Report on Hospital Safety Index

National Assessment of Multi-Hazard risk and critical infrastructure under climate change and Development and Pilot-Testing of Lao PDR Hospital Safety Index

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Acronyms and Abbreviations

DCDC	Department of Communicable Disease Control
DHHP	Department of Hygiene and Health Promotion
DHO	District Health Office
DHP	Department of Health Personnel
DHR	Department of Healthcare and Rehabilitation
DPC	Department of Planning and Cooperation
DPF	Department of Planning and Finance
FDD	Food and Drug Department
HEPR	Health Emergency Preparedness and Response
HSI	Hospital Safety Index
IDA	International Development Association
INFORM	Index for Risk Management
Lao PDR	Lao People's Democratic Republic
MOH	Ministry of Health
ND-GAIN	Notre Dame Global Adaptation Initiative
PHO	Provincial Health Office
ToT	Training of trainers
UNDP	United Nations Development Programme
UN-Habitat	United Nations Human Settlements Programme
UNICEF	United Nations Children's Fund
WASH	Water, sanitation, and hygiene
WASH FIT	Water and Sanitation for Health Facility Improvement Tool
WHO	World Health Organisation

Executive Summary

This comprehensive report details the development and implementation of a Hospital Safety Index (HSI) in Lao PDR. The project, spearheaded by UN-Habitat and supported by the World Bank, aims to enhance the resilience of healthcare facilities in the face of climate-related and other hazards. The HSI, initially a concept by the World Health Organization (WHO), was adapted to the unique context of Lao PDR, with a special focus on integrating water, sanitation, and hygiene (WASH) elements.

1. Introduction and Background

Lao PDR's vulnerability to climate risks, underscored by its low rankings in the ND-GAIN and INFORM Risk Indexes, highlights the urgent need to strengthen healthcare facilities. Major floods in recent years have not only caused fatalities and significant economic loss but have also underscored the critical importance of resilient health infrastructure, particularly in the context of Covid-19. The World-Bank funded Lao PDR COVID-19 Response Project, aimed to, among other things, enhance the preparedness and resilience of healthcare facilities. Under this project, UN-Habitat developed a Lao version of the Hospital Safety Index.

2. Development and Scope of HSI

The HSI for Lao PDR was developed through a collaborative process involving various MOH departments and focused on three key components: Structural, Non-Structural, and Functional aspects of healthcare facilities. This involved translating and culturally adapting the HSI questionnaire into the Lao language, ensuring relevance and comprehensibility for local health professionals. The inclusion of a WASH module, based on the WHO and UNICEF's WASH FIT approach, was a crucial addition, addressing critical gaps in healthcare facility safety.

3. Methodology: Data Collection and Analysis

The methodology featured a dual approach of paper-based questionnaires at the district level and digital transformation at the provincial level using Kobo Toolbox. This approach ensured efficient data collection and management, with Kobo Toolbox enhancing data accuracy and aggregation. The data analysis was conducted using Excel, categorizing health facilities into three safety levels based on structural safety, non-structural safety, and emergency and disaster management.

4. Pilot Testing and Training

The HSI was pilot tested in selected healthcare facilities across Vientiane Prefecture and three southern provinces. This phase involved interviews and on-site inspections to assess current safety management practices. Following the pilot, a comprehensive training session was conducted for health workers across all 18 provinces, focusing on the practical application of the HSI and data collection methodologies. The pilot testing and training generated safety ratings for 22 hospitals and health centres, and highlighted structural, non-structural and functional risks.

5. National Roadmap and Future Implementation

The successful pilot and training set the stage for a nationwide rollout of the HSI. The national roadmap outlines a detailed plan for scaling up the HSI, including training provincial health staff, conducting assessments in district hospitals, and managing data through KoboToolbox and Power BI. This roadmap is instrumental in systematically enhancing the safety and preparedness of hospitals across Lao PDR.

The adaptation and implementation of the Hospital Safety Index in Lao PDR represent a significant step towards strengthening the resilience of health facilities against climate and disaster risks. The project's comprehensive approach, encompassing data collection, analysis, pilot testing, and training, provides a robust framework for assessing and improving hospital safety. The rollout of the HSI across the nation is poised to fundamentally transform the preparedness and response capabilities of healthcare facilities, ensuring better protection for both patients and healthcare workers in times of crisis.

1 Introduction

1.1 Background

Lao PDR is highly exposed to climate and disaster risks such as floods and droughts and, with high vulnerability and low readiness for climate resilience, ranks 121st of 180 countries according to the 2021 Notre Dame Global Adaptation Initiative (ND GAIN) index.[1] Significantly, the fact that the readiness ranking (136) is lower than the vulnerability ranking (117) shows a need to build resilience in institutions, systems and processes, infrastructure, and the environment. Flooding is particularly problematic, with Lao PDR scoring 9.1 out of 10 for flooding in the 2023 INFORM Risk Index,[2] the 6th highest score of the 191 countries in the index. Major flooding events in recent years, for example, led to 29 deaths and total damages and losses of over US$270 million in 2013, and 56 fatalities and damage and losses of an estimated US$371.5 million in 2018. Over the next decade, flood-related urban damage alone is estimated to increase from US$49.2 million to US$273 million and affected GDP from US$373.9 million to US$1.6 billion according to the World Resources Institute.[3] Flooding and other climate-related hazards have direct and indirect impacts on health facilities throughout the country. In addition to these climate-related events, the COVID-19 pandemic increased the urgency to enhance the national capacity for the preparedness of health facilities including preparedness against multi-hazard and cascading risks.

Disaster and cascading risk pose significant risks to public health in a variety of ways. In addition to deaths and injuries caused by such events as drowning, electrocution and building collapse, hazards such as floods raise follow-on health risks including water and vector-borne diseases, infections, and mental health issues. Disasters can also severely disrupt the functioning of health facilities through direct damage as well as through indirect channels such as damage to critical infrastructure including electricity, water, sanitation, roads, and waste management systems. These can pose cascading risks to the functioning of the country's health facilities, especially when natural hazard events interact with pandemic risks. To strengthen the resilience of healthcare facilities under climate and disaster risk, therefore, proper understanding is needed on the current state of hospital safety in Lao PDR.

With the COVID-19 situation in Lao PDR, there has been a need to enhance country capacity on preparedness for health emergency response, especially on water, sanitation, and waste management for health care facilities.

The Lao PDR COVID-19 Response Project received financial support of US$ 33 million through the World Bank's International Development Association (IDA) loan and Health Emergency Preparedness and Response (HEPR)-Trust Fund aimed at responding to the COVID-19 pandemic and enhancing the preparedness and resilience of healthcare facilities, workers, water, sanitation, and waste management. As part of the HEPR-Trust Fund technical assistance project entitled "Strengthening Health Facility and Lifeline Infrastructure for Health Emergency Preparedness in Lao PDR," UN-Habitat developed, and pilot tested a

[1] https://gain.nd.edu/our-work/country-index/rankings/

[2] https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk

[3] https://www.wri.org/applications/aqueduct/floods/

hospital safety index (HSI) for the assessment of Lao PDR health facilities.

1.2 Scope of Hospital Safety Index

Lao PDR Hospital Safety Index update: Working closely with the executing agencies and relevant government departments, suggest the scope of hospital safety assessment appropriate to Lao PDR using the World Health Organisation's (WHO's) hospital safety index including the types of stakeholders to be involved, data collection procedures and analytical methods. Develop survey instruments, data management strategy, and site inspection procedures, and address gaps and specific needs through adaptation and localization of the Index accordingly.

Pilot Testing: In the target hospitals, identify and work with major stakeholders and pilot-test the localized hospital safety assessment, further adapting the WHO's hospital safety index if needed. Data collection should involve interviews with major stakeholders to understand the current practice of hospital safety management practices at the target hospitals. In addition, implement appropriate analyses such as rapid visual inspection of building integrity, critical facilities and equipment and review of emergency management and business continuity planning.

National roadmap and capacity building: Provide technical assistance to develop a national road map for scale-up of the Lao PDR hospital safety assessment. The national roadmap should clarify the strategy to scale-up and integrate the Lao PDR national hospital safety index from the target hospitals to the context of existing health and disaster risk management sector policies, identifying timelines, priority actions and actors to lead the assessment of hospital safety. In addition, work with relevant national agencies and development partners to identify opportunities for improved alignment of the Lao PDR hospital safety assessment with the other ongoing health sector assessment initiatives currently being developed by WHO. Develop training materials and conduct capacity building workshop(s) on the use of the Lao PDR Hospital Safety Index for health workers at the provincial health offices, provincial hospitals, and district hospitals.

Develop technical reports in Lao, with translation in English and submit to the Ministry of Health (MOH) and the World Bank.

Table 1: Health facilities by type within the scope of the Hospital Safety Index

Health Facility Type	
Central Hospital	**8**
Provincial Hospital	**20**
Community Hospital	**137**
Community Hospital (DH-A)	34
Community Hospital (DH-B)	103
Health Centre	**1082**
Health Centre (HC-A)	176
Health Centre (HC-B)	906
Grand Total	**1247**

2 Methodology

The methodology section explains the methodology for development of the HSI and for data collection and management.

2.1 Development of Hospital Safety Index

The United Nations Human Settlements Programme (UN-Habitat) developed an adapted version of the Hospital Safety Index tailored to the context of Lao PDR. The original Hospital Safety Index, developed by the World Health Organization (WHO), assesses the safety and resilience of healthcare facilities across a range of topics, including infrastructure, operational capacity, and emergency preparedness. However, this index was not designed to account for the unique needs and challenges faced by healthcare facilities in Lao PDR. UN-Habitat therefore reviewed HSIs adapted to other countries, especially those with medium-sized and small hospitals and health centres such as those in Lao PDR. In particular, the *Índice de Seguridad Hospitalaria. Guía Para Evaluadores,*[4] developed by the Pan American Health Organization, provided useful guidance. The WHO HSI was then simplified for use with the type of health facilities in Lao PDR, preserving the core structure of the original index and providing a thorough assessment of structural, non-structural, and functional aspects of health facilities.

