazards, with 51 per cent of the villages experiencing floods that affect nearly half of the population. While the majority of the affected villages are concentrated in the northeast of the province, in Paksong district, exposure to floods is high to the centre of the province, thus affecting villages in all the districts, especially southern Khong. Sukhuma district, situated in the flatter region, is mainly hit by storms while landslides mostly strike villages in western Moolanpamok. Adaptive capacity levels are high, since primary DRR resources are in place.



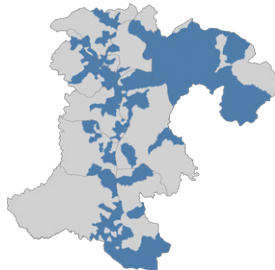
POPULATION

694,023 total

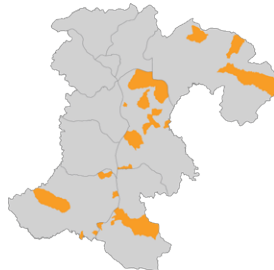
50.8% female

IMPACTED AREAS

Floods



Droughts



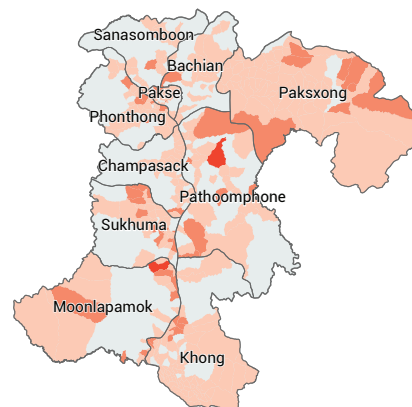
Storms



Landslides



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	339,743
Droughts	31,930
Landslides	21,186
Storms	68,023

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	Yes
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

N°17 ATTAPEU

Attapeu province is located in southern Lao PDR, bordered by Cambodia in the south and Vietnam in the east. The province has an area of 10,237 square kilometres, which is divided into 5 districts. With a total population of 139,628 people, Attapeu is the third lowest populated province in Lao PDR. The analysis shows that the province is highly impacted by climate change related hazards. High proportion of villages in Phouvong and Sanamxay districts are affected by floods, droughts, storms and landslides. Phouvong, Samakkhixay, Sanamxay and Xaysetha are highly affected by floods, while Sanamxay, Sanxay and Phouvong districts are highly impacted by droughts. Sanamxay and Phouvong districts, which are situated in the flat areas of the provinces, are highly affected by storms. Mountainous regions of Sanxay and Xaysetha districts are impacted by landslides as well as few flatter regions of Sanamxay district.



POPULATION

139,628 total

50.5% female

IMPACTED AREAS

Floods

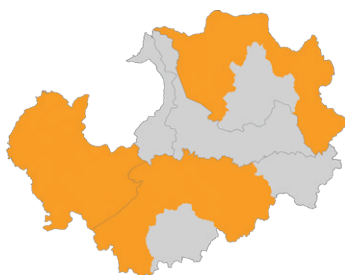


46%

Droughts



60%



Storms



35%

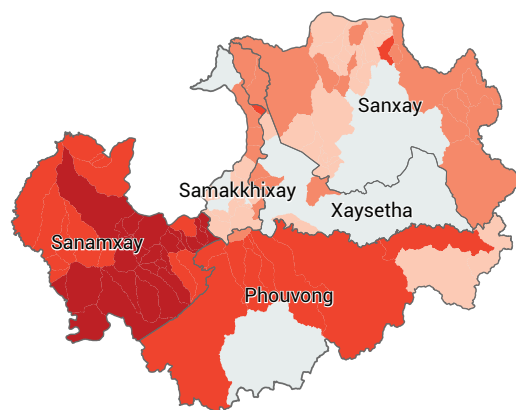
Landslides



46%



MULTI-HAZARD MAP



PEOPLE AFFECTED

Floods	72,955
Droughts	65,424
Landslides	59,290
Storms	47,439

ADAPTIVE CAPACITY

Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	Yes
Evacuation Center	No
Weather Monitoring Station	Yes
Water Level Monitoring Station	Yes

Nº18 SAYSOMBOUN

Saysomboun province is located in northern Lao PDR, with no touching borders to any neighbouring country. The province has an area of 7,958 square kilometres, which is divided into 5 districts. With a total population of 85,168 people, Saysomboun is the third smallest and least populated province in Lao PDR. The analysis shows that the province is slightly impacted by climate change related hazards, with landslides being the major threat in 3 out of 5 districts (12 per cent of villages). While that is the main hazard registered in Longcheng, Longsane and Anouvong districts, the latter is also affected by droughts. Floods are only registered in the northern tip of Home district. Adaptive capacity levels are low, since primary DRR resources, such as DRR plan, evacuation centres and water level monitoring stations are not in place.



POPULATION

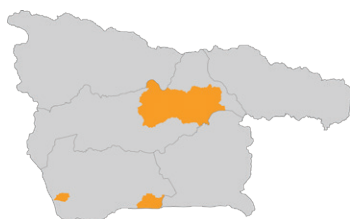
85,168 total
48.8% female

IMPACTED AREAS

Floods



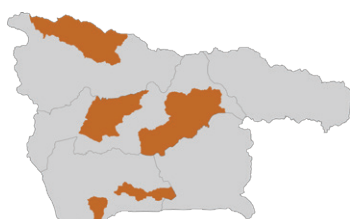
Droughts



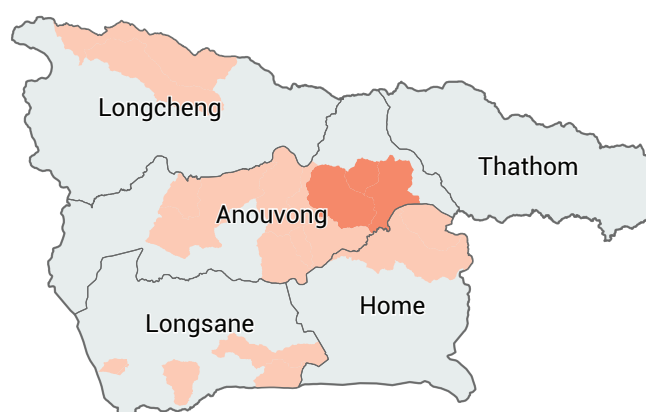
Storms



Landslides



MULTI-HAZARD MAP



PEOPLE AFFECTED

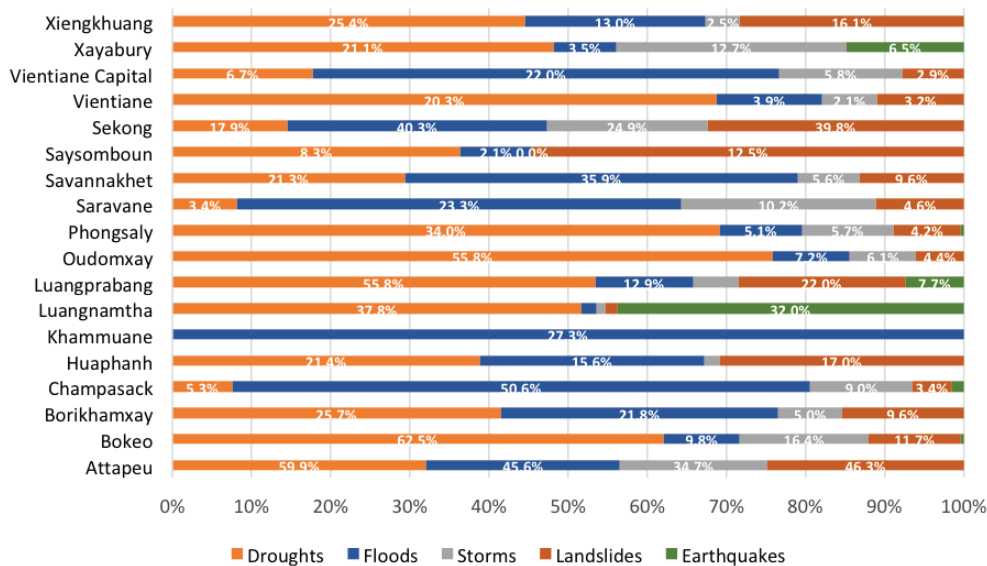
Floods	714
Droughts	14,326
Landslides	16,222
Storms	0

ADAPTIVE CAPACITY

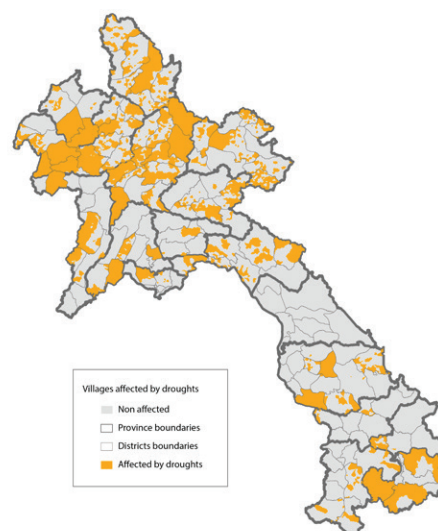
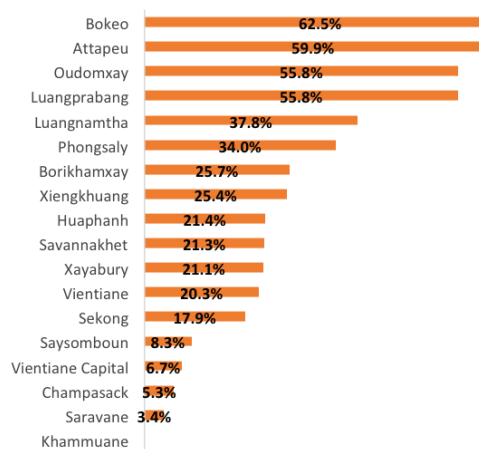
Provincial Master Plan	Yes
Early Warning System	Yes
Disaster Risk Reduction Plan	No
Evacuation Center	No
Weather Monitoring Station	Yes
Water Level Monitoring Station	No

Appendix 1. Hazard Maps and Figures

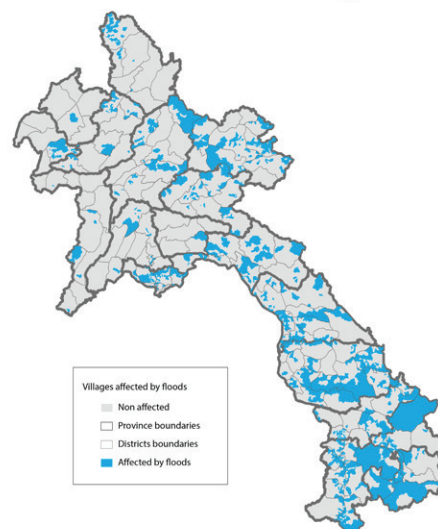
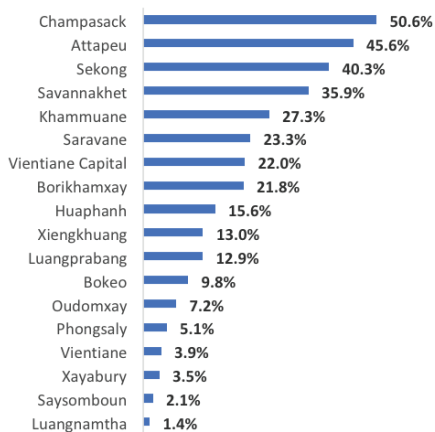
Hazard Incidence per Province



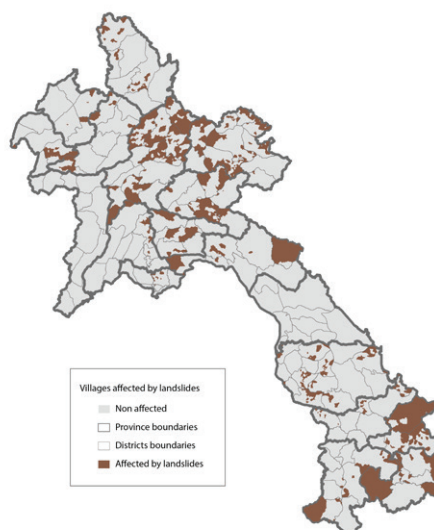
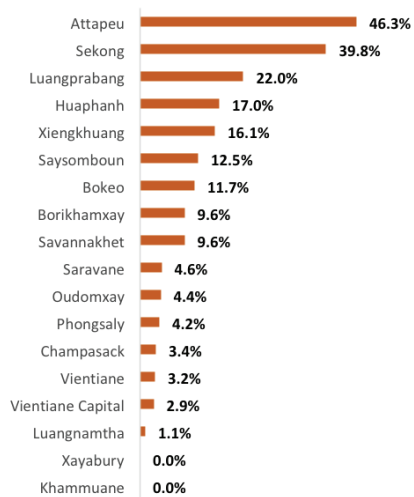
Droughts



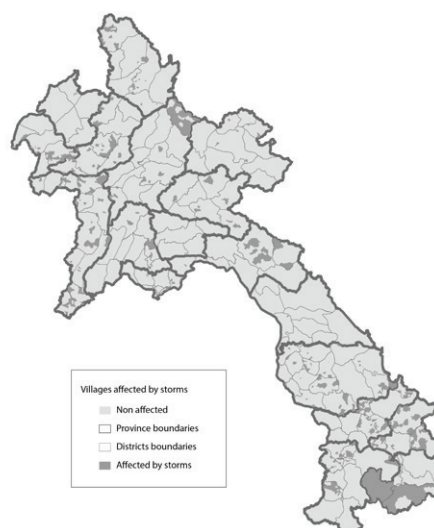
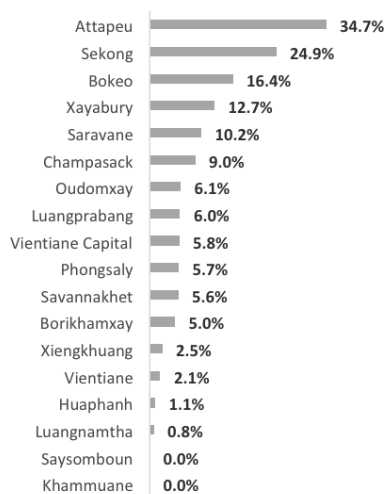
Floods



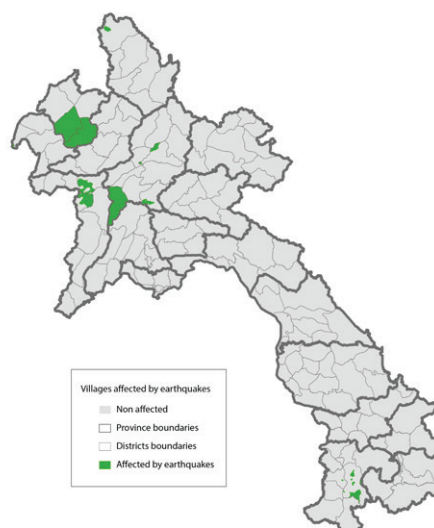
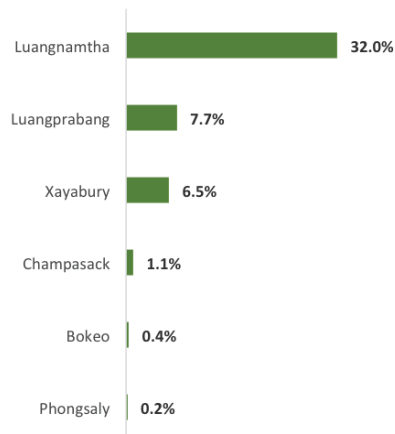
Landslides



Storms



Earthquakes



Prepared by UN-Habitat Lao PDR

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