



KINGDOM OF CAMBODIA

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Ministry of Water Resources and Meteorology

CAMBODIA NATIONAL ACTION PLAN ON DROUGHT MANAGEMENT AND ADAPTATION 2025-2030

Phnom Penh, June 2025



This version of the Action Plan for Cambodia is released for the purpose of the launch event on 19 June 2025. The final endorsed version will be disseminated following official approval by His Excellency Minister of Water Resources and Meteorology

Foreword

It is with a profound sense of urgency and purpose that I present the National Action Plan on Drought Management and Adaptation (NAP-DMA) 2025–2030—a pivotal document for Cambodia’s journey toward climate resilience, sustainable water governance, and community-centered adaptation.

In recent decades, Cambodia has witnessed the increasing frequency, severity, and complexity of drought events. These prolonged dry spells have placed immense pressure on our agricultural systems, water resources, energy security, and the livelihoods of our most vulnerable populations. As Minister of Water Resources and Meteorology, I am acutely aware that drought is no longer an occasional hazard but a persistent risk that demands integrated, proactive, and science-based solutions.

This National Action Plan, developed through a collaborative process with support from national and international partners, embodies Cambodia’s commitment to advancing sustainable drought management. It outlines a comprehensive and pragmatic framework to:

- Establish early warning systems based on advanced meteorological and hydrological modelling,
- Strengthen drought risk communication networks across all levels of government,
- Implement locally driven adaptation strategies, and
- Enhance the technical and institutional capacities of our people and institutions.

The NAP-DMA aligns with our national development priorities and is fully consistent with regional and global commitments, including the Mekong River Commission’s Drought Adaptation Guidelines, the ASEAN Regional Plan of Action for Adaptation to Drought, and the Strategic Plan 2024–2028 of MOWRAM. Most importantly, it centers around the people of Cambodia—ensuring that farmers, women, youth, and other vulnerable groups are at the forefront of our efforts to mitigate drought risks and build resilient communities.

Implementing this plan will require strong inter-ministerial coordination, robust data systems, targeted investments, and active engagement from development partners, civil society, and the private sector. As we move forward, I urge all stakeholders to approach drought management not as a sectoral challenge, but as a shared national responsibility.

Let this Action Plan serve as both a roadmap and a call to action—for a Cambodia where every drop of water is used wisely, every community is empowered, and every drought is met with preparedness, unity, and resilience.

Phnom Penh, June 2025

H.E. Thor Chetha

Minister of Water Resources and Meteorology

Acknowledgement

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Cover Image:

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Photo By: Md. Hasanuzzaman Himela

Executive Summary

Developed under Cambodia's Climate Resilience and Early Warning System (CREWS) project, the National Action Plan for Drought Management and Adaptation (NAP-DMA) 2025-2030 provides a comprehensive framework to tackle escalating drought challenges exacerbated by climate change. This strategic roadmap aims to mitigate drought impacts, protect water resources, and promote climate-smart agriculture, ultimately securing food security, sustaining livelihoods, and ensuring community well-being amidst increasing environmental uncertainty. The NAP-DMA outlines five key outputs to enhance national drought resilience:

1. Drought Risk Data Collection and Communication Network
2. Drought Early Warning System (DEWS)
3. Drought Adaptation and Response Actions
4. Coordination Between Relevant Ministries and Departments
5. Capacity Building on Drought Management and Adaptation

By implementing these outputs, the plan seeks to strengthen climate resilience, boost adaptive capacity, and foster long-term sustainability. It aligns with the MRC Drought Adaptation Guidelines, the ASEAN Regional Plan of Action for Adaptation to Drought, and complements MOWRAM's Strategic Plan 2024-2028.

Abbreviations and Acronyms

- ADPC** Asian Disaster Preparedness Center (ADPC)
- CDI** Combined Drought Index
- CEDMHA** The Center for Excellence in Disaster Management and Humanitarian Assistance
- CNMC** Cambodia National Mekong Committee
- CREWS** Climate Resilience E
- DCWS** Department of Clean Water and Sanitation
- DHRW** Department of Hydrology and River Works
- DoM** Department of Meteorology
- DWRMC** Department of Water Resources Management and Conservation
- FAPAR** Fraction of Absorbed Photosynthetically Active Radiation
- LMB** The Lower Mekong Basin
- RGC** Royal Government of Cambodia
- MAFF** Ministry of Agriculture, Forestry and Fisheries
- MEF** Ministry of Economy and Finance
- MoE** Ministry of Environment
- MoP** Ministry of Planning
- MRC** The Mekong River Commission
- MRD** Ministry of Rural Development
- MOWRAM** Ministry of Water Resources and Meteorology
- MoWA** Ministry of Women Affairs
- NAP-DMA** National Action Plan on Drought Management and Adaptation
- NCDM** National Committee on Disaster Management
- NDMC** National Drought Mitigation Center
- NDVI** Normalized Different Vegetation Index
- NGO** Non-Government Organization

Abbreviations and Acronyms

SPI Standardized Precipitation Index

TSA Tonle Sap Authority

UNCCD The United Nations Convention to Combat Desertification

UNDP United Nations Development Programme

WFP World Food Program

WMO World Meteorological Organization

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1. Introduction



A boat in the middle of the sand in the dry season in Cambodia
Source: www.shutterstock.com

1.1. Background

Drought poses a significant challenge to Cambodia, affecting agriculture, water resources, and rural livelihoods. As a country heavily reliant on the Mekong River and seasonal rainfall, prolonged dry periods disrupt rice production, the backbone of Cambodia's economy and food security. Water shortages also threaten fisheries, a critical protein source for millions, while reduced river flows impact hydropower generation, leading to energy deficits. In rural areas, drought exacerbates poverty by limiting access to drinking water and reducing crop yields, pushing vulnerable communities into deeper hardship. Additionally, the increasing frequency and severity of droughts, driven by climate change, highlights the urgent need for improved water management strategies, early warning systems, and sustainable farming practices to build resilience against future dry spells.

In line with its national and international commitment, as a signatory of the United Nations Convention to Combat Desertification (UNCCD), Cambodia aims to implement a comprehensive drought plan to significantly reduce drought risks and their effects on the environment and livelihoods. Supported through the Climate Risk and Early Warning Systems (CREWS) project, this National Action Plan on Drought Management and Adaptation (NAP-DMA) for 2025-2030 was prepared through a collaborative process in 2024-2025. This plan outlines strategies to mitigate drought impacts and establish a coordinated implementation framework involving various Ministries and agencies, promoting efficient collaboration in addressing drought-related challenges.

1.2. Plan Development Objectives and Approach

The National Action Plan on Drought Management and Adaptation (NAP-DMA) 2025-2030 aims to serve as a comprehensive framework to address the increasing challenges posed by drought in the region, exacerbated by climate change and variability. By establishing a systematic and strategic approach, the NAP-DMA aligns with both the MRC Drought Adaptation Guidelines and the ASEAN Regional Plan of Action for Adaptation to Drought, while also complementing the Strategic Plan 2024-2028 of the Ministry of Water Resources and Meteorology (MOWRAM).

The formulation of the NAP-DMA followed a participatory and iterative process, grounded in the principles of integrated drought management. Since August 2024, the plan has undergone extensive stakeholder engagement involving key Ministries and Departments, with support from the World Meteorological Organization (WMO). The process began with a Start-up Meeting on 16 August 2024, where participants were introduced to the objectives and roadmap of the NAP-DMA and invited to join the Technical Working Group. This was followed by a Consultative Workshop on 21–22 November 2024, during which stakeholders reviewed and provided input on the first draft of the plan, including its structure, goals, activities, and a preliminary budget for implementation from 2025 to 2030. The Final Consultative Workshop, held on 24 December 2024, facilitated a comprehensive review of a second version, allowing for the integration of stakeholder feedback, including proposals for additional infrastructure-related actions and an expanded budget. The entire process was informed by the three pillars of integrated drought management—monitoring and early warning systems, vulnerability and impact assessment, and mitigation, preparedness, and response—ensuring a balanced and forward-looking approach to national drought resilience.

1.3. Plan Components Overview

The NAP-DMA comprises five expected outputs and 17 sub-actions that aim to enhance the nation's resilience to drought threats:

- 1. Drought Risk Data Collection and Communication Network:** This component focuses on the establishment of robust data collection mechanisms and a comprehensive communication network to monitor and disseminate information related to drought risk. This will facilitate informed decision-making and proactive management practices.
- 2. Drought Early Warning System (DEWS):** Implementation of a sophisticated DEWS is essential for predicting drought events and mitigating their impacts. The system will leverage advanced meteorological data and modeling techniques to provide timely and accurate warnings, enabling stakeholders to implement preemptive measures.
- 3. Drought Adaptation and Response Actions:** This output emphasizes the need for practical adaptation strategies that address the multi-faceted impacts of drought utilizing nature base solutions. This includes the development and implementation of response strategies and actions tailored to enhance the adaptive capacity of communities, particularly in agriculture, water management, and ecosystem preservation.
- 4. Coordination Between Relevant Ministries and Departments:** Effective drought management necessitates collaboration among various governmental bodies. The NAP-DMA outlines mechanisms for enhanced coordination and communication to ensure a cohesive approach in planning and response, thereby optimizing resource allocation and minimizing overlaps.
- 5. Capacity Building on Drought Management and Adaptation:** Investing in human capital is crucial for the successful implementation of the NAP-DMA. This output focuses on enhancing the skills and knowledge of line Ministries and agencies as well as the young generation through trainings, workshops, on-the-job trainings, and study exchanges to the most drought disaster areas in other regions, fostering a culture of proactive drought risk management through early warning system, early preparedness and planning.

Consequently, the NAP-DMA 2025-2030 represents a vital initiative for Cambodia to combat the challenges posed by drought. By operationalizing the five expected outputs, the plan seeks to build a resilient society capable of adapting to climate fluctuations, ensuring sustainable development and food security in the face of growing environmental threats.