In addition, UN-Habitat incorporated a WASH module into the HSI, based on the comprehensive Water and Sanitation for Health Facility Improvement Tool (WASH FIT) approach. This WASH module assesses the quality and availability of water, sanitation, and hygiene services in healthcare facilities, which are critical for ensuring the safety and well-being of patients and healthcare workers. The WASH module was incorporated into the HSI to address an observed deficiency in healthcare facility safety regarding WASH provision. The WASH FIT tool is an internationally utilized tool developed by WHO and UNICEF that assesses the quality and availability of WASH services in health facilities and is designed to aid quality improvement. It has already been introduced to MOH's Department of Hygiene and Health Promotion (DHHP) by UNDP supporting them with training provision and the development of a translated WASH FIT textbook in the Lao language.

The inclusion of the WASH FIT approach in the Hospital Safety Index has several synergetic benefits for assessing and improving the safety and resilience of healthcare facilities. While the Hospital Safety Index provides a broader assessment of the overall safety and resilience of healthcare facilities covering a range of topics among which are infrastructure, operational capacity, and emergency preparedness, the WASH FIT module provides a detailed assessment of the WASH services offered in healthcare facilities, including the availability of clean water, hand hygiene facilities, and adequate waste management.

By integrating data gathered from the Hospital Safety Index and the WASH FIT module, specific areas necessitating improvement can be pinpointed. This allows for the creation of holistic strategies to tackle these identified issues. Consequently, healthcare facilities in Lao PDR will be more prepared for emergencies, and capable of providing crucial services to their communities. This will culminate in the enhancement of the overarching healthcare system in the country.

Once all the HSI questions were identified, all parts of the HSI were improved for ease of use by the addition of descriptions to clarify the answers. The HSI therefore has descriptions for the questions and answers. An example is shown below on how to answer a question on the foundations of

[4] https://iris.paho.org/handle/10665.2/51462

buildings. It can be seen that guidance is provided on how to check the security of the foundations. A description is then given of the state of the foundations required for each of the three levels of low, medium, and high.

2.1.1 HSI structure

The HSI is meticulously organized into three primary categories: Structural, Non-Structural, and Functional components, each playing a pivotal role in ensuring the overall safety and resilience of healthcare facilities.

Structural Component: Within the Structural Component of the HSI, a thorough examination is conducted to evaluate the physical integrity and robustness of healthcare buildings. This segment delves into architectural and engineering aspects, closely scrutinizing construction quality, materials utilized, and the design's capacity to withstand environmental stressors. The inquiries within this subsection are strategically formulated to determine whether the health facility's physical structure is equipped to endure adverse events such as floods, droughts, storms, or other climate-related disasters. The questionnaire includes pointed queries regarding building foundations and load-bearing capacities, underscoring the critical importance of structural resilience in safeguarding both patients and healthcare staff.

Non-Structural Component: The often overlooked but indispensable Non-Structural Component assumes a critical role in ensuring hospital safety. This segment assesses elements not integral to the building's structural frame but crucial to its functionality. It encompasses a meticulous evaluation of medical equipment, utilities, furnishings, and other items that may pose hazards if not properly secured during a disaster. Inquiries within this category probe the efficacy of safety measures in place for non-structural elements, including the reliability of utility systems and the accessibility of essential medical supplies.

Functional Component: The functional component revolves around the operational aspects of a healthcare facility during emergencies. It scrutinizes preparedness, response capabilities, and the continuity of critical services under duress. This section evaluates the effectiveness of emergency plans, staff training, and communication systems. Additionally, it assesses the facility's ability to sustain essential services during and after a disaster. The questionnaire delves into emergency protocols, staff readiness, and resource availability, ensuring that the facility is not only physically resilient but also operationally robust.

Subsections of the Questionnaire: Each of these main categories is further subdivided into detailed subsections, featuring specific inquiries that collectively form a comprehensive evaluation tool. The subsections are shown in Table 2 while the English version of the full HSI questionnaire can be seen in Annex 1.

Table 2: HSI Subsections

I. Structural Aspects
A. Architectural Aspects
1.1 Security due to the history of the health facility
1.2. Degree of security related to the structural system and the type of material
II. Non-structural Aspects
A. Architectural Aspects
2.1 Internal System
2.1.1 Electricity
2.1.2 Telecommunications system
2.2 Architectural Aspects
B. WASH
2.1.3 Water
2.1.4 Sanitation

2.1.5 Waste Management
2.1.6 Hand Cleaning
C. Medical Supply/Logistics
2.1.7 Gas, gasoline, diesel
2.1.8 Oxygen
III. Aspects related to safety based on the functional capacity of the health facility
A. Disaster Steering Committee
3.1 Organization of Disaster Committee
3.2 Operational plan for internal and external disasters
3.3 Contingency plans for medical care in disasters
B. Medical Supply/Logistics
3.4 Availability of medicines, supplies, instruments and equipment during emergencies or disasters

2.1.2 Translation and Validation

The transformation of the Hospital Safety Index questionnaire into the Lao language represented a pivotal milestone in the progression of the project. The translation process transcended a mere linguistic conversion; it was a comprehensive cultural adaptation. The primary objective was to ensure that each question exhibited linguistic precision while also embodying cultural resonance and situational relevance pertinent to Lao healthcare practitioners. This meticulous approach played a decisive role in rendering the assessment tool accessible and meaningful within the local healthcare milieu.

Subsequent to the completion of the translation phase, the preliminary questionnaire was scrutinised by the Ministry of Health. This stage was deliberately designed as a collaborative effort, seeking the insights and expertise of diverse representatives from various departments. The multifaceted perspectives garnered from these internal stakeholders proved invaluable, facilitating the customization of questions to address the intricacies of Lao PDR's health system infrastructure and operational practices. The engagement with the ministry was not confined to mere consultation; rather, it was a co-creative process that ensured the resultant document was not an externally imposed instrument but rather an outcome derived from shared wisdom and collective expertise.

MOH departments included in the review were:

- Department of Hygiene and Health Promotion (DHHP)
- Department of Communicable Disease Control (DCDC)
- Department of Healthcare and Rehabilitation (DHR)
- Food and Drug Department (FDD)
- Department of Health Personnel (DHP)
- Department of Planning and Finance (DPF)
- Department of Planning and Cooperation (DPC)
- Cabinet (Governance, Management, and Inspection)

The feedback provided by the ministry was thoroughly examined and incorporated into the questionnaire, resulting in a polished instrument that accurately reflected the health safety priorities in Lao PDR. This iterative process not only bolstered the technical robustness of the questionnaire but also fostered a heightened sense of ownership and commitment among local health authorities. Direct involvement in the development process established a foundation of trust and mutual respect, integral to the successful implementation and adoption of the HSI.

2.2 Data management and analysis

With a finalized questionnaire, data management systems were put in place.

2.2.1 Data collection

A system was set up for data to be collected from the health centres and recorded on paper questionnaires. The data collection methodology was one which has been

previously used by UN-Habitat and government counterparts and has proved to be highly efficient and cost-effective. The success of the methodology is reliant on coordination between the Ministry of Health (MOH) and the provincial and district health offices, with technical assistance from UN-Habitat. The monitoring of progress and accountability at each level is ensured by assigning specific roles and responsibilities during various stages of the procedure. The methodology involves collecting data at the district level and aggregating the information subsequently as it goes from the district to the national level (see figure 1). However, to streamline the process and enhance accuracy, the data collection process transitions to digital means. Collected data is entered into a pre-designed online questionnaire for analysis and the generation of the final HSI.

Paper questionnaires at the district level:

A HSI questionnaire is completed for each health centre in a district. The responsibility for this task rests with staff of the District Health Office (DHO). In districts with a small number of health centres, the questionnaires may be completed by a Focal person at the DHO but in more populous districts with a greater number of health centres, a team will be required.

Kobo Platform: Enhancing Data Collection Efficiency:

At the provincial level, the collected data is digitalised through a primary data collection platform called Kobo Toolbox. This open-source data collection tool, created by the Harvard Humanitarian Initiative, has a proven track record of efficiently collecting data. The platform enables the aggregation of all district-level data into a centralized database, ensuring organized and easily accessible information. Kobo Toolbox also offers data validation and quality control checks to guarantee the accuracy of the collected data.

The decision to incorporate the Kobo platform was a deliberate strategic move, underscoring a dedication to effective data management. Kobo's intuitive interface streamlines the process of data entry, enabling real-time data submissions. This methodology not only reduces the potential for errors in data entry but also expedites the compilation of data. The resilient design of the platform guarantees the concurrent collection and input of data from diverse healthcare facilities. The responsibility for entering data into the Kobo platform falls upon the provincial focal points within the Provincial Health Offices (PHOs).

2.2.2 Data analysis

Centralized Database and Data Integrity:

Following submission, the Kobo platform is engineered to automatically synchronize the data with a centralized database. The centralization aspect plays a pivotal role in upholding data integrity and consistency. It facilitates the amalgamation of data from diverse sources into a singular repository, offering a comprehensive overview of safety assessments conducted across numerous health facilities. The centralized database not only streamlines data retrieval and management but also guarantees the secure storage and easy accessibility of all information for analytical purposes.

Integration with Excel for Enhanced Analysis:

The subsequent phase in the data management process involves linking the gathered data to an Excel spreadsheet, which automatically computes the score for each health facility. This integration exemplifies the synergy achieved by combining traditional data collection methods with sophisticated analytical tools.

