

CREWS Project Presentation Note to the Steering Committee		
Project Title	<i>Reinforcing the capacities of meteorological and hydrological services and enhancing the early warning systems in Cambodia and Lao People's Democratic Republic (PDR)</i>	
Project Reference	CREWS/RProj/08/South-East Asia	
Geographic coverage	<i>Cambodia and Lao People's Democratic Republic</i>	
Timeframe	4 years	
Total cost of CREWS Contribution	US\$ 5,540,000	
Lead Implementing Partner	World Meteorological Organization (WMO)	
	a. Allocation requested for execution by Partner	US\$ 3,162,775
	b. Fees of Implementing Partner	US\$ 411,161
	c. Total	US\$ 3,573,936
Additional Implementing Partner	World Bank (WB)	
	a. Allocation requested for execution by Partner	US\$ 991,000
	b. Fees of Implementing Partner	US\$ 128,880
	c. Total	US\$ 1,119,830
Additional Implementing Partner	United Nations Office for Disaster Risk Reduction (UNDRR)	
	a. Allocation requested for execution by Partner	US\$ 748,880
	b. Fees of Implementing Partner	US\$ 97,354
	c. Total	US\$ 846,234
Project Recipient/Beneficiary	Lao People's Democratic Republic (PDR): Department of Meteorology and Hydrology (DMH), Ministry of Natural Resources and Environment (MONRE), National Disaster Prevention and Control Committee (NDPCC), Ministry of Labour and Social Welfare (MoLSW)	
	Cambodia: Department of Meteorology (DOM), Cambodia & Department of Hydrology and River Works (DHRW), Ministry of Water Resources and Meteorology (MOWRAM), National Committee on Disaster Management (NCDM)	

Additional Implementing Partners	<p>Regional Forecasting Support Centre (RFSC) Ha Noi, Viet Nam</p> <p>Regional Specialized Meteorological Centre (RSMC), Hong Kong</p> <p>Centre for Climate Research (CCRS), Singapore, part of Meteorological Service Singapore under the National Environment Agency (NEA)</p> <p>People in need (PIN) - International NGO with country operations in Cambodia.</p> <p>World Food Program (WFP)</p> <p>International Federation of Red Cross and Red Crescent Societies (IFRC)</p>
Total Project Amount	<p>US\$ 5,540,000</p>
Main objective(s)	<p>To enhance the capacities of national and regional stakeholders/institutions to provide hydromet, early action and response services to ensure that vulnerable populations in Cambodia and Lao PDR are reached through effective and inclusive risk-informed early warning services.</p>
Executive Summary	<p>The Lower Mekong Countries (LMCs) are extremely vulnerable to a host of disasters. Cambodia and Lao PDR have consistently figured among the most disaster-prone countries in the region, and the world. Among the various hydrometeorological hazards, floods and droughts are ranked as two of the main hazards affecting both countries. Their vulnerabilities to such hazards are compounded by the fact that both countries rely heavily on their services sector, and climate sensitive sectors such as agriculture, which employs the largest proportion of the workforce of any sector.</p> <p>The region has received support from national governments, United Nations agencies, Non-governmental Organizations (NGOs) and the private sector for the development and implementation of Early Warning Systems (EWSs) at local, national and regional levels. Despite these investments, there is still a need for consolidating the past and ongoing efforts of EWS initiatives along with a platform for information exchange among these systems and a set of metrics for measuring the access and effectiveness of EWS in both countries. An overview of the status of EWS in the country's outlines identified gaps and expressed needs. Given the recent disasters witnessed by both countries, it becomes crucial that a funding mechanism like the Climate Risk and Early Warning Systems (CREWS) can be used to address some of the most pressing gaps while building on the existing initiatives for provision of improved risk informed early warning and early action services to the vulnerable populations. With support from the CREWS Implementing Partners, namely the World Meteorological Organization (WMO), the World Bank / Global Facility for Disaster Reduction and Recovery (GFDRR) and the United Nations Office for Disaster Risk Reduction (UNDRR), the proposed project would deliver technical and financial support to the countries and communities, tailored to their context.</p> <p>The CREWS Cambodia and Lao PDR project aims to strengthen capacities at national and regional level to provide Hydromet, early warning and response services to ensure that vulnerable populations in Cambodia and Lao PDR are reached through effective and inclusive risk-informed early warning services. Enhanced access to effective early action - early warning services is expected to contribute to enhance climate change adaptative capacities and strengthen climate and disaster resilience. The project has been designed</p>

around the four elements of an EWS and based on a consultative process with EWS stakeholders including, the National Meteorological and Hydrological Services (NMHSs), National Disaster Management Organizations (NDMOs), UN Country Teams, sub-national governments, civil society organizations, private sector entities, and other relevant sector departments, stakeholders, actors/experts. It is important that Cambodia and Lao PDR are supported to address such challenges, therefore a set of actions (recommendations) are designed using these findings which will help develop, evaluate and refine their EWS. These actions have been categorised into five broad outcomes (composed of a set of country-driven activities), namely: (i) strengthening governance mechanism and creating an enabling environment, (ii) enhancing capacity of NMHSs to provide forecasts and warnings, (iii) strengthening information and communication technology of the national services, (iv) enhanced preparedness and response capability and (v) improved integration of gender and disability inclusiveness across the EWS value chain.

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<p>Initial state of play - project rationale</p>	<p>a. Vulnerability, exposure to risks, disasters impacts (on people and economy)</p>	<p>The Southeast Asia (SeA) region is highly vulnerable to the impacts of natural hazards. Hydrometeorological hazards, such as strong winds, floods, or droughts, and subsidiary hazards such as landslides, pose a direct threat to lives and, impact livelihoods by damaging and destroying infrastructure, assets and land. Underlying processes, including climate change impacts, population growth, land use change, and urbanisation patterns, are resulting in an increase in the number of people, infrastructure systems and services, livelihoods and assets in SeA at risk from hydrometeorological hazards.</p> <p>The weather and climate conditions over the Indochina Peninsula, along with the complex air-land-water interactions in the Lower Mekong Region (including Cambodia and Lao PDR), make it one of the most vulnerable regions on the planet. Climate change adds another layer of uncertainty with more intense dry seasons, wetter monsoons, intensifying floods and storms (associated with heavy precipitation and strong winds), and rising sea levels.</p> <p>Cambodia and Lao PDR have been affected by a succession of typhoons, floods and droughts in recent years. The impacts of such disasters are not felt equally through society. Gender, income inequality, geography, age, and other socio-economic factors determine how such events impact people. Like most countries, the availability of sex, age and disability disaggregated disaster-related data in Cambodia and Lao PDR is limited. However, disasters exacerbate many of the prevailing gender inequalities that exist within societies, with women, girls and people with disabilities disproportionately affected. As such any early warning system that does not explicitly consider gender and disability are likely to increase marginalisation¹.</p> <p>The disasters experienced in Cambodia and Lao PDR have resulted in major loss of lives, livelihoods, economic assets and have disrupted infrastructure services, hindering access to social services in the region. For example, on 23 July 2018, flash floods led to the collapse of Saddle Dam D, in Lao PDR. According to Government figures 2,382 villages, 126,736 families and 616,145 people were reported to be affected by the floods². The collapse of the Saddle Dam D was also significant for Cambodia as it is located close to the Attapeu and Champasak provinces which border Cambodia. As Cambodia is downstream from the same Xepian-Xe Nam Noy river system which led to intense floods, leading to the evacuation of thousands of individuals from many</p>
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¹ Brown et al., (2019) Gender Transformative Early Warning Systems: Experiences from Nepal and Peru, Rugby, UK: Practical Action. Available from <https://reliefweb.int/sites/reliefweb.int/files/resources/Gender%20Transformative%20Early%20Warning%20Systems.pdf>

² Lao PDR: Floods – Humanitarian Country Team Information Bulletin No.4 (as of 19 October 2018)

	<p>villages in the area. This disaster outlays the transboundary nature of hazards in Cambodia and Lao PDR given their proximity and, in this case, shared river systems.</p> <p>In Cambodia, from 1900 to 2018, more than 40 hydro-meteorological related disasters (i.e., floods, droughts, storms) killed 55,642 people, affected over 23.8 million and caused USD 1.56 billion in damages. These figures account for 78% of total disasters, 68% of total deaths, 98% of affected population and 100% of total damages recorded from 1900 to 2018³.</p> <p>In terms of frequency and severity of impact, meteorological, climatological and hydrological disasters rank high in Cambodia. From 1900-2018, 7 of the top 10 disasters in terms of casualties are floods. Similarly, the top 10 disasters in terms of population affected and damage are all hydro-meteorological related events.</p> <p>In Lao PDR, 49 of the most recently recorded disasters, resulted in 1585 deaths, affecting over 11 million people and causing damages worth USD 802.6 million. Many of these disasters are a direct or indirect consequence of weather, water and climate related events.</p> <p>From 1966 to 2018, four of the top 10 disasters in terms of casualties have been hydrological. The others are health epidemics such as dengue, cholera, diarrhoea and avian influenza, some of which may also have hydro-meteorological influences. The top 10 disasters in terms of total population affected and total damage are associated with floods, droughts and storms, which are generally followed by severe flooding. Floods typically happen from May to September as monsoon rains accumulate in the upper Mekong River basin while droughts occur between November and March.</p> <p>An estimated 56.82% or USD 456 million of USD 802.6 million total damage for the period 1966-2018 resulted from disasters occurring in the 21st century (i.e., 2001-2018), 89% of which are either meteorological or hydrological. This means that from 2001 to 2018, Lao PDR lost an average of USD 25 million per year to floods (68%) and storms (21%).</p> <p>In recent years, a succession of extreme events such as tropical cyclones/typhoons, floods, and droughts have resulted in major loss of lives, livelihoods, and economic assets in both countries. For instance, Lao PDR experienced major typhoons in 2009 (Ketsana), in 2011 (Haima) and in 2013, with the resultant floods</p>
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		<p>causing damages estimated over USD 270 million. In 2018, Lao PDR experienced its most devastating floods in a decade, with estimated damage and losses worth USD 371.5 million, or 2.1 percent of Lao PDR’s projected Gross Domestic Product (GDP) for 2018⁴. On the other hand, Typhoon Ketsana in 2009 and floods in 2011 and 2014 caused damages and losses totalling over USD 1.1 billion in Cambodia⁵. Besides, the strongest El Niño episode of the past 50 years in 2015/2016, resulted in 2.5 million people being affected by droughts leading to water shortages, land degradation, livestock loss and reduced agricultural productivity.</p> <p>In this regard, Cambodia and Lao PDR rank first and second in the sub-regional risk rank with 5.5% and 5.4% agriculture droughts AAL (average annual losses) as a proportion of their GDPs. Considering the agricultural sector’s contribution to livelihoods and food security in both countries, the expected increase in economic impacts of more intense and frequent agricultural droughts, will translate into significant human impacts.</p> <p>In Lao PDR, the climate-sensitive agriculture sector contributes to 20.9% of the GDP and employs 73.1% of the labour force³. For example, rain-fed rice cultivation constitutes more than 90% of the rice growing area in the country, whereas only about 6% of rice growing areas have access to irrigation facilities. Drought occurrence therefore has a significant impact on the total annual rice production of smallholder farmers⁶.</p> <p>Similarly, in Cambodia, the agriculture sector contributes to a large proportion of the economy. For instance, it contributes to 25.3% of Cambodia’s GDP, and employs 48.7% of the country’s labour force. Most of the food production is concentrated in the southern and central parts of the country, and crops are mainly rainfed, with irrigated cropped area estimated at only 10%. Production is highly dependent on weather and is vulnerable to hydro-meteorological hazards. The 2013 floods, for instance, contributed to more than USD 355 million in total damage in agriculture, infrastructure and people’s homes.</p> <p>While Khmer women in Cambodia and are able to own assets, manage financial transactions and contribute to household decision making, in practice, traditional norms and low levels of education and literacy limit women and girls’ choices and access to information in both Cambodia and Lao PDR, which needs to be</p>
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4 Government of Lao PDR. 2018. Post Disaster Needs Assessment, 2018 floods

5 UN ESCAP, 2020. Ready for the Dry Years: Building resilience to drought in South-East Asia

6 FAO, ADPC. (Forthcoming): Developing a Regional Drought Risk Management Programme in Greater Mekong Sub-region

		<p>considered in warning dissemination methods. Women do not have equal access to extension services, irrigation, or farm equipment⁷. According to FAO and Ministry of Environment, women receive only 10% of agriculture extension services.⁸</p> <p>Research in other countries has found that early warning systems typically reach men before women, and often do not reach women working in the home⁹. Women in Cambodia spend more than 10 times as much time doing unpaid care and domestic work than men and boys do, and in Lao PDR they spend 6-8 times¹⁰. Furthermore, women are less likely to travel or communicate at night due to gender norms, caring roles and safety concerns, even if warning messages are received.</p> <p>In Cambodia 9.5% of the population has some degree of disability, and in Lao PDR the prevalence of disability is 2.8% according to the 2015 census, yet in both countries services for people with disabilities are very limited generally and even more so in rural areas. The ability of people with disabilities to access and act on early warnings is dependent on the accessibility of the information and services provided¹¹.</p> <p>Although the governments of both Cambodia and Lao PDR continue to establish policies and mechanisms to help reduce and/or avoid some of the impacts of extreme events and disasters, significant challenges remain. Hence, in both countries, immediate preventive action is required to in order to accelerate the resilience of vulnerable populations.</p>
	<p>b. Status of the EWS, DRM agencies and NHMSs, actors / players present</p>	<p>At the national level, both Cambodia and Lao PDR have rigorous structures in place containing a multitude of institutions coordinating on disaster risk management (DRM), as shown in Annex 3 & 4. Furthermore, the status of national EWSs is assessed using the framework of the four elements of end-to-end, people centred EWSs¹²:</p> <ol style="list-style-type: none"> 1. Disaster risk knowledge

7 Von der Dellen, K (2020) CARE Rapid Gender Analysis for COVID-19 Cambodia, available from <https://reliefweb.int/sites/reliefweb.int/files/resources/CARE%20Cambodia%20Rapid%20Gender%20Analysis%20for%20COVID-19%20FINAL%20APPROVED%20July%202020.pdf>

8 Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), and International Labour Organization (ILO). 2010. Gender Dimensions of Agriculture and Rural Employment: Differentiated Pathways out of Poverty: Status, Trends and Gaps. Rome.

9 Ibid.

10 Sriprasert, P. and Nguyen A. (2020) CARE Rapid Gender Analysis COVID-19 Lao People's Democratic Republic, available from: https://reliefweb.int/sites/reliefweb.int/files/resources/CARE%20in%20Lao%20PDR_RGA%20report_Jul%202020.pdf

11 Guideline on inclusive disaster risk reduction: Early warnings and accessible broadcasting available from https://www.preventionweb.net/files/42819_42819didrrguidelineearlywarninganda.pdf

12 WMO, 2019. Multi-hazard Early Warning Systems: A Checklist - https://library.wmo.int/doc_num.php?explnum_id=4463

2. Detection, monitoring, analysis and forecasting of the hazard and possible consequences
3. Warning dissemination and communication
4. Preparedness and response capabilities

Cambodia

1. Disaster risk knowledge

With regards to risk knowledge, while the country maintains a DesInventar-based national disaster loss database (CamDi) with records since 1996, key challenges refer to: availability of up-to-date risk information, institutionalisation of post-disaster assessment and data collection; consistency in sex, age and disability disaggregation; absence of national standards for disaster and risk information¹³.

Application of risk information is also constrained by the lack of standards on hazard, vulnerability and risk assessments and limited development of multi-hazard risk analysis. As well, there are technological limitations in systematic risk assessment and risk mapping. For instance, DHRW does not have digitised maps of river systems, and continues to rely on topographic maps developed in 2002.