2. Background and Rationale



Underground, Brittle, Dry image
Photo Credit: JessyPhotography
Source: www.pixabay.com

2.1. Overview of Drought in Cambodia

Drought in Cambodia has historically posed a significant threat to livelihood, particularly in agriculture, livestock, and water resources, though it has not directly caused loss of life. Over the past two decades, notable droughts occurred in 2004, 2012, and 2016, with the 2016 event—driven by El Niño—being the most severe in 50 years. It affected 18 of Cambodia’s 25 provinces, leading to water shortages, agricultural losses, and a shortened monsoon season (UNDP, 2019).

According to the National Committee for Disaster Management (NCDM) and the United Nations Development Programme (UNDP), droughts were recorded in every province between 1996 and 2013 (Figure 1). Kampong Speu had the highest frequency with 197 incidents, followed by Kampot (153 incidents), Takeo (124 incidents), and Siem Reap (102 incidents). Typically, drought years are marked by delayed monsoons, erratic rainfall, early season termination, and increased dry spells which severely affect crop productivity.

Cambodia’s vulnerability to both natural and human-induced hazards has intensified in the 21st century. Reports from the Royal Government of Cambodia (2014) and the Ministry of Environment (2016) highlight a growing trend of extreme weather events, including increasingly frequent and severe droughts in 2010, 2015, 2019, and 2023. This pattern reflects the country’s mounting exposure to climate variability and associated risks to food security and rural livelihoods, leading to more frequent and intense floods and droughts.

Drought in Cambodia is typically characterized by the sudden, prolonged absence of rainfall, resulting in reduced surface water and soil moisture, and disrupting the country’s agricultural sector (Heng An, 2014). It is particularly damaging to rice farming communities that rely on rain-fed agriculture, resulting in a significant deficit in water supply for human consumption and agriculture (NCDM & UNDP, 2014). A 2017 report by the Center for Excellence in Disaster Management and Humanitarian Assistance (CEDMHA) estimated that 18 provinces were severely affected by the 2015–2016 drought, impacting 2.5 million people. This led to crop failures, water scarcity, and rising debt among smallholder farmers (UNDP, 2019).

Agricultural losses from drought are well-documented. In 2009 alone, 57,965 hectares of rice crops were destroyed across 13 provinces. Similar impacts occurred in subsequent years: 14,103 hectares in 2010, 3,804 in 2011, and 14,190 hectares in 2012 (Nong, 2021). These events underscore agriculture’s acute sensitivity to climatic stress.

To support the formulation of the National Action Plan, a comprehensive assessment on drought risk for all provinces in Cambodia has been conducted and is presented in Annex 1 of this document. It classifies provincial drought exposure into four categories:

- **Extreme risk:** Prey Veng, Battambang, Oddar Meanchey
- **Severe risk:** 11 provinces including Kampong Speu, Siem Reap, Kratie, and Kampong Thom
- **Moderate risk:** 7 provinces including Kampot, Takeo, and Svay Rieng
- **Mild risk:** Koh Kong, Preah Sihanouk, Kep, and Phnom Penh

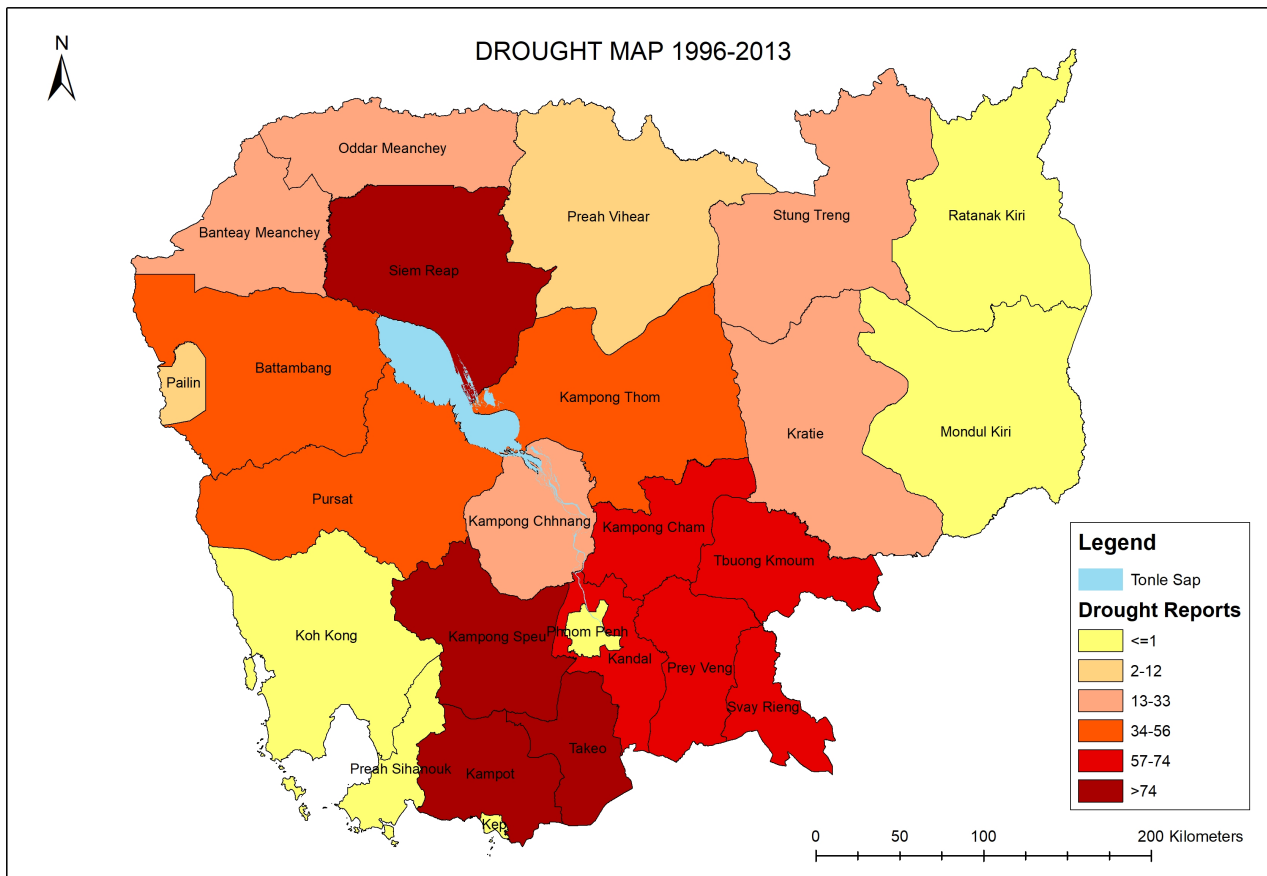


Figure 1. Thematic map of drought from 1996 to 2013 (Source: NCDM & UNDP, 2014)

The assessment results (Figure 2) indicates that Prey Veng, Battambang, and Oddar Meanchey are at extreme risk of drought; 11 provinces are at severe risk of drought including Kampong Spue, Siem Reap, Kratie, Kandal, Kampong Thom, Preah Vihear, Banteay Meanchey, Pursat, Kampong Chhnang, Stung Treng, and Pailin; 7 provinces at moderate risk including Kampot, Takeo, Kampong Cham, Mondul Kiri, Ratana Kiri, Tbong Khmum, and Svay Rieng; and the rest 3 provinces including Koh Kong, Phreah Sihanouk, and Kep and also the Capital City of Phnom Penh are at mild risk of drought.