To categorise the health facilities, a mathematical model initially developed by WHO was adapted for use in the Lao context, using the three subindices of structural safety, non-structural safety, and emergency and disaster management. Each subindex of a health facility is rated proportionally as 'Unlikely to function,' 'Likely to function,' or 'Highly likely to function.' Using Excel, the mathematical model bundles the three subindex scores to generate a total index score between 0 and 1 and allow categorization of each health facility into one of three levels: A (0.66-1), B (0.36-0.65), or C (0-0.35). Recommendations on areas that require improvement are able to be given to each facility according to the health facility's risks, interdependencies, and cascading consequences of hazards.

3 Pilot testing of HSI

To pilot test the HSI, MOH created a data collection team. This multidisciplinary team was selected to provide expertise in all the structural, non-structural, and functional elements of the HSI. The committee comprised:

- a representative of the Registration Division of FDD
- a representative from DPF
- a monitoring and evaluation specialist from the MOH project team
- a data management /hazard risk expert from UN-Habitat
- an engineering and infrastructure specialist from UN-Habitat
- a data management specialist from UN-Habitat

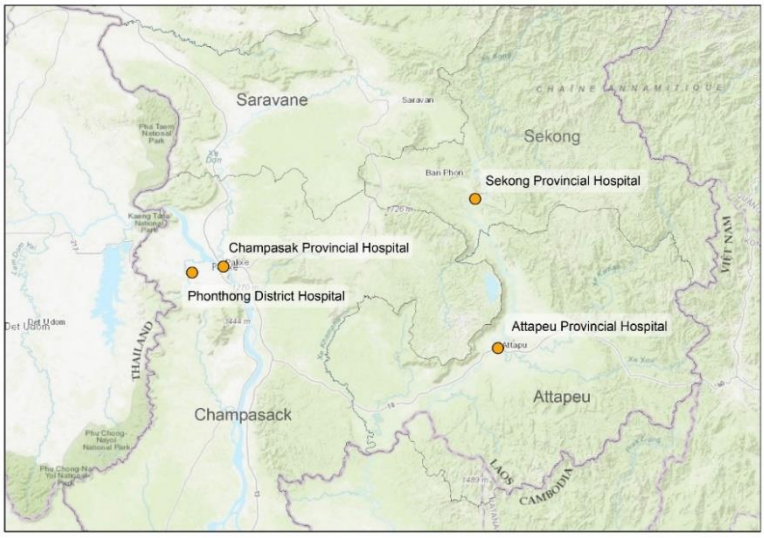

Figure 1: Hospitals in southern Lao PDR in which the HSI was piloted.

The HSI was first piloted in four facilities in Vientiane Prefecture on October 16-17, 2023. The facilities, which were selected by MOH to cover a range of size and type of facility, are shown in Table 3.

Table 3: Health facilities in Vientiane Prefecture in which the HSI was piloted.

District	Health Facility
Naxaythong	Naxaythong Community Hospital
Sisattanak	Mahosot Hospital
Sangthong	Sangthong Community Hospital
Sangthong	Nasa Health Centre (Namsang)

The following week, on October 23-27, 2023, the HSI was piloted in four hospitals in three southern provinces. The hospitals were Sekong Provincial Hospital, Champasak Provincial Hospital, Attapeu Provincial Hospital and Phonthong District Hospital. These are shown in **Error! Reference source not found.**.

To comprehend the current safety management practices at the targeted hospitals, interviews were conducted with key stakeholders at each location. Additionally, on-site inspections of the targeted hospitals were conducted to gather information on structural factors and equipment.

Following the pilot data collection, the collected data was input into the digital system by members of the data collection team and results were generated for each of the eight hospitals and health facilities in the pilot. Each hospital or health centre was given an overall percentage safety score which led to an overall safety rating of A, B or C. Percentage scores were then given under the headings of low, medium or high. for each of the three categories (structural, non-structural, and functional). A high, medium, or low rating was then given for each of the questions that were asked. The results for Mahosot Hospital are shown in Annex 3 as an example of the generated results. The overall ratings for the piloted hospitals are shown in Table 4.

Table 4: Safety ratings from pilot testing HSI in hospitals and health centre

Health Facility	Province	District	Safety Index	Category
Naxaythong Community Hospital	Vientiane Capital	Naxaythong	0.74	A
Mahosot Hospital	Vientiane Capital	Sisattanak	0.91	A
Nasa Health Centre (Namsang)	Vientiane Capital	Sangthong	0.60	B
Sangthong Community Hospital	Vientiane Capital	Sangthong	0.61	B
Attapeu Provincial Hospital	Attapeu	Samakhixay	0.57	B
Sekong Provincial Hospital	Sekong	Lamam	0.75	A
Phonthong Community Hospital	Champasak	Phonthong	0.72	A
Champasak Provincial Hospital	Champasak	Pakse	0.62	B

4 Training on use of the HSI

After the successful piloting of the HSI, the next step in the project was to conduct a training in the use of the index.

Although the original scope of the project required representatives from 10 health centres to be trained, it was decided to go beyond the initial scope and to hold a training of trainers (ToT) with participants from all 18 provinces.

Ahead of the training, the HSI questionnaire was sent to all the participants, who had an initial attempt at completing it before the training. The participants then gathered in Vientiane for a training which took place on Dec 6-7, 2023.

The training was informed by the lessons learned through the piloting process which had been completed prior to the training. Topics covered all aspects of the data collection process, including completion of the paper questionnaires and entry into Kobo toolbox. After the process had been demonstrated, participants were given the opportunity to amend their initial attempts to complete the questionnaire, resulting in more accurate data. The resulting safety ratings for the provincial hospitals are shown in Annex 3.

At the conclusion of the training, 74% of participants were confident that they had the expertise to use the HSI questionnaire independently, with a further 24% of participants confident that they could use the questionnaire after reviewing the materials and possibly requesting support. The participants from the training will be the provincial focal points with the responsibility of ensuring that the HSI index is completed within all districts of their province.

5 National Road Map

An adapted Lao HSI has been developed and piloted with safety ratings generated for 22 hospitals and health centres. The results generated from the pilot testing and a subsequent training exercise show the current and future structural, non-structural, and functional risks for the 22 hospitals, including cascading risks affecting infrastructure and services.

In order for the full benefits of the HSI to be realized it is necessary to assess every hospital and health centre in Lao PDR. Once the full HSI has been completed, data will be available on which to base prioritisations for actions to reduce risks and improve emergency management.

In light of the above and following the successful adaptation of the HSI to the Lao context and completion of the pilot testing phase, the focus has now shifted to a nationwide rollout, characterized by a comprehensive capacity-building program and sophisticated data management strategies. The national roadmap for scaling up the HSI in Lao PDR is, therefore, a critical initiative aimed at enhancing hospital safety and preparedness across the country.

The nationwide rollout can be facilitated using the same methodology as was used to index the 22 hospitals and health centres which have already been assessed. At the heart of the initiative is a detailed capacity-building session where provincial health staff were thoroughly trained on the HSI tool. This training extended beyond traditional data collection methods, incorporating digital data entry techniques using KoboToolbox. This approach standardizes and centralizes data collection, ensuring consistency and accessibility of information in a unified database.

The training program, designed as a 'Training of Trainers,' equips provincial focal points with the necessary skills and knowledge to train district focal points in their respective provinces. These provincial focal points then convene a one-day intensive training session in their provincial capitals, focusing on the practical application of conducting HSI assessments using paper-based questionnaires.

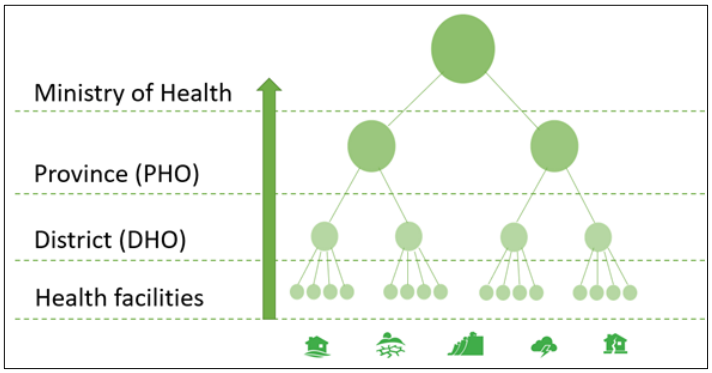

Figure 2: Data collection and aggregation pathway from health centres to national level.

Following these training sessions, district focal points return to their districts to conduct the HSI assessments in district hospitals. The collected data, in paper questionnaire form, is then submitted to the provincial focal points who are responsible for the digital input of this data into KoboToolbox. This process ensures that data collection at the national level occurs simultaneously and in a standardized format.

Monitoring the progress of this nationwide data collection is a crucial aspect of the initiative. A national focal point, utilizing a Power BI dashboard linked to KoboToolbox, not only tracks the progress of data collection but also provides assistance to provinces and districts that may be facing. This real-time monitoring is essential for maintaining the momentum of the project and ensuring its timely completion. Figure 2 gives a diagrammatic representation of the collection and aggregation of data by different levels of the health sector.

Once the data collection phase is complete, all the information is consolidated into a single dataset. Advanced data analysis software like Excel and GIS are then employed to calculate the HSI for each provincial and district hospital in Laos. This analysis will provide valuable insights into the safety standards and preparedness of hospitals across the nation.

Resource allocation and logistics play a key role in the successful implementation of this roadmap. Organizing one-day training sessions in each province and managing the submission of paper questionnaires post-data collection are essential components. Moreover, the deployment of digital tools like KoboToolbox and Power BI requires a robust infrastructure to ensure seamless operations.