NCDM is yet to develop multi-hazard maps, vulnerability profiles and risk assessments at the national level. Several organisations (see PIN, 2013) have developed hazard and vulnerability maps and assessments based on their priority themes and locations within the country. However, there is no standardisation of methods employed nor consolidation of data gathered, and there is limited, if any, use and integration of these map and assessment outputs in the early warning system. In the absence of national integrated high-resolution risk maps and assessments, decision-makers rely on local knowledge about past hazard events. Strengthening science-based continuous multi-hazard risk assessment capacities continues to be a priority action in the Cambodia DRR framework and national Action plan.

The government approved National Action Plan (NAP – DRR) 2019 – 2023 has identified as a priority action, the establishment of a national disaster management information systems which is expected to build on the existing Cambodia Disaster Database to enhance inter-operability across sector information systems and national statistics office to improve the quality and quantity of

¹³ Cambodia Disaster Damage & Loss Information System (CamDi)

disaster-related data and make evidence available to inform policies and investments.

2. Detection, monitoring, analysis and forecasting of the hazards and possible consequences

The Ministry of Water Resources and Meteorology (MOWRAM) has the mandate to lead and manage water resources, including meteorological and hydrological services. The ministry is comprised of one technical centre and ten departments including DOM, which is mandated to provide weather and climate services, and DHRW, which is responsible for hydrological monitoring and forecasting.

As both DOM and DHRW are members of the NCDM, they play a vital role in assisting the decision-making process on hydro-meteorological induced disasters, particularly early warning and advisory on flood and drought management. For example, DOM provides warnings of extreme events (i.e., storms, thunderstorms, extreme heat and rainfall, dry spell), while DHRW is responsible for flood (riverine and flash flood) warnings and drought monitoring. DOM forecasters were previously trained to generate as well as statistically validate monthly forecasts and seasonal outlooks (i.e., 3-month) using Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) Forecast Customization (FoCus) Tool. Additionally, DOM is committed to assist the National Council for Sustainable Development (NCSD) by providing information on climate change projections. The agencies send the announcement (in green arrow in Figure 1) to the Cabinet Minister of MOWRAM for official warning issuance (blue arrow).

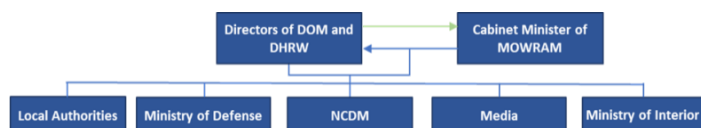


Figure 1. Flow of hydro-meteorological forecasts, bulletins and warnings in Cambodia

Currently, DOM and DHRW have separate databases and would benefit greatly from integrating their agencies' hydro-meteorological datasets into one database for enhanced access, storage and analysis of information on weather-, water- or climate-related hazards with some inter-operability with risk datasets.

Compared with other NMHSs in SeA countries, DOM and DHRW are relatively limited in their activities due to inadequate

equipment, skills and human resources, which can be attributed to insufficient funding. In addition, lack of human resources at the provincial level has also been identified as a major setback for both institutions. Visibility of DOM to the public and the scientific community is also weak, as they currently have limited capacity and tools to publish their activities and services to the public.

There is also a need to expand and support the existing observational network in Cambodia. Many existing and on-going projects have helped the country in modernising its hydromet network. MOWRAM has also been receiving support to integrate the stations. But because these installations were largely project-driven, DOM and DHRW had problems on interoperability and data compatibility.

Despite the establishment and re-installation of stations, Cambodia still faces challenges in sustaining and maintaining these Hydromet stations. DOM, for instance, pays an estimated USD 100,000 annually to Meteo France International (MFI) for its Synergie and radar system. After which, there is very little budget left to maintain the meteorological stations and rainfall gauges. DHRW reports similar deficiencies in the maintenance budget for hydrological stations. Therefore, their existing capacities and resources to maintain and update their ever-growing observation network may pose a risk. Additionally, it would be beneficial to also look at using the data from these stations for early warnings as well as consider aspects related to sustaining the upgraded hydromet stations.

3. Warning dissemination and communication

In Cambodia, the NCDM is tasked with leading, administering and coordinating all disaster management activities. This includes issuing policies, strategic plans, plans of action, regulations, guidelines, programmes and projects across the whole spectrum of disaster management from prevention, mitigation, preparedness, emergency response and recovery. Following the NCDM, committees are formed at the subnational and local levels including the Provincial Committees for Disaster Management (PCDM), District Committees for Disaster Management (DCDM), and Commune Committees for Disaster Management (CCDM). In some areas, Village Disaster Management Groups (VDMG) are also formed under the CCDM.

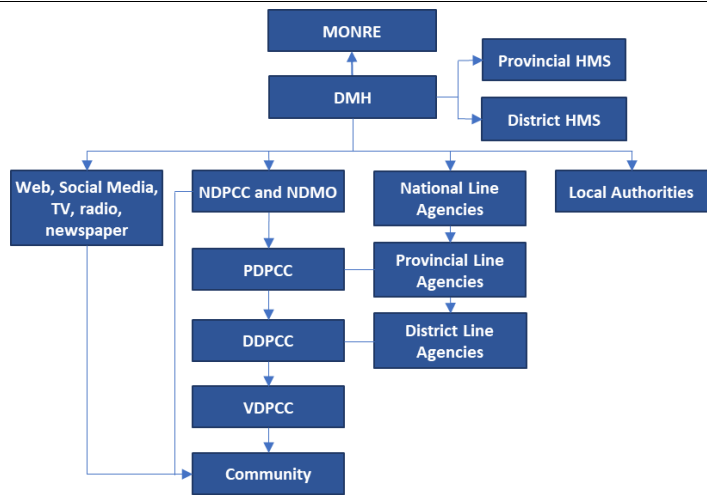


Figure 2. Multi-hazard early warning information flow

Annex 3 provides a more detailed overview of how institutions coordinate as well as disseminate early warning information from warning agencies (DOM and DHRW) to the NCDM.

Warnings and advisories are disseminated through various channels – telephone, fax, email, mobile phone, radio, television, online (DOM and DHRW websites), social media and mobile applications (i.e., Facebook, Telegram, WhatsApp, Viber and Line)¹⁴. In addition, NCDM established the EWS 1294¹⁵, a system that sends warning messages to mobile phones of registered users in areas at risk of flooding. EWS 1294 was developed under the UNDP project “Strengthening climate information and early warning systems in Cambodia” with technical assistance from People In Need (PIN). To sign up, mobile phone users simply dial FREE CALL 1294 and follow the prompts to register their province, district, and commune.

4. Preparedness and response capabilities

One of NCDM’s main roles is coordinating with multiple ministries, agencies and sectors in disaster risk reduction, management and response. Other ministries and agencies who are members of the NCDM also have critical roles, as follows (CFE-DM, 2017).

- a. MOWRAM provides early warning services for hydro-meteorological hazards and is involved in flood and drought management.

¹⁴ <https://techwireasia.com/2017/08/cambodia-government-communications-telegram/>

¹⁵ <https://ews1294.info/en/how-it-works/>

		<ul style="list-style-type: none"> b. The Ministry of Health has set up its own Emergency Operation Center (EOC) in the ministry, and Rapid Response Teams (RRT) in the provinces. c. Cambodian military forces¹⁶ is actively involved in disaster response and relief, rescuing people during natural disasters, helping rehabilitate physical infrastructure as well as building and repairing roads for communication and irrigation systems. d. Cambodian Red Cross (CRC) is officially recognised by the Government of Cambodia as an auxiliary to public authorities in the context of humanitarian services. Considered as a key community-based actor of the NCDM and PCDM, CRC has one branch in all 24 provinces of Cambodia, a network of more than 5,000 volunteers and more than 5,000 youth who implement programs and deliver services. Most government assistance is channeled through CRC, consequently making the institution provide relief and response mechanisms. <p>The NAP DRR 2014-2018¹⁷ listed the conducting of annual national and sub-national simulation of standard operating procedures as a medium priority with corresponding budget. While there were efforts by NCDM and CRC to enhance public awareness on the Law on Disaster Management, simulations and exercises are not conducted regularly. The Cambodia DRR Framework and national action plan (NAP DRR) 2019- 2023 has highlighted among its strategic objective to strengthen preparedness for effective response, the priority accorded to end-to-end early warning systems and disaster response capacities at national and sub-national levels.</p> <p>The Cambodia Roadmap on Risk-informed and Shock-Responsive Social Protection has highlighted relevant issues to strengthen the Early Warning – Early Action chain and identified opportunities to use social protection to respond earlier before an emergency is declared as well as to expand current social safety schemes in response to disaster events. The NAP DRR 2019-2023 has also identified as a priority program on disaster risk reduction resilience building through social protection and safety nets in the context of disaster (Strategic Objective 4) disaster response in Cambodia is largely ex post, signalling the need to strengthen the EWS, contingency planning and response system. Preparedness planning is largely under-resourced, especially at sub-national</p>
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16 Cambodia’s military forces include the Royal Cambodian Armed Forces (RCAF), Royal Cambodian Army, Royal Cambodian Navy, Royal Cambodian Air Force, Central Department of National Police, Cambodian National Police and Royal Gendarmerie of Cambodia (Military Police)

17 National Action Plan for Disaster Risk Reduction (NAP-DRR) 2014-2018, Kingdom of Cambodia

level and early action is hampered by a lack of an established system of triggers for major shocks such as floods and droughts.

Lao PDR

1. Disaster risk knowledge

With regards to risk information, in 2010, the Government of Lao PDR analysed, mapped and assessed seven hazards in the country including earthquakes, floods, landslides, epidemics, unexploded ordnances (UXOs), drought and storms. However, there has been no comprehensive update of the maps and assessments since 2010. Systematic collection and analysis of data should consider the dynamic nature of hazards and vulnerabilities arising from urbanisation, land-use change, infrastructure development, environmental degradation and climate change, among others.

For disaster information, Lao PDR's National Disaster Management Office (NDMO) also established the country's disaster loss and damage database using the methodology and analytics within Desinventar (LaoDI), however the database has not been updated since 2012, coinciding with institutional changes on DRR mandates.

Non up to date disaster and risk information presented in static reports and maps hinders the application of risk knowledge in decision-making, especially when planning decisions relevant for climate and DRM such as land-use planning, infrastructure development or preparedness and risk modelling.

2. Detection, monitoring, analysis and forecasting of the hazards and possible consequences

DMH operates under MONRE and is responsible for providing meteorological and hydrological services. Along with the NDMO, DMH serves on the National Disaster Management Steering Committee (NDMC) which is the lead institution for decision making on hydrometeorological hazards.

When compared to most of the NMHSs in the region, DMH has relatively limited technical, human and financial resources to deliver relevant and timely weather, water and climate products and services. However, in Lao PDR, the observation network covers most of the country.

DMH recently established the National Early Warning Centre (NEWC) for meteorology and hydrology with the aim to help reduce the impact of disasters through the provision of reliable and timely flood and drought forecasts and warnings. The centre

collects hydro-meteorological data, uses hydro-meteorological models and forecasting tools, disseminates the forecasts and warnings, and monitors response.

Like DOM in Cambodia, DMH has also received support through various projects and initiatives on the modernisation of its hydromet network. In addition, WB financed projects are also providing support to upgrade hydromet networks and integrate data from different projects. With new stations and upgrades in the observation network, DMH is able to improve their observation and monitoring capacities.

However, because these installations were largely project-driven, there are problems on interoperability and data compatibility along with server duplication. In addition, there is a very limited capacity and resources to maintain these networks. Therefore, it is crucial to assess the sustainability and maintenance associated with these network upgrades. Furthermore, it is also important to compliment national station data with global data.

3. Warning dissemination and communication

In Lao PDR, the National Disaster Prevention and Control Committee (NDPCC), plays the leading role in ensuring effective coordination of all interventions across the DRM cycle from mitigation and prevention to preparedness, response and recovery.

The NDMO is the national secretariat to the NDPCC and leads the data gathering and assessment of disaster loss and damage in cooperation with national agencies involved in the EWS value chain. The NDMO reports to the NDPCC for decision, supervision and action. NDPCC is replicated at the provincial, district and village levels with Disaster Prevention and Control Committees (DPCC) headed by the Vice Provincial Governor, District Governor or Vice District Governor and Village Head respectively. As the lead institution, the NDPCC defines the country's DRR strategy and outlines mechanisms for managing disaster risks. Figure 3 shows the flow of multi-hazard early warning information between national institutions.

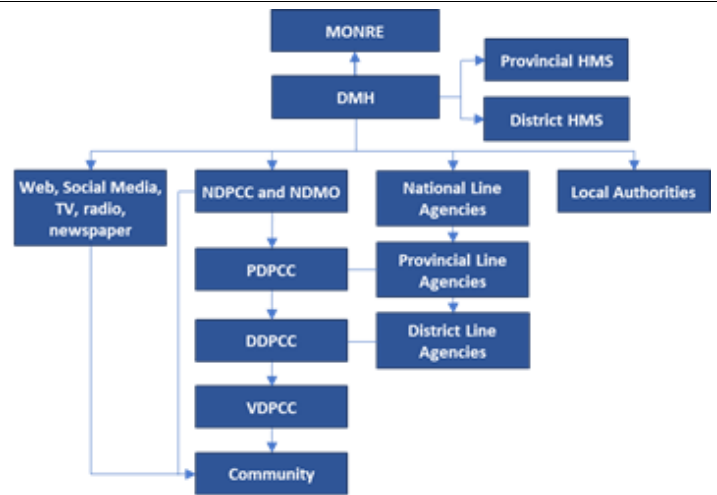


Figure 3. Multi-hazard early warning information flow

Annex 5 provides a more detailed overview of how institutions coordinate as well as disseminate early warning information from warning agencies (DOM and DHRW) to the NCDM.

Hydrological and meteorological forecasts are generally disseminated by the Weather Forecasting Division through DMH’s YouTube and Facebook accounts, WhatsApp, radio (i.e., Lao Army Radio, Lao National Radio, Vientiane Radio Station), television and newspaper. Message is sent to provincial and district hydro-meteorological services, media, NDPCC and NDMO, line ministries and agencies as well as local authorities.

Despite the existence of 40 dams and 50 additional dams being under construction, currently, there is limited coordination between DMH and dam operators. Only one government-operated dam – Nam Ngum 1 provides daily data on their water levels as well as potential release of water. There is also limited coordination with the Department of Irrigation under the Ministry of Agriculture and Forestry. Nevertheless, DMH provides warnings to all ministries and government offices during extreme weather conditions.

4. Preparedness and response capabilities

The Ministry of Labour and Social Welfare (MLSW) is responsible for preparing national disaster and emergency response plans, preparedness, early relief and response activities. The NDPCC is tasked with direct relief operation, disaster preparedness, response and rehabilitation using government budget and contribution of concerned agencies, international, local, and non-governmental organisations.

As previously mentioned, the responsibilities of forecasting, monitoring and warning fall within MONRE. MONRE is also expected to strengthen preparedness through its role in land management, watershed management, hazard mapping and early warning. Therefore, MONRE helps provide structural and non-structural measures to enhance preparedness.

MONRE's roles are shared with the Ministry of Agriculture and Forestry (MAF), which manages agricultural and forest land as well as the Ministry of Energy and Mines (MEM), which looks after hydropower and mining projects. Forest and agriculture land use planning has been used in Lao PDR to help stabilise shifting cultivation, improve natural resource management, manage resettlement, clarify the status of land for concessions and improve tenurial rights of local people. But most planning process is not inclusive of local needs and such plans are mostly unsuccessful in achieving key development and conservation goals.

The lead agency in mobilising communities, mitigating disasters, monitoring damage, and dispatching relief is MLSW. Other line ministries and agencies coordinate with MLSW and the Department of Social Welfare (DSW). Additionally, MONRE is tasked by the NDPC to provide guidance on preparedness and early warning and further supports the MLSW to carry out its mandate for response.