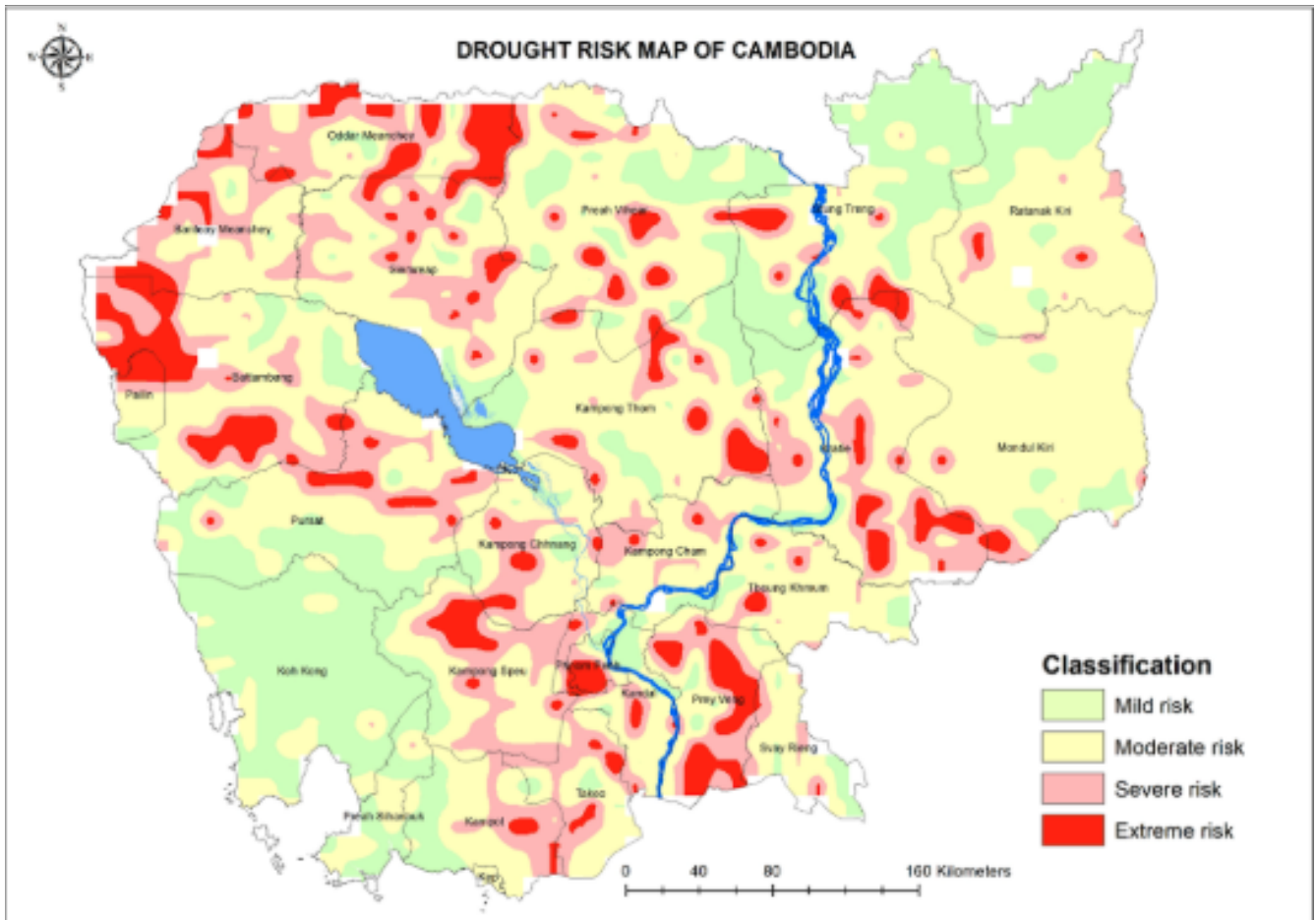


Figure 2. Drought risk map of Cambodia (MOWRAM, 2024)

The assessment results can be summarized in the table below:

Table 1. Drought risk results with area in hectare by drought class

Drought Area (ha)						
RN	Province	Mild	Moderate	Severe	Extreme	Drought Class
1	Battambang	171,366.70	409,337.78	272,536.00	333,943.50	Extreme
2	Oddar Meanchey	99,158.55	114,993.48	191,755.77	257,238.33	Extreme
3	Prey Veng	81,403.56	71,143.17	101,797.05	221,799.84	Extreme
4	Siem Reap	137,863.65	355,555.05	380,933.88	180,132.11	Severe
5	Banteay Meanchey	80,289.65	149,704.01	268,798.37	116,028.94	Severe
6	Kampong Spue	90,540.01	218,581.00	265,952.53	121,399.65	Severe
7	Kratie	191,164.35	522,122.60	233,024.59	251,764.36	Severe
8	Kampong Thom	230,595.00	618,941.72	218,501.49	176,539.47	Severe
9	Preah Vihear	354,265.92	669,146.41	180,602.51	199,166.93	Severe
10	Kampong Chhnang	83,382.45	197,745.87	173,422.95	74,963.79	Severe
11	Pursat	394,983.50	469,223.74	137,929.51	156,442.88	Severe
12	Stung Treng	662,001.40	364,086.72	78,027.23	97,571.72	Severe
13	Kandal	71,306.12	135,668.63	52,769.09	65,587.20	Severe
14	Pailin	13,918.80	54,443.30	0.00	39,365.28	Severe
15	Mondul Kiri	122,949.66	1,127,555.42	55,241.99	61,170.80	Moderate
16	Ratana Kiri	347,805.92	689,789.74	96,435.52	43,853.72	Moderate
17	Tbong Khmum	100,367.61	250,220.44	105,784.87	36,465.02	Moderate
18	Kampong Cham	73,654.99	206,191.26	140,448.41	34,606.89	Moderate
19	Kampot	91,906.74	184,631.32	154,935.89	40,468.85	Moderate
20	Takeo	39,385.14	117,567.16	137,869.25	54,203.16	Moderate
21	Svay Rieng	106,045.21	87,990.54	63,171.63	29,617.11	Moderate
22	koh Kong	890,906.61	201,374.30	12,073.57	0.00	Mild
23	Preah Sihanouk	162,399.07	84,043.13	12,076.03	0.00	Mild
24	Phnom Penh	18,107.87	0.00	11,353.04	38,973.56	Mild
25	Kep	1,762.15	13,485.63	0.00.0	0.00	Mild

Figure 3 below illustrates examples of meteorological drought in Cambodia, based on the Standardized Precipitation Index (SPI), for the years 2001, 2005, 2015, and 2019. The data indicate that no severe droughts occurred in 2001 and 2005. In contrast, severe to extreme drought conditions were recorded in 2015 and 2019, particularly in the southwestern and eastern regions of the country. Affected provinces included Battambang, Pailin, Banteay Meanchey, Siem Reap, Kampong Thom, Kampong Chhnang, Kampong Cham, Tbong Khmum, Kratie, Stung Treng, Mondulkiri, and Ratanakiri. Notably, the drought in 2019 was more intensive than that of 2015.

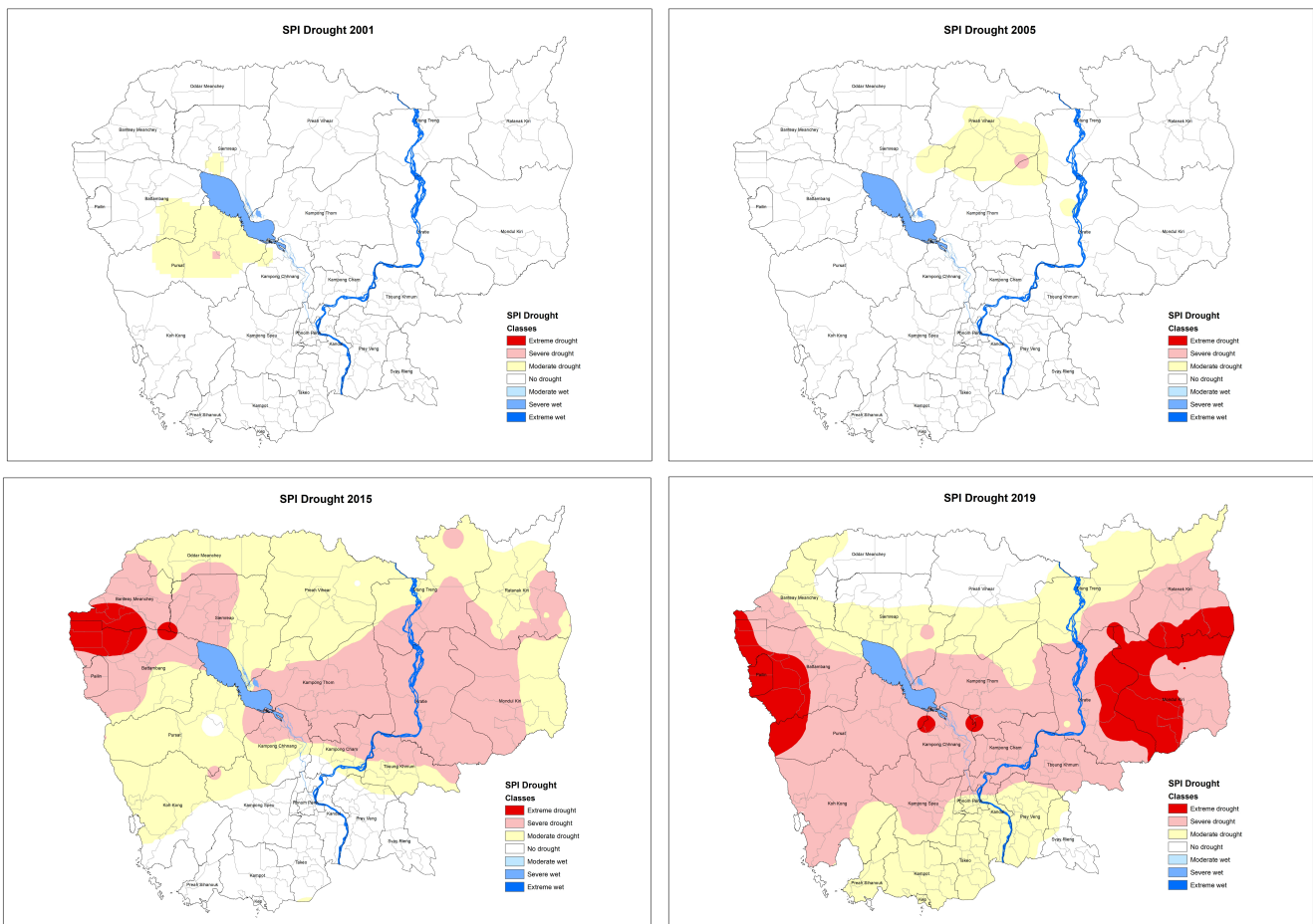


Figure 3. Meteorological drought map in Cambodia by SPI in 2001, 2005, 2015, and 2019 (MOWRAM, 2024)

Figure 4 presents agricultural drought maps for the years 2001, 2005, 2015, and 2019, based on the Normalized Difference Vegetation Index (NDVI). The analysis reveals that among these years, 2005 experienced the most severe agricultural drought, followed by 2019 and 2016. In contrast, drought conditions in 2001 were relatively limited, affecting only the southern region of Cambodia—specifically the provinces of Kandal, Takeo, Prey Veng, and Svay Rieng.