Central to the efficacy of this entire process is the role of the national focal point. The ideal candidate for this position should have a strong background in data management, be skilled in using KoboToolbox, Power BI, Excel, and GIS, and be adept at data analysis and reporting. Their expertise will not only facilitate effective data management but also ensure the results of the national-level data collection are comprehensive and actionable.

This initiative would mark a significant step towards improving hospital safety in Laos. Through meticulous training, standardized data collection, rigorous monitoring, and detailed analysis, the goal is to elevate the standards of emergency preparedness and resilience in health facilities across the country, thereby enhancing public health security and healthcare infrastructure.

The entire process from provincial trainings to the end point reporting is estimated to take six weeks as shown in Table 5.

Table 5: Chronogram for national rollout of HSI

Activities for National Roadmap	W1	W2	W3	W4	W5	W6
Trainings at provincial level						
Data collection at the district level						
Data entry (digitalization)						
Monitoring and progress tracking						
Data analysis and reporting						

Annex A: HSI Questionnaire (English language)

1 Structural aspects

1.1 Security due to history of the health facility	Security level			
	Low	Medium	High	
1 Has the establishment suffered prior structural damage? Check if there is a structural opinion indicating that the degree of security has been compromised and at what level. If there is not, find out if after an event, there were cracks or settlements in the building, or if there was evidence of alteration in its structure or if there was no damage. ***Low,*** *major damage;* ***Medium****, moderate damage;* ***High,*** *minor damage.*				
2 Has the establishment been built, repaired, remodelled, or adapted in a way that has affected the behaviour of the structure? **Low,** Remodelling or adaptations with evidence of being poorly done (e.g. removal of a load-bearing wall, construction of buildings close together, window opening, etc.); **Medium**, moderate remodelling or adaptations (small openings for doors and windows); **High**, minor remodelling or adaptations have been well done (e.g. placing columns and/or beams) or have not been necessary.				

1.2. Degree of security related to the structural system and the type of material. ລະດັບຂອງຄວາມປອດໄພ ທີ່ກ່ຽວຂ້ອງ ລະບົບໂຄງສ້າງ ແລະ ປະເພດວັດສະດຸ				
3. What condition is the building in? Verify loss of coating, cracks, or subsidence. **Low**, damaged by weathering or exposure to the environment, with cracks in areas of special care (see according to each construction material) and with evidence of sinking; **Medium**, presents two of the cases; **High**, healthy, no sign of deterioration, cracks or subsidence.				
4. In what condition are the structure's building materials? Verify if the elements whose materials are in poor condition are structural. **Low**, oxidized with flakes or cracks larger than 3 mm, diagonal cracking in walls, perceptible deformations in elements of steel/wood or missing elements in connections, loss of section; **Medium**, cracks between 1 and 3 mm or rust in the form of dust, incipient diagonal cracks in the wall or, lack of some elements in connections of steel structures and wood; **High**, cracks less than 1 mm and there is no rust on concrete, minimal cracks in the walls, deformations imperceptible in steel and wood elements.				

5. Is there interaction of non-structural elements with the structure? Check if: windows cause short columns; there are pipes that rigidly cross expansion joints; there is a weight in a specific way (e.g. a water tank) on a structural element of the building, etc. ***Low**, there are two or more of these cases, or similar ones; **Medium**, only one of these or similar cases is presented; **High** none of these or similar cases is presented.*				
6. Are the foundations secure? Assess the state of the foundation. If you have plans, verify material used and depth, and identify evidence of subsidence, cracks in the floors and possible settlement. If you don't have plans, assume a low level of security. ***Low**, if it is made of stone or it is not known; **Medium**, if it is concrete, it has a depth less than 0.60 m and there is evidence of affectation; **High**, if it's from concrete, has a depth greater than 0.60 m and there is no evidence of affectation.*				
7. Are there irregularities in the plant?				

Verify the shape of the building, that the structure is uniform (e.g. seismic joints are respected, there are no courtyards inside the building, the columns and elements bearings retain axes, etc.) and the presence of elements that can cause twisting (e.g. water tanks located at one end of the deck) ***Low**, three or at least two of the options (non-regular shapes, non-uniform structure in the plant or presence of elements that can cause twisting); **Medium**, one of the options is presenting; **High**, none of the options are presenting.*				
8. Are there irregularities in elevation? Identify the presence of discontinuity (i.e. different construction materials used in the different levels, that the second floor over comes out of the first, etc.); concentrated masses (e.g. water tanks located on the roof); soft floors (e.g. floors of different height either by lobby, parking, waiting room) or short columns. ***Low**, all three or at least two of the options (the building presents discontinuity, concentrated masses, soft floors and short columns); **Medium**, one of the alternatives is presented; **High**, none of the options are presented.*				

9. Is the structure built with adequate resilience to natural phenomena? In accordance with the guidelines of the second chapter (Geographical location) and the prevention or mitigation measures that have been implemented, verify the capacity of the establishment as a whole, to face the different threats to which it is exposed. ***Low**, High structural vulnerability to the threats present in the area where the establishment is located; **Medium**, medium structural vulnerability; **High**, low structural vulnerability.*				

2 Non-structural aspects

2.1 Life lines	Security level			Observations
	Low	Medium	High	
2.1.1 Electrical system				
10. Does the facility have a functional and well-maintained source of electricity (e.g., electricity grid, solar, or other)? In remote inpatient settings (such as rural hospitals) as a minimum, a safe type of kerosene or gas lantern and powerful hand torches should be available. ***Low**, No electricity supply. **Medium**, There is a source of electricity, but it is not currently functioning., **High** there is a well-maintained and functioning source of electricity*				
11. Is the energy supply sufficient for all the facility's electrical needs, including for lighting and stand-alone devices (e.g., EPI cold chain)? All needs include lighting, communications, medical devices/apparatus, and staff accommodation. ***Low**, No power available. **Medium**, Sufficient power is available to meet part of the demand, but not all of it. **High**, Sufficient power is available at all times.*				

12. Is the delivery room adequately lit, including at night? ***Low**, No power available. **Medium**, Sufficient power is available to meet part of the demand, but not all of it. **High**, Sufficient power is available at all times.* .*				
13. Is there an alternative source capable of permanently supplying electricity for a period of 72 hours in the critical areas of the health facility? According to the type of health centre/hospital, check if they have an alternative source of energy that allows them to continue providing services in an adverse context. If there is an electric generator, verify its operating status and if it has a fuel reserve. If there is not a generator, verify that there are at least lighting lamps, that they are in good condition and that the batteries are charged for operation when required. ***Low**, there is no alternative source of energy for the establishment; **Medium**, the establishment has an alternative source of energy, but it does not work (it is in poor condition or the necessary fuel/battery reserve is not available); **High**, the required alternative power source is available, works properly, and is maintained.*				

14. Is the alternative source of electrical energy adequately protected from natural phenomena? According to the type of health centre/hospital, check if the energy source that must be available (electric current generator, etc.) is located in a safe and accessible place, with the required fasteners. ***Low**, an alternative source of energy is not available; **Medium**, there is an alternative source of energy, but it is not protected; **High**, the alternative source of energy is protected.*				
15. Is the establishment's electrical system protected against adverse events? Verify the operation, signalling, fastening means and protection of the different components of the electrical system, among them: circuits and networks in general, panel and its accessories, ducts, and electrical cables. Verify the presence of trees and poles that put ducts and cables at risk. ***Low**, two or more of the described or similar problems are present; **Medium**, one of the problems described or similar is present; **High**, the problems described or similar are not present.*				

16. Does the electrical system include protection mechanisms for electric shocks? Verify the presence of ground connections that are working correctly. If necessary, in the area, verify the availability of lightning rods, their condition, and anchorages. ***Low**, there are no ground connections, or if lightning rods are needed, they are not available; **Medium**, there are ground connections, but they are not maintained, or the lightning rods are not correctly anchored; **High**, there are protection mechanisms for electric shocks that receive periodic maintenance*				
2.1.2 Telecommunications system / ລະບົບການຊື່ສານ				
17. Are the establishment's communication systems operational? Verify the existence and operating status of the basic communication system. ***Low**, poor condition or no communication system exists; **Medium**, there is a basic communication system in an acceptable condition; **High**, has a basic communication system in good condition.*				
18. Is there an alternate communication system? Verify the existence of an alternative communication system, its state of operation and its protection elements,				

verifying the state of antennas and their supports, as well as the fastening elements. ***Low**, there is no alternative system; **Medium**, there is an alternate communication system but it doesn't work properly; **High**, there is a healthy alternate communication system, independent of the base system.*				
2.1.3 Water supply system / ລະບົບສະໜອງນ້ຳ				
19. Is there an improved water supply at the facility, piped or located on premises? Improved drinking-water sources are defined as those that are likely to be protected from outside contamination, and from faecal matter in particular. Improved water sources include household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collection. ***Low** There is no access to an improved water source on the premises **Medium** Improved water supply accessible on the premises (but outside the facility building) **High** On-site accessible improved water supply (within the facility building)*				
20. Does the facility have piped water supplies on the premises? In the case of secondary and tertiary care hospitals, the water must be channelled to the interior of the				

establishment, at least to the rooms and high-risk service areas. (maternity, operating room, intensive care/ICU) ***Low**, There is no piped water supply. **Medium**, Water is piped within the establishment but not to high-risk services **High**, Water is channelled within the establishment to all high-risk services (maternity, operating room, intensive care/ICU)*				
21. Are all taps in the facility connected to an available and functioning water supply, with no leaks in pipes? Water pipes should be regularly inspected, and a system should be in place to repair leaks as soon as they are detected. ***Low**, Less than half of the taps are connected and working. **Medium**, More than half of the faucets are connected and working. **High**, All faucets are connected and working*				
22. Is water available during all operating times of the facility? Water must be available at the facility during all days/hours that it is open. ***Low**, Water is available less than four days a week and/or water is not available for more than half the day. **Medium**, Water is available four days a week and/or not*				

*all day. **High**, Water is available seven days a week, all day, every day*				
23. Was water available at the time the assessment was carried out? ***Low**, No water available. **Medium**, Water is available at some water points, but not all. **High**, Water is available throughout the establishment*				
24. Is water available throughout the year, not affected by seasonality, weather variability/extreme events, or other constraints? ***Low** Water shortages occur for three months or more. **Medium**, Water shortage occurs for one to two months, **High**, Water is available all year.*				
25. Has the main water supply system been functional for the last 3 months with no major breakdowns? An outage is the absence of water supply OR the system supplies less than 50% of the design flow rate. ***Low**, The water supply system has suffered interruptions that have taken more than a week to correct or have not been solved. **Medium**, The water supply system has suffered interruptions, but they have been corrected within a week. **High**, In the last three months, the main water supply system has not suffered any interruption or has been remedied within 48 hours*				
26. Is water of sufficient quantity for all uses?				