For example, in 2018, the responsibility for the coordination of DRR and disaster recovery interventions shifted from the MONRE to the MLSW as per Prime Minister Decree No.75 of 28 February 2018. The government approved a new Disaster Management Law in June 2019 and has embarked on the development of its new National Strategy for DRR.

However, increased coordination is required between these institutions as gaps exist in dissemination of warnings to the end user and mechanisms for anticipatory action which are major weaknesses of EWS and early action in Lao PDR. This is due to the limited capacity of the MLSW to implement its mandate.

In addition, the Armed Forces and Laos Red Cross also play critical roles in disaster preparedness, response and early recovery. For example, the Armed Forces have their own disaster preparedness and response plan in relation to response and relief operations in different parts of the country.

The Lao Red Cross (LRC) is an auxiliary to the government. LRC is a recognized member of DPCC from national to village levels. It

supports the government in disaster preparedness, response and humanitarian services, and cooperates with public authorities in i) communicating early warning information, ii) providing joint emergency operations and relief supplies (e.g., food and medical kits) for affected communities, and iii) conducting joint assessments of damage and loss and needs of disaster survivors.

In order to better coordinate these efforts, the Inter-Agency Standing Committee (IASC) was established as a mechanism to coordinate humanitarian action among Government and international actors. United Nations agencies, INGOs, Red Cross Societies and development partners support government response in coordination with line ministries at national and subnational levels. These entities have MOUs with line ministries for development activities as well as separate agreements at national and provincial level for emergency response activities. The Emergency Task Force (ETF) is a technical coordination body for disaster preparedness and response between government and non-government actors¹⁸.

Despite the above mentioned coordination structures, there remain major gaps in disaster response including i) insufficient financial resources and commodities, ii) limited capacities and coordination among national bodies, iii) challenges in information management and reporting mechanisms, iv) limited access of NGOs in areas outside their operation, v) limited access due to terrain or bad roads, and vi) lack of clear protocol between the government and international Humanitarian Country Team in requesting and accepting international assistance.

Lao PDR is currently developing its 9th National Socio-Economic Development Plan (NSED) and has completed its new National DRR Strategy, which identify the need to strengthen early warning systems in country.

Regional perspective

Regional cooperation in SeA exists through various regional bodies and institutions who play a pivotal role in operational and technical support to Cambodia and Lao PDR. For example, the ASEAN Secretariat, is a regional intergovernmental organization comprising ten countries in SeA, including Cambodia and Lao PDR. Under the ASEAN Secretariat, the ASEAN Specialised Meteorological Centre (ASMC) located in Singapore, aims to improve the understanding of weather and climate systems in the

¹⁸ Inter-Agency Contingency Plan, Lao PDR – September 2019, prepared by the Humanitarian Country Team

region and provide additional support to NMHSs' through capacity development programmes.

DMH receives data as well as model outputs from regional and global centres. It receives rainfall and water level data from stations in neighbouring countries through the Mekong-Hydro Meteorological Cycle Observation System Project (Mekong-HYCOS). Similarly, it has access to regional/global data and NWP products from various sources through its synergy forecasting system, and via the Severe Weather Forecast Programme in Southeast Asia (SWFP-SeA) portal and soon to have access to the Southeast Asia Flash Flood Guidance System (SeAFFGS).

The Viet Nam Meteorological and Hydrological Administration (VNMHA), Ha Noi, is a Regional Forecast Support Centre (RFSC) within the framework of WMO SWFP-SeA and implementation of SeAFFGS. Strengthening the RFSC has been one of the main priorities under the WMO-led Canada CREWS SIDS and SeA Project, and the additional support and services it provides will be leveraged under this project. For example, the RFSC has received additional support in its ability to provide forecasts and products on severe weather (including heavy rain, strong winds, damaging waves), under the SWFP-SeA, and on flash floods, through the SeAFFGS.

The Climate Services Information System (CSIS) component of the Global Framework for Climate Services (GFCS) is the principal mechanism through which information about climate – past, present and future – is routinely archived, analysed, modelled, exchanged and processed. In this regard, the Regional Climate Outlook Forums (RCOFs) and their national counterparts play a central role in synthesising and clarifying information fed by the CSIS entities to the various elements of the User Interface Platform. The ASEAN Climate Outlook Forum (ASEANCOF), which covers Cambodia and Lao PDR brings together national, regional and international climate experts, on an operational basis, to produce regional climate outlooks based on input-climate predictions from its Members. It is a way to ensure consistency in access to, and interpretation of, climate information among countries with common climatological characteristics. The 72nd session of the WMO Executive Council decided to initiate strengthening of the operationalisation of objective seasonal forecasts and tailored products at sub-regional scales, and the ASEAN region will be one of the regions under focus.

With the recent WB project 'Vietnam Managing Natural Hazards Project', foundational and transformative investments have been

made in modernising the VNMHA infrastructure with state-of-the-art operational forecasting capabilities, including improved computing capacities for regional Numerical Weather Prediction (NWP) which underpins the generation of the forecasts and products made available through the SWFP-SeA. Additionally, Hong Kong Observatory (HKO), Hong Kong, China which is also a WMO designated Regional Specialized Meteorological Centre (RSMC) for Nowcasting) has been a technical support centre for SWFP-SeA to develop capacity of the participating NMHSs on NWP interpretation, nowcasting and service delivery. With the help of these WMO and WB led initiatives, both DOM (Cambodia) and DMH (Lao PDR) receive support in terms of data sharing, strengthening forecasting capability, and training of staff.

Additionally, there are several scientific, technical and research institutions which provide support to countries in strengthening their national multi-hazard early warning systems (MHEWSs) and contributing to disaster preparedness and response. For example, the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) and the Asian Disaster Preparedness Center (ADPC), provide technical support on weather, climate and hydrological research and development and capacity building in early warning.

Key actions

Below are a set of practical actions to be taken to assist in developing or refining the early warning systems in Cambodia and Lao PDR, that were gathered using national MHEWS assessments, reports¹⁹ and WMO guidance documents²⁰ and further consolidated using the information collected from consultations with national stakeholders in the proposal development process.

The following set of actions are used to develop the overall project intervention strategy design, details on activities are available on the section *a. Project components and activities*.

Below, the actions are categorised based on the four elements of EWS.

MHEWS Governance, Policy and Institutional Framework

- Ensure standardised processes, roles and responsibilities of all institutions generating and issuing warnings are established and mandated by legislation

19 PIN, 2019. Flood Early Warning Systems in the Lower Mekong: The state of national and transboundary flood early warning systems in Cambodia, Laos, Myanmar, Thailand and Vietnam

20 WMO, 2018. Multi-hazard Early Warning Systems: A Checklist - https://library.wmo.int/doc_num.php?explnum_id=4463

1. Disaster risk knowledge

- Integrate and update disaster loss databases and risk information management systems, to effectively store, analyse and manage flood, droughts and other hazard, vulnerability and disaster impact data.
- Ensure exposure and hazard maps (dynamic and multi-hazard, when possible) are up to date, that identify the geographical areas/people that could be affected.
- Damage and loss data analysis capacity development for improved understanding of vulnerabilities of key economic sectors, assets, social groups and systems at national and local levels.
- Establishment of standard post-disaster assessment data methods and enhancement of capacities for field data, collection in disaggregated manner (sex, age, disability, geographic, hazard and income-level as applicable), loss estimation and attribution (direct damage quantification and indirect change on flows or losses) and data management and sharing of data.

2. Detection, monitoring, analysis and forecasting of the hazards and possible consequences

- Create a Modernisation and/or Strategic Plan including capacity needs assessment, cost-effective operation and maintenance strategy and plan, human resources development plan and business model/plan.
- Develop systems/platforms to integrate all hydrometeorological observation data.
- Support the modernisation of hydrometeorological system, including its operation and maintenance.
- Capacity-building on hydrological modelling, drought monitoring and forecasting, NWP and climate forecasting.
- Build technical capacity for accurate flood and drought risk mapping, monitoring and forecasting.

3. Warning dissemination and communication

- Increase collaboration between NMHSs and NDMOs, other disaster management partners and stakeholders for more effective disaster preparedness.

		<ul style="list-style-type: none"> • Improve coordination between NMHSs and dam operators. • Develop robust SOPs covering the roles and responsibilities in dissemination of timely early warnings (flood, droughts and other hazard emergency response operations). • Address gaps in timeliness and last mile connectivity in warning dissemination from warning issuers to end-user communities. • Ensure early warnings and early action protocols consider the different risks and needs of population groups, including differential vulnerabilities (urban and rural, women and men, older people and youth, people with disabilities, etc.), local context and risk mitigation knowledge and coping capacities. <p>4. Response capacity</p> <ul style="list-style-type: none"> • Risk communication and disaster preparedness and response plans are co-developed with stakeholders at the district and communal level, and integrate local and indigenous knowledge, along with last mile connectivity. • Support flood impact-based warnings to support decision making processes and preparedness at community level. • Further develop feedback mechanisms to measure the effectiveness, enhance inclusiveness and tailor early warning messaging, risk communication to different group's risk profile and needs. • Integration of insights from previous emergency and disaster events into preparedness and response plans, capacity-building strategies, risk communication and awareness campaigns. • Scalability frameworks for floods and drought enhanced and incorporated on programmatic mechanisms for vertical and horizontal expansion of social protection coverage in anticipation or response to shocks. Early action protocols and trigger systems developed, and financing mechanism identified for selected hazards.
	<p>c. Projects and programs dealing with EWS and hydromet under implementation or preparation</p>	<p>Several EWS programmes and projects for Cambodia and Lao PDR are ongoing, or in the pipeline. The CREWS Cambodia and Lao PDR project aims to build upon these national and regional level initiatives and will utilise country level support from the NMHSs and NDMOs. In addition, it will also build upon regionally led initiatives which have focused on strengthening the capacity of</p>

and leveraging support from regional centres specialising in weather, water and climate services.

Completed Projects and Initiatives

Strengthening climate information and EWSs in Cambodia (UNDP) focused on enhancing the inclusion of climate change considerations in short- and long-term planning, sectoral planning and other decision-making processes. Data generated through installed hardware, along with risk mapping and forecasted data, is being made available to specifically benefit agriculture and water management sectors in their planning processes.

Community-based Approaches to Flood Management in Thailand and Lao People's Democratic Republic (PDR) (WMO & ADPC) The community-centred approach applied for this project was aimed at reducing the negative impacts of floods while enhancing community preparedness and resilience to flood events. This complements the community-based disaster risk management in the Sendai Framework, specially linking with priorities of action 1, 3 and 4. The project benefits included: participatory risk assessments, promotion of gender inclusive participation, formation of a community-based flood management committee and a village disaster prevention and control committee, encouraging non-structural solutions and shifting to a more proactive approach in managing/handling floods.

Greater Mekong Subregion Flood and Drought Risk Management and Mitigation Project (ADB) helped Cambodia and Lao PDR to strengthen disaster risk management and raise the ability of vulnerable communities to cope with floods and droughts. The project enhanced regional data, information and knowledge base for the management of floods and droughts through development of design criteria for flood and drought risk schemes and water control infrastructure in the Mekong Delta and facilitated the assessment of cross-border flood management options. The project also focused on capacity building for the National Forecasting Centre, Cambodia and the National Early Warning Centre, Lao PDR, including provision of server and forecasting models.

Improvement of Equipment and Facilities for Meteorological and Hydrological Service Project by JICA supported with the effective mitigation of the adverse effects of natural disasters through the improvement of the meteorological and hydrological forecasts/warnings of the DMH. Under this project 18 Automatic

Weather Stations (AWS) and around eight hydrological stations were installed.

The Synergized Standard Operating Procedures for Coastal Multi-Hazards Early Warning Systems (SSOP) Project (Phases I and II) implemented by the ESCAP/WMO Typhoon Committee and funded by the ESCAP Trust Fund on Trust Fund for Tsunami, Disaster and Climate Preparedness focused on training countries in Southeast Asia how to establish an appropriate standard operating procedure (SOP) based on the published SSOP Manual. concentrated on training the “mechanism” of preparing and implementing synergized SOPs for MHEWSs (not only for coastal hazards) in beneficiary countries with the goal of promoting especially the resilience of coastal communities.

Ongoing Projects

Building Resilience to High-Impact Hydro-meteorological Events through Strengthening MHEWS) in Small Island Developing States (SIDS) and Southeast Asia (SEA) (“Canada-CREWS”) (WMO)

The Project focuses on strengthening forecasting capabilities on a regional scale, and increased regional integrated forecasting, as well as the participating NMHSs capacities to access and use global and regional data, products and tools through several pilot programmes / projects. This is achieved through sponsoring WMO flagship activities in the Project regions, such as the SWFP and FFGS in support of WMO’s strategic objectives on DRR and service delivery.

SWFP represents a systematic approach for building capacity and for transferring knowledge and skills to operational weather forecasting teams across the NMHSs community. It aims to (i) Implement the ‘Cascading Forecasting Process’ through efficient use of the WMO Global Data Processing and Forecasting System (GDPFS) Centres, (ii) Improve lead-time of warnings, (iii) Improve interaction of NMHSs with their users including for impact-based forecast and warning services, and (iv) identify areas for improvement and requirements for the WMO Basic Systems.

SeAFFGS contributes towards reducing the vulnerability of the region to flash floods, by developing and implementing a flash flood guidance system to strengthen regional and national capacity to develop timely and accurate flash flood warnings. The approach entails development of regional technology, training, protocols and procedures to mitigate the impacts of flash floods

and provision of critical and timely information by the NMHSs of the participating countries.

Applying seasonal climate forecasting and innovative insurance solutions to climate risk management in the agriculture sector in Southeast Asia (also known as DeRisk SeA) (WMO/USQ/CIAT)

The project is aimed at developing resilient climate risk management systems, best practices and insurance products that will shield smallholder farmers and businesses engaged across the agricultural value chain from the physical and financial disaster associated with climate change. Relevant governments will be assisted in developing national/regional adaptation and risk management strategies.

Mekong Integrated Water Resources Management Project (WB)

The project aims to establish key examples of integrated water resource management practices in the Lower Mekong Basin (LMB) at the regional, national, and sub-national levels, thus contributing to more sustainable river basin development in the Lower Mekong. The project seeks to extend technical and financial support to closely coordinate with Lao PDR, Cambodia, and Viet Nam on: (a) institutional arrangements for river basin management and planning; (b) hydromet network modernisation and sharing; (c) development of decision system to support river basin management and planning. In Lao PDR, the project financed 25 hydromet stations in 2019 and additional 64 hydromet stations will be modernized by March 2022. The real-time data recorded by these stations will be integrated into a centralized data management system of DMH in Lao PDR. In addition, the project also supports the development of water modelling packages for 8 priority river basins for water resources assessment and river basin planning in Lao PDR.

For Cambodia, the project is financing the modernization of 28 hydromet stations in north-eastern part of Cambodia. Water modelling packages will also be developed to support river basin planning and water resources assessment for 7 river basins in the north-eastern part of Cambodia.

Scaling up Forecast based Financing/Early Warning Early Action (FbF/EWEA) and Shock-Responsive Social Protection (SRSP) (ECHO-ASEAN-UN (UNICEF, FAO, IFRC WFP (as main partners) with PIN, UN WOMEN (only in Vietnam), Save the Children)

This project aims to reduce disaster impacts and enhance resilience in ASEAN through advancement of forecast-based financing and shock responsive social protection informed by

innovative use of climate risk data. The project is being implemented in Cambodia, Viet Nam, Philippines and Myanmar supporting the use of climate risk data and strengthening EWSs to trigger early action and SRSP based on impact-based forecasts. It promotes the adoption of the FbF/EWEA approach and implementing roadmaps to establish SRSP systems and equipping governments with capacities and financial options to implement FbF/EWEA and SRSP.