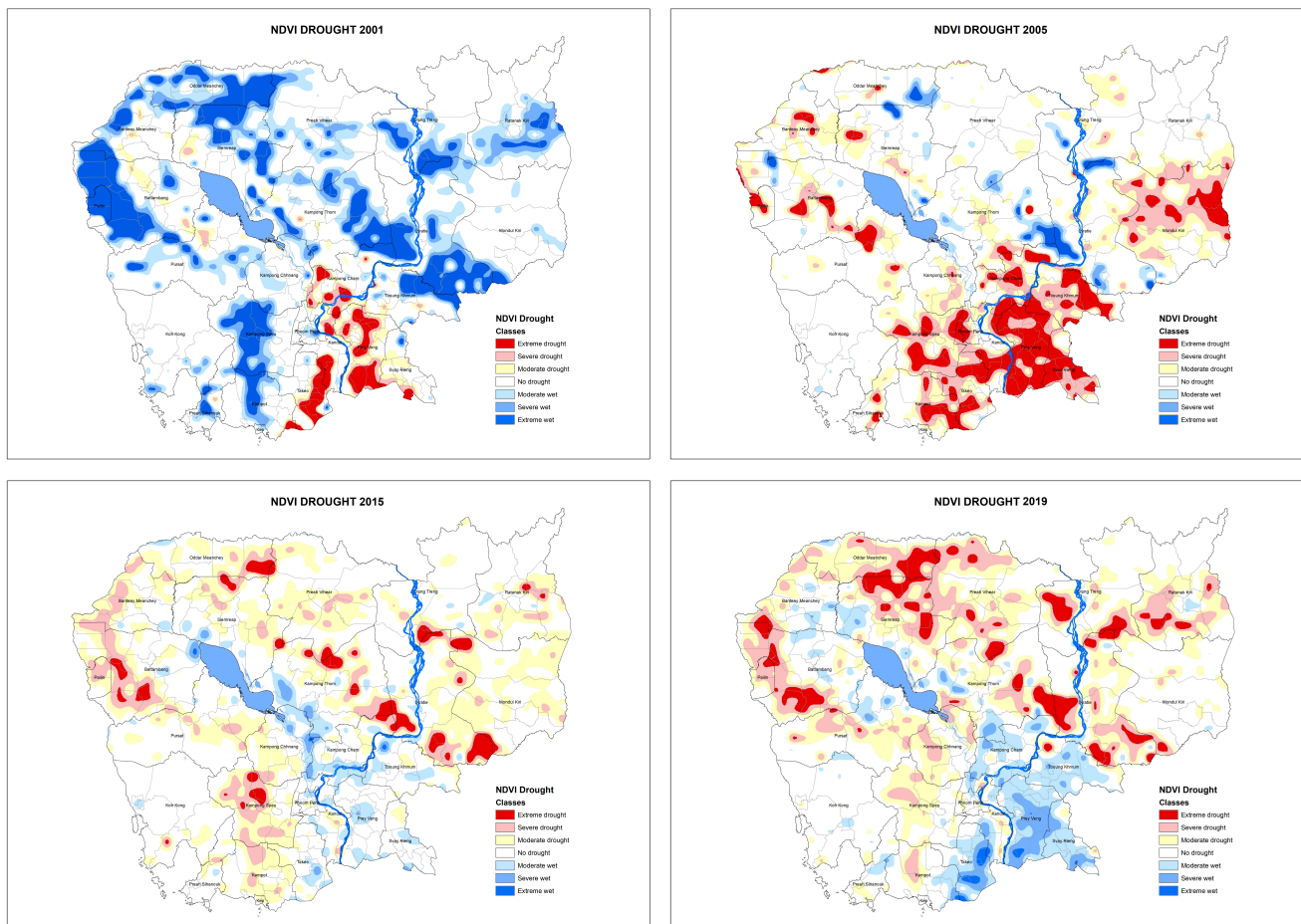


Figure 4. Agricultural drought map of Cambodia by NDVI Anomaly in 2001, 2005, 2015, and 2019 (MOWRAM, 2024)

To provide a more comprehensive understanding, a Combined Drought Indicator (CDI) was developed by integrating both meteorological and agricultural drought data, as illustrated in Figure 5. The analysis shows that 2019 was the driest year on record, with extreme and exceptional drought conditions spreading from the western to eastern regions and parts of the north. This was followed by 2015, which exhibited similar levels of severity and spatial extent.

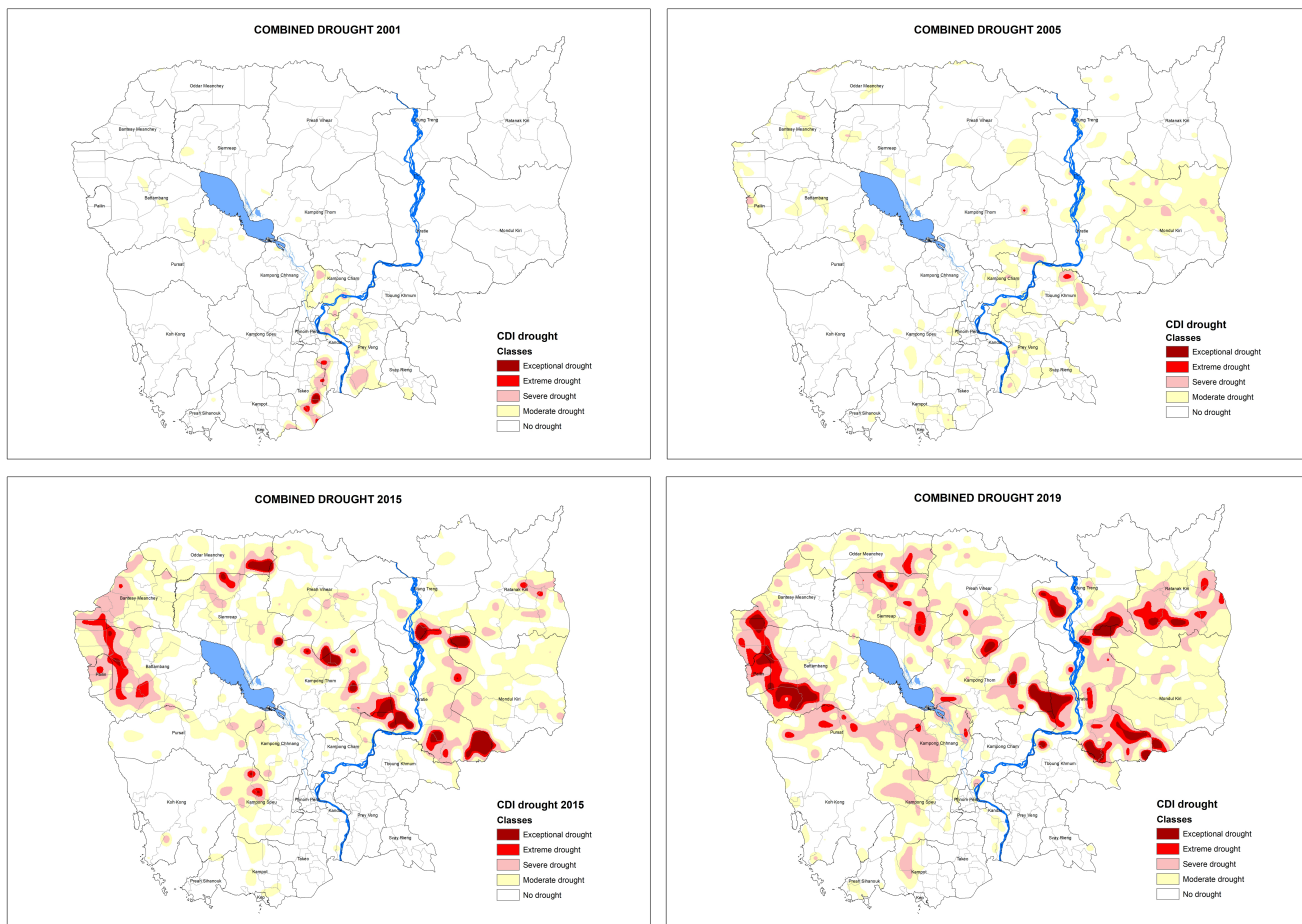


Figure 5. Combined Drought Index map of Cambodia in 2001, 2005, 2015, and 2019 (MOWRAM, 2024)

Figure 6 illustrates the frequency of drought occurrences in Cambodia from 2000 to 2023. The northern provinces of Oddar Meanchey and Siem Reap, along with the eastern provinces of Kratie, Kampong Thom, and Stung Treng, experienced the highest frequency of droughts, ranging from 6 to 11 events. In contrast, Koh Kong and Sihanoukville recorded the fewest drought occurrences, with only 1 to 2 events during the same period.