***Low**, The amount of water is sufficient for less than 75% of the needs. **Medium**, The amount of water is sufficient for 75% of the needs (for all services and uses). **High**, The amount of water is sufficient for all uses in the entire establishment*				
27. Does the facility have tanks to store water in case of disruption to the main supply, and are water storage tanks protected and adequately managed? ***Low**, Storage is available for less than a day's needs or none at all. **Medium**, The water is enough for two days but it is not protected or it is protected but it is only enough for one day. **High**, Water storage is available, the water is protected and is sufficient for two days' needs.*				
28. Is drinking water chlorinated, with an appropriate free chlorine residual (≥0.2mg/L or ≥0.5mg/L in emergencies) where chlorine disinfection takes place? Drinking water must meet WHO quality standards (Guidelines for drinking-water quality, WHO, 2017) or national standards ***Low**, Residual concentration is not known/capacity to analyse it is not available/potable water is not available. **Medium**, there is a residual concentration of free chlorine, but it is <0.2 mg/l.*				

***High**, drinking water with an adequate free chlorine residual concentration is available*				
29. Is there a permanent reserve water storage system available to provide around 60 litres per hospitalized person and around 15 for outpatients per day for three days? Verify if there is a water reserve and the coverage it provides. ***Low**, they do not have a water reserve; **Medium**, its water reserve covers less than three days; **High**, guaranteed to meet demand for three days or more.*				
30. Are the water tanks protected? Evaluate if the cistern and/or elevated tank is covered, anchored -if required-, free from being contaminated, and without evidence of cracks or leaks, etc. ***Low**, No; **Medium**, Partially; **High** Yes.*				
31. Is there an alternate water supply system in addition to the main distribution network? In addition to the provision of water from the main distribution network, verify the existence of another source -which if necessary- alternates the provision of this service, identifying the coverage it can provide.				

***Low**, there is no alternative source, or it provides less than 30% of the demand; **Medium**, there is an alternative source which supplies values from 30% to 80% of the demand; **High**, there is an alternative source which supplies more than 80% of the daily supply.*				
32. Is the water distribution system within the establishment safe? Check the state of the networks, verifying that the water reaches all points, that there are no leaks and that there are flexible joints when crossing seismic joints. ***Low**, less than 60% is in good operating condition; **Medium**, between 60% and 80% is in good operating condition; **High**, more than 80% is in good operating condition.*				
33. Does the health facility develop actions to ensure water quality? Verify that there is a water quality control program that considers the implementation of the necessary corrective measures. ***Low**, no; **Medium**, samples are analysed sporadically without follow-up on corrective actions; **High**, samples are analysed periodically, implementing corrective actions.*				
2.1.4 Sanitation /				
34. Does the facility have a sufficient number of improved toilets for patients?				

Improved sanitation facilities include toilets with a water tank with discharge to the sewer or septic tank and infiltration pit, improved ventilated pit latrines, pit latrines with slabs and composting toilets. ***Low**, Neither inpatients nor outpatients have a sufficient number of toilets or existing toilets are not upgraded, **Medium**, The requirement is met for either outpatient or inpatient, but not both. **High**, There are two or more improved outpatient toilets plus one for every 20 users/inpatients*				
35. Are all patient toilets available and usable? The toilet or latrine must have a door that can be locked from the inside during use, it must not have large holes in its structure, the hole or pit must not be obstructed, the tank or siphon toilets must have water available, and the toilet structure must not have cracks or leaks. ***Low**, None of the patient toilets are available or usable. **Medium**, some, but not all, of the patient toilets are available and usable . **High**, All patient toilets are available and usable.*				
36. Do all toilets have functional hand washing stations within 5 meters?				

The place to wash hands should have soap and water. ***Low**, None of the toilets have functional hand washing stations within 5 meters, **Medium**, Some, but not all, of the toilets have functional hand washing stations within 5 meters **High**, All toilets have functional hand washing stations within 5 meters*				
37. Is at least one improved toilet available for staff and clearly separated or labelled? ***Low**, There is no separate toilet for staff use, or the toilets are not upgraded, **Medium**, A toilet is available for staff use, but it is not clearly marked or marked, or it is not working, **High** There is at least one working toilet available for staff use, and it is clearly marked or marked*				
38. Are improved toilets clearly separated/labelled for male and female or provide privacy? ***Low**, Separate toilets are not available and there is no privacy in other toilets or toilets are not upgraded. **Medium**, Separate toilets are available, but not clearly marked. **High**, Separate toilets for men and women are available and clearly marked (and offer privacy to users)*				
39. Does at least one improved usable toilet provide the means for menstrual hygiene management (MHM) needs?				

Toilets must have a container for waste disposal or a sink area, with water available. ***Low**, Facilities for menstrual hygiene management are not available, or facilities are available, but the toilet is not usable, or toilets are not improved. **Medium**, There is a space available for women to wash but there is no water, the toilet is not clean/in poor condition or a waste disposal container is available but it is full. **High**, one or more usable toilets meet menstrual hygiene management needs.*				
40. Does at least one functional improved toilet meet the needs of people with reduced mobility? A toilet is considered to meet the needs of people with reduced mobility if it meets the following conditions: it can be accessed without stairs or steps, it has a grab bar anchored to the floor or side walls, the door is at least 80 cm wide , The toilet has a raised seat (between 40 and 48 cm high), has a backrest and the cubicle has room to move and manoeuvre (150x150 cm). Outside, the sink, tap and water should also be accessible, and the top of the sink should be 75cm off the ground (with room for your knees). Light switches, where applicable, must also be at an accessible height (maximum 120 cm). ***Low**, Toilets for disabled users are not available or toilets are not upgraded. **Medium**, The toilet meets the needs of people with reduced mobility but is not*				

working, or is working but only partially meets the needs of people with reduced mobility. ***High****, One or more working toilets meet the needs of people with reduced mobility.*				
41. Does the establishment have a history of flooding by inadequate evacuation of sewage? If you have a history of this event, verify the measures implemented to solve the problem. **Low**, with a history of flooding by sewage; **Medium**, with the implementation of some palliative measures (which allow the evacuation of sewage); **High**, the establishment does not have a history of sewage flooding or with corrective measures that have eliminated this problem.				
2.1.5 Solid Waste				
42. Are functional waste collection containers available in close proximity to all waste generation points for non-infectious (general) waste, infectious waste, and sharps? Functional means that there must be at least three containers ("three-container system") that are no more than three-quarters full, are leak-proof with a lid, and are all clearly labelled. ***Low****, There are no containers or separate collection of sharps,* ***Medium****, There are functional waste collection containers at some but not all waste generation points.*				

***High**, There are functional waste collection containers with separation of non-infectious (general) waste, infectious waste, and sharps at all waste generation points*				
43. Are appropriate protective equipment and resources to perform hand hygiene available for all staff responsible for handling waste and in charge of waste treatment? Protective equipment for waste managers includes: mask, heavy gloves, long-sleeved shirt, apron, goggles, and sturdy rubber boots. Products (soap and water or hydroalcoholic hand gel) should also be available for hand hygiene. ***Low**, No equipment available for staff. **Medi um**, Some type of equipment is available, but not for all staff, or equipment is available, but it is unusable. **High**, Resources for hand hygiene and protective equipment are available.*				
44. [On-site treatment & disposal only; Where there is a risk of flooding] Are the waste pit(s) built to withstand climate-related events and emergencies (e.g. flooding) and/or is there a backup waste storage site available? Waste pits must be covered to prevent flooding and must not be overfilled. ***Low**, There is no pit or no other method of waste disposal is used. **Medium**, There*				

is a moat in the establishment, but its dimensions are insufficient; it has overflowed or is not fenced and locked; the municipal collection service is irregular, etc. ***High****, There is a functional pit, a fenced area or a municipal collection service sufficient to meet the demand*				
2.1.6 Hand Washing / ການລ້າງມື				
45. Are functioning hand hygiene stations available at all points of care, including in the delivery room? A functional hand hygiene point can consist of soap and water with a sink or container for hand washing and disposable or clean towels, or a hydroalcoholic gel. ***Low****, Less than 75% of service points have hand hygiene points in operation.* ***Medium****, At least 75% of service points have hand hygiene points in operation.* ***High****, All service points have hand hygiene points that work (with soap and water or with a hydroalcoholic gel)*				
46. Are functioning hand hygiene stations available in all waiting areas and/or public areas and in the waste disposal area? A functional point for hand hygiene can consist of soap and water with a sink or container for hand washing and disposable or clean towels or a hydroalcoholic gel. ***Low****, There are no points for hand hygiene in operation.* ***Medium****, Functional*				

hand hygiene points are available in some areas, but not all. ***High****, Hand hygiene points are available in operation in all areas.*				
47. Are hand hygiene promotion materials displayed and clearly visible in all wards/treatment areas? The hand hygiene promotion material contains instructions for hand hygiene (the WHO five moments for hand hygiene) and correct technique. ***Low****, No material available.* ***Medium****, Material is on display in some treatment rooms/areas, but not all.* ***High****, Material is clearly displayed in all treatment rooms/areas.*				
2.1.7 Fuel tanks (Gas, gasoline, diesel)				
48. Is there a fuel reserve with sufficient capacity for a minimum of five days in safe conditions? Verify that the establishment has a fuel reserve that allows it to continue operating for five days. Verify that the fuel is in a safe, marked, and fenced area, and that the tank that contains it is secured to prevent spillage. ***Low****, fuel is not available or the environment is unsafe;* ***Medium****, storage with some security and with less than 3 days of fuel supply;* ***High****, there is 5 or more days of fuel supply and it is safe.*				
2.1.8 Medical gases (Oxygen)				

49. Is there sufficient storage of medical gases for at least 3 days? According to the daily consumption of the establishment and the number of people affected that the establishment could receive in a disaster situation, verify the reserve capacity of medical gases available. ***Low**, less than 1 day; **Medium**, between 1 and 3 days; **High**, 3 days or more.*				
50. Is the gas storage in a safe area? Inspect if there is a specific area for this purpose, accessibility to the environment, its location away from heat sources, presence of signage and firefighting equipment. ***Low**, there are no areas reserved for the storage of gases or the enclosures do not have access; **Medium**, there are areas reserved for storing gases, but without appropriate security measures or access to the premises represents a risk; **High**, there are adequate storage areas, the enclosures are accessible and do not have risks*.				
2.2 Architectural elements / ໜາສະຖາປັດ				
51. Does the health facility have a storm drainage system in good condition? Verify if there is an efficient system for the evacuation of rainwater with adequate slopes and in an adequate condition.				

***Low**, there is no storm drainage system or it is deteriorated; **Medium**, there is a storm drainage system in a regular condition; **High**, there is a storm drainage system that is in good condition and receives periodic maintenance.*				
52. Are the doors or entrances to the establishment safe and allowing movement through them? Examine the state of the doors, that they are free of obstacles and that they do not affect the security of the establishment (avoid glass, etc.) ***Low**, they are not safe and prevent movement in the establishment; **Medium**, are not safe or do not allow circulation in the establishment; **High**, they are safe and do not impede movement in the establishment*				
53. Are the windows of the establishment safe and in good condition? Verify window condition and that the windows do not affect the safety of the building. ***Low**, when they are damaged, they can affect the operation of the establishment; **Medium**, even when they are damaged they do not affect the operation of the establishment; **High**, they are not damaged or their damage may be minor and it does not impede the operation of the establishment.*				

54. Are the closing elements of the establishment safe and in good condition? Verify that the external walls, bars, facades, and perimeter fences are properly anchored and do not affect the security of the establishment; In addition, they are in optimal condition. ***Low**, when they are damaged, they can affect the operation of the establishment; **Medium**, even when they are damaged, they do not affect the operation of the establishment; **High**, they are not damaged or their damage may be minor and it does not impede the operation of the establishment.*				
55. Are the roofs and covers of the establishment safe and in good condition? Verify roof condition and the possibility of being affected by strong winds, earthquakes, ash fall or heavy rain. Check fixing elements, leaks, etc. ***Low**, in poor condition and/or when damaged, may affect the operation of the establishment; **Medium**, in fair condition and/or even when damaged, does not affect the operation of the establishment; **High**, in good condition and/or are not damaged or damage may be minor and does not impede the operation of the establishment.*				
56. Are the parapets and other perimeter elements of the				

establishment safe and in good condition? Verify condition, verifying that the parapets, railings, cornices, ornaments, etc., are properly anchored and do not affect the security of the establishment. ***Low**, when they are damaged, they can affect the operation of the establishment; **Medium**, even when they are damaged they do not affect the operation of the establishment; **High**, they are not damaged or damage may be minor and does not impede the operation of the establishment.*				
57. Are the external circulation areas of the establishment safe and in good condition? Verify that there are no trees, poles, signs, vehicles, walls, etc. that may obstruct external circulation. ***Low**, damage to the pathway or walkways impedes access to the building or puts pedestrians at risk; **Medium**, the damage to the road or the passageways does not impede pedestrian access to the building, but does impede vehicular access; **High**, there are no damages or damage is minor and does not impede the access of pedestrians or vehicles.*				
58. Are the internal circulation areas of the establishment safe and in good condition? Check that the interior corridors, stairs, and exits are clear.				

***Low**, damage to internal circulation routes prevents movement within the building or puts people at risk; **Medium**, damage to the road or the passageways does not impede the circulation of people, but it does prevent the access of stretchers and others; **High**, there is no damage or damage is minor and does not impede the movement of people or stretchers and rolling equipment.*				
59. Are the false ceilings in the establishment safe and in good condition? Verify that they do not present breaks or humidity and that they are well anchored so as not to affect the operation of the establishment. If they do not exist, leave blank. ***Low**, when they are damaged, they can affect the operation of the establishment; **Medium**, even when they are damaged, they do not affect the operation of the establishment; **High**, are not damaged or damage may be minor and does not impede the operation of the establishment.*				
60. Is the lighting system -internal and external- of the establishment safe and in good condition? Evaluate the condition and operation of the system, verifying that there is an emergency lighting system and that its components do not affect the safety of the building.				

***Low**, damage to the lighting system can affect the operation of the establishment; **Medium**, even with damage, the operation of the establishment is not affected; **High**, there is no damage or damage may be minor and does not impede the operation of the establishment.*				
61. Do you have a fire protection system that is safe and in good condition? Verify the presence of fire extinguishers in places of greatest risk, that they are operational, accessible, secured, and signposted. Also check that the fire extinguishers are not expired. ***Low**, there is no fire equipment, equipment has expired or is not accessible; **Medium**, there is insufficient equipment and it is not secured and/or marked; **High**, there is sufficient fire-fighting equipment in good working order, accessible, secured and signposted.*				
62. Are the stairs and/or ramps in the establishment safe and in good condition? Verify that these areas are in good condition, clear, that they have railings, and with other measures that facilitate their use in a disaster. If they do not exist, leave blank. ***Low**, in poor condition, can affect the operation of the establishment; **Medium**, in fair or poor condition, but does not affect the operation of the establishment;*				

***High**, in good condition and does not affect the operation of the establishment.*				
63. Are the floors safe and in good repair? Verify the condition of the floors and that they do not increase the vulnerability of the building (with cracks or unevenness, slipperiness, etc.) ***Low**, in poor condition, can affect the operation of the establishment; **Medium**, in fair or poor condition, but does not affect the operation of the establishment; **High**, in good condition and does not affect the operation of the establishment.*				
64. Are the access roads to the health facility in good condition? Check that the access roads facilitate the access of patients to the establishment, that they are free of obstacles (kiosks, vendors, barriers); that there are no elements that could obstruct them (trees, poles, possible stagnant water, etc.) and that there are traffic lights that order traffic. Check if alternate routes are available. ***Low**, there may be damage that obstructs the road and impedes access to the establishment; **Medium**, the damage to the road does not impede pedestrian access, but vehicular access does; **High**, minor or no damage may be present, which does not impede the access of pedestrians or vehicles.*				

65. Does the health facility have safety signs and are these known by the staff? Verify if the evacuation routes are marked and that they are known by health personnel. ***Low**, does not have safety signs; **Medium**, has signs but the staff don't know them; **High**, has safety signs and the staff are aware of them.*				

3. Aspects related to safety based on the functional capacity of the health facility / ຄວາມປອດໄພ ທີ່ກ່ຽວກັບ ຄວາມສາມາດ ຂອງການດຳເນີນງານ ຂອງສະຖານ ບໍລິການທາງສາທາລະນະສຸກ

	Security level			Observations
	Low	Medium	High	
3.1 Organization of the disaster committee of the health facility / ຄະນະກຳມະການຕ້ານໄພພິບັດ ໃນສະຖານບໍລິການ ສາທາລະນະສຸກ				
66. Does the establishment have a committee for emergencies and disasters? Verify that there is a formal constitution document, and that the committee is multidisciplinary. ***Low**, there is no committee, or they do not have a document that proves it; **Medium**, there is a committee with three or fewer disciplines represented, but it is not operational; **High**, a committee with more than four disciplines represented exists and is operational.*				

67. Is each committee member aware of their specific responsibilities? Verify that they have their activities in writing depending on their specific function. ***Low**, not assigned or do not have a document to prove it; **Medium**, officially assigned but not known or implemented; **High**, all members know and fulfil their responsibility*				
68. Is there a physical space allocated to set up an emergency operations centre for the establishment? Verify that they have a space from which to manage the emergency, located in a safe place, duly implemented and that it has the key information. ***Low**, they do not have an assigned space for the emergency operations centre or cannot demonstrate it; **Medium**, have an assigned space but do not have a secure location, or are not equipped or lack key information; **High**, they have an assigned space, with a secure location, properly equipped and have the key information.*				
69. Is there a telephone directory of authorities (internal and external) and other contacts, updated and available? Verify that there is a directory that includes support services needed in an emergency.				

***Low**, does not have a directory or does not have it available to display; **Medium**, has a directory but it is not updated/disseminated or it only has a directory of internal authorities; **High**, has an updated/disseminated directory of authorities internal and external.*				
3.2 Operational plan for internal and external disasters / แผนการดำเนินงานสำลับอุภาๆนไพพิบัดพายนอก และพายใน				
70. Does the establishment have a plan for emergencies and disasters? Verify that a plan exists and also that it is up-to-date, that it is operational and that it has been disseminated among health personnel. ***Low**, it does not exist or they do not have a digital or printed document that proves it; **Medium**, exists but it is not operative, it is not updated, disseminated or put in practice; **High**, it exists, it is operative, it is updated, disseminated and put in practice.*				
71. Have specific activities been identified to reinforce the essential services of the establishment? The plan must indicate the manner and activities to be carried out. ***Low**, does not exist or exists only in the document; **Medium**, there is a schedule of activities and it is partially fulfilled; **High**, there*				

is a schedule of activities, and it is fully complied with.				
72. Does the establishment have a specific budget assigned for the implementation of the disaster plan? Check that the establishment has a specific budget to be applied in case of disasters, which considers both the preparation for and the response to emergencies or disasters. ***Low**, not budgeted or do not have a document that proves it; **Medium**, there is a budget but it only guarantees either the preparation for or only the response to emergencies or disasters; **High**, there is a budget for the preparation for and response to emergencies or disasters*				
73. Are there procedures for admission in emergencies and disasters, with specific formats and protocols for mass care of victims? The places and people in charge of this admission process must be specified, as well as the formats and protocols available. ***Low**, the procedure does not exist, or they do not have a document that demonstrates it; **Medium**, the procedure exists, it only has formats or only protocols; **High**, the procedure exists and there are formats and protocols.*				

74. Are there procedures for triage, resuscitation, stabilization, and treatment? According to the level of complexity of the establishment, verify if they have defined procedures for this issue, have received training and if they are equipped. ***Low**, the procedure does not exist, or they do not have a document that demonstrates it; **Medium**, there is a procedure and trained personnel, but it is not implemented; **High**, the procedure exists, the personnel is trained, and there are resources to implement it.*				
75. Does the plan provide for transportation and logistical support to transfer patients? Verify what means of transport -own and not owned by the establishment- as well as logistical support, is available for the transfer of patients. ***Low**, there are no vehicles or logistical support for the transfer of patients or there is no document to prove it; **Medium**, there are insufficient vehicles and/or logistical support; **High**, there are vehicles and logistical support in sufficient quantity.*				
76. Are there levels of coordination with the other institutions of the local health network and those that provide pre-hospital care?				

Verify that there are written protocols that demonstrate this coordination and that the staff confirm it. ***Low**, there is no coordination or there is no document that proves it; **Medium**, there is communication, but procedures and protocols have not been established to deal with emergencies or disasters; **High**, there is communication and coordination with the other institutions of the helth network, and they also have procedures and protocols to deal with emergencies or disasters.*				
77. Is the establishment's disaster plan linked to the local emergency plan? Check if there is a written record that proves this link. **Low**, *not linked or there is no document to prove it; **Medium**, linked and non-operational; **High,** linked, and operational.*				
78. Are there procedures for the evacuation of the building (both internal and external)? Assess whether there is an evacuation plan or procedures for the users of the establishment. ***Low**, the procedure does not exist or there is no document that*				

demonstrates it; ***Medium****, the procedure exists but it is not publicized and/or the exit routes do not facilitate the process;* ***High****, the procedure exists, it is publicized and the routes are clearly marked and free of obstructions.*				
79. Are health personnel trained to act in disaster situations? Verify that there is a permanent training program, which is complied with. For this, it is suggested to verify directly with the staff their level of training. ***Low****, the staff is not trained or there is no training program;* ***Medium****, there is a sporadic training program but less than half of the personnel is trained;* ***High****, there is a permanent training program and more than 85% of the personnel is trained.*				
80. Does the establishment have a defined and publicized alert system? Verify that the establishment has an alert system that has been disseminated among the staff. ***Low****, does not have an alert system or there is no document that proves it;* ***Medium****, has an alert system but it has not been disseminated;* ***High****, it has an alert system that has been disseminated .*				

81. Has an emergency drill or simulation been carried out in the health facility in the last year? Review if they carry out drills or simulations and the frequency of these. ***Low**, the plans are not put to the test or there are no documents to prove it; **Medium**, the plans are put to the test with a frequency greater than one year; **High**, the plans are tested at least once a year and are updated according to the results of the exercises.*				
3.3 Contingency plans for medical care in disasters / ແຜນສຸກເສີນ ໃນການຮັກສາຄົນເຈັບ ກໍລະນີເກີດໄພພິບັດ				
82. Are there contingency plans for different events? According to specific contingencies that the establishment may face, check if there are specific contingency plans, if they are updated, if they have been disseminated, and if there are resources to implement them. ***Low**, there are no contingency plans or there is only the document; **Medium**, there are plans but they are not updated and/or disseminated; **High**, there are plans, they are updated, they have been disseminated, and there are resources to implement them.*				
83. Is there a maintenance plan for the electric power service?				

It should be checked that: the plan exists, that it is being followed (see the log with the actions carried out), that it has assigned and trained personnel, that it has tools and that a budget is available for this purpose. This plan must consider the maintenance and testing of the alternative energy source (generator, batteries with inverters, etc.) available. ***Low**, there is no plan or there is only the document; **Medium**, the plan exists, but personnel are not assigned or are not trained, without tools or budget; **High**, the plan exists, there are assigned and trained personnel, there are tools and the resources to implement the plan .*				
84. Is there a maintenance plan for the drinking water supply system? It should be checked that: the plan exists, that it is being followed (see the log with the actions carried out), that it has assigned and trained personnel, that it has tools and that a budget is available for this purpose. ***Low**, there is no plan or there is only the document; **Medium**, the plan exists, but staff are not assigned or are not trained, without tools or budget; **High**, the plan exists, there are assigned and trained personnel, there are tools, and the resources to implement the plan .*				

85. Is there a maintenance plan for the communication system? It should be checked that: the plan exists, that it is being followed (see the log with the actions carried out), that it has assigned and trained personnel, that it has tools and that a budget is available for this purpose. ***Low**, there is no plan or there is only the document; **Medium**, the plan exists, but personnel are not assigned or are not trained, without tools or budget; **High**, the plan exists, there are assigned and trained personnel, there are tools and the resources to implement it.*				
86. Is there a maintenance plan for the wastewater system? It should be checked that: the plan exists, that it is being followed (see the log with the actions carried out), that it has assigned and trained personnel, that it has tools and that a budget is available for this purpose. ***Low**, there is no plan or there is only the document; **Medium**, the plan exists, but staff are not assigned or are not trained, without tools or budget; **High**, the plan exists, there are assigned and trained personnel, there are tools, and the resources to implement the plan .*				

3.5 Availability of medicines, supplies, instruments, and equipment for disaster situations ມີການສໍຣອງ ກ່ຽວກັບ ຢາ, ການສະໜອງການບໍລິການສາທາລະນະສຸກ, ເຄື່ອງມື ແລະ ອຸປະກອນ ທາງການແພດ ໃນກໍລະນີເຫດ ໄພພິບັດ ຫລືບໍ່?				
87. Are medicines available to deal with an emergency? Verify if the establishment has a supply of medicines for patient care in an emergency or disaster. ***Low**, does not have a reserve or does not have a document that proves it; **Medium**, the reserve is sufficient only for daily use; **High**, they have reserves for emergency care.*				
88. According to the type of health centre/hospital, is there life support equipment available? Verify if these elements are available. ***Low**, does not have this equipment; **Medium**, the equipment available, is for daily use only; **High**, they have this equipment for emergency care.*				

Hospital Safety Index

Mahosot Hospital

Province:	Vientiane Capital
District:	Sisattanak
Health Facility:	Mahosot Hospital

Overall Safety and Unsafety Index

Safety Index: **0.91**

Unsafety Index: **0.09**

Responses by category

The following table displays the percentages of responses related to structural, non-structural, and functional aspects considered in the Hospital Safety Index.

Category	Low	Medium	High
Structural	**0%**	**0%**	**100%**
Non-structural	**4%**	**7%**	**88%**
Functional	**8%**	**33%**	**58%**

Health Facility Category: **A**

Safety index	Category	What should be done?
0.66 – 1	**A**	It is likely that the hospital will function in case of a disaster. It is recommended, however, to continue with measures to improve response capacity and to carry out preventive measures in the medium- and long-term to improve the safety level in case of disaster.
0.36 – 0.65	**B**	Intervention measures are needed in the short-term. The hospital's current safety levels are such that patients, hospital staff, and its abilityto function during and after a disaster are potentially at risk.
0 – 0.35	**C**	Urgent intervention measures are needed. The hospital's current safety levels are inadequate to protect the lives of patients and hospital staff during and after a disaster.

1 Structural aspect	
1.1 Architectural section	
1.1.1 Security due to history of the health facility	High
1.1.2. Degree of security related to the structural system and the type of material.	High
2 Non-structural aspects	
2.1 Systems in the building	
2.1.1 Electrical system	High
2.1.2 Telecommunications system	High
2.1.3 Architectural elements	High
2.2 Water, sanitation, hygiene and waste management	
2.2.1 Water supply system	High
2.2.2 Sanitation	High
2.2.3 Solid Waste Management	High
2.2.4 Hand Washing	High
2.3 Medical Logistics	
2.3.1 Fuel tanks (Gas, gasoline, diesel)	High
2.3.2 Medical gases (Oxygen)	High
3. Aspects related to safety based on the functional capacity of the health facility	
3.1 Disaster Management Commettee	
3.1.1 Disaster Prevention Committee in Health Services	High
3.1.2 Operational plan for internal and external disasters	High
3.1.3 Contingency plans for medical care in disasters	Medium
3.2 Medicine provision	Medium

Hospital Safety Index Questionnaire

The following section provides a comprehensive explanation of how health facilities have responded to each specific question in the Hospital Safety Index questionnaire. The responses are categorized to indicate different levels of safety, which are identified as either low, medium, or high.

1 Structural aspect			
1.1 Architectural section			
1.1.1 Security due to history of the health facility			
1. Has the establishment suffered prior structural damage?			High
2. Has the establishment been built, repaired, remodelled, or adapted in a way that has affected the behaviour of the structure?			High
1.1.2. Degree of security related to the structural system and the type of material.			
3. What condition is the building in?			High
4. In what condition are the structure's building materials?			High
5. Is there interaction of non-structural elements with the structure?			High
6. Are the foundations secure?			High
7. Are there irregularities in the plant?			High
8. Are there irregularities in elevation?			High
9. Is the structure built with adequate resilience to natural phenomena?			High

2 Non-structural aspects			
2.1 Systems in the building			
2.1.1 Electrical system			
10. Does the facility have a functional and well-maintained source of electricity (e.g., electricity grid, solar, or other)?			High
11. Is the energy supply sufficient for all the facility's electrical needs, including for lighting and stand-alone devices (e.g., EPI cold chain)?			High
12. Is the delivery room adequately lit, including at night?			High
13. Is there an alternative source capable of permanently supplying electricity for a period of 72 hours in the critical areas of the health facility?			High
14. Is the alternative source of electrical energy adequately protected from natural phenomena?			High
15. Is the establishment's electrical system protected against adverse events?			High
16. Does the electrical system include protection mechanisms for electric shocks?			High
2.1.2 Telecommunications system			
17. Are the establishment's communication systems operational?			High
18. Is there an alternate communication system?		Medium	

2.1.3 Architectural elements			
19. Does the health facility have a storm drainage system in good condition?			High
20. Are the doors or entrances to the establishment safe and allowing movement through them?			High
21. Are the windows of the establishment safe and in good condition?			High
22. Are the closing elements of the establishment safe and in good condition?			High
23. Are the roofs and covers of the establishment safe and in good condition?			High
24. Are the parapets and other perimeter elements of the establishment safe and in good condition?			High
25. Are the external circulation areas of the establishment safe and in good condition?			High
26. Are the internal circulation areas of the establishment safe andin good condition?			High
27. Are the false ceilings in the establishment safe and in good condition?			High
28. Is the lighting system -internal and external- of the establishment safe and in good condition?			High
29. Do you have a fire protection system that is safe and in good condition?			High
30. Are the stairs and/or ramps in the establishment safe and ingood condition?			High
31. Are the floors safe and in good repair?			High
32. Are the access roads to the health facility in good condition?			High
33. Does the health facility have safety signs and are these knownby the staff?			High

2.2 Water, sanitation, hygiene, and waste management			
2.2.1 Water supply system			
34. Is there an improved water supply at the facility, piped or located on premises?			High
35. Does the facility have piped water supplies on the premises?			High
36. Are all taps in the facility connected to an available and functioning water supply, with no leaks in pipes?			High
37. Is water available during all operating times of the facility?			High
38. Was water available at the time the assessment was carried out?			High
39. Is water available throughout the year, not affected by seasonality, weather variability/extreme events, or other constraints?			High
40. Has the main water supply system been functional for the last3 months with no major breakdowns?			High
41. Is water of sufficient quantity for all uses?			High
42. Does the facility have tanks to store water in case of disruption to the main supply, and are water storage tanks protected and adequately managed?			High
43. Is drinking-water chlorinated, with an appropriate free chlorine residual (≥0.2mg/L or ≥0.5mg/L in emergencies) where chlorine disinfection takes place?	Low		
44. Is there a permanent reserve water storage system available to provide around 60 litres per hospitalized person and around 15 for outpatients per day for three days?			High
45. Are the water tanks protected?			High
46. Is there an alternate water supply system in addition to the main distribution network?	Low		
47. Is the water distribution system within the establishment safe?			High
48. Does the health facility develop actions to ensure water quality?	Low		

2.2.2 Sanitation			
49. Does the facility have a sufficient number of improved toilets for patients?			High
50. Are all patient toilets available and usable?			High
51. Do all toilets have functional hand washing stations within 5 meters?			High
52. Is at least one improved toilet available for staff and clearly separated or labelled?			High
53. Are improved toilets clearly separated/labelled for male and female or provide privacy?			High
54. Does at least one improved usable toilet provide the means for menstrual hygiene management (MHM) needs?	Low		
55. Does at least one functional improved toilet meet the needs of people with reduced mobility?			High
56. Does the establishment have a history of flooding by inadequate evacuation of sewage?			High
2.2.3 Solid Waste Management			
57. Are functional waste collection containers available in close proximity to all waste generation points for non-infectious (general) waste, infectious waste, and sharps?			High
58. Are appropriate protective equipment and resources to perform hand hygiene available for all staff responsible for handling waste and in charge of waste treatment?		Medium	
59. [On-site treatment & disposal only; Where there is a risk of flooding] Are the waste pit(s) built to withstand climate-related events and emergencies (e.g. flooding) and/or is there a backup waste storage site available?			High
2.2.4 Hand Washing			
60. Are functioning hand hygiene stations available at all points of care, including in the delivery room?			High
61. Are functioning hand hygiene stations available in all waiting areas and/or public areas and in the waste disposal area?			High
62. Are hand hygiene promotion materials displayed and clearly visible in all wards/treatment areas?			High

2.3 Medical Logistics			
2.3.1 Fuel tanks (Gas, gasoline, diesel)			
63. Is there a fuel reserve with sufficient capacity for a minimumof five days in safe conditions?			High
2.3.2 Medical gases (Oxygen)			
64. Is there sufficient storage of medical gases for at least 3 days?			High
65. Is the gas storage in a safe area?			High

3. Aspects related to safety based on the functional capacity of the health facility			
3.1 Disaster Management Committee			
3.1.1 Disaster Prevention Committee in Health Services			
66. Does the establishment have a committee for emergencies and disasters?			High
67. Is each committee member aware of their specific responsibilities?			High
68. Is there a physical space allocated to set up an emergency operations centre for the establishment?			High
69. Is there a telephone directory of authorities (internal and external) and other contacts, updated and available?			High

3.1.2 Operational plan for internal and external disasters			
70. Does the establishment have a plan for emergencies and disasters?			High
71. Have specific activities been identified to reinforce the essential services of the establishment?			High
72. Does the establishment have a specific budget assigned for the implementation of the disaster plan?		Medium	
73. Are there procedures for admission in emergencies and disasters, with specific formats and protocols for mass care of victims?			High
74. Are there procedures for triage, resuscitation, stabilization, and treatment?			High
75. Does the plan provide for transportation and logistical support to transfer patients?			High
76. Are there levels of coordination with the other institutions of the local health network and those that provide pre-hospital care?		Medium	
77. Is the establishment's disaster plan linked to the local emergency plan?		Medium	
78. Are there procedures for the evacuation of the building (both internal and external)?			High
79. Are health personnel trained to act in disaster situations?			High
80. Does the establishment have a defined and publicized alert system?	Low		
81. Is the hospital prepared for its services during disasters or emergency circumstances to minimize effects on other services.		Medium	
82. Has an emergency drill or simulation been carried out in the health facility in the last year?		Medium	

3.1.3 Contingency plans for medical care in disasters			
83. Are there contingency plans for different events?		Medium	
84. Is there a maintenance plan for the electric power service?			High
85. Is there a maintenance plan for the drinking water supply system?	Low		
86. Is there a maintenance plan for the communication system?			High
87. Is there a maintenance plan for the wastewater system?	Low		
3.2 Medicine provision			
88. Is there a list of medicines and medical products to support in case of emergency or disaster?			High
89. Are medicines and medical products available to deal with an emergency?		Medium	
90. According to the type of health centre/hospital, is there life support equipment available?		Medium	
91. Does the hospital do monthly/quarterly planning for medicines and medical equipment for dealing with Emergencies or disasters		Medium	

Annex C: Overall safety ratings for provincial hospitals

Health Facility	Province	District	Safety Index	Category
Attapeu Provincial Hospital	Attapeu	Samakhixai	0.57	B
Bokeo Provincial Hospital	Bokeo	Houayxay	0.81	A
Borikhamxay Provincial Hospital	Borikhamxay	Pakxan	0.67	A
Champasak Provincial Hospital	Champasak	Pakxe	0.62	B
Huaphanh Provincial Hospital	Huaphanh	Xamnua	0.42	B
Khammuane Provincial Hospital	Khammuane	Thakhek	0.49	B
Luangnamtha Provincial Hospital	Luangnamtha	Namtha	0.60	B
Luangprabang Provincial Hospital	Luangprabang	Luangprabang	0.73	A
Oudomxay Provincial Hospital	Oudomxay	Xai	0.75	A
Phongsaly Provincial Hospital	Phongsaly	Bounnua	0.40	B
Saravane Provincial Hospital	Saravane	Saravane	0.44	B
Savannakhet Provincial Hospital	Savannakhet	Kaysone Phomvihane	0.57	B
Vientiane Provincial Hospital	Vientiane	Viangkham	0.69	A
Mahosot Hospital	Vientiane Capital	Sisattanak	0.91	A
Xayaboury Provincial Hospital	Xayaboury	Xayaboury	0.49	B
Xaysomboun Provincial Hospital	Xaysomboun	Anouvong	0.29	C
Sekong Provincial Hospital	Sekong	Lamam	0.75	A
Xiengkhuang Provincial Hospital	Xiangkhouang	Pek	0.83	A

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