Strengthening the Development and Implementation of National Disaster Risk Reduction Strategies and Plans (UNDRR – BMZ)

This project, which includes Cambodia and Lao PDR among priority countries is providing additional training and technical support to vulnerable LDC and SIDS countries in their efforts to strengthen their National Disaster Risk Reduction Strategies and Plans with regard to climate risk and other emerging risks as well as guidance on how to ensure alignment with relevant climate change policies (specifically the National Adaptation Plan).

Lao PDR Southeast Asia Disaster Risk Management Project (WB)

The SeA DRM Project for Lao PDR aims to reduce the impacts of flooding in target areas in Oudomxay, Luang Prabang and Borikhamxay provinces and enhance the Government’s capacity to provide hydro-meteorological services and disaster response. A key focus of the project is to modernise hydrometeorological institutions (to improve the delivery of weather, climate, and hydrological services) and end-to-end EWSs, along with ensuring that Lao PDR has effective emergency preparedness and response structures in place. The project is financing 70 new hydromet stations, in addition to the 25 stations being financed by the World Bank supported Mekong Integrated Water Resource Management project (MIWRM). Data generated from these stations will be integrated in a centralized data management system, also supported by the project. The focus is on standardizing Data Collection and Processing, Analysis and Forecasting, and Warning production and near real-time dissemination. It does not support the improvement of data transmission and upgrade of existing stations, nor earthquake detection.

Southeast Asia Disaster Risk Insurance Facility – SEADRIF ASEAN+3 countries (World Bank)

SEADRIF is a regional platform to provide ASEAN countries with financial solutions and technical advice to increase their financial

resilience to climate and disaster risks. This includes the development of a catastrophe risk insurance pool for Lao PDR and Myanmar. A tool has also been developed to provide the risk data needed for the flood insurance risk pool.

Strengthening Agro-climatic Monitoring and Information Systems (SAMIS) to Improve Adaptation to Climate Change and Food Security in Lao PDR (FAO)

The project aims to increase the decision-making and planning capacity for the agricultural sector at national and decentralized levels in Lao PDR. To achieve this, the project seeks to strengthen institutional and technical capacity for monitoring and analysis of agriculture production systems and development of Land Resources Information Management Systems (LRIMS), Agro-Ecological Zones (AEZ) and Socio-Agricultural Vulnerability Analysis (SAVA).

Laos Climate Services for Agriculture (LaCSA) (FAO, CIAT and APC)

The project aims to development of online system and mobile phone app and provision of agro-meteorological forecasts and advisories for farmers.

Installation of automatic weather stations (AWS) (Korea Meteorological Agency (KMA))

Installation of 25 AWS, development of data receiving system and training of DOM staff.

Capacity Building on End-to-End MHEWS in Cambodia through Seasonal Forecasting, SESAME program and Monsoon Forum (RIMES, with funding from UNDP)

The project aims to build the capacity of DOM for generation of forecasts at different timescales using short-range NWP and long-range statistical models. It focuses on enhancing the capacity of DHRW on hydrological forecasting and the General Directorate of Agriculture (GDA) to produce agrometeorological advisories.

SERVIR-Mekong Project (USAID-ADPC) supported governments, regional institutions and key stakeholders in the Lower Mekong countries to use publicly available satellite imagery and geospatial technologies to prepare for and respond to disasters, manage natural resources and improve food security.

Swiss Policy on Reducing Disaster Risks in SeA (SDC)

The regional DRR Advisory is supporting Swiss Cooperation Offices (SCOs) in SeA, particularly, in Cambodia, Lao PDR and Myanmar to identify, implement and monitor DRR and climate change adaptation (CCA) mainstreaming in their development and humanitarian programmes and projects.

Existing initiatives, Regional Organizations and Systems (selection)

ASEAN Climate Outlook Forum (ASEANCOF)

ASEANCOF aims to provide collaboratively developed and consensus-based seasonal climate outlooks and related information on a regional scale. These activities support decision-making to manage climate-related risks and support sustainable development. The outlooks generally include probabilistic predictions of seasonal mean rainfall, surface air temperature and other weather parameters, as well as the likely evolution of key drivers of seasonal climate variability relevant to the region such as the El Niño/Southern Oscillation (ENSO).

WMO Hydrological Observing System (WHOS)

WHOS facilitates hydrological data sharing and is a registry of hydrological data and information services catalogued using the standards and procedures developed by the Open Geospatial Consortium (OGC) and WMO. This registry is a specialized hydrological component within the WMO Information System (WIS) and is open to all users and institutions from any country or level of government.

ESCAP/WMO Typhoon Committee

The Typhoon Committee is an inter-governmental body organized under the joint auspices of the UN Economic and Social Commission for Asia and the Pacific (ESCAP) and WMO to promote and coordinate the planning and implementation of measures required to minimize the loss of life and material damage caused by typhoons in Asia and the Northwest Pacific.

World Food Program (WFP) and NCDM- Platforms for Real-time Information Systems (PRISM) and the National Contingency Plan update in July 2020.

WFP and NCDM initiated the redesign and upgrade of the web-based PRISM in 2020 based on user needs and availability of new data. New features include a user-friendly, map-based interface and the integration of earth observation satellite data and remote sensing products on flood and drought, mobile phone data

		<p>collection tools for rapid field assessments, flood early warning system data and socio-economic vulnerability data.</p> <p>Other</p> <p>In addition, the project will also look at closely coordinating with other initiatives in the pipeline such as the Asia Regional Resilience to Climate Change 2 (ARRCC2) that could be used to further strengthen the outcomes within this project, particularly on aspects relating to Impact Based Forecasting and Warning Services.</p> <p>Furthermore, the countries have also received support from the private sector with regards to dissemination of EWS information. For instance, in Lao PDR, telecommunication companies such as Lao Telecom, ETL, UNITEL and Beeline—use short message service (SMS) to deliver weather-related information to subscribers who are registered to receive EWS text messages.</p>
	<p>d. Describe the multiplier /leveraging potential of the CREWS investments</p>	<p>As detailed in the sections above, Southeast Asia, particularly, Cambodia and Lao PDR has benefited from a large number of projects focused on improving various aspects of their EWSs. The ongoing projects listed above have significant investments in both countries. However, there are still some gaps and challenges to be addressed with respect to integrating the four elements of EWS, both at the national and regional level.</p> <p>Keeping in mind the above points, the Project will map against:</p> <p>(1) Ongoing projects such as:</p> <ul style="list-style-type: none"> (i) Canada CREWS SIDS and SeA (ii) DeRisk SeA (iii) Scaling up FbF/EWEA and SRSP with innovative use of climate risk information for disaster resilience in ASEAN (iv) Lao PDR Southeast Asia Disaster Risk Management Project (v) SeA DRM Project and Mekong Integrated Water Resources Management Project (v) SEADRIF Initiative (vi) Strengthening climate information and EWSs in Cambodia (vii) WFP - NDMC Platform for Real Time Impact and Situation Monitoring (PRISM) <p>(2) Key national and regional initiatives and committees/commissions such as:</p>

- (i) Monsoon Forum
- (ii) ESCAP/WMO Typhoon Committee
- (iii) ASEAN
- (iv) Mekong River Commission (MRC)
- (v) Cambodia – Humanitarian Response Forum
- (vi) Cambodia - National Committee for Disaster Management

(3) Existing systems such as SWFP-SeA, SeAFFGS and coordinate with WMO regional centres such as RFSC Ha Noi, CCRS Singapore and Regional Training Centre (RTC), Seoul to strengthen forecasting capabilities and dissemination of information.

(4) Seeking synergies with key priorities and frameworks that aim to strengthen NMHSs and overall DRR (e.g., AADMER, RIMES Master Plan, ADPC Strategy, ESCAP Plans, WMO SP/OP, Drought management strategy for Lower Mekong region (by MRC), Mekong Climate Change Adaptation Strategy and Action Plan, Asia Regional Plan for Implementation of the Sendai Framework, AADMER Work Programme 2021-2025, Making Cities Resilient 2030 campaign, etc.).

In addition to the mapping against the various initiatives (as mentioned above), by working closely with the NMHSs and NDMOs, this project will align itself with key national policies and plans such as the Cambodia’s Climate Change Strategic Plan (2014-2023), Cambodia disaster risk reduction framework and national action plan 2019-2023, Cambodia Roadmap to develop a risk-informed SRSP, Lao PDR’s Strategic Plan on Disaster Risk Management (2020) and Disaster Risk Reduction Framework (2019 – 2030), ASEAN guidelines on disaster-responsive social protection, ASEAN Vision 2025 on Disaster Management, ASEAN Regional Disaster Management Framework and ASEAN-UN Joint Strategic Plan of Action on Disaster Management (JSPADM), ASEAN Agreement on disaster management and emergency response (AADMER) work programme 2021-2025, Basin development strategy for the Mekong River Basin 2021-2030 (forthcoming) and Mekong River Commission Strategic plan for 2021-2025, among others.

Through such collaboration, it is envisaged to enhance the resilience of vulnerable populations which can lead to increased confidence of beneficiary countries and development partners to provide financial support to EWS and Early action in the region.

	<p>e. Describe measures to ensure coherence with existing initiatives</p>	<p>Considering the work that has happened or is ongoing in the region, this project will be crucial to build upon and sustain some of the key initiatives that have been instrumental for both Cambodia and Lao PDR. It will further support better coordination among the various projects / initiatives for more coherent regional / longer-term approaches with economies of scale and pave the way for potential future investments from pipeline projects and long-term financing. The CREWS implementing partners, WMO, World Bank and UNDRR, bring their expertise and will draw on key engagements in the region, to support the NMHSs, NDMOs and regional centres by strengthening its seamless and sustainable operationalisation of a set of complementary systems and associated services in an MHEWS context. It will also ensure continuity and further enhance the outcomes from these projects, especially through capacity development, institutionalization and development of standards, for sustained benefit at local, national and regional level.</p> <p>The project will also ensure cooperation with existing WMO network of regional centres such as the CCRS and RFSC, Ha Noi and further build upon regional initiatives such as SeASWFP and SeAFFGS. For instance, RFSC Ha Noi can aid with providing capacity development and technical support to the NMHSs to forecast severe weather and build upon the implementation of SeAFFGS in the subregion (Cambodia, Lao PDR, Thailand and Viet Nam) and leverage support from the CCRS to develop operationalized objective seasonal to sub-seasonal forecasts on a sub-regional scale. Additionally, the project will also leverage support from other regional centres, such as the ASMC. With respect to exchange of data, the project partners will review existing mechanism for data exchange along with the identification of potential gaps and challenges. The project will also explore the possibility of facilitating data exchange through WMO Information Systems (WIS), WMO Integrated Global Observing System (WIGOS), WHOS etc.</p> <p>UNDRR will leverage its leadership role within the ASEAN-UN JSPADM, in particular, the pillar on Prevention and Mitigation. The JSPADM is the key joint ASEAN-UN mechanism to coordinate the implementation of disaster risk management in the ASEAN region and has been designed to support the AADMER Work Programme, which is coordinated by the ASEAN Committee on Disaster Management (composed of ASEAN Member States). UNDRR is also supporting the ASEAN Secretariat in developing the new AADMER Work Programme 2021-2025 and the overarching Plan of Action to Implement the Joint Declaration on</p>
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		<p>Comprehensive Partnership between ASEAN and the UN 2021-2025.</p> <p>UNDRR will further strengthen a coordinated UN action on relevant strategic matters as the co-chair of the Issue-based Coalition (IBC) on Resilience Building. IBCs are broad, multi-partner coalitions formed to coordinate the United Nations action on cross-cutting challenges within the region and aim to help realise synergies among related areas of work of different United Nations entities, while serving as a regional asset to ensure national implementation. UNDRR will leverage support from locally active NGOs, IFRC and Red Cross societies especially in activities related to risk communication, community feedback mechanisms and local preparedness where those partners have a comparative advantage due to their field presence and expertise at community level. UNDRR will also mobilize its stakeholder on gender, youth, children, person with disabilities to capitalize on their expertise, advocacy and research work in the region and countries for inclusivity guidelines. In areas related to shock-responsive social protection UNDRR will partner with WFP to synergize activities with their current ASEAN and country-level initiatives and planned investments.</p>
<p>Project design</p>	<p>a. Project components and activities</p>	<p>The activities presented in this section are designed to address capacity gaps within Cambodia and Laos PDR and are designed based on findings and proposed actions included within section B: <i>Status of the EWS, DRM agencies and NHMSs, actors / players present</i> section. The project design involved extensive consultation with the national and regional level stakeholders and the activities were developed based on the feedback received through these consultations. In addition, the implementing partners (WMO, WB and UNDRR) will closely collaborate with these entities who are actively engaged in the region and countries at focus, to address the gaps and ensure that the efforts are better coordinated to create synergies.</p> <p>Therefore, activities target and aim to strengthen each of the four elements of people-centred early warning systems within Cambodia and Lao PDR.</p>
<p>Description of Activities</p> <p><i>(More details on the baseline, milestones, targets and indicators against each of the outputs are provided in the logframe)</i></p>		
<p>Outcome 1: Strengthened governance mechanism (policies, strategic frameworks, institutional mechanism and capacities) and enabling environment created for national and regional stakeholders.</p>		
<p><i>Output 1.1: National Meteorological and Hydrological Services' (NMHSs) service delivery improved, including the development of long-term service delivery strategies and development/action plans</i></p>		

Output indicator 1.1.1: Drafting of new and / or review & updating of existing legislation targeting weather, water and climate services

EWS pillar: Monitoring and warning / MHEWS Governance, Policy and Institutional Framework

Key action (s): Ensure standardised processes, roles and responsibilities of all organisations generating and issuing warnings established and mandated by legislation.

Activity description: Several legislation and Standard Operating Procedures have been identified by institutions such as DOM, DHRW and DMH and are required to be reviewed, and updated or developed. These documents will help to define agencies' mission and mandate; ensure clarity in the definition of its responsibilities; provide legal authority for certain responsibilities; gain recognition of its contribution to society; and facilitate allocation of adequate resources.

Deliverable(s): 2 updated legislation

Output indicator 1.1.2: DRR/Preparedness and response coordination mechanisms (DRR & Humanitarian response platforms) effectively functioning

EWS pillar: Warning dissemination and communication / Response capacity / MHEWS Governance, Policy and Institutional Framework

Key action(s): Disaster preparedness and response plans are co-developed with stakeholders, including women and people with disability representatives and rights advocates, at the district and communal level, and integrate local and indigenous knowledge, along with last mile connectivity

Activity description: Challenges in horizontal (intersectoral) and vertical (national and sub-national) coordination mechanisms between sectors and disaster (risk) management institutions and stakeholders in both Cambodia and Lao PDR have been reported by stakeholders. Through this activity it is envisaged to strengthen (or establish new, as appropriate) coordination mechanisms in line with the new DRR strategies and governance mechanisms setting up/strengthening of multi-stakeholder DRR platforms that integrate roles, responsibilities and actions on EW-EA.

Deliverable(s): Functional multi-stakeholder disaster risk reduction platform established/supported

Output indicator 1.1.3: Development of National Strategic Plans (for NMHSs) and Frameworks for Weather, Water and Climate Services (NS-FWCS)

EWS Pillar: Monitoring and warning / MHEWS Governance, Policy and Institutional Framework

Key action(s): Create a modernisation and/or strategic plan including capacity needs assessment, cost-effective operation and maintenance strategy and plan, human resources development plan and business model/plan

Activity description: The NMHS led National Strategic Plan will provide its institutional vision along with an operation and maintenance plan, business model/plan, a human resource plan, a capacity needs assessment and a complementary costed action plan. The Framework for Weather, Water and Climate Services will also be led by the NMHSs and will propose a governance structure for weather, water and climate service users and producers, to coordinate at the national level and co-design and codevelop services.

Deliverable(s): 2 newly drafted or updated National Strategic Plans and Frameworks for Weather, Water and Climate Services

Output indicator 1.1.4: User Interface Platforms (UIPs) established

EWS pillar: Monitoring and warning / MHEWS Governance, Policy and Institutional Framework

Key action(s): Create a modernisation and/or strategic plan including capacity needs assessment, cost-effective operation and maintenance strategy and plan, human resources development plan and business model/plan

Activity description: The UIP will provide a structured means for users, researchers and climate service providers to interact at the global, regional and national levels to ensure that user needs for weather, water and climate services are addressed.

Deliverable(s): 4 UIPs held

Output indicator 1.1.5 & 1.1.6: Support the countries with the development of needs assessments and related investment plans and bidding documents with focus on weather, water and climate services which leverage upon completed and/or ongoing projects/initiatives in the region

EWS Pillar: Monitoring and warning

Key action(s): Support the modernisation of the hydrometeorological system, including its operation and maintenance

Activity description: These assessments will build on support being provided by the World Bank financed projects both in Lao and in Cambodia. The needs assessment will undertake a stock take on the overall hydromet system that incorporates the support provided through the ongoing World Bank investments (focused on specific provinces), and identify existing and future requirements to fully modernise, operate and maintain their nation-wide observation network and tools to achieve end-to-end modernization. The needs will be identified based on user requirements (including NMHS) and will consequentially attempt to leverage further funding. Issues such as improving data acquisition and transmission, potential expansion of the observation network to cover the whole country, data distribution and delivery to end users, enhanced end users to the warning information as well as preparation of climate databases and services are not likely to be covered under the ongoing investments. These are items likely to be identified as needs in the context of the overall hydromet system. Operation and maintenance &M plans will also be developed to ensure sustainability of investments.

Deliverable(s): 2 investment plans and bidding documents developed

Output indicator 1.1.7: Improve coordination between the stakeholders to address the challenges in integrated water resources management

EWS Pillar: Monitoring and warning / MHEWS Governance, Policy and Institutional Framework

Key action(s): Improve coordination between NMHSs and dam operators & Develop robust SOPs covering the roles and responsibilities in dissemination of timely early warnings (floods and other hazard emergency response operations)

Activity description: A strategy for enhancing integrated regional water resource management (WRM) is required, to address gaps in coordination of NMHSs and relevant stakeholders including dam operators at the sub-regional level.

Deliverable(s): 1 WRM strategy developed/updated

Output indicator 1.1.8, 1.1.9 & 1.1.10: Improve coordination and planning for drought monitoring and forecasting

EWS pillar: Communication and dissemination / Response capacity (early action & disaster responsive social protection)

Key action(s): Capacity-building on hydrological modelling, drought monitoring and forecasting, NWP and climate forecasting & Develop robust SOPs covering the roles and responsibilities in dissemination of timely early warnings (floods, droughts and other hazard emergency response operations)

Activity description: Recent assessments conducted in both countries indicated that drought monitoring and forecasting was an area that required further strengthening in terms of improving the capacities at both local and

<p>national levels and at the same time ensuring better coordination among the key stakeholders. This activity tries to address the gaps through the development of strategies for drought management, aligned with Mekong River commission basin-wide strategies with clearly defined roles and responsibilities, establishment of a coordination mechanism at sub-regional level for better exchange of information and setting up of dedicated national team(s) for drought monitoring and forecasting.</p> <p>Deliverable(s): 1 drought management strategy developed/updated, 1 coordination mechanism established/supported with detailed roles and responsibilities of each stakeholder defined at sub-regional level & 2 national level teams established</p>
<p>Outcome 2: Enhanced capacity of NMHSs to provide forecasts and warnings</p>
<p>Output 2.1: Increased access and use of global/regional/national data products, tools and services</p>
<p>Output indicator 2.1.1: Improve discovery, access and use of hydromet data and products at national and transboundary levels through the implementation of the WMO Hydrological Observing System (WHOS) in participating countries</p> <p>EWS pillar: Monitoring and warning</p> <p>Key action(s): Develop systems/platforms to integrate all hydrometeorological observation data</p> <p>Activity description: Aims to address data sharing issues and encourage key institutions to adopt data sharing protocols/agreements. This is particularly desirable between Cambodia and Lao PDR given the transboundary nature of hazards.</p> <p>Deliverable(s): WHOS implemented for 2 NMHSs</p>
<p>Output indicator 2.1.2, 2.1.3 & 2.1.4: Enhance the capacity of the NMHSs to issue forecasts and warnings for severe weather and flash floods building upon the outcomes already achieved in the region</p> <p>EWS pillar: Monitoring and warning</p> <p>Key action(s): Capacity-building on hydrological modelling, drought monitoring and forecasting, NWP and climate forecasting, Support the operation and maintenance of the hydrometeorological system</p> <p>Activity description: Focuses on providing technical support and capacity building on existing forecasting tools and systems on severe weather and flash floods (FFGS and SWFP). These activities will be designed and implemented with the support of regional centers such as RFSC Ha Noi, RSMC Hong Kong and Regional Center for FFGS at Vietnam Meteorological Hydrological Administration (VMHA).</p> <p>Deliverable(s): ECMWF EcChart licences provided for 2 NMHSs, 5 trainings/workshops delivered for NMHSs & 2 joint SWFP RSMT and FFGS meetings held</p>
<p>Output indicator 2.1.5: Enhance the access and use of flood and drought monitoring tools to strengthen early warning capacity</p> <p>EWS pillar: Disaster risk knowledge / Monitoring and warning / Response capacity (scenarios for contingency planning, anticipatory action)</p> <p>Key action(s): Develop systems / platforms to integrate all hydrometeorological observation data, Support the modernization of the hydrometeorological system (including operation and maintenance) & Build technical capacity for accurate flood and drought risk mapping, monitoring and forecasting</p> <p>Activity description: An MHEWS platform (Real-time GIS system for hydro-meteorological forecasting and monitoring) will be used to integrate the available hydrometeorological observation data and incorporate existing</p>

and new forecasting products and tools. Furthermore, the system will aggregate data both in a temporal or spatial way and build scenarios of risk and damage.

Deliverable(s): 1 visualisation platform provided covering both countries

Output indicator 2.1.6: Incorporate additional functionalities to the Southeast Asia Flash Flood Guidance System (SeAFFGS) based on inputs from the countries

EWS pillar: Monitoring and warning

Key action(s): Capacity-building on hydrological modelling, drought monitoring and forecasting, NWP and climate forecasting

Activity description: Requests by countries on upgrades to the SeAFFGS system to incorporate new products, that meet their needs.

Deliverable(s): 1 enhancement and addition to SeAFFGS

Output indicator 2.1.7: Implement an integrated water resource assessment tool in one pilot site each in Cambodia and Lao PDR

EWS pillar: Monitoring and warning

Key action(s): Capacity-building on hydrological modelling, drought monitoring and forecasting, NWP and climate forecasting

Activity description: Ongoing efforts in the two countries with respect to integrated water resources management will be reviewed followed by interaction with key stakeholders to identify potential pilot sites in both countries for the implementation, testing and validation of an integrated water resources assessment tool.

Deliverable(s): Integrated water resource assessment tool piloted in both Cambodia and Lao PDR

Output indicator 2.1.8: Improved climate service delivery through operationalization of climate monitoring and forecasting, with support of ASEAN Climate Outlook Forum (ASEANCOF) and Singapore RCC

EWS pillar: Monitoring and warning.

Key action(s): Capacity-building on hydrological modelling, drought monitoring and forecasting, NWP and climate forecasting

Activity description: Technical and capacity building support to NMHSs will be provided on seasonal and sub-seasonal forecasting at the national level, with support from regional entities, including ASEAN and Singapore RCC.

Deliverable(s): Both countries are able to provide seasonal and sub-seasonal forecasts

Output indicator 2.1.9: Support the development and/or strengthening of Impact-Based Forecast and Warning Services (IBFWS).

EWS pillar: Monitoring and warning / communication and dissemination

Key action(s): Increase collaboration between NMHSs and NDMOs, other disaster management stakeholders for effective disaster preparedness

Activity description: In-country stakeholders training provided on IBFWS, along with a country led assessment of existing communication channels. Following assessment, requests will be made by the NMHSs for upgrades to existing or new communication channels to be provided.

Deliverable(s): IBFWS strengthened through 4 in-country trainings and 2 communication channels utilised

Output indicator 2.1.10: Develop new and/ or review and update climate data management and monitoring system for NMHSs' and other relevant agencies

EWS pillar: Monitoring and warning

Key action(s): Support the operation and maintenance of the hydrometeorological system

Activity description: At the request of the NMHSs, existing climate data management and monitoring systems will be reviewed. Following reviews, updates will be provided along with complementary training.

Deliverable(s): 1 review and 1 training per country

Output 2.2: Risk information to guide early warning systems developed and accessible

Output indicator 2.2.1: Review, develop new and/or update existing flood and drought risk maps and dynamic risk analytics capacities

EWS pillar: Disaster risk knowledge

Key action(s): Ensure exposure (including age, gender and disability disaggregated demographic data) and hazard maps (dynamic and multi-hazard, when possible) are up to date, that identify the geographical areas / people that could be affected & build technical capacity for accurate flood and drought risk mapping, monitoring and forecasting

Activity description: Technical assistance and capacity-building for relevant stakeholders on flood and drought risk mapping (to ensure future sustainability), resulting in developing/updating vulnerabilities and exposure maps.

Deliverable(s): Existing flood and drought risk maps are reviewed and updated

Output indicator 2.2.2: Vulnerability index and profiling capacities for floods and droughts enhanced to inform risk assessment and early action. Application of impact-based forecasting and establishment of triggers for early action and forecast-based financing (linked to the SEADRIF initiative and using information collected by the tool to feed into vulnerability assessments)

EWS pillar: Disaster risk knowledge / warning and monitoring (tailored communication and dissemination systems to specific group's needs) / response capacity (early action- forecast-based financing, inclusive and gender-sensitive preparedness measures)

Key action(s): Integrate and update sex, age, gender and disability disaggregated disaster loss events and risk information management databases, to effectively store, analyse and manage flood, droughts and other hazard impact data

Activity description: Development of vulnerability index for floods and droughts, its integration into risk analysis and scenario building/decision support platforms and documentation of methodology based on consensus of the partners.

Deliverable(s): Both countries are supported through analysis on vulnerability to hazards such as floods and drought and triggers and indicators for early action are proposed

Output indicator 2.2.3, 2.2.4 & 2.2.5: Enhance capacities for post-disaster impact assessment and disaster loss data management, reporting and sharing to enable improved risk and vulnerability assessment and application for preparedness, early action and impact-based forecasting (IBF)

EWS pillar: Disaster risk knowledge

Key action(s): loss data analysis capacity development for improved understanding of vulnerabilities of key economic sectors, assets, social groups and systems at national and local levels / establishment of standard post-

disaster assessment data methods including field data collection in disaggregated manner (sex, age, disability, geographic, hazard and income level as applicable), loss estimation (direct- damage quantification and indirect – change on flows or losses) and data management and sharing of data

Activity description: Improved quality of disaster loss data (including sex, age, disability, income group, hazard and geographic disaggregation), linking of disaster loss databases with extreme events catalogues to develop impact matrices for impact-based forecasting and strengthened coordination and capacities of all contributors for reporting on Sendai Framework Monitoring, including Target G custom indicators on EWS effectiveness.

Deliverable(s): Disaster loss and impact data quality and improved to enhance its applicability. Disaster loss databases linked with extreme events catalogues to inform impact and vulnerability assessments to develop impact matrices for impact-based forecasting, strengthened coordination mechanisms and capacities of all contributors for Sendai Framework monitoring

Outcome 3: NMHS's Information and communication technology and capacities strengthened

Output 3.1: IT Capacity to support with the activities of the NMHSs improved

Output indicator 3.1.1, 3.1.2, 3.1.3 & 3.1.4: Number of improvements/upgrades to IT systems including technical and human capacity of the NMHSs

EWS pillar: Monitoring and warning / communication and dissemination

Key action(s): Create a Modernization and/or Strategic Plan including capacity needs assessment, cost-effective operation and maintenance strategy/plan, human resources development plan and business model/plan / support the modernisation of the hydrometeorological system (including operation and maintenance) / address gaps in timelines and last mile connectivity in warning dissemination from warning issuers to end-user communities

Activity description: Support will be provided to DOM, DMH and DHRW to review and upgrade current IT systems and technical capacity. For example, in DMH there is currently no dedicated IT specialist, therefore, following the review a roadmap will be developed with suggestions for improvements and human resource requirements. Additionally, upgrades will be made to web-based platforms to visualise forecasting and information products from NMHSs.

Deliverable(s): 2 detailed assessment reports outlining IT requirements for NMHSs produced, 2 roadmaps which target IT capacity development which also covers sustainability aspects developed, 2 new products showing on NMHSs website & 1 training on CAP for both Cambodia and Lao PDR provided

Outcome 4: Enhanced preparedness and response capability to act upon warning and risk information to minimize impact of disasters on lives, livelihoods and socio-economic systems

Output 4.1: Preparedness and response plans with operational procedures that outline early warning dissemination processes strengthened and accessible

Output indicator 4.1.1, 4.1.2 & 4.1.3: Enhanced understanding of existing hydromet warnings at the national level, through increased collaboration between NMHSs and DRM authorities to harmonise multi-risk information and warnings

EWS pillar: Communication and dissemination / response capacity.

Key action(s): Increase collaboration between NMHSs and NDMOs, other disaster management stakeholders for more effective, inclusive and accessible disaster preparedness / disaster preparedness strategies, contingency

plans, guidelines co-developed with stakeholders, including persons with disabilities, women and girls at the district and communal level

Activity description: Carry out analysis of existing hydromet warnings and severe events and conduct trainings and workshops between NMHSs and DRM authorities to harmonise multi-risk information and warnings. Conduct table-top exercises and evacuation drills to enhance preparedness and response capability of the stakeholders at all level. Develop SOPs explaining clear roles and responsibilities of NMHS and NDMO before, during and after early warning dissemination. This will support with the translation of forecasts into DRR actions and promote participation of NDMOs and provincial level DRM entities in regional and national climate outlook forums.

Deliverable(s): 1 analysis of both Cambodia and Lao PDR conducted and report developed, 2 workshops conducted & 2 trainings provided

Output indicator 4.1.4: Number of co-developed preparedness and response plans (sub-national level) detailing roles, responsibilities and operational procedures for warning dissemination, early action and response activation

EWS pillar: Response capacity

Key action(s): Disaster preparedness and response plans are co-developed with stakeholders, including persons with disabilities, women and girls at the district and communal level, and integrate local and indigenous knowledge, along with last mile connectivity

Activity description: Capacity building activities that strengthen support from the national level to the provincial level on DRR planning and implementation, preparedness planning, provision of support to at least 2 provinces and/or districts.

Deliverable(s): Strengthened capacities of national entities to support sub-national level planning and capacity development on end-to-end EWS and EA, & at least 2 provinces and/or districts supported

Output indicator 4.1.5 & 4.1.6: Strengthen linkages of early action with shock/disaster-responsive social protection p roadmaps rollout in line with ASEAN disaster responsive social-protection guidelines

EWS pillar: Response capacity

Key action(s): Scalability frameworks for floods and droughts incorporated on programmatic mechanism for vertical and horizontal expansion of social protection coverage in anticipation or response to shocks / early action protocols and trigger systems developed, and financing mechanism identified for selected hazards

Activity description: Design and develop early action protocols and triggers for identification of financing mechanisms for selected hazards. Identification/ review of scalability frameworks for flood and drought events proposed in line with national roadmap for shock-responsive social protection based on impact analysis from previous events on well-being, livelihoods, health and coping mechanisms. This will be based on the review of past experiences, best practices and lessons learned for both countries as well as from other countries in the region and in line with the ASEAN adopted guidelines for shock-responsive social protection and ongoing developments in Cambodia regarding social protection floors responsive to multi-hazard shocks.