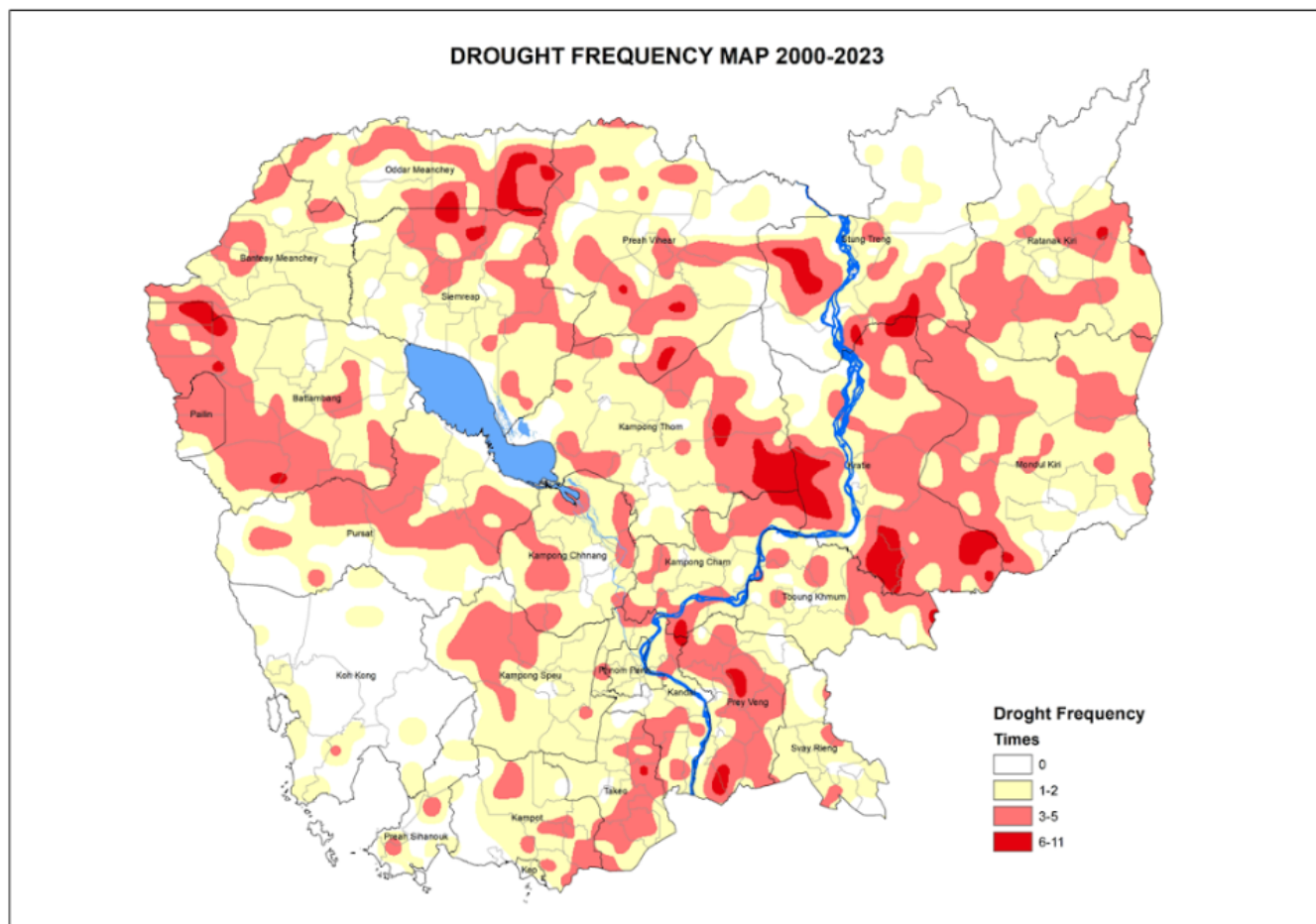


Figure 6. Drought frequency (hazard) map from 2000 to 2023 (MOWRAM, 2024)

More detailed information on drought risk assessment in Cambodia can be referred in Annex 1 of this document.

2.2 Institutional Arrangement

The National Committee for Disaster Management (NCDM) is the primary government agency responsible for preventing and mitigating all types of natural disasters in Cambodia. While NCDM has been effective in providing aid to affected communities and mitigating the impacts of floods and typhoons, it faces significant limitations in terms of early warning systems and capacity for drought management. Established in 1995, NCDM serves as the coordinating body for disaster management-related activities in Cambodia, working to lead and coordinate disaster management efforts across the country.

The NCDM Secretariat, the central hub of disaster management operations in Cambodia, provides critical support to the committee by leading and coordinating disaster management activities. As part of the country's decentralization efforts, disaster management institutions such as the Provincial Committee for Disaster Management (PCDM), District Committee for Disaster Management (DCDM), and Commune Committee for Disaster Management (CCDM) have been established to oversee disaster management at their respective levels. These institutions play a vital role in ensuring that disaster management efforts are coordinated and effective at all levels of government. Figure 7. provides an overview of the organizational arrangements for drought risk management coordination.

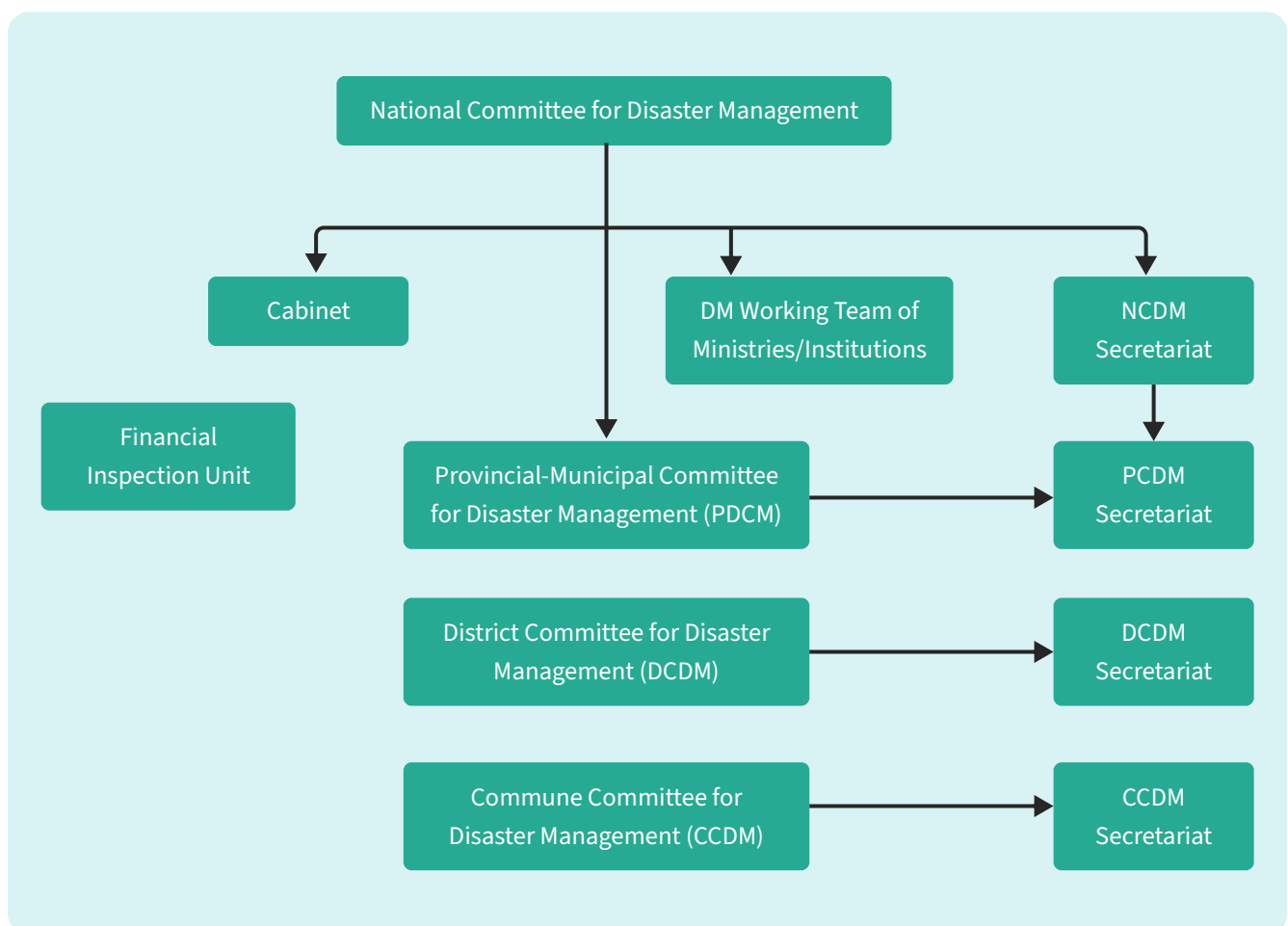


Figure 7. Disaster risk management coordination mechanism.

Source: UNCCD Cambodia country profile document ([1%20FINAL_NDP_Cambodia%5B1157%5D.pdf](#))

Beyond its role in NCDM, the Ministry of Water Resources and Meteorology (MOWRAM) is also entrusted with the critical responsibility of managing water resources sustainably to ensure a reliable supply of water for various national sectors, including agriculture, irrigation, waterborne transportation and navigation, tourism, and others (Figure 6). This involves monitoring and regulating water use to prevent depletion and ensure that these sectors can operate effectively. Furthermore, MOWRAM is responsible for implementing a comprehensive drought monitoring and forecasting system, which focuses on both meteorological and hydrological indicators to provide timely warnings and inform decision-making. The current monitoring and forecasting system under MOWRAM, however, is in need of significant upgrading and capacity building to optimize its performance and accuracy.

Additionally, international organizations and NGOs have been instrumental in supporting drought response measures (refer to Annex 2). These efforts include improving water management practices, implementing early warning systems, and providing financial and technical assistance to affected communities. Below is a detailed overview of key implementation agencies and their respective roles:

Table 2. Key Implementation Agencies and Roles

Institution/Organization	Role	Functions
Ministry of Water Resources and Meteorology (MOWRAM)	Primary government agency responsible for water resources management (river basins, irrigation, hydrometeorology, flood, and drought management).	<ul style="list-style-type: none"> • Develop and implement water policies and regulations • Monitor rainfall, rivers, and water levels for early warnings. • Manage irrigation systems for agricultural productivity.
Ministry of Agriculture, Forestry and Fisheries (MAFF)	Focuses on agricultural water management crucial for food security in drought-prone areas.	<ul style="list-style-type: none"> • Promote development of irrigation systems. • Provide technical support for sustainable water use. • Implement drought resilience programs in agriculture.
Cambodian National Mekong Committee (CNMC)	Oversees Cambodia’s involvement in the Mekong River Commission and regional water management.	<ul style="list-style-type: none"> • Ensure sustainable water management aligned with regional strategies • Implement programs/projects managing climate change and water variability impacts.
National Committee for Disaster Management (NCDM)	Focuses on disaster risk reduction, including drought and flooding.	<ul style="list-style-type: none"> • Develop and coordinate disaster management policies • Facilitate drought and disaster response and recovery • Raise awareness and guide drought mitigation.

