



Climate vulnerability of water and sanitation services in rural Savannakhet

An assessment

September 2024



Contents

Understanding climate vulnerability	3
Methods	4
Existing water and sanitation services in Savannakhet Province	5
Water services overview	5
Sanitation services overview	9
Exposure to climate hazards	10
Flooding	10
Drought	10
Heatwaves	11
Future climate risks	11
Sensitivity	12
Identified consequences of climate events on different socio-economic profiles	16
Perceptions on how gender and disability impact vulnerability	17
Adaptive capacity	18
Summary of findings	20
Recommendations	21
References	23

About SNV

SNV is a global development partner deeply rooted in the African and Asian countries where we operate. With 60 years of experience and a team of approximately 1,600 people, we strengthen capacities and catalyse partnerships that transform agri-food, energy, and water systems. Working on the core themes of gender equality and social inclusion, climate adaptation and mitigation, and strong institutions and effective governance, we tailor our approaches to different contexts to achieve large-scale impact and create sustainable and more equitable lives for all.

Acknowledgements

This study was carried out as part of SNV's Towards Inclusive Climate Resilient Rural Water, Sanitation and Hygiene Services (ICRRWASH) programme, which aims to strengthen the capacity of local governments and private sector actors to support adaptation and integrate climate change resilience within inclusive, area-wide rural WASH services and systems in the districts of Atsaphone, Champhone, and Phalanxay in Savannakhet Province (2023-24).

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Cover photo: Collecting water from a pond in Savannakhet Province to transport back home by hand tractor. Photo credit: SNV/Bart Verweij.

Suggested citation: SNV, *Climate vulnerability of water and sanitation services in rural Savannakhet: An assessment*, Vientiane, SNV, 2024.

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SNV's ICRRWASH programme in Lao PDR is supported by the Water for Women Fund of the Government of Australia's Department of Foreign Affairs and Trade.

Savannakhet province is the most populous in Lao PDR, with a population of over 1.1 million people. The province lies in the country's southern plains, bordered by the Mekong River to the west, forming the boundary with Thailand and a mountainous eastern border with Vietnam. Climate hazards such as flooding, droughts, storms, heat waves, and erosion vastly affect the region. These threats exacerbate the challenges of ensuring the population has sustainable access to basic water and sanitation services. Savannakhet has the highest number of people still practising open defecation. It also has the second-highest levels of source drinking water contamination in the country.¹ There is an urgent need to improve basic service provision and ensure that service investments are resilient and inclusive of the most vulnerable. To achieve these, an assessment is necessary to understand how climate hazards impact existing water and sanitation systems, highlighting the variable exposure, sensitivity, and adaptive capacities within and across communities. The assessment's community and household consultations were carried out in Atsaphone, Champhone, and Phalanxay Districts between June and November 2023, capturing the diverse range of demographic groups and climate-related risks posed to communities in the province.

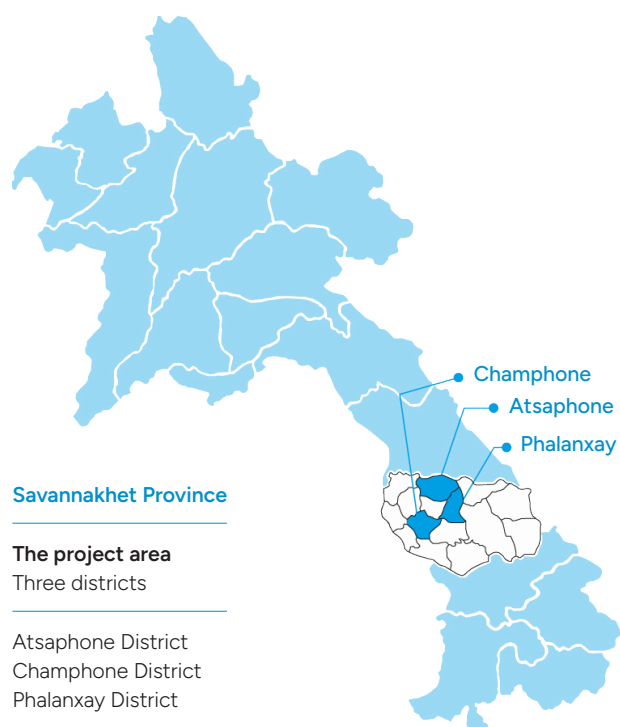


Figure 1: Map of Savannakhet Province (SNV and Upward Spiral, 2022, p.11).

Understanding climate vulnerability

Vulnerability is the susceptibility to adverse effects of climate change, including climate variability and extremes. Vulnerability measures the intersection of exposure, sensitivity to harm, and the capacity to adapt to change.²

Exposure

Exposure describes the nature and magnitude of a climate event (e.g., extreme temperature, flood, drought). Exposure also describes the probability of occurrence, duration, and intensity of the climate event and its spatial magnitude.

Sensitivity

Sensitivity describes the characteristics that can make people, assets, or systems susceptible to the negative effects of an exposure. It captures the magnitude of the potential negative impacts of the hazards posed.

Adaptive capacity

People use formal and informal mechanisms, resources, assets, interpersonal relationships, and institutions to cope with or adapt to climate hazards. Adaptive capacity captures these mechanisms' potential to avoid, reduce, or cope with the negative effects of climate exposure.

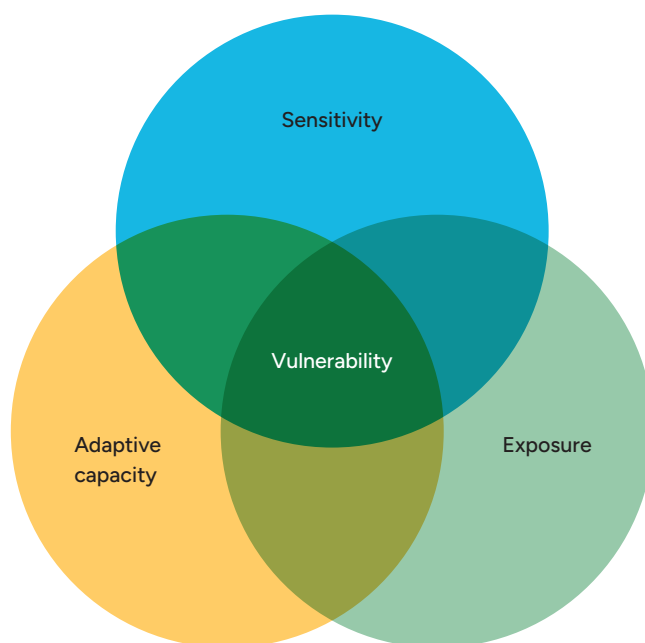


Figure 2: Dimensions of climate vulnerability, adapted by SNV (National Oceanic and Atmospheric Administration, n.d.).

¹ Lao Bureau of Statistics, Laos Social Indicator Survey 2023, Vientiane, Lao Bureau of Statistics, 2023.

² National Oceanic and Atmospheric Administration, 'Assess Vulnerability & Risk', *US Climate Resilience Toolkit*, Silver Spring, National Oceanic and Atmospheric Administration, n.d., <https://toolkit.climate.gov/steps-to-resilience/assess-vulnerability-risk> (accessed 20 August 2024).



Photo: Champhone family showing the water line formed by flooding in the community. Photo credit. SNV/Bart Verweij.

Methods

This report aims to synthesise findings from a range of targeted research components carried out by SNV in Lao PDR throughout this project period (2023-2024); these include:

- i A comprehensive desk review of documents, research and data on WASH and associated climate topics in Lao PDR.
- ii Interviews with community leaders and 36 households in Champhone and Phalanxay in November 2023 focused on communities with experiences of flood and drought to understand their domestic water access, supply, and behaviours. This included 12 households of people with disabilities and their carers.
- iii A set of 24 gender-disaggregated focus group discussions, with 165 participants across the three districts of Atsaphone, Champhone, and Phalanxay, focused on WASH impacts of climate events based on a vulnerability assessment methodology developed by the Institute for Sustainable Futures, University of Technology Sydney.³
- iv A series of interviews and consultations with non-governmental actors and over 30 government stakeholders have been conducted over the research period (June 2023- June 2024). Government key informants (from the national, provincial and district levels) have spanned a broad range of departments, including Health, Natural Resources and Environment, Labour and Social Welfare, Planning and Investment, Public Works and Transport, Lao Women's Union, Lao Youth Union, and the Governor's Office.
- v Over 20 private sector actors were interviewed and consulted during the research period. These span the broad range of different WASH products and service providers in the target locations.

To provide further insights, contexts, and analyses, the following additional research components include:

- vi **WASH Gender Equality Measure survey.** SNV surveyed in November 2022, 396 households in Savannakhet. The WASH Gender Equality Measure (WASH-GEM) is a quantitative assessment tool developed by the Institute for Sustainable Futures, University of Technology Sydney, which gives insights into gender disparities in access to resources, support, voice, and influence of different population groups during a severe weather event and disaster due to climate change.
- vii **SNV Towards Climate Resilient Rural WASH project baseline survey.** In November 2022, SNV surveyed 1,592 households across Champhone, Atsaphone, and Phalanxay districts.

³ J. Kohlitz, T. Megaw, J. Chong, F. Sugi, P. Palaipeni, Y. Emanuel, H. Brikman, Y. Joman, S. Landa, J. Talan, L. Leong, J. Kelleher, and A. Gero, *Climate Change Response for Inclusive WASH: A guidance note for Plan International Indonesia*. Prepared by ISF-UTS for Plan International Indonesia, Jakarta, Plan International Indonesia, 2020, <https://multisitestaticcontent.uts.edu.au/wp-content/uploads/sites/57/2021/03/08190901/Guidance-Note-CCRIW-Indonesia-1.pdf> (accessed 12 August 2024).

Existing water and sanitation services in Savannakhet province

There is minimal support, organisation, or regulation for service delivery in either water or sanitation in rural areas of Savannakhet. Most rural households practise self-supply for all their water needs, and sanitation is exclusively on-site, with no centralised and managed treatment of waste in the province.⁴ Private sector service provision (bottled drinking water factories, borehole drillers, waste emptying trucks, and latrine component manufacturers) is informal, small-scale, and operates with limited regulatory oversight or support to ensure appropriate standards are adhered to.

In policy, responsibility for service regulation and delivery is decentralised, fragmented across multiple government line ministries, and could benefit from more specific guidance. In practice, government departments have insufficient budget, capacity, or resources to carry out their prescribed functions.

The focal ministry for rural water and sanitation services is the Centre for Clean Water and Environmental Health (*Nam Saat*), a division of the Ministry of Health. Despite their mandate, in practice, their work and available budget to strengthen water and sanitation services

are limited to specific development-funded project activities, which historically have primarily focused on sanitation promotion, hygiene awareness, and improving facilities in schools and health centres. Presently, the available budget for sanitation and achieving the national Open Defecation Free Target by 2025 are the priorities. Unfortunately, despite these being a priority for communities, there is limited budget and technical expertise to address complex water supply challenges.

Water services overview

Across all communities in Savannakhet (and Lao PDR as a whole), water quality is a significant problem. Data from the 2023 Lao PDR Social Indicator Survey, which measured *E. coli* levels in household drinking water, found that 85% of drinking water sources in Savannakhet were contaminated. This includes 63% of sources that had 'very high,' unsafe levels of *E. coli*. Water quality is a challenge across all water sources, even improved sources; 67% of all improved sources were contaminated and 59% of bottled water was also found to contain *E. coli*. Despite widespread quality issues, household water treatment has a very low prevalence. Tackling the issue of improvements to water services is hampered by existing governance arrangements and a lack of resources to improve service provision.

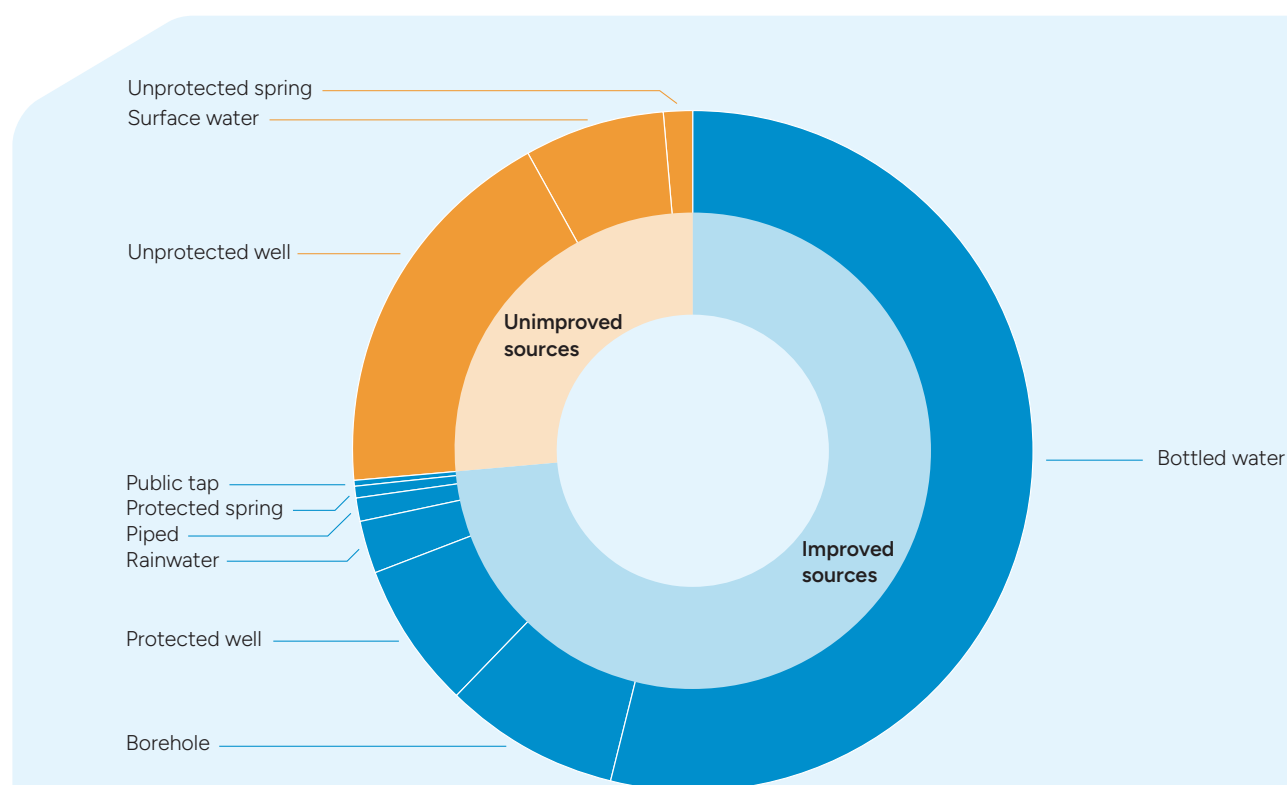


Figure 3: Primary drinking water sources for households in Savannakhet.

⁴ There is one decentralised faecal sludge disposal facility in Kaisone district, but they offer limited service. About eight truckloads of waste per month are delivered to the treatment plant, a tiny fraction compared to the estimated 20 latrine emptying companies operating in the vicinity.

Groundwater: Most rural households have on their premises either an open well or an enclosed tubewell. While responsibility resides within the Groundwater Department of the Office for Natural Resources and Environment to register and monitor boreholes, in practice, this registration is limited to deep wells for large-scale industrial purposes or those installed by development partners for shared use. Their remit does not extend to registration, standards or management of the ubiquitous household boreholes and open wells, of which there are tens if not hundreds of thousands in the province. All borehole drillers contracted by households surveyed were unregistered and unregulated. Interviewed households pointed to the lack of proper sealing and poor-quality construction. All households interviewed had a complaint regarding quality water from their boreholes; specific issues include water becoming visibly dirty as surface water runoff contaminates the shallow aquifers in the rainy season and in the dry season, the water becomes discoloured or increasingly turbid. In drought-prone communities, groundwater is unavailable for parts of the year; however, there is no monitoring or data to understand risks and trends better.



Photo: Typical open borewell in Champhone District.



Photo: A 20-litre bottled water, the most desirable and common source of drinking water across Savannakhet.

Bottled water: Bottled water – in the form of 20-litre containers – is the most common source of drinking water for those who can afford it. Factories that produce ice and water bottles, regardless of size, must be registered with the Department of Public Works and Transport, for which there is a high compliance rate. However, while factories are inspected at least annually, the inspectors do not offer feedback or exercise enforcement mechanisms to encourage the sanitary improvements needed (such as the need to clean bottles between refills). In the factories surveyed, although water samples had been collected for testing, the results were not shared with the factories. The standards vary between producers, and there is no accreditation or quality standard certification for consumers to differentiate between the options available. Consumers typically make decisions based on a combination of taste, delivery reliability, and cost.

Photo: A large rainwater jar and collection system.



Rainwater: Most households observed collect and use rainwater for domestic purposes during the wet season. Collection methods are often improvised using recycled materials such as corrugated iron off-cuts to divert water from roofs to storage containers. Storage is typically either in large cement jars (many reported that these have been donated to households in the past) or smaller, cheaper (US\$ 20) 200-litre blue plastic drums imported from Thailand. Larger purpose-built cement constructions are typically equipped with a spigot for easy collection, whereas collection from blue jars is done by scooping, increasing the risk of contamination. Rainwater collection is filtered using a cloth to remove leaves and dirt. All households reported practising some form of first flush at the beginning of the rainy season to keep water visibly clean. Only a tiny number of households have storage to prolong usage past the main wet season. In highly drought-prone areas, it is common for households to use an ad hoc collection of containers to maximise storage capacity.

Surface water: Reliance on surface water for drinking and other domestic use is most prevalent in very remote rural areas, with poorer ethnic minorities most affected. Nationally, 10.4% of households belonging to the Mon-Khmer ethnic group (the predominant minority group in Savannakhet) depend on surface water for their drinking water source, compared to 1.4% of Lao-Tai ethnic people.⁵ The poor quality of surface water often requires lengthy round-trip collection times.



Photo: A surface water source in Phalanxay District used by a nearby community for drinking water.

⁵ Lao Bureau of Statistics, Laos Social Indicator Survey 2023, 2023.

Photo: A discarded receptacle for a household ceramic drinking water filter.



Household water treatment: Despite the potential of household water treatment to improve water quality, less than 1% of people are using a water filter. While boiling is reported to be 7.3%,⁶ observations and interviews suggest this is not always practised consistently. Boiling is usually done when someone is sick or for tea preparation.

Supply chains for drinking water treatment products are limited. Household ceramic water filters were observed, but none were currently in use. Reasons cited include insufficient water flow (it takes 2-3 litres per hour filtration rates that require attentive refilling to ensure adequate volumes are available for a typical household) and the inability to buy replacement parts. Filters are considered less convenient and less aspirational compared to bottled water. The filter can become clogged and would need replacement after one or two years (especially when using poor-quality surface water sources or hard water from a borehole). Moreover, filters are not readily available, and households have no financing mechanism to enable them to pay over time. Filters cost US\$ 30-40, so they offer cost savings compared to bottled water but are unaffordable to those who would most benefit.

Piped water: Some rural communities in rural Savannakhet have access to piped water supplied by state-owned utility or private enterprises and regulated by the Department of Public Works and Transport. Development of piped infrastructure has been supported through financing from multi- and bi-lateral loans and grants. Once the loan is approved, a metered connection per household is provided with low tariffs ranging from 2,500-3,500 Kip (US\$ 0.10-15c) per cubic meter. Piped water is used for non-consumption domestic uses and supplemented with either bottled water for drinking or free on-site water sources.



Photo: A household water metre connection to the state-owned water provider utility in peri-urban Champhone District.

⁶ Lao Bureau of Statistics, 2023.



Photo: A sanitation enterprise producing concrete rings to store latrine waste.

Sanitation services overview

On-site sanitation: As of June 2024, provincial government data indicated that 71% of all villages in Savannakhet were now open-defecation-free – up from 56% one year ago. The most common type of toilet is a pour-flush latrine,⁷ with an onsite pit constructed from concrete rings used to store effluent. It is the norm in rural Savannakhet for latrine component producers to provide materials only. The household oversees the installation of the underground components and construction of the superstructure. Whilst there exist guidelines, published by Nam Saat on quality latrine construction, they are voluntary, with no oversight. In most cases, households install latrines themselves or hire informal labour without any knowledge of the guidelines. As a result, the construction standards vary with unlined pits and improper siting putting water sources at risk.

Faecal sludge management: Across the province, only around 10% of latrine pits in Savannakhet have ever been emptied,⁸ with the rate likely to be even lower for rural areas. The most common disposal method is via a pump truck, with over 30 private, small-scale operators estimated to be operating across the province. While there is a sludge treatment centre in the provincial capital (*funded by the Asian Development Bank, with a 20-year operating concession awarded in 2022*) that could theoretically service several surrounding districts, the cost of transport and disposal fees have led to it being entirely unused. The actual practices of waste disposal are unseen and unregulated across the province. Anecdotal, there are reports that operators receive payment from farmers to dispense the untreated waste on their land as natural fertiliser.⁹

⁷ In the project baseline report 96% of respondents that owned toilets had a pour flush latrine.

⁸ Lao Bureau of Statistics, 2023.

⁹ SNV, 'Realising safely managed sanitation in Lao PDR', *SNV Learning paper*, The Hague, SNV, 2021, <https://www.ircwash.org/sites/default/files/2021-safely-managed-sanitation-laopdr.pdf> (accessed 12 August 2024).

Exposure to climate hazards

The climate of Savannakhet is tropical, with the wet season running from May to mid-October, characterised by high temperatures and periods of intense rainfall. Savannakhet, like the rest of Lao PDR, experiences spatial and temporal variations in rainfall. Annual rainfall is among the highest in the country along the Savannakhet's eastern border with Vietnam, with mean annual rainfall reaching 2,500 mm in this region over the period 1991–2020¹⁰ – compared to 1,600 mm in the west of the province. Over 70% of annual precipitation occurs in the wet season (April–October). Temperatures in Savannakhet are highest along the western border with Thailand, with mean annual temperatures recorded at 26°C in the period 1991–2020, compared to a slightly cooler 24°C in the east. There are significant seasonal variations in temperature and can exceed 40°C between April–June.

Flooding

Rainfall from mountainous regions to the north and east of Savannakhet drains through the province westwards towards the Mekong. Many communities near these tributaries of the Mekong are highly prone to flooding and riverbank erosion. In Savannakhet, the primary areas at risk of flooding are Champhone District and some communities along the Banghiang River that runs across the south of the province.

Champhone district is home to the Xe Champhone Wetlands which cover an area of over 12,000 hectares comprised of perennial and seasonal rivers, as well as scattered lakes, ponds, freshwater marshes, and rice paddy fields that become interconnected during the wet season.¹¹ The Bannghieng River, runs east to west across the province, crossing through the districts of Sephon, Phine, Xonbuly, Thapanthong, and Songkhone. For communities living within these areas, the wetlands are an important source of livelihood yet expose people to both prolonged seasonal flooding and damaging flash floods.

Drought

Twenty-one per cent of villages across the province, including all the villages in Phalanxay and Songkhone districts, have experienced drought. Most rural communities in Savannakhet rely on self-supplied water in the dry season, which are open wells, boreholes, and surface water. For remote rural communities away from main water bodies, drought incidences are characterised by depleted groundwater in shallow wells, as well as prolonged dry spells and drying up of surface water sources.

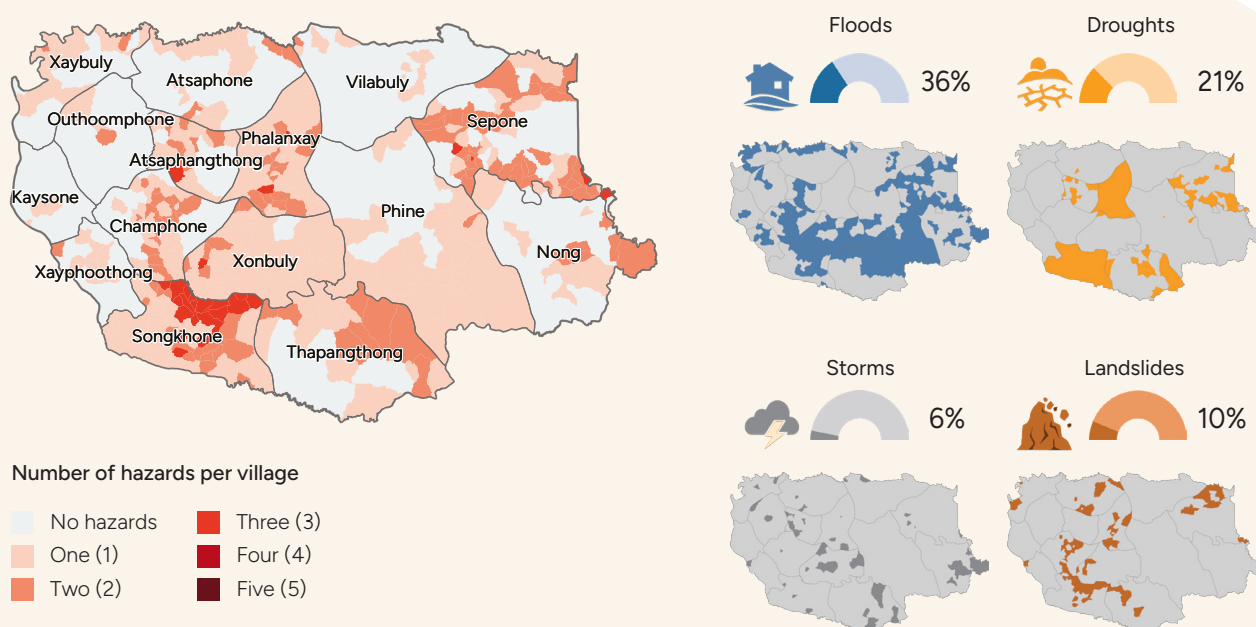


Figure 4: Savannakhet Climate Hazards Mapping (UN-Habitat, 2021).

¹⁰ World Bank, 'Lao PDR,' Climate Change Knowledge Portal, *The World Bank*, 2021, <https://climateknowledgeportal.worldbank.org/country/lao-pdr/climate-data-historical> (accessed 10 August 2024).

¹¹ IUCN, 'Baseline Report Xe Champhone Wetland, Champhone and Xonbuly Districts, Savannakhet Province, Lao PDR', *Mekong Water Dialogues Project*, Gland, IUCN, 2011, <https://portals.iucn.org/library/sites/library/files/documents/2011-082.pdf> (accessed 5 July 2024).

Heatwaves

Lao PDR has experienced record-breaking temperatures in the last two consecutive years; first during the May 2023 heatwave, and again in April 2024, which lasted three weeks experienced across Southeast Asia. In Savannakhet, temperatures reached 42°C in April 2024. During the three-week heatwave, the government advised people to avoid all outdoor activity and schools; businesses and government offices were forced to close. In rural farming communities, there were complaints of heat-related illness, crop damage, and death of livestock due to heat stress.

Future climate risks

Future climate risks are projected to include several significant changes, with high confidence indicating that the region will experience overall hotter temperatures and more extreme heat waves. Additionally, there will be an increase in the number of days with extremely heavy rainfall, particularly during the wet season, leading to more frequent flooding events. With medium confidence, it is expected that the wet season will see increased rainfall and streamflow, while the dry season will experience a decrease in both. This will result in a potential overall increase in annual rainfall, further complicating water management and flood prevention strategies.¹²



Photos: Flooding, drought, and other.
Photo credit: SNV/Bart Verweij.

¹² World Bank, 'Lao PDR,' *Climate Change Knowledge Portal*, The World Bank, 2021.

Sensitivity

The sensitivities of water and sanitation services to climate hazards in Savannakhet are complex and multi-dimensional. To illustrate the key issues, the report will analyse sensitivity through two different lenses – the first lens is the sensitivity of WASH services, assets, and infrastructure to climate impacts (*Table 1*) and the second lens is through the people who avail of the services. For the latter, it will consider three individual socio-economic

profiles. These profiles use real photos and data from the research to understand better and visualise differing demographic and socio-economic groups in the region. The sensitivity of climate events on people's water and sanitation access is highly variable across the region, and understanding the base case scenarios for different segments of the population is essential to being able to assess the impacts of climate events.

Table 1: Identified risks that climate hazards pose to water and sanitation services

Service component	Climate hazard		
	Flooding	Drought	Other
Groundwater	<ul style="list-style-type: none"> Contamination from floodwater Inability to access during flooding Damage to infrastructure 	<ul style="list-style-type: none"> Water depletion due to low recharge Concentration of pollutants and quality degradation 	<ul style="list-style-type: none"> Storm damage to pumps and wells
Bottled water	<ul style="list-style-type: none"> Difficulty in accessing in times of extreme flooding if supply routes are disrupted 	<ul style="list-style-type: none"> Safe water source during drought for those that can afford Depletion of water source and increased treatment needs 	<ul style="list-style-type: none"> More water needed during heatwaves
Rainwater	<ul style="list-style-type: none"> Contamination from floodwater Storing and properly capturing water can be a safe source during floods 	<ul style="list-style-type: none"> Lower water availability 	<ul style="list-style-type: none"> Attracts mosquitos in heatwaves Prone to storm damage
Surface water	<ul style="list-style-type: none"> Contamination from floodwater 	<ul style="list-style-type: none"> Increased evaporation Water depletion due to low recharge Increases risks of mosquito breeding and associated health risks Concentration of pollutants and quality degradation 	<ul style="list-style-type: none"> Increased evaporation in heatwaves Increases risks of mosquito breeding and associated health risks in heatwaves
Household water treatment	<ul style="list-style-type: none"> If available can be used to treat contaminated water 		
Piped water	<ul style="list-style-type: none"> Infrastructure damage risks 	<ul style="list-style-type: none"> Depletion of source water, increases treatment costs and viability of scheme 	
On site sanitation	<ul style="list-style-type: none"> Require high quality construction of latrines to withstand floods High risk of pits contaminating water sources 	<ul style="list-style-type: none"> Inadequate water for pour-flush latrine use (risk of reverting to open defecating) 	
Waste management services	<ul style="list-style-type: none"> Difficult to access during flooding Increased emptying frequency and service costs for flooded areas 		

Profile 1 – Ms King

King is 29 years old; she is married and lives with her husband, their three children (ages range between 9 and 2), and her mother- and father-in-law. During the wet season, the roads become impassable, isolating her community for several months. She lives in one of only 2% villages in Lao PDR that does not have access to electricity. King belongs to the minority Bru ethnic group. Her first language is Katang; she does speak a little Lao but cannot read or write in Lao. She and her husband are subsistence rice farmers. In most years, there is enough to eat, but in drought, their crops do not yield enough for their family to eat. To increase their food supply, she and her eldest child collect insects and mushrooms from the nearby forest.

During the wet season, King relies on rainwater for domestic use. The water is collected using scrap pieces of corrugated iron and stored in a 200-litre plastic drum, which her husband purchased by trading bags of rice from their harvest four years ago. She drinks rainwater when available to save herself the trip to the pond. During the dry season, King collects drinking water from a pond, a 15-minute walk from her home. She makes this trip 2-3 times per day to collect enough water for her family. Every three years or so this pond dries up and she must go much further to find water. She does not treat the water before drinking; unless someone is sick, then she boils it first.

Like most people in her village, King and her family do not own a toilet. They go to the forest that surrounds them for their toilet needs. When asked, she agrees that a toilet may be more convenient to use but she is concerned about the effort of bringing extra water for it. The Women's Union village representative has spoken to her before about how a toilet would make her family healthier and have a better living standard, but it is beyond their financial means so she has not given it much thought.



Profile 2 – Mrs Thong

Thong is a 74-year-old widow and head of her household. She lives with two adult children and her baby granddaughter. Her family makes a living primarily from rice farming, which has become increasingly unstable due to weather variability and crop diseases. Thong also raises chickens, ducks, and cows, which she can sell if the family needs extra money.

When available, Thong uses rainwater for drinking. She would like to have this year-round, but her storage is not big enough and she cannot afford to invest in additional, large storage tanks. The large, elevated tank she primarily uses to collect and store water was provided by an organisation more than a decade ago. In the dry season they have bottled water delivered; the delivery person brings it upstairs for her and puts it in the convenient spot, which she appreciates very much. She used to collect water from the stream, but much prefers having water delivered to save her the trip and for her peace of mind of having safe water. They started buying bottled water in the dry season around six years ago, although the price has increased now from 4,000Kip to 6,000Kip for a 20-liter bottle (US\$ 0.19c to \$US 0.28) and is expensive for her.

They have a borehole at home, which is very bad in quality. She has never drunk or cooked with the water from the borehole and she worries about the toilet water contaminating it during floods. The borehole's water is at its worst during the dry season. When the water turns yellow – they only use it for the garden, animals, and the toilet.

Her family pooled money to purchase a toilet several years ago. They bought the toilet because she is getting older and it is not convenient to walk to the forest anymore. Furthermore, the family lives in the middle of the village and to get privacy they have to walk long distances. Having a toilet at home is much more convenient and comfortable but it was a big investment. They had to sell some of their livestock to buy the materials and it took several months to save money for materials and build.



Profile 3 – Sisavai

Sisavai is 49 years old. He is married and lives with an extended family of 12 people. Their lives changed radically around six years ago, when their two older children left to work in Thailand. Before that they had no land of their own. He and his wife worked as labourers when they could, but most times could not afford enough food. Since his children left to work abroad, they would send money home – far more than they could ever earn working in the community. This enabled them to buy a piece of farmland, improve their home, and support the wider family. Before, his wife had to walk a 1km round trip three, or sometimes four times each day, to collect water from a pond for their family.

Sisavai and his wife were told about the importance of drinking clean water by health care staff. Wanting to ensure that they provided safe water for their family, in 2014, they purchased a ceramic drinking water filter to treat the pond water before drinking, but it was difficult as it did not filter quickly enough to provide for everyone in the family on time.

In 2018, they started buying 20-litre bottled water daily to have enough for everyone. When they first started buying bottled water, he was unsure about the taste and wanted to educate himself about the product before buying. He now trusts the product's safety. He believes that it is certified and has seen the machines used to treat the water. He has also discussed the treatment process with the factory operator.

When available, they use rainwater for cooking; otherwise, they need to buy more bottled water, which can get expensive. For other domestic water, they have a tubewell with an electric pump, and several taps installed around the home to make it convenient to access. They wouldn't drink or cook with rainwater, though, as it is not clean.


When asked if he has a toilet at home, Sisavai laughs, 'Yes of course. If we have no toilet, my children will not come to visit us!' He tells us, for most of his life, he used to go to the forest, but he would never do that now. Times have changed, people must use a toilet for their health and the environment of the community.



Identified consequences of climate events on different socio-economic profiles

The table below summarises the impacts and consequences of climate hazards on different socio-economic groups.

Table 2: Impacts and effects of climate hazards by socio-economic groups

Profile	Flooding	Drought	Other
	<ul style="list-style-type: none"> • Damage to crops or livestock leading to significant proportional loss of income • Difficult to access surface water sources • Unable to access open defecation areas • Contaminated drinking and domestic water sources • Evacuation without money, resources, or alternative accommodation 	<ul style="list-style-type: none"> • Damage to crops or livestock leading to significant proportional loss of income • Dried up water sources, degrading the accessibility, quantities and often quality of water used for drinking and domestic purposes • Inadequate water for hygiene purposes 	<ul style="list-style-type: none"> • Increased physical stress of collecting water, productivity loss, damage to crops/livestock due to heatwaves, and heat-related illness exacerbated by unsafe water consumption • Damage to household infrastructure due to storms
	<ul style="list-style-type: none"> • Damage to crops or livestock leading to significant proportional loss of income • Temporary flooded and clogged toilets • Contaminated borehole used for domestic water • Inconvenient and costly temporary relocation 	<ul style="list-style-type: none"> • Damage to crops or livestock leading to significant proportional loss of income • Dried up water sources, degrading the accessibility, quantities and quality of water used domestic purposes • High proportion of expenditure on income for water consumption 	<ul style="list-style-type: none"> • Productivity loss, damage to crops/livestock and heat-related illness due to heatwaves • Damage to household infrastructure due to storms
	<ul style="list-style-type: none"> • Damage to crops or livestock leading to a reduction in household disposable income • Flooded and clogged toilets temporarily • Contaminated borehole used for domestic water • Inconvenient and costly temporary relocation 	<ul style="list-style-type: none"> • Damage to crops or livestock leading to a reduction in household disposable income • Need to purchase water for domestic purposes leading to additional household expenditure 	<ul style="list-style-type: none"> • Productivity loss, damage to crops/livestock and heat-related illness due to heatwaves • Damage to household infrastructure due to storms

Perceptions on how gender and disability impact vulnerability

While socioeconomic situation is an important differentiating factor in sensitivity to climate impacts, there are other key factors that influence sensitivity, including gender and disability.

Gender

In addition to discussing the nature of impacts, focus group participants, specifically, were asked to score the severity of the impacts of the climate events they had experienced. Focus groups were gender separated to allow for sensitive discussions and an opportunity to voice alternative experiences.

While broadly male and female participants scored climate event consequences similarly, there are noticeable differences. Only women (in flood-affected communities only) brought up the difficulty of open defecation during times of flooding.

Only men highlighted the challenges of the road access being impassable and the inability to leave the community. Across the impacts, men rated the severity of impacts either the same or slightly higher than women. One exception was the impact of flood damage to household assets, which women rated marginally more severe than men.

The focus group discussions focused exclusively on the impacts of drought and floods. Impacts from heatwaves were not scored, although in-depth interviews highlighted this as a major source of stress for both men and women that caused extreme heat exhaustion, exacerbating existing health vulnerabilities, as well as causing livelihood impacts through the death of small livestock, damage to crops and lost productivity. For the 30%¹³ of households in Savannakhet that need to spend over half an hour collecting water daily, heatwaves cause additional physical stress and challenges in collecting their water.

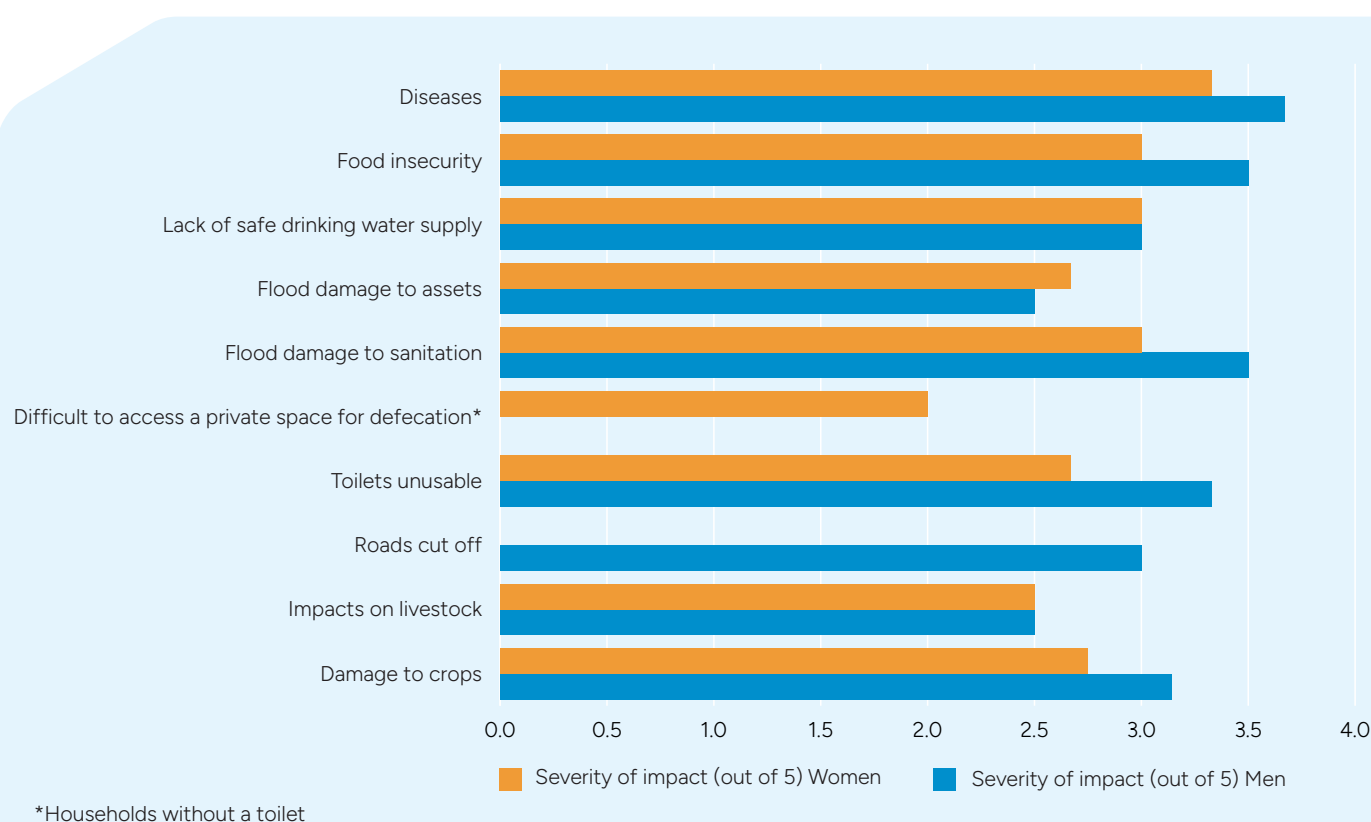


Figure 5: Scoring of severity of climate event consequences.

¹³ Lao Bureau of Statistics, 2023.

Insights from the WASH Gender Equality Measure Survey¹⁴ across the three provinces in November 2022, indicated that during a severe weather event or climate disaster:

- Men are more likely than women to find it easier to raise concerns about water, sanitation, and hygiene (WASH) with influential people.
- In climate events across all districts, women's perceived influence in household decision-making significantly decreases. Additionally, women exhibit less confidence than men in solving household and community problems during emergencies.
- Women are also more likely than men to expect difficulties in accessing non-financial support. They tend to feel unsafe while defecating during severe weather events, a sentiment less common among men.
- Both women and men consider their access to non-financial support to be limited, but a small proportion of each group manages to access support without difficulty.
- Women are more likely than men to view WASH issues as sources of conflict.

People with disabilities and their carers

In households where people are living with physical disabilities, carers or other family members were responsible for collecting and transporting water where it was not available on the premises. All families made provisions to ensure that water is accessible to people with disabilities throughout the day. For people with physical disabilities living alone or with families that can afford it, they opt to purchase bottled water for ease of access. In in-depth interviews, all people with disabilities and older people with mobility challenges reported that bottled water delivery services carried bottled water and placed it in a convenient location for easy access. This delivery practice is at risk during flooding (when villages become inaccessible) or is not available in remote areas or affordable to all.

For sanitation accessibility, people with disabilities experience challenges in terms of accessibility features such as handrails or ramps not incorporated into latrine designs. People with physical disabilities rely on their carers in accessing and using sanitation facilities. In periods of flooding, accessibility is worsened as access becomes slippery, muddy and in severe flooding, cut off entirely.

Adaptive capacity

Across Savannakhet province, the government (from the provincial to the community level) has well-established, functional early warning systems, Disaster Risk Reduction plans, and evacuation centres in flood-prone areas. Specific procedures are followed for supporting the most vulnerable groups, including people with disabilities, pregnant women, the elderly, and families with young children. The provincial Department of Labour and Social Welfare also has a dedicated Emergency Budget to provide shelter, food, and water for people who need to evacuate due to seasonal floods, drought, and forest fires. However, these budgets are limited and would not be sufficient in times of a very severe, lengthy, or widespread disaster.

The table on the next page illustrates the coping mechanisms available to and used by different socio-economic groups in Savannakhet in response to existing climate hazards.

¹⁴ Further information is available at <https://waterforwomen.uts.edu.au/wash-gem/>.

Table 3: Coping mechanisms by different socio-economic groups in times of calamities

Profile	Coping mechanisms		
	Flooding	Drought	Other
	<ul style="list-style-type: none"> • Move belongings and livestock to higher ground • Harvest crops early where possible • Find natural food such as cricket, frog and bamboo shoots to replace lost crops • Sell livestock for buying foods, replant crops and fix damage • Join community clean up • Boiling water for drinking • Evacuate to government emergency camp 	<ul style="list-style-type: none"> • Find food and water elsewhere • Find natural food such as cricket, frog and bamboo shoots to replace lost crops • Boil water for drinking • Evacuate to government emergency camp • Store rainwater in ad hoc containers 	<ul style="list-style-type: none"> • Collect less water, reduce labouring and physical activity during heatwave to prevent heat exhaustion • Sell livestock to pay for repairs from storms • Join community to repair storm damage
	<ul style="list-style-type: none"> • Move belongings and livestock to higher ground • Harvest crops early where possible • Buy more bottled water • Sell livestock for buying foods, replant crops and fix damage • Share water for household use by relatives not affected by flood • Join community clean up • Stay with relatives in non-affected area 	<ul style="list-style-type: none"> • Build ponds to reserve the water for their crops • Pump water from another source for crops • Buy more bottled water • Drill borehole for water during drought • Pay for water pump to water their crops • Return to open defecate if no water 	<ul style="list-style-type: none"> • Sell livestock to pay for damage from storms • Reduce labour and physical activity to prevent heat exhaustion • Buy and drink more water during heatwaves
	<ul style="list-style-type: none"> • Stay with relatives in another village or city • Move belongings and livestock to higher ground • Harvest crops early where possible • Buy more bottled water • Diversify crops for more income • Share water for household use by relatives not affected by flood 	<ul style="list-style-type: none"> • Build ponds to reserve the water for their crops • Explore the hybrid crop that can be resilient the climate change • Pump water from another source for crops • Buy more bottled water • Drill borehole for water during drought • Improve irrigation for crops • Diversify crops for more income • Pay for water pump to water their crops • Initiate community dialogue to prevent forest degradation and burning 	<ul style="list-style-type: none"> • Reduce labour and physical activity to prevent heat exhaustion • Buy and drink more water during heatwaves

Summary of findings

Savannakhet province's geographical position makes it highly prone to extreme weather conditions, and Indigenous populations have developed approaches to adapt and respond according to their means. However, cyclical damage and asset loss continues to perpetuate poverty and suppress living standards, which is most severe for the poorest households. As climate events become more severe, lengthy, or frequent, without urgent action, this situation will only worsen.

Lack of access to safe water for consumption is a pressing challenge. The health risks and consequences of consuming unsafe drinking water are well documented, and the findings on water consumption and safety in Savannakhet are dire. There is a dependency on private service provision that has limited regulatory oversight, knowledge of quality standards, or best practices. Without financial support or other mechanisms, access is strictly for those who can afford to pay. The most vulnerable are those unable to afford bottled water and reliant on unsafe water sources that are at risk of further quality degradation. Future climate change is forecasted to drive more frequent and intense rainfall events which will heighten the risk of contamination events.

An emerging issue regarding water quality is the impact of on-site sanitation. There have been substantial gains in Savannakhet in the use of improved sanitation in recent years. However, the risks posed by the lack of construction standards and poor waste containment, combined with prevailing climatic conditions, have the potential to further degrade water quality. This would impact the most vulnerable who rely on groundwater or surface water for their drinking water.

Economic and climate vulnerability are inextricably linked. Across all demographic groups and for all climate hazards, the impacts of climate events on livelihoods were identified as the most serious consequences. Loss of income further exacerbates their vulnerabilities to water and sanitation service impacts, leaving households unable to invest in products or services that could increase their resilience or maintain a personal emergency fund to cope with adverse events. This vulnerability is most severe for the poorest, who in some instances live outside of the cash economy and rely on exchanging crops and foraging from the forest.

Coping mechanisms to counteract the impacts of climate events on water and sanitation services are available, but at present, no mechanisms exist to ensure their affordability and inclusivity. Household water filtration and improved and increased rainwater storage, for example, have the potential to ensure that households in even the most remote, rural areas have year-round access to safe water. However, there are currently no resources allocated to this. This is further hampered by the lack of recognition or guidance at a policy level for self-supply communities and how best to support them in the most remote rural areas.

Compounding the challenges of climate vulnerability in Savannakhet (and the rest of Lao PDR) has been high inflation. In the years following the COVID pandemic, the Laotian Kip sharply devalued. In 2019, US\$ 1 bought approximately 8,500 kip; by June 2024, the market exchange rate reached 22,000 kip to US\$ 1. This has led to widespread inflation and economic pressures. Costs of materials, fuel for transportation and labour has increased leading to a subsequent rise in the costs of water and sanitation services. A further consequence of inflation is that it has fuelled mass migration of labour across the border to Thailand. On one hand, remittances from Thailand, enable households to invest in improving their economic situation, invest in building their resilience and create an important secure additional income stream. However, it can further exacerbate vulnerability to climate events, as the elderly and young children are left behind without the support of adult family members. Mass migration has created a chronic lack of labour, which is a critical constraint in advancing improved sanitation access in parts of the province. The flow of remittances into communities further drives inflation - and thus greater inequity between the poorest and most vulnerable who do not have relatives working outside. Amongst the Bru ethnic group, labour migration is much less common. In part, as they do not speak Lao or Thai¹⁵ and also prevailing patriarchal society norms that include prohibition of young women from leaving their communities to work.

¹⁵ While distinct script and language Thai and Laos languages are closely related and in Savannakhet, given the proximity to Thailand most native Laos speakers are also conversant in Thai which opens labour opportunities across the border.

Recommendations

Addressing the challenges of water and sanitation services for the most vulnerable is no easy feat. Solutions need to account for communities that are challenging to physically access, have low population density, complex cultural considerations, and limited ability to pay. To deliver resilient and inclusive services will require substantial investment and bold, ambitious approaches.

Increase access to basic, resilient services

People's vulnerability to climate change peaks in contexts where their daily access to functional services is limited or non-existent. Significant improvements are needed in the development of quality, resilient services, appropriate regulation of those services and explicit mechanisms to ensure services are inclusive.

Invest in private sector service provision to build capacity and facilitate access to finance, technology, and resources to deliver quality services.

- Provide direct training for private sector actors on relevant best practices. This can include for example, i) improved construction techniques of latrines for community labourers, ii) water treatment, testing and sanitary processes for bottling plants. This can be complimented with business management skills to help ensure private service providers run profitable and sustainable operations.
- Facilitate access to affordable finance to enable service providers to invest in better equipment, expand their services, and improve quality. An example of this could be for well drillers to invest in upgrading from basic, manual drilling equipment that can only be used for shallow wells to improve equipment capable of drilling deeper wells to access water with improved quality and reliability.
- Simplify regulatory processes to make it easier for private providers to comply with requirements and operate legally. This includes reducing bureaucratic requirements and ensuring standards, guidelines and policies are clear and communicated.
- Provide support to enterprises to better promote and communicate the value proposition of products such as drinking water filters, water boilers and enclosed rainwater storage.
- Create learning opportunities for entrepreneurs to increase their exposure to new technologies, practices and others' experience. This will not only build their knowledge but foster the confidence to make investments in upgrading their services.

While strengthening existing service providers is needed, there are also opportunities to incubate new enterprises that have the potential to fill gaps in service delivery or elevate the quality of service and consumer experience.

Improve regulatory guidelines, mandates, and enforcement mechanisms for water and sanitation service delivery.

- Create detailed quality compliance standards for all aspects of water and sanitation service provision. These need to be accessible, proactively disseminated and tailored to meet the needs of the different service provider groups.
- Introduce a rigorously monitored certification requirement for bottled water to help consumers make informed choices on water safety.
- Ensure that local government actors have the resources, capacity, and authority to implement and enforce regulations.
- Improve multi-sectoral coordination and actions across different line ministries including Health, Natural Resource & Environment, and Public Works & Transport to ensure a cohesive approach to service delivery and climate resilience. This includes an urgent need to address the management of household boreholes to improve water security, ensure safely managed disposal of faecal sludge and ensure water quality standards of bottled water.
- Maximise opportunities to leverage expertise, equipment and expand infrastructure within the town water supply systems to rural areas.
- Ensure regulatory mechanisms address the need for climate risk detection and adaptation to worsening climate risks.

Photo: Sanitation entrepreneur in Savannakhet Province.
Photo credit: SNV/Bart Verweij.





Photo: Proper siting and installation of toilets is essential to protect the groundwater from contamination. Photo credit: SNV/Bart Verweij.

Invest in developing evidence-led, scalable interventions that explicitly integrate pro-poor service model design.

- Invest in the expansion of piped water supplies where feasible and ensure private concessions or state utilities provide piped water on a stepped tariff structure. In this case a basic minimum amount of water is supplied at a very low cost (or free) and subsequent volumes are charged at an increasingly higher rate.
- Offer flexible support packages for sanitation subsidies for the most vulnerable households address specific barriers. For example,
 - A revolving fund for superstructure materials that can be paid back over time. This could support improved and sustainable sanitation coverage in flood-prone areas where high quality superstructures are both necessary and costly.
 - Additional funds and incentives for community labour teams can be provided to assist in construction – particularly in areas where there are labour shortages.
 - Facilitate the provision of microloans for households to invest in key assets that can build resilience, such as drinking water filters and expanded safe rainwater storage.
- Explore the feasibility, costs, and implications of long-term social assistance programmes, such as the provision of subsidised bottled water to the most vulnerable households.

Support livelihood security and diversification

The linkage between secure, increased income and resilience is clear. In Savannakhet, investment is needed to foster rural economic prosperity that redresses the reliance on remittances and capitalises on income-generation opportunities in both agricultural and non-agricultural sectors.

Create extension services for flood and drought-resistant crop varieties and farming methods.

- Farming is the primary source of income for over half of households in rural Savannakhet (rice and cassava). Access to climate resilient seed varieties, technologies, information, and technical support have the potential to: i) minimise income losses caused by climate events for their primary crop; ii) enable households to earn additional and diversified income by introducing additional crops.

Provide targeted initiatives and engage local communities to create opportunities for women, people with disabilities, and other marginalised groups.

- To achieve this there is a need to pair detailed regional economic analysis with an in-depth consultative process with target groups. Together these insights will provide the cornerstone principles for a comprehensive, equitable investment programme aimed at strengthening resilience of vulnerable people in Savannakhet.

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