Deliverable(s): Enhanced capacities for Early action and rollout ASEAN disaster responsive social-protection guidelines & scalability frameworks incorporated on programmatic mechanism for vertical and horizontal expansion of social protection coverage in anticipation or response to shocks

Output 4.2: Mechanisms considering local and indigenous knowledge established to ensure warning communication and dissemination systems reach local communities, including seasonal populations and those in remote locations

Output indicator 4.2.1, 4.2.2, 4.2.3 & 4.2.4: In collaboration with NMHSs, DRM authorities at national and local level, NGOs and community-based organizations, implement Community-Based Flood Management (CBFM) practices and pilot test IBFWS at community level using the Associated Programme on Flood Management (APFM) approach

EWS pillar: Warning dissemination / response capacity

Key action(s): Address gaps in timeliness and last mile connectivity in warning dissemination from warning issuers to end-user communities, ensure early warnings consider the different risks and needs of subpopulations, including differential vulnerabilities (urban and rural, women and men, older people and youth, people with disabilities, etc.) and support flood impact-based warnings to support decision making processes and preparedness at community level

Activity description: CBFM approaches will be implemented in the selected pilot communities of Cambodia and Lao PDR enhancing their self-help capabilities to the Hydro-Meteorological events including development of early warning dissemination channels and improve end users' response. The objective is to develop capacities and increase resilience of communities in selected vulnerable areas where flooding poses a prominent risk. The self-help capacities of communities will improve the effectiveness of preparedness and response measures implemented through the National forecasts and warning services.

Deliverable(s): 4 community simulation/drills conducted, 4 communities receive preparedness equipment, 4 community flood management committee established with roles and responsibilities & 4 community-based flood management plans established

Output indicator 4.2.5: Assessment of risk communication, nature hazard precursor signs, local and indigenous knowledge integration and last-mile connectivity of multi-hazard EWSs (MHEWSs) in the region to support national/local EWS hazard monitoring, communication strategies and preparedness plans

EWS pillar: Warning dissemination / response capacity (public awareness and education)

Key action(s): Risk communication and disaster preparedness and response plans are co-developed with stakeholders at the district and communal level, and integrate local and indigenous knowledge, along with last mile connectivity and ensure early warnings consider the different risks and needs of subpopulations, including differential vulnerabilities (urban and rural, women and men, older people and youth, people with disabilities, etc.)

Activity description: The existing methodologies for assessing the effectiveness of preparedness plans and response systems, including EWS related practices will be reviewed. The assessment will also include a study on natural warning signs and traditional and local knowledge on hazard detection, mitigation and adaptation followed by a pilot survey to support people-centric warning dissemination systems and last mile connectivity.

Deliverable(s): Warning dissemination systems and risk communications approaches are people-centered to ensure inclusiveness, last mile connectivity and to enable action

Output indicator 4.2.6: Support enhancement of warning dissemination and users' feedback mechanisms to support continuous learning and improvement

EWS pillar: Warning dissemination / response capacity

Key action(s): Further develop feedback mechanisms to measure the effectiveness and tailored early warning messaging and risk communication enhancement

<p>Activity description: Improve of users' feedback mechanism through review of the current effectiveness of warning communications & assessment of response conditioners' factors (risk perception, trust, local knowledge, coping and self-response capacities) and user satisfaction</p> <p>Deliverable(s): Users' feedback mechanisms enhanced to improve effectiveness of warning and support continuous learning, improvement and accountability. Monitoring and evaluation tools for EWS adopted</p>		
<p>Outcome 5: Improved integration of gender and vulnerable groups across the EW-EA value chain</p>		
<p>Output 5.1: Gender-sensitive and vulnerable people inclusive (incl. those with disabilities, children, migrants, marginalized minorities, etc.) guidance and capacity building programmes provided</p>		
<p>Output indicator 5.1.1: Government EWS actors and stakeholders' workshops on mainstreaming gender and inclusivity aspects in end-to-end and people centered EWS for floods, droughts and other hazards</p> <p>EWS pillar: Warning dissemination / response capacity / MHEWS governance, policy and institutional framework</p> <p>Activity description: based on a gender and disability analysis, this activity will see the development and provision of gender-responsive and vulnerable people inclusive (including those with disabilities, children, elder, etc.) trainings as part of respective, capacity development programmes covering gender-sensitive impact-based forecasting and warning services, gender and disability sensitive risk communication and inclusive early action, contingency and response plans.</p> <p>Deliverable(s): Warning messages, risk communication strategies and response plans are inclusive of marginalized groups and gender and disability responsive</p>		
<p>Output indicator 5.1.2: Guidance document on mainstreaming gender and disability in MHEWS that can be used throughout the project to ensure gender and disability mainstreaming developed, and proposed for gender-transformative EW-EA national initiatives</p> <p>EWS pillar: Disaster risk knowledge / monitoring and warning / warning dissemination / response capacity / MHEWS governance, policy and institutional framework</p> <p>Key action(s): Ensure early warnings and early action protocols consider the different risks and needs of population groups, including differential vulnerabilities (urban and rural, women and men, older people and youth, people with disabilities, etc.), local context and risk mitigation knowledge and coping capacities</p> <p>Activity description: A national level guidance document on mainstreaming gender and vulnerable groups in EWS will be developed to guide the inclusiveness of gender and vulnerable groups. This guidance document will be used to ensure inclusiveness of gender and marginalized and most at-risks group throughout the project. The document will focus on multiple hazards such as floods, drought etc.</p> <p>Deliverable(s): 1 guidance document for government and their EWS partners developed and tested</p>		
	b. Work plan	Refer to Annex 1 and 2 for budget and logframe, respectively
Organization and operating procedures	a. Institutional framework	<p>The project will be jointly implemented by WMO, WB and UNDRR supporting the NMHSs and NDMOs of Cambodia and Lao PDR, respectively, in collaboration with other relevant stakeholders at the local, national and regional level. A project governance mechanism will be set up to ensure delivery on time, budget and with the expected quality results.</p> <p>Hence, the partners are committed to initiating a Project Steering Committee (PSC) that will be led by national stakeholders with</p>

		<p>support from CREWS implementing partners and relevant regional stakeholders. The PSC will ensure quality of governance, and the effective delivery of project activities on time, on budget and within the expected quality results. The PSC will play an oversight role including:</p> <ul style="list-style-type: none"> a) definition of roles, responsibilities and contributions of project stakeholders; b) review of implementation progress; c) management of project risks; d) guidance and recommendations including for developing synergies and leveraging opportunities with other initiatives in the countries and region; and e) alignment with the existing coordination bodies of the SWFP and FFGS. <p>For continuity with ongoing activities in both Cambodia and Lao PDR, the proposed PSC will attempt to build upon the existing Steering Committee which was created under the auspices of the project funded by Environment and Climate Change Canada (ECCC). This will likely ensure that the same set of national stakeholders/institutions such as the relevant national agencies for example the NMHSs' and NDMOs (with support from key regional actors) are engaged and guide the overall project implementation process.</p> <p>The PSC will provide oversight and direction on the project activities. The main functions would include ensuring alignment with relevant frameworks, strategies and priorities in the region along with assessing the project progress. The PSC will also be used as a mechanism to engage with key regional stakeholders such as ASEAN, ESCAP/Typhoon Committee, Mekong River Commission (MRC), among others, to enhance collaboration at the regional level and to promote sustainability of the activities planned within this project. The proposed PSC will meet once a year and will consist of actors who play a key role in the project development and execution. Furthermore, the PSC will act as a channel to keep the relevant ministries informed of the developments and achievements made within the project. A draft of the detailed Terms of Reference for the PSC is provided in Annex 3.</p>
	<p>b. Monitoring and evaluation system</p>	<p>As part of the project kickoff process, a Monitoring and Evaluation plan is expected to be developed by an expert who will work with the partners to set measurable beneficiary indicators and deliver a framework upon which the project performance can be</p>

		<p>predicted, measured and improved. the project logical framework will be used to monitor progress and achievements against the indicators for each of the outputs.</p> <p>Formal project reviews will be carried out under the guidance and supervision of the PSC on an annual basis and will include review of outputs, risks and progress achieved. These annual reviews will be in accordance with CREWS Monitoring and Evaluation System and will also comply with the systems set up by WMO, WB and UNDRR. To track the impacts of the project, beneficiaries including vulnerable groups (people with disabilities, women, elderly and minority groups) will be included in the feedback process. In addition to the annual review, WMO, WB and UNDRR will jointly conduct an internal half-yearly evaluation of the project to review the progress, highlight the risks and take corrective actions, as required. The outcomes of this half-yearly evaluation will be recorded as official reports.</p> <p>An external evaluation will be undertaken mid-way through, and at the end of the project to examine the projects performance and provide guidance as necessary.</p>
<p>Project viability and sustainability</p>	<p>a. Main identified risks</p>	<p><u>Political/Institutional Risks:</u></p> <p>Commitment from participating countries (including national government agencies and targeted communities) for the project (medium): The complex structure of the various departments involved in the project along with the potential administrative complexities may impede the realization of the project activities. Partners will establish and maintain its strong communication lines with the countries and the different stakeholders through its regional and national networks/offices. This will be realised through the nomination of focal points, who will create a systematic communication channel with the stakeholders to ensure that they are informed of needs, developments and progress. Additionally, through the support of the PSC, institutional and operational challenges may be addressed by establishing a high-level framework for cooperation among the participating countries and agencies.</p> <p>Human resources / capacity risks (medium): The capacity of the NMHSs and NDMOs and sub-national DRM authorities to cope with the project activities on top of their regular activities is a risk that can impact the project outputs. In addition, the ongoing pandemic may further exacerbate this risk. Cambodia for instance, does not have adequate human resources in DOM, whereas, Lao PDR has almost twice the staff in DMH. Some of the training requirements of the staff can be supported through the project. However, the issue of inadequate staff may not be fully</p>

		<p>addressed through the project, though efforts will be made to provide guidance to the Institutions on a long-term hiring strategy , Through close collaboration, the partners will provide support and training to the NMHSs and NDMOs and sub-national DRMs authorities to manage any extra demand brought upon by the project.</p> <p><u>Environmental risks (medium):</u></p> <p>Natural hazards such as severe weather, floods, droughts and landslides have the potential to cause delays in project implementation. To mitigate this risk, flexible adjustment of the sequence of activities as well as regular project reviews are required. As the project mainly provides technical assistance no large civil works are anticipated and hence, will not generate any negative environmental impact.</p> <p><u>Financial risks (low):</u></p> <p>Financial sustainability of investments following completion of the project: This risk will be mitigated through increased ownership and synergy with existing or planned investments in the sector.</p> <p><u>Project implementation risks (low/medium):</u></p> <p>The prevalent situation on account of the Covid-19 pandemic may compromise the timelines and project inception and implementation, especially where travel (local and international) is required. Some of the activities may be conducted virtually, however, activities that are implemented at site may still be impacted. An Inception workshop will be held following the planning process at the very start of the project. The objective of this kick off meeting is to ensure understanding of the project and respective responsibilities and roles of stakeholders involved, adjust activities and finalize the implementation plan based on new developments. To further tackle project implementation risks, a risk management and contingency plan will also be put in place at the start of the project.</p>
	b. Critical assumptions	<p>The success of the project hinges on the following critical assumptions:</p> <ul style="list-style-type: none"> • Strong political commitment from governments of the participating countries;

		<ul style="list-style-type: none"> • Cooperation among/between and support from the WMO network of NMHSs, Regional Centres, and partners; • An increase in public awareness to hydro-meteorological hazards and a desire to build resilience; • Agreement among partners and stakeholders on their complementary roles within the four components of people-centred EWSs (Disaster risk knowledge; Detection, monitoring, analysis and forecasting of the hazards and possible consequences; Warning dissemination and communication; Preparedness and response capabilities) (and the early warning – early action, which focuses on reducing risks, especially vulnerabilities and minimizing disaster impacts); • Agreement among the stakeholders on the objectives along with a clear understanding of the initiatives implemented.
	<p>c. Judgment on the project sustainability</p>	<p>The project activities have been co-designed based on inputs from multiple entities within both target countries and relevant actors in the region who are involved in various initiatives that target early warning services, early action and preparedness. The sustainability of the outcomes achieved through this project, will be ensured through:</p> <p>(i) Transferring and ensuring country ownership during the project development and execution through active engagement of the key stakeholders.</p> <p>(ii) The project aims to provide guidance to and improve visibility of the project beneficiaries (national institutions), to promote the relevant initiatives and support with mobilization of additional resources (financial, human, technological) from National Governments and other donors to sustain the benefits of the project outcomes.</p> <p>(iii) The projects PSC and WMO Regional Associations will support with putting in place the appropriate mechanisms for sustaining the progress made in the project. In addition, a sustainability plan driven by the PSC will be developed over the lifetime of the project. This plan will not only focus on sustaining the tools and the hardware but also address ways of sustaining knowledge and capacity within the region.</p> <p>(iv) With support of the regional initiatives/committees such as ASEAN, ASEAN Disaster Management Committee, ESCAP/WMO Typhoon Committee, ASEANCOF, Monsoon Forum and the</p>

		<p>guidance from regional centres such as CCRS, RFSC Ha Noi and ASMC enhance capacities in the region.</p> <p>(v) Leverage the ASEAN-UN JSPADM, Asia Pacific Climate week, UNDRR Asia Pacific sciences and technology advisory group and the Asia Pacific Ministerial Conference on Disaster Risk Reduction (APMCDRR) and Asia Pacific Disaster Risk Reduction partnership (AP DRR) to ensure synergies with other resilience, preparedness and risk financing initiatives in early action, forecast based financing and risk-informed sock responsive social protection, to promote relevant learning from this project at ASEAN level and to mobilize additional resources to replicate good practices and to sustain the benefits of the project outcomes.</p>
	<p>Outputs and indicators</p>	<p>Refer to Annex 1 for Outputs and Indicators and Appendix 1 Logical Framework for a more detailed breakdown of baselines, milestones, targets, indicators and means of verification against each of the outputs.</p>

ANNEX 1: Budget

Output/Indicator	Estimated Total Cost (USD)	Cambodia (USD)	Lao PDR (USD)	Regional (USD)
Outcome 1: Strengthened governance mechanism (policies, strategic frameworks, institutional mechanism and capacities) and enabling environment created for national and regional stakeholders.				
<i>Output 1.1: National Meteorological and Hydrological Services' (NMHSs) service delivery improved, including the development of long-term service delivery strategies and development/action plans</i>				
New and/or updated legislation targeting weather, water and climate services developed	80,000	40,000	40,000	
DRR/ Preparedness and response coordination mechanisms (DRR & Humanitarian response platforms) effectively functioning (# of DRR forum conducted – Cambodia; # of national DRR platform meetings conducted – Lao PDR)	77,970	38,985	38,985	
National Strategic Plans (NSP) for NMHSs and Frameworks for Weather, Water and Climate Services (NS-FWCS) along with complementary Action Plans updated or established	140,000	70,000	70,000	
User Interface Platforms (structured forum for weather, water and climate service information users, researchers and providers to interact) set up	150,000	75,000	75,000	
Needs assessments for strengthening national network architecture conducted	100,000	50,000	50,000	
Investment plans and bidding documents developed	100,000	50,000	50,000	
Strategy for enhancing integrated water resource management (WRM) developed and/or updated, inclusive of dam operators and relevant stakeholders at sub-regional level	200,000	50,000	50,000	100,000
Drought plans/strategies developed and/or reviewed and updated	80,000	30,000	30,000	20,000

Coordination mechanism established/supported with detailed roles and responsibilities of each stakeholder defined at sub-regional level	100,000	30,000	30,000	40,000
Dedicated national teams established for drought monitoring and forecasting	100,000	50,000	50,000	
	1,127,970	483,985	483,985	160,000
	1,127,970	483,985	483,985	160,000
Outcome 2: Enhanced capacity of NMHSs to provide forecasts and warnings				
<i>Output 2.1: Increased access and use of regional/national data products, tools and services</i>				
Enabling improved data sharing among NMHSs	80,000	30,000	30,000	20,000
ECMWF EcChart licences renewed, and relevant training provided to the NMHSs	12,000	6,000	6,000	
Regional meetings and in-country trainings on Nowcasting, SWFP and SeAFFGS tools and products provided to NMHSs, leveraging support from regional centres	260,000	75,000	75,000	110,000
SWFP management meetings linked with FFGS that will provide support to Cambodia and Lao PDR (aspects covering capacity building, availability of products, specific country needs etc.)	50,000			50,000
Visualisation platform for flood and drought monitoring and warning established (incorporating existing information, products and tools)	260,000	80,000	50,000	130,000
New functionalities integrated into the Southeast Asia Flash Flood Guidance System along with the requisite operational training	200,000			200,000
Implement an integrated water resource assessment tool in two pilot sites in both Cambodia and Lao PDR	100,000	50,000	50,000	

Seasonal and sub-seasonal forecasts provided at the national level, translated into DRR actions	250,000	100,000	100,000	50,000
Trainings/workshops on strengthening Impact-Based Forecast and Warning Services (IBFWS) in Cambodia and Lao PDR	150,000	100,000	50,000	
NMHS staff and staff from other relevant agencies given training and access to climate database management system	50,000	25,000	25,000	
	1,412,000	466,000	386,000	560,000
<i>Output 2.2: Risk information to guide early warning systems and climate and weather service developed and accessible</i>				
New/updated flood and drought risk tools/products	280,000	140,000	140,000	
Vulnerability index for floods and droughts developed	100,000			100,000
Standard post-disaster assessment data collection forms with relevant data disaggregation levels and loss estimation methodologies agreed and used	108,970			108,970
Number of disaster statistics reports produced and/or analytical research products conducted on sector-impact of disaster events to inform recovery, impact and vulnerability assessments	-			
Qualitative improvement of SFM reporting on both Cambodia and Lao PDR, including the use of new custom indicators for Sendai Target G on risk information and EWS and availability of disaggregated figures	-			
	488,970	140,000	140,000	208,970

	1,900,970	606,000	526,000	768,970
Outcome 3: NMHS's Information and communication technology and capacities strengthened				
<i>Output 3.1: IT Capacity to support with the activities of the NMHS' improved</i>				
Detailed assessment reports outlining IT requirements for NMHSs	120,000	60,000	60,000	
Roadmaps which target IT capacity development which also covers sustainability aspects developed	190,000	95,000	95,000	
Forecasting products are made available to the public through web-based platforms	110,000	55,000	55,000	
Training support provided to countries in using a Common Alerting Protocol (CAP)	30,000	15,000	15,000	
	450,000	225,000	225,000	-
	450,000	225,000	225,000	-
Outcome 4: Enhanced preparedness and response capability to act upon warning and risk information to minimize impact of disasters on lives, livelihoods and socio-economic systems				
<i>Output 4.1: Preparedness and response plans with operational procedures that outline early warning dissemination processes strengthened and accessible</i>				
Analysis of existing hydromet warnings and climatological analysis of severe events conducted	60,000	30,000	30,000	
Workshops between NMHSs and DRM authorities to harmonize multi-risk information and warnings	60,000	30,000	30,000	

Trainings between NMHSs and DRM authorities to harmonize multi-risk information and warnings conducted	120,000	60,000	60,000	
Preparedness and response plans (sub-national level) developed, integrating roles, responsibilities and detailing operational procedures for EW dissemination and response activation mechanisms, including Early action	48,970	24,485	24,485	
Early action protocols and trigger systems and financing mechanism enhanced for selected hazards (e.g. droughts and floods) Scalability frameworks for flood and drought events enhanced in line with national roadmaps & ASEAN guidance for disaster/shock-responsive social protection	90,000	30,000	30,000	30,000
	378,970	174,485	174,485	30,000
<i>Output 4.2: Mechanisms considering local and indigenous knowledge established to ensure warning communication and dissemination systems reach local communities, including seasonal populations and those in remote locations</i>				
Community simulations (emergency drills) in coordination with NMHS, DRM and provincial authorities (2 countries) conducted	260,000	130,000	130,000	
Flood preparedness equipment provided at community level	-			
Community flood management committee (CFMC) established and other representatives engaged in the process including the number of women, disabled, elderly, community elders	-			
Community-based flood management plan (CFMP) developed in joint consultation of communities, local municipality and DRM stakeholders	-			

Reviews on risk communication, warning dissemination and behaviour conditioning factors conducted for selected events and communities to distil recommendations for last-mile connectivity	45,000	22,500	22,500	
Warning dissemination systems include mechanisms for 2-way and interactive communications (users' clarification/ feedback, crowdsourcing of local information and verification on warning reception) Monitoring and evaluation tool co-designed and shared with the national/local stakeholders for user-responsive EWS chain, after-action review systems and feedback integration	90,000	45,000	45,000	
Communications material developed	45,000	15,000	15,000	15,000
	440,000	212,500	212,500	15,000
	818,970	386,985	386,985	45,000
Outcome 5: Improved integration of gender and vulnerable groups across the EW-EA value chain				
<i>Output 5.1: Gender-sensitive and vulnerable people inclusive (incl. those with disabilities, children, migrants, marginalized minorities, etc.) guidance and capacity building programmes provided</i>				
Risk communication plans, early action protocols and response plans developed that are gender-responsive and include recommendations on anticipatory actions and risk communication tailored to marginalized groups	109,000			109,000
Guidance document on mainstreaming gender and disability in MHEWS developed and tested for gender-transformative EW-EA developed	98,970			98,970
	207,970	-	-	207,970

	207,970	-	-	207,970
	4,505,880	1,701,970	1,621,970	1,181,940
Cross-cutting activities				
Programme Management	281,375			
Steering Committee Meetings, 4X	15,000			
Project Kick-off and End of Project Meeting	20,000			
Project Mid-term and Final Evaluation	80,400			
	396,775			
	4,902,655			
Project Support Cost (13%)	637,345			
Total	5,540,000			

ANNEX 2: Draft Terms of Reference - Project Steering Committee (under development) - Working Doc

Terms of Reference for the Project Steering Committee (PSC) for the Project “Reinforcing the capacities of hydro-meteorological services and enhancing early warning systems in Cambodia and Lao People’s Democratic Republic (PDR)”

Background

Cambodia and Lao PDR are highly vulnerable to the impacts of natural hazards. Hydrometeorological hazards, such as strong winds, floods, droughts, or storm surges and those triggered by these hazards (such as landslides), pose a direct threat to lives and impact livelihoods by damaging and destroying infrastructure, assets, and land. In recent years, a succession of tropical cyclones/typhoons, floods, and droughts has resulted in major loss of lives, livelihoods, and economic assets in both countries. Lao PDR experienced major typhoons in 2009 (Ketsana) and in 2011 (Haima), and in 2013 when floods caused damages of over US\$270 million²¹. In 2018, Lao PDR experienced its most devastating floods in a decade, with estimated damage and losses worth US\$371.5 million, or 2.1 percent of Lao PDR’s projected Gross Domestic Product (GDP) for 2018²². In Cambodia, Typhoon Ketsana in 2009 and floods in 2011 and 2014 caused damages and losses totalling over US\$1.1 billion. In Cambodia, the strongest El Niño episode of the past 50 years in 2015/2016, resulted in 2.5 million people being affected by droughts, water shortages, land degradation, livestock loss and reduced agricultural productivity.

1. Climate Risk and Early Warning Systems (CREWS) Initiative

Announced by the French Minister of Foreign Affairs in Sendai in March 2015, the Climate Risk and Early Warning Systems (CREWS) Initiative was officially launched at the COP21 in Paris as part of the Solutions Agenda. The Initiative aims to raise USD 100 million by 2020 to strengthen multi-hazards early warning systems (MHEWSs) in Least Developed Countries (LDCs) and Small Island Developing States (SIDS). CREWS implementing partners are the World Bank (WB), World Meteorological Organization (WMO) and United Nations Office for Disaster Risk Reduction (UNDRR), through a Special Program managed by the WB’s Global Facility for Disaster Reduction and Recovery (GFDRR). WMO provides Secretariat services, and WB serves as Trustee (see <http://crews-initiative.org/en> for more information).

The CREWS-financed project titled “**Reinforcing the capacities of hydro-meteorological services and enhancing early warning systems in Cambodia and Lao PDR (CREWS Cambodia and Lao PDR)**” project aims to strengthen and streamline regional and national systems and capacities related to weather forecasting, hydrological services, multi-hazard impact-based warnings and service delivery for enhanced decision-making. It is implemented jointly by all three implementing partners and in close collaboration with the Department of Meteorology (DOM), the Department of Hydrology and River Works (DHRW) and the National Committee for Disaster Management (NCDM) of Cambodia, the Department of Meteorology and Hydrology (DMH) and the National Disaster Prevention and Control Committee (NDPCC), Lao PDR. The project consists of five outcomes, namely:

1. Strengthened governance mechanism (policies, strategic frameworks, institutional mechanism and capacities) and enabling environment created for national and regional stakeholders

21 UN ESCAP, 2020. Ready for the Dry Years: Building resilience to drought in South-East Asia

22 Government of Lao PDR. 2018. Post Disaster Needs Assessment, 2018 floods

2. Enhanced capacity of NMHSs to provide forecasts and warnings
3. NMHS's Information and communication technology and capacities strengthened
4. Enhanced preparedness and response capability to act upon warning and risk information to minimize impact of disasters on lives, livelihoods and socio-economic systems
5. Improved integration of gender and vulnerable groups across the EW-EA value chain

2. Project Steering Committee (PSC) Members

The PSC will be led by the national institutions, including National Meteorological and Hydrological Services (NMHSs) and National Disaster Management Offices (NDMOs), and also be comprised of representatives of the implementing partners of the project, namely WB, WMO and UNDRR and representatives from RFSC Ha Noi for regional initiatives such as SeASWFP and SeAFFGS. Other national and regional bodies can be invited as observers and will be determined by the PSC members.

Further, the PSC members will be required to nominate a focal point from an organization who will oversee the mainstreaming of gender and disability across the project outcomes and is connected with DRM in Cambodia and Laos. This focal point will also provide recommendations on how the project activities can better meet the expectations and address the gaps with respect to the engagement and participation of women, children, people with disabilities, minorities etc.

3. PSC Terms of Reference

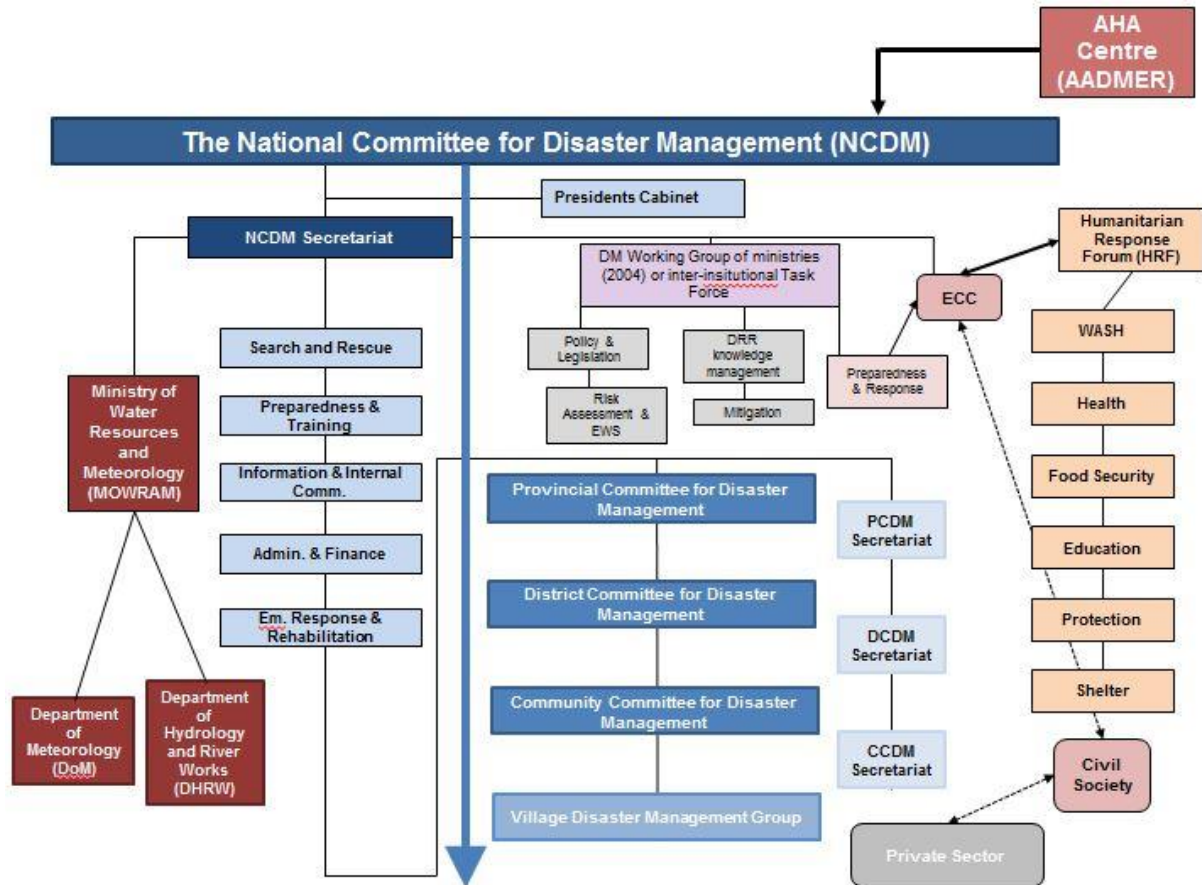
The PSC will provide oversight and direction on the project with the aim of strengthening the NMHSs and NDMOs in the two countries. Specifically, the PSC will consider options to overcome in-country and regional barriers to implementation; identify and recommend incentives to advance strong coherence, complementarity, collaboration and coordination within and between projects; and reflect on progress towards achieving key milestones, which includes reviewing good practice and lessons learned from concrete country examples. The PSC will also ensure strong alignment regional and national initiatives to ensure complementarity.

The PSC will perform the following functions:

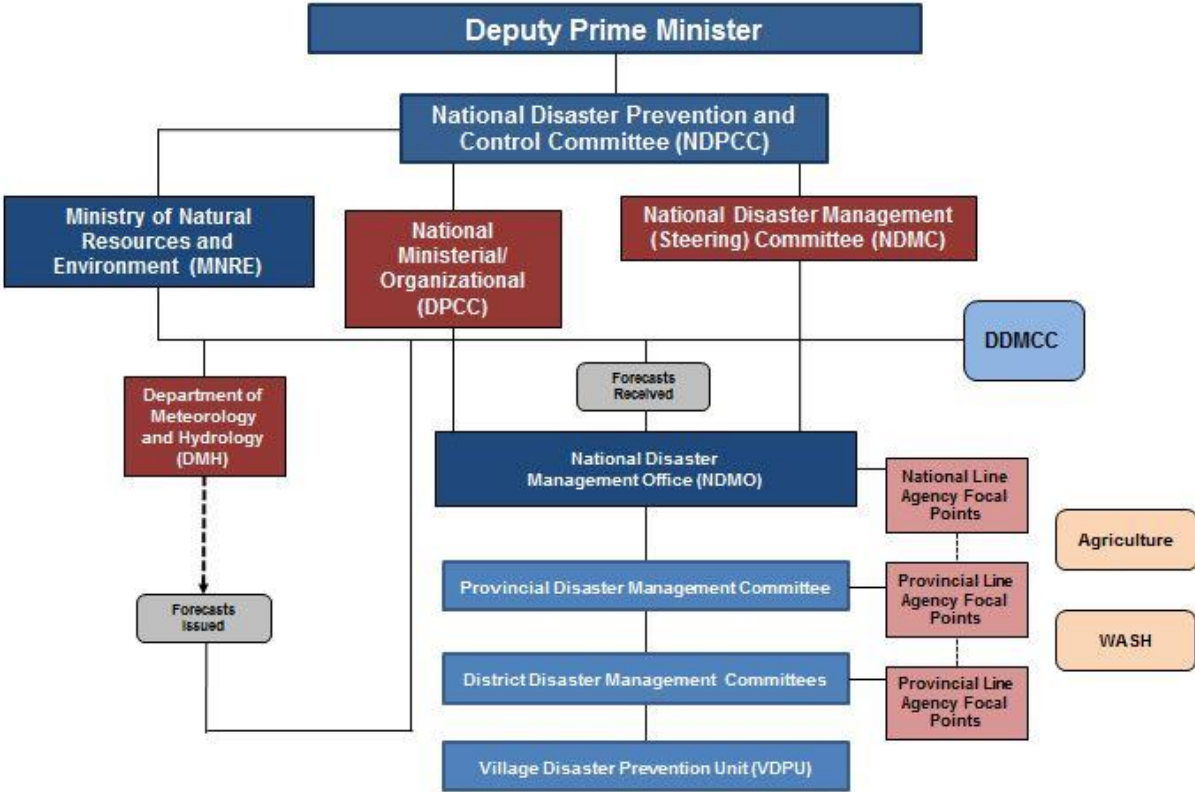
- a. Lead in anchoring the project to relevant regional and national institutions, and ensuring alignment with relevant frameworks, strategies and priorities, to ensure ownership and sustainability of investment;
- b. Ensure alignment with key national and regional strategies and priorities in SeA, in order to raise visibility of the projects, and maximize their benefits for the countries;
- c. Assist in resolving implementation issues, policy conflicts and priority settings
- d. Assess project progress and ensure that project delivery is in line with the agreed project timelines and budget
- e. Ensure coordination with other related programmes and projects implemented by other UN agencies and development partners
- f. Review, advise and endorse project's annual implementation workplan and budget
- g. Work with WMO and its partners to secure national and regional level leadership support for projects and initiatives aimed at addressing the needs and priorities.

4. Role of the PSC Members

ANNEX 3: DRM Institutional Structure - Cambodia



ANNEX 4: DRM Institutional Structure – Lao PDR



Annex 5: Stakeholders Consulted in the Project Development Process

	Cambodia	Lao PDR
National Consultations (National Agencies and Organisations)	Ministry of Water Resources and Meteorology (MOWRAM) <ul style="list-style-type: none"> • Department of Meteorology (DOM) • Department of Hydrology and River Works (DHRW) • Provincial Department of Water Resources and Meteorology • National Committee for Disaster Management • Provincial Committee for Disaster Management 	Ministry of Natural Resources and Environment (MONRE) <ul style="list-style-type: none"> • Department of Meteorology and Hydrology (DMH) • Department of Water Resources • Natural Resources and Environmental Statistic and Research Institute Ministry of Labour and Social Welfare (MoLSW) <ul style="list-style-type: none"> • National Disaster Management Office/National Disaster Management Committee • Department of Disaster Management and Climate Change • Provincial Disaster Prevention and Control Committee
National Consultations (UN Country Teams)	<ul style="list-style-type: none"> • Food and Agriculture Organisation • United National Development Programme • World Food Programme • UNICEF • UNEP • UN Resident Coordinators Office 	<ul style="list-style-type: none"> • Food and Agriculture Organisation • United Nations Development Programme • World Food Programme • UNEP • UN Resident Coordinators Office
Regional Consultations	<ul style="list-style-type: none"> • Regional Support Forecast Centre (RFSC), Ha Noi (SWFP & FFGS) • Mekong River Commission • People In Need (PIN) • ASEAN Hydroinformatics Data Centre (AHC) • Regional Integrated Multi-Hazard Early Warning System (RIMES) • Asian Disaster Reduction Center (ADRC) 	
Other	<ul style="list-style-type: none"> • Centro Internazionale in Monitoraggio Ambientale (CIMA) – Italy 	

Annex 6: Timeline Workplan

Project Components	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Outcome 1 Strengthened governance mechanism (policies, strategic frameworks, institutional mechanism and capacities) and enabling environment created for national and regional stakeholders																
<i>Output 1.1 National Meteorological and Hydrological Services' coordination with EWS stakeholders (users) improved through long-term strategies and development plans</i>																
1.1.1 Number of new and/or updated legislation targeting weather, water and climate services			X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.1.2 DRR/ Preparedness and response coordination mechanisms (DRR & Humanitarian response platforms) effectively functioning (# of DRR forum conducted – Cambodia; # of national DRR platform meetings conducted – Lao PDR)		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.1.3 Number of National Strategic Plans (NSP) for NMHSs and Frameworks for Weather, Water and Climate Services (NFWCS) along with complementary Action Plans updated or established			X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.1.4 User Interface Platforms established and carried out (structured forum for weather, water and climate service information users, researchers and providers to interact)				X			X				X					X
1.1.5 Needs assessments for strengthening national network architecture conducted			X	X	X	X										
1.1.6 Investment plans and bidding documents developed					X	X	X	X	X	X						

1.1.7 Strategy for enhancing integrated water resource management (WRM) developed and/or updated, inclusive of dam operators and relevant stakeholders at sub-regional level	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
1.1.8 Number of drought plans/strategies developed and/or reviewed and updated	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
1.1.9 Coordination mechanism for drought management established/supported with detailed roles and responsibilities of each stakeholder defined at sub-regional level									x	x	x	x	x	x	x	x
1.1.10 Dedicated national teams established for drought monitoring and forecasting									x	x	x	x	x	x	x	x
Outcome 2 Enhanced capacity of NMHSs to provide forecasts and warnings																
<i>Output 2.1 Increased access and use of global/regional/national data products, tools and services</i>																
2.1.1 Number of NMHSs with improved data sharing					x	x	x	x	x	x	x	x	x	x	x	x
2.1.2 Number of ECMWF EcChart licences and relevant training provided to NMHSs					x											
2.1.3 Number of regional meetings and in-country trainings on Nowcasting, SWFP and SeAFFGS tools and products provided to NMHSs, leveraging support from regional centres				x			x	x					x			x
2.1.4 SWFP management meetings linked with FFGS that will provide support to Cambodia and Lao PDR (aspects covering capacity building, availability of products, specific country needs etc.)						x							x			

2.1.5 Visualisation platform for flood and drought monitoring and warning established (incorporating existing information, products and tools)			x	x	x	x	x	x	x	x	x	x	x	x	x	x
2.1.6 New functionalities integrated into the Southeast Asia Flash Flood Guidance System along with the requisite operational training			x	x	x	x	x	x	x	x	x	x	x	x	x	x
2.1.7 Implement an integrated water resource assessment tool in two pilot sites in both Cambodia and Lao PDR			x	x	x	x	x	x	x	x	x	x	x	x	x	x
2.1.8 Seasonal and sub-seasonal forecasts provided at the national level, translated into DRR actions			x	x	x	x	x	x	x	x	x	x	x	x	x	x
2.1.9 Number of activities/trainings leading to strengthened Impact-Based Forecast and Warning Services (IBFWS) in Cambodia and Lao PDR			x	x	x	x	x	x	x	x	x	x	x	x	x	x
2.1.10 NMHS staff and staff from other relevant agencies given training and access to climate database management system					x	x					x	x				
<i>Output 2.2 Risk information to guide early warning systems developed and accessible</i>																
2.2.1 Number of new/updated flood and drought risk tools/products			x	x	x	x	x	x	x	x	x	x	x	x	x	x
2.2.2 Vulnerability index for floods and droughts developed to inform risk assessment and early action			x	x	x	x	x	x	x	x	x	x	x			

2.2.3 Standard post-disaster assessment data collection forms with relevant data disaggregation levels and loss estimation methodologies agreed and used																	
Number of disaster statistics reports produced and/or analytical research products conducted on sector-impact of disaster events to inform recovery, impact and vulnerability assessments			X	X	X	X	X	X	X	X	X						
Qualitative improvement of SFM reporting on both Cambodia and Lao PDR, including the use of new custom indicators for Sendai Target G on risk information and EWS and availability of disaggregated figures																	
Outcome 3 NMHS's Information and communication technology and capacity strengthened																	
<i>Output 3.1 IT Capacity to support with the activities of the NMHSs improved</i>																	
3.1.1 Number of detailed assessment reports outlining IT requirements for NMHSs					X	X											
3.1.2 Number of roadmaps developed which target IT capacity development which also covers sustainability aspects									X	X							
3.1.3 Number of forecasting products are made available to the public through web-based platforms											X	X	X	X			
3.1.4 Training provided to support countries in using a Common Alerting Protocol (CAP)							X	X									

Outcome 4 Enhanced preparedness and response capability to act upon warning and risk information to minimize impact of disasters on lives, livelihoods and socio-economic systems																
<i>Output 4.1 Preparedness and response plans with operational procedures that outline early warning dissemination processes strengthened and accessible</i>																
4.1.1 Analysis of existing hydromet warnings and climatological analysis of severe events conducted					X	X	X	X	X	X						
4.2.1 Number of workshops between NMHSs and DRM authorities to harmonize multi-risk information and warnings					X	X	X	X	X	X	X					
4.1.3 Number of trainings between NMHSs and DRM authorities to harmonize multi-risk information and warnings				X	X	X	X	X	X	X	X	X	X	X	X	X
4.1.4 Co-develop preparedness and response plans (sub-national level) integrating roles, responsibilities and detailing operational procedures for EW dissemination and response activation mechanisms, including Early action				X	X	X	X	X	X	X						
4.1.5 Early action protocols and trigger systems developed, and financing mechanism identified for selected hazards				X	X	X	X	X	X	X	X	X				
4.1.6 Scalability frameworks for flood and drought events proposed in line with national roadmap for shock-responsive social protection						X	X	X	X	X	X	X	X	X		
<i>Output 4.2 Mechanisms considering local and indigenous knowledge established to ensure warning communication and dissemination systems reach local communities, including seasonal populations and those in remote locations</i>																

4.2.1 Number of community simulations (emergency drills) in coordination with NMHS, DRM and provincial authorities (2 countries) conducted			X	X	X	X	X	X	X	X	X	X				
4.2.2 Flood preparedness equipment provided at community level			X	X	X	X	X	X								
4.2.3 Community flood management committee (CFMC) established and other representatives engaged in the process including the number of women, disabled, elderly, community elders					X	X	X	X	X	X	X	X	X	X	X	X
4.2.4 Community-based flood management plan (CFMP) developed in joint consultation of communities, local municipality and DRM stakeholders													X	X	X	X
4.2.5 Reviews on risk communication, warning dissemination and behaviour conditioning factors conducted for selected events and communities to distil recommendations for last-mile connectivity		X	X	X	X	X	X	X	X	X						
4.2.6 Warning dissemination systems include mechanisms for 2-way and interactive communications (users' clarification/ feedback, crowdsourcing of local information and verification on warning reception) Monitoring and evaluation tool co-designed and shared with the national/local stakeholders for user-					X	X	X	X	X	X	X	X	X	X		

responsive EWS chain, after-action review systems and feedback integration																
4.2.7 Number of communication materials developed					x	x	x	x	x	x	x	x	x	x	x	x
Outcome 5 Improved integration of gender and disability across the EW-EA value chain																
<i>Output 5.1 Gender-sensitive and vulnerable people inclusive (incl. those with disabilities, children, migrants, marginalized minorities, etc.) guidance and capacity building programmes provided</i>																
5.1.1 Number of risk communication plans, early action protocols and response plans that are gender-responsive and include recommendations on anticipatory actions and risk communication tailored to marginalized groups			x	x	x	x	x	x	x	x	x	x	x	x	x	x
5.1.2 Guidance document on mainstreaming gender and disability in MHEWS developed and tested for gender-transformative EW-EA		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Acronyms List

AADMER	Agreement on Disaster Management and Emergency Response
AAL	Average Annual Losses
ADB	Asian Development Bank
ADRC	Asian Disaster Reduction Center
AEZ	Agro-Ecological Zones
SeAFFGS	Southeast Asia Flash Flood Guidance System
AHC	ASEAN Hydroinformatics Data Centre
APFM	Associate Programme on Flood Management
APMCDRR	Asia Pacific Ministerial Conference on Disaster Risk Reduction
ARRCC2	Asia Regional Resilience to Climate Change 2
ASEAN	Association of Southeast Asian Nations
ASEANCOF	ASEAN Climate Outlook Forum
ASMC	ASEAN Specialised Meteorological Centre
SeASWFP	Southeast Asia Severe Weather Forecasting Programme
AWS	Automatic Weather Stations
CAP	Common Alert Protocol
CBFM	Community-based Flood Management
CCA	Climate Change Adaptation
CCDM	Commune Committees for Disaster Management
CCRS	Hong Kong Centre for Climate Research
CFMC	Community Flood Management Committee
CFMP	Community-based Flood Management Plan
CIAT	International Center for Tropical Agriculture
CIMA	Centro Internazionale in Monitoraggio Ambientale
CRC	Cambodian Red Cross
CSIS	Climate Services Information System
DRR	Disaster Risk Reduction
ECCC	Environment and Climate Change Canada
ECHO	European Union Directorate General for Humanitarian and Civil Protection
ECMWF	European Centre for Medium-Range Weather Forecasts
ENSO	El Niño–Southern Oscillation
EOC	Emergency Operation Center
ETF	Emergency Task Force
GDA	General Directorate of Agriculture
GDPPS	Global Data Processing and Forecasting System
GFCS	Global Framework for Climate Services
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic Information System
HKO	Hong Kong Observatory
Mekong-HYCOS	Mekong-Hydro Meteorological Cycle Observation System Project
IASC	Inter-Agency Standing Committee
IBC	Issue-based Coalition
JSPADM	ASEAN-UN Joint Strategic Plan of Action on Disaster Management
LMB	Lower Mekong Basin

LMC	Lower Mekong Countries
LRC	Laos Red Cross
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines
MoLSW	Ministry of Labour and Social Welfare
MONRE	Ministry of Natural Resources and Environment
MOWRAM	Ministry of Water Resources and Meteorology
MRC	Mekong River Commission
NAP	National Adaptation Plan
NCDM	National Committee on Disaster Management
NCSd	National Council for Sustainable Development
NDMC	National Disaster Management Steering Committee
NDMO	National Disaster Management Office
NDPCC	National Disaster Prevention and Control Committee
NEA	National Environment Agency
NEWC	National Early Warning Centre
NSEDP	National Socio-Economic Development Plan
NWP	Numerical Weather Prediction
OGC	Open Geospatial Consortium
PCDM	Provincial Committees for Disaster Management
PRISM	Platforms for Real-time Information Systems
PSC	Project Steering Committee
RCC	Regional Climate Centre
RCOF	Regional Climate Outlook Forum
RFSC	Regional Forecast Support Centre
RIMES	Regional Integrated Multi-Hazard Early Warning System for Africa and Asia
RRT	Rapid Response Teams
RSMC	Regional Specialized Meteorological Centre
RTC	Regional Training Centre
SAMIS	Strengthening Agro-climatic Monitoring and Information Systems
SAVA	Socio-Agricultural Vulnerability Analysis
SEADRIF	Southeast Asia Disaster Risk Insurance Facility
SOP	Standard Operating Procedure
SSOP	Synergized Standard Operating Procedures
SWFP	Severe Weather Forecasting Programme
UIP	User Interface Platform
USQ	University of Southern Queensland
UXO	Unexploded Ordnances
VDMG	Village Disaster Management Groups
WHOS	WMO Hydrological Observing System
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WRM	Water Resource Management