Institution/Organization	Role	Functions
Tonle Sap Authority (TSA)	Focuses on water resources management and drought issues in the Tonle Sap region.	<ul style="list-style-type: none"> • Monitor water levels and quality in Tonle Sap Lake.- Collect and analyze hydrology, climate, and biological data • Develop policies for sustainable water management in the Tonle Sap Basin.
Research and Academic Institutions	Research and education on sustainable agriculture, water management, and technology.	<p>Royal University of Agriculture (RUA):</p> <ul style="list-style-type: none"> • Research on water-efficient agriculture • Train farmers on drought-resilient practices. <p>Institute of Technology of Cambodia (ITC): High education in engineering, science and technologies.</p>
Regional and International Organizations	Support Cambodia’s efforts in water management, disaster risk reduction, and sustainable development.	<ul style="list-style-type: none"> • WMO: Facilitate meteorological and hydrological cooperation. • FAO: Enhance agricultural water management and resilience. • WFP: Implement drought risk management in food assistance. • UNDP: Support water governance and IWRM projects. • World Bank: Fund irrigation and water management projects. • UNESCAP: Promote sustainable development, flood, and drought management. • GWP: Promote IWRM and water governance. • MRC: Coordinate sustainable Mekong River Basin management. • ADPC: Strengthen disaster risk reduction and climate resilience.
NGOs and Civil Society Organizations	Work at grassroots levels to improve water management, resilience, and disaster preparedness.	<ul style="list-style-type: none"> • ISD: Promote sustainable water practices and community drought resilience. • CWP: Engage stakeholders in promoting IWRM. • Oxfam: Improve rural water access and sustainable management. • WaterAid: Enhance community resilience and access to safe water. • Cambodian Red Cross: Promote health, preparedness, and disaster response for drought impacts.

2.3. Relevant Policies, Strategies and Plans Related to Drought

2.3.1. National-Level Policies and Plans

The Strategic National Action Plan on Disaster Risk Reduction (NAP-DRR), Strategic Plan on Water Resources, as well as the Climate Change Policy serve as the cornerstone for disaster risk management in Cambodia, providing a comprehensive framework for mitigating and responding to natural disasters. Additionally, the National Environment Strategy and Action Plan (NESAP) 2016-2023 outlines a roadmap for sustainable development, emphasizing environmental protection and the conservation of natural resources. An updated version of the NESAP, titled the Cambodian Environmental Protection Strategic Plan 2024-2028, is currently being finalized and will soon be endorsed by the Royal Government of Cambodia.

a) The National Environment Strategy and Action Plan 2016-2023

The National Environment Strategy and Action Plan (NESAP) 2016-2023 serves as a strategic framework for integrating environmental protection and promote sustainable development. It promotes inter-ministerial cooperation, capacity building, and stakeholder awareness to ensure effective environmental protection and sustainable use of natural resources. The plan also supports national and sub-national administrations in managing the environment and implementing financial mechanisms for environmental protection and natural resource management.

b) National Action Plan for Disaster Risk Reduction 2024-2028 (Building on the 2019-2023 Framework)

The National Action Plan for Disaster Risk Reduction (NAP-DRR) 2024-2028 builds upon the achievement of its predecessor, NAP-DRR 2019-2023, which emphasized an integrated approach to disaster risk reduction. The updated plan seeks to further strengthen national and local capacities, enhance risk assessment and early warning systems, and promote sustainable development. To achieve these objectives, the Royal Government of Cambodia has incorporated actions from previous plans into the NAP-DRR 2024-2028.

c) MOWRAM's Strategic Plan 2024-2028 : Strategies and Strategic Actions

The Strategic Plan 2024-2028 of the Ministry of Water Resources and Meteorology (MOWRAM) outlines five key strategies aimed at enhancing the management and resilience of Cambodia's water resources. These include:

- (1) Strengthening governance, institutional framework, human resource, gender, cooperation, and water policy;
- (2) Enhancing the effectiveness of water infrastructure, and promoting climate-resilient and high-quality irrigation system,
- (3) Improving water security and disaster management to increase resilience to climate change,
- (4) Strengthening of management and use of technologies and innovations in water data and information management system.
- (5) Improving the effectiveness of water resources management and conservation.

This National Action Plan on Drought Management and Adaptation is directly and partially aligned with these strategic priorities, supporting MOWRAM's broader objectives for sustainable and resilient water resource development.

d) Cambodian Law on Disaster Management

The Law on Disaster Management (DM Law), adopted in 2015, provides a legal framework for disaster management in Cambodia. It defines the roles and responsibilities of relevant institutions and establishes mechanisms for disaster prevention, preparedness, response, and recovery. The law emphasizes the importance of proactive measures, including early warning systems and strategic emergency response planning. It also addresses post-disaster activities such as relief, rehabilitation, and reconstruction. The DM Law designates the National Committee for Disaster Management (NCDM) as the primary authority responsible for coordinating and leading disaster management efforts across the country.

e) National Strategic Action responding to climate change including drought in Cambodia.

The Climate Change Strategic Plan (CCSP) of the Ministry of Water Resources and Meteorology (MOWRAM) outlines Cambodia's strategic priorities for addressing climate change impacts in the water sector. The plan identifies four key focus areas: enhancing hydrological planning; improving flood and drought management; strengthening the capacity of MOWRAM personnel; and promoting gender responsiveness in climate change planning. These priorities are operationalized through a comprehensive set of actions detailed in the accompanying planning matrix.

2.3.2. National-Level Policies and Plans

a) ASEAN Regional Plan of Action for Adaptation to Drought 2021-2025

The ASEAN Regional Plan of Action for Adaptation to Drought (ARPA-AD) 2021–2025 serves as a strategic framework aimed at enhancing drought resilience across Southeast Asia. Adopted by ASEAN Member States, the plan addresses the increasing frequency and severity of droughts exacerbated by climate change and growing water demands.

The primary goal of ARPA-AD is to strengthen coordination at both regional and national levels to achieve sustainable drought management. This involves:

- Developing comprehensive drought policies to manage risks effectively.
- Enhancing adaptive capacities of communities and sectors vulnerable to drought.
- Minimizing vulnerabilities and impacts on livelihoods, natural resources, agriculture, energy, and overall socio-economic development.

ARPA-AD outlines nine strategic actions, each encompassing specific sub-actions:

- 1. Risk, Impact, and Vulnerability Assessment:** Conducting thorough evaluations to understand drought-related risks and vulnerabilities.
- 2. Early Warning Systems, Preparedness, and Planning:** Establishing robust systems for timely drought detection and response planning.
- 3. Adaptation Actions:** Implementing measures to adjust practices and reduce drought impacts.
- 4. Response and Recovery:** Developing strategies for effective response and recovery post-drought events.
- 5. Strengthening Coordination Between ASEAN Sectoral Bodies:** Enhancing collaboration among various ASEAN bodies for cohesive drought management.
- 6. Partnership and Collaboration with Non-ASEAN Partners:** Engaging with external partners to leverage expertise and resources.
- 1. Capacity-Building/Enhancement:** Improving skills and knowledge related to drought adaptation and management.
- 2. Data Sharing and Dissemination:** Promoting the exchange of drought-related data and information.
- 3. Monitoring and Evaluation:** Regularly assessing the effectiveness of drought adaptation strategies and actions

These actions are designed to align with the three pillars of effective drought management: monitoring and early warning; vulnerability and impact assessment; and mitigation, preparedness, and response.

b) The MRC Drought Adaptation Guidelines

The Mekong River Commission (MRC) developed its first drought adaptation guidelines document for the Lower Mekong Basin in 2023 for the regional and national levels. The document was approved by the MRC Joint Committee (JC) at its 57th meeting in June 2024, while the MRCS was instructed to take immediate actions on guiding the Member Countries and build capacity for national drought risk assessment and development of national action plan for drought management and mitigation.

The overall objective of the Drought Adaptation Guidelines (DAG) document is to provide guidance to the MRC and Member Countries in developing and/or enhancing appropriate options to adapt to and mitigate drought risks and impacts, and build capacity and resilience for the short, medium, and long terms.

The specific objective of the DAG is “to provide technical guidance to the MRCS, NMCSs, and line agencies in assessing drought risks, and selecting and preparing/enhancing drought adaptation options/plans suitable for the regional/transboundary, national and local levels, as well as the necessary capacity and resilience for drought adaptation and mitigation¹.

The document has provided the overall drought risk assessment methods and guidance for developing national drought management and action plan during the next MRC strategic period 2025-2028. It highlights the potentially impacted sectors by droughts that the Lower Mekong Basin has been facing during the last decades.

²¹ MRC. 2024. Drought Adaptation Guidelines for the Lower Mekong Basin.

2.4. Existing Constrains and Key Challenges

Drought poses an increasingly serious threat to Cambodia's agricultural productivity, water security, and rural livelihoods, especially under the intensifying impacts of climate change. Despite recent progress, Cambodia's drought management and adaptation framework continues to face numerous systemic, institutional, technical, and financial gaps that undermine its effectiveness. Those constrains can be highlighted below:

1. Fragmented Institutional Coordination and Governance

- Lack of a unified institutional framework: Various government bodies, including the Ministry of Water Resources and Meteorology (MOWRAM), National Committee for Disaster Management (NCDM), Ministry of Agriculture, Forestry and Fisheries (MAFF), and Ministry of Environment (MoE), have overlapping responsibilities without clear coordination mechanisms.
- Weak local capacity: At sub-national levels, provincial and commune authorities often lack the mandate, training, and resources to implement drought-related planning and response measures effectively.
- Limited integration into national development plans: Drought is still not sufficiently mainstreamed into national and sectoral planning, resulting in reactive rather than proactive responses.

1. Inadequate Drought Monitoring, Forecasting, and Early Warning Systems

- Sparse meteorological and hydrological data coverage: Existing weather stations are unevenly distributed and technologically outdated, limiting the accuracy of real-time monitoring and seasonal forecasting.
- Very few agricultural monitoring stations (soil moisture): There are only 7 soil moisture stations in the ground which were installed in 2023 under MRC project. Some soil moisture stations supported by international organizations or NGOs' are left malfunctioning due to lack of funding for maintenance.
- Lack of a centralized drought early warning system: While efforts like the Standardized Precipitation Index (SPI) and NDVI-based monitoring exist, they are not yet fully institutionalized or made accessible to decision-makers and vulnerable communities in timely, actionable formats.
- Data gaps on drought impacts and vulnerabilities: There is insufficient socio-economic and environmental data to support vulnerability and risk assessment and mapping. There is no post-disaster impact assessment of drought on different sectors.

1. Limited Drought Risk Assessment and Planning

- Absence of a comprehensive national drought risk map: Although we have just conducted drought risk assessment for the first time, there are still lack of essential data for a full and comprehensive drought risk assessment such as groundwater potential, irrigation database, etc. Cambodia lacks a regularly updated national-scale drought risk and vulnerability atlas to guide investments and planning of different fields.
- Reactive rather than proactive planning: Most drought interventions are emergency-based and relief-oriented rather than focused on prevention, preparedness, and long-term resilience building.

1. Technological and Infrastructure Limitations

- Inefficient water management infrastructure: Many existing irrigation and water storage systems are either non-functional or unable to meet increasing water demands during dry seasons.
- Limited adoption of water-saving technologies: There is minimal uptake of drought-resilient practices such as drip irrigation, drought-tolerant crop varieties, and conservation agriculture due to cost, awareness, or knowledge gaps.

1. Weak Community Engagement and Capacity

- Limited awareness and education: Many rural communities lack knowledge of drought risks, preparedness strategies, and coping mechanisms.
- Gender and social inclusion gaps: Vulnerable groups, including women, ethnic minorities, and the poor, are disproportionately affected by droughts but often excluded from planning and decision-making processes.

1. Inadequate Budget for Drought Risk Reduction

- Limited national budget allocation: Investments in drought resilience are insufficient and heavily reliant on external donor support.
- Lack of risk transfer mechanisms: There are few financial instruments (e.g., drought insurance, contingency funds) available to mitigate losses and support recovery among farmers and local governments.

1. Policy and Legal Gaps

- Absence of a specific drought law or policy: While climate change and disaster risk management policies mention drought, there is no legal framework that specifically mandates and guides drought risk governance and adaptation.
- Lack of incentives for private sector involvement: There are limited policy measures to promote private sector engagement in drought-proof infrastructure, technologies, or financing

1. Transboundary Water Resources Management Issues

- Cambodia relies heavily on the Mekong River, which is affected by upstream water management decisions in countries like China, Laos, and Thailand. Hydropower dam constructions and water diversions in upstream regions can exacerbate drought conditions downstream, reducing water availability in Cambodia.

Addressing the above-mentioned gaps and challenges will require a multi-sectoral, inclusive, and forward-looking approach in the 2026–2030 National Action Plan. Strengthening institutional coordination, expanding early warning systems, investing in risk reduction infrastructure, empowering local communities, and mainstreaming drought adaptation across sectors are critical to building a more resilient Cambodia in the face of growing climate uncertainties.

3. Action Plan



A girl sits on her boat at a Bak Angrout dried up pond at the drought-hit Kandal province in Cambodia
Photo credits: Reuters

3.1. Scope, Goal and Objectives of the Plan

The goal of the National Action Plan on Drought Management and Adaptation is to reduce vulnerability of people and water related resource systems, and economic losses to drought conditions, while building national capacity and capability to effectively manage and implement drought adaptation and mitigation measures.

The objectives of the National Action Plan are to:

- Enhance and operationalize an effective Drought Early Warning System and improve drought risk communication; and
- Strengthen national capacity and capability to guide drought management and adaptation efforts in Cambodia, thereby reducing vulnerability and increasing the resilience of affected communities.

3.2. Formulation and Consultation Process

This National Action Plan on Drought Management and Adaptation (NAP-DMA) was developed through extensive and inclusive consultation process with key stakeholders from relevant Ministries and Departments, since August 2024. From the inception to the finalization, the process involved a series of structured engagements that culminated in the endorsement of the NAP-DMA by Ministry of Water Resources and Meteorology (MOWRAM). The key consultation milestone included:

- Start-up Meeting (hybrid format with WMO on 16 August 2024): Representative from the most relevant ministries and line departments were invited to join this introductory meeting, where the overall objectives and development roadmap for the NAP-DMA were presented. Participants from those relevant Ministries and Departments were invited to join the Technical Working Group to support the NAP-DMA development process.
- Consultative Workshop on Drought Risk Assessment and NAP-DMA Outline (in-person format with WMO on 21-22 November 2024): MOWRAM presented the first draft version 1.1 of the NAP-DMA, including the proposed document outline, goals and objectives, strategic outputs and activities, implementation mechanism, and a preliminary budget for the 2025-2030 implementation period.
- Final Consultative Workshop on the Finalization of the NAP-DMA (In-Person format on 24 December 2024): The final consultation brought together stakeholders to critically review Version 2.0 of the NAP-DMA. The objective was to critically review and validate the updated content, gather final comments, and confirm recommendations for its completion. During the session, participants proposed additional actions focused to strengthen water infrastructure, thereby enhancing the comprehensiveness of NAP-DMA. Furthermore, a larger budget was also recommended to ensure sufficient resources are available to deliver the expected outputs and meet financial requirements.



Figure 8. Photos of the first (left) and second (right) consultation meetings

3.3. Action Plan Components and Outputs

This section outlines the key components and strategic outputs of the National Action Plan on Drought Management and Adaptation (NAP-DMA), which collectively aim to reduce drought vulnerability, strengthen resilience, and build national and local capacity for effective drought risk management. The Action Plan is structured around five major outputs, each with clearly defined objectives and targeted actions that support the implementation of an integrated, inclusive, and sustainable drought management, response, and adaptation. These outputs serve as the foundation for the NAP-DMA's operationalization from 2025 to 2030, providing a comprehensive roadmap for action across sectors and administrative levels. A detailed logical framework—including objective indicators and risk for each output and action—is presented in **Annex 3**.

Output 1:

Drought risk data collection and communication network developed and operationalized

Objective:

To develop a national drought risk data collection and communication network between the national and local communities and collect near-real time information on drought conditions nationwide to support the drought early warning system (Output 2) and water allocation planning at the national level through a mobile communication channel or application.

Actions:

- 1.1. Develop and operate a national real-time drought risk data collection from the drought risk areas through mobile application or the existing mobile program such as Telegram or CoolApp to support the drought early warning and water resources allocation planning.
- 1.2. Build connection between the National Committee on Disaster Management (NCDM) with all levels (national, provincial, district and commune) and the Drought Early Warning System centre and enable the communication channel from the commune level to the DEWS centre. NCDM at commune level can play a vital role in collecting all the information on drought risk and report to the district, province, and central level before sharing with the DEWS centre for further processing and analysis.
- 1.3. Formulate a robust and detailed implementation plan for data collection and analysis and carry out a nationwide data update aimed at enhancing the drought risk assessment for Cambodia upon the conclusion of the NAP-DAM Phase-I (2025-2030). This initiative might include assessing groundwater potential in rural areas and developing a comprehensive or updating the existing irrigation database through integrating all existing irrigation data from different line Ministries and Departments.

Output 2:

Drought Early Warning System (DEWS) formulated and operationalized

Objective:

To develop a national Drought Early Warning System (DEWS) with end-to-end early warning services which consists of drought condition monitoring, forecasting and an early warning system, using advanced technology.

Actions:

- 2.1. Carry out assessment study on the existing drought monitoring, forecasting and early warning system currently being adopted by relevant national agencies and identify the main responsibilities of the agencies with their existing drought monitoring, forecasting, or early warning activities.
- 2.2. Develop and implement a national standardized Drought Early Warning System and activity which consists of the following component
 - (a) weekly drought monitoring,
 - (b) weekly and monthly drought forecasting,
 - (c) seasonal outlook, and
 - (d) early warning system, and
 - (e) weekly drought bulletin.An integration between the ground monitoring stations (hydro-meteorological and agricultural parameters) might be substantially needed to bring the monitoring and forecasting accuracy to high standard, while considering regional monitoring and forecasting systems from ASEAN and MRC as lesson learnt to improve the forecasting technique and accuracy.
- 2.3. Collaborate with regional organizations such as MRC and ADPC to enhance drought monitoring and forecasting system by utilizing existing projects or initiating joint projects, such as MRC-ADPC's Regional Hydrological Extreme Assessment System (RHEAS), which includes crop yield estimates, and the MRC-ADPC's Mekong-Reservoir Assessment Tools (RAT).

Output 3:

Drought Adaptation and Response Actions Formulated and Implemented

Objective:

To reduce drought risk, mitigate impacts, and build adaptive capacity and resilience to local communities, particularly women and vulnerable groups.

Actions:

- 3.1. Carry out a participatory pilot project on drought adaptation and mitigation with active participation by local farmers and vulnerable groups for the 3 most drought prone provinces by using the recommended drought adaptation measures of the MRC's DAG document. Local farmers and vulnerable groups might get involved from the planning stage till the end of the project.
- 3.2. Formulate a 10-year Drought Risk Reduction and Adaptation Guidelines and Action Plan taking into account lessons learnt from the pilot project aiming to build adaptive capacity and strengthen drought resilience for vulnerable communities.
- 3.3. Develop and implement a drought adaptation programme utilizing nature-based solutions for small scale water infrastructures including rehabilitation of agricultural ponds, artificial lining for small and medium sized agricultural ponds for community-based rain water harvesting, and interconnecting natural water resources system to improve agricultural irrigation and fisheries production in rural communities.
- 3.4. Closely coordinate with MAFF to implement an agro-ecology programme to increase the use of drought resilience crops in the most drought prone provinces.
- 3.5. Carry out a national assessment study on adaptive capacity and resilience of the most vulnerable groups, including women, children, elderly people and people with disabilities.
- 3.6. Develop a national technical team comprising national focal points from relevant agencies and (i) evaluate post-drought economic, social and technical damage by the severe drought hazards at the national and subnational levels with comprehensive reports, and (ii) provide technical assistance and guidance to the severely impacted communities, especially women and children in urgent need of support.
- 3.7. Formulate and implement a community-based capacity building programme on drought adaptation measures including drought resilient crops, particularly those being implemented by relevant Ministries and institutions such as MAFF, WFP, MRD, and others with the aim of strengthening local farmers' resilience to water scarcity.

Output 4:

Coordination between relevant Ministries strengthened

Objective:

To build coordination and communication networks among line Ministries with the aim of strengthening and developing close cooperation between relevant sectors working on drought and water resources for implementing the National Action Plan on Drought Management and Adaptation.

Actions:

- 4.1. Develop and implement a national activity on communication and coordination networks through a Technical Working Group (TWG) on drought adaptation to strengthen the coordination between relevant Ministries and Departments in order to effectively address the slow onset and accumulative impact of drought on, inter alia, the environment, agriculture, energy and water, with consideration of vulnerable groups in society. The TWG is a collaborative cross-sectoral joint task force focused on drought management, comprising a diverse team of experts from various pertinent National Agencies including disaster management, agriculture, water resources, environment, waterborne navigation, and several others, working together to develop comprehensive strategies for effective drought response and resilience.
- 4.2. Organize regular coordination meetings with members of the National Drought Working Group to report on progress of the NAP-DMA and challenges encountered and discuss on possible solutions to the problems faced.

Output 5:

Capacity building on drought management and adaptation enhanced

Objective:

To build and enhance drought management and adaptation capacity, and institutional capability, including sophisticated technology, on drought forecasting and early warning system for the national relevant Ministries and Departments.

Actions:

- 5.1. Develop and implement national capacity-building programmes on drought risk assessment and drought early warning systems to support drought preparedness and drought management. All capacity-building programmes need to promote the participation and leadership of women, youths and persons with disabilities.
- 5.2. Initiate six-month on-the-job training programmes at the DEWS centre to enable young professionals from relevant Departments to learn and exchange their knowledge on advanced science, technology and innovations to improve national capacity to: (i) Prepare and respond to drought through the use of meteorological, hydrological and agricultural drought forecasts, leading to more effective risk assessment, monitoring and early warning, sound policy formulation for drought response and relief, appropriate early action, and promotion of resilience; and (ii) recover from recurrent and future drought through innovative risk financing opportunities.
- 5.3. Develop study tours to the ASEAN Member States and other regional drought-prone areas. The objective of such study tours would be to enable them to enhance national capacity as well as share lessons learnt from national best practices on drought forecasting and early warning, drought impact mitigation and adaptation measures.
- 5.4. Establish a regional learning forum platform dedicated to drought management and adaptation, aimed at fostering the exchange of best practices and innovative mitigation strategies among stakeholders in the Mekong region and ASEAN. This platform will serve as a collaborative hub for knowledge-sharing, facilitating effective responses to environmental challenges posed by drought.

4. Implementation Plan



Cambodian men use a net to catch fish in a nearly dried pond at a village in Kandal province
Photo Credits: Tang Chhin Sothy
Source: www.gettyimages.com

This chapter presents the implementation framework for the National Action Plan on Drought Management and Adaptation (NAP-DMA), outlining the Planning Phase which consist of institutional arrangements, and resource mobilization and communication and coordination mechanism necessary for effective execution. Furthermore, this chapter also addresses the Implementation phase which consists of an implementation schedule and mechanism and proposed system for Monitoring, evaluation and reporting.

Recognizing the complex nature of drought-related interventions, this report is also highlighting the potential risks that may hinder implementation and emphasizes the importance of proactive risk management. A more detailed analysis of these potential risks and corresponding mitigation measures is provided in **Annex 4**.

4.1. Planning phase

The planning phase is the most important phase of the NAP-DMA during which the institutional arrangement, resource mobilization, and communication and coordination network will need to be properly set up before the process of the national action plan can get started.

4.1.1. Institutional arrangement

The establishment of the Technical Working Group (TWG) comprising inter-institutional representatives for the implementation, facilitation, coordination, and monitoring and evaluation of the National Action Plan will be formulated during the planning phase with roles and responsibilities detailed in section 4.2.2 to support the Drought Unit.

4.1.2. Resource mobilization

Resource mobilization includes the focal points of MOWRAM, NCDM, and other key Ministries and Departments, and financial and material resources. The financial resources are the key element for the National Action Plan on Drought Management and Adaptation (NAP-DMA) to be fully and effectively implemented with great success. Thus, all levels of funding sources, including national, regional and international sources, are essential. These sources need to be financially secure, institutionally capable and materially adequate for ensuring successful implementation of NAP-DMA.

4.1.3. Communication and coordination mechanism

As the Technical Working Group from all relevant Government entities play a vital role in joint implementation of NAP-DMA, a strong and effective communication and coordination network under TWG needs to be established to implement NAP-DMA, concurrently with the institutional arrangement and resource mobilization. A key focal person or coordinator is required to lead the activities and facilitate the coordination process.

4.2. Implementation phase

4.2.1. Implementation Schedule




The implementation phase shall immediately begin upon completion of the preparation or planning phase. All key personnel, stakeholders and partners will act according to the roles and responsibilities developed and agreed during the institutional arrangement process. An indicative workplan and timeline for implementation is displayed in table below.

Table 3. Workplan and timeline

Output/Action	2025	2026	2027	2028	2029	2030
1. Drought Risk Data Collection and Communication Network Developed and Operationalized						
1.1. Develop and operate a national real-time drought risk data collection from the drought risk areas through mobile application or the existing mobile program to support the drought early warning and water resources allocation planning.						
1.2. Build connection between the National Committee on Disaster Management (NCDM) with all levels (national, provincial, district and commune) and the Drought Early Warning System centre and enable the communication channel from the commune level to the DEWS centre.						
1.3. Formulate a robust and detailed implementation plan for data collection and analysis and carry out a nationwide data update aimed at enhancing the drought risk assessment for Cambodia upon the conclusion of the NAP-DAM Phase-I (2025-2030).						
2. Drought Early Warning System (DEWS) Formulated and Operationalized						
2.1. Carry out assessment study on the existing drought monitoring, forecasting and early warning system currently being adopted by relevant national agencies and identify the main responsibilities of the agencies with their existing drought monitoring, forecasting, or early warning activities.						
2.2. Develop and implement a national standardized Drought Early Warning System and activity which consists of the following component (a) weekly drought monitoring, (b) weekly and monthly drought forecasting, (c) seasonal outlook, and (d) early warning system, and (e) weekly drought bulletin.						
2.3. Collaborate with regional organizations such as MRC and ADPC to enhance drought monitoring and forecasting system by utilizing existing projects or initiating joint projects, such as MRC-DPC's Regional Hydrological Extreme Assessment System (RHEAS), which includes crop yield estimates, and the MRC-ADPC's Mekong-Reservoir Assessment Tools (RAT).						

Output/Action	2025	2026	2027	2028	2029	2030
3. Drought Adaptation and Response Actions Formulated and Implemented						
3.1. Carry out a pilot project on drought adaptation and mitigation with participation by local farmers and vulnerable groups for the 3 most drought prone provinces by using the recommended drought adaptation measures of the MRC's DAG document.						
3.2. Formulate a 10-year Drought Risk Reduction and Adaptation Guidelines and Action Plan taking into account lessons learnt from the pilot project aiming to build adaptive capacity and strengthen drought resilience for vulnerable communities.						
3.3. Develop and implement a drought adaptation programme utilizing nature-base solutions for small scaled water infrastructures including rehabilitation of agricultural ponds, artificial lining for small and medium sized agricultural ponds for community-based rain water harvesting, and interconnecting natural water resources system to improve agricultural irrigation and fisheries production in rural communities.						
3.4. Closely coordinate with MAFF to implement an agro-ecology programme to increase the use of drought resilient crops in the most drought prone provinces.						
3.5. Carry out a national assessment study on adaptive capacity and resilience of the most vulnerable groups, including women, children, elderly people and people with disabilities.						
3.6. Develop a national technical team comprising national focal points from relevant agencies and (i) evaluate post-drought economic, social and technical damage by the severe drought hazards at the national and subnational levels with comprehensive reports, and (ii) provide technical assistance and guidance to the severely impacted communities, especially women and children in urgent need of support.						
3.7. Formulate and implement a community-based capacity building programme on drought adaptation measures including drought resilient crops, particularly those being implemented by relevant Ministries and institutions such as MAFF, WFP, MRD, and others with the aim of strengthening local farmers' resilience to water scarcity.						
4. Strengthening Coordination Between Relevant Ministries Strengthened						
4.1. Develop and implement a national activity on communication and coordination networks through a Technical Working Group on drought adaptation to strengthen the coordination between relevant Ministries and Departments in order to effectively address the slow onset and accumulative impact of drought on, inter alia, the environment, agriculture, energy and water, under consideration of gender aspects.						
4.2. Organize regular coordination meetings with members of the Technical Working Group to report on progress of the NAP-DMA and challenges encountered, and discuss on possible solutions to the problems faced.						

Output/Action	2025	2026	2027	2028	2029	2030
5. Capacity Building on Drought Management and Adaptation						
5.1. Develop and implement national capacity-building programmes on risk assessment and drought early warning systems to support drought preparedness and drought management. All capacity-building programmes need to promote the participation and leadership of women, youths and persons with disabilities.						
5.2. Initiate six-month on-the-job training programmes at the DEWS centre to enable young professionals from relevant Departments to learn and exchange their knowledge on advanced science, technology and innovations to improve national capacity to: (i) Prepare and respond to drought through the use of meteorological, hydrological and agricultural drought forecasts, leading to more effective risk assessment, monitoring and early warning, sound policy formulation for drought response and relief, appropriate early action, and promotion of resilience; and (ii) recover from recurrent and future drought through innovative risk financing opportunities.						
5.3. Develop study tours to the ASEAN Member States and other regional drought-prone areas. The objective of such study tours would be to enable them to enhance national capacity as well as share lessons learnt from national best practices on drought forecasting and early warning, drought impact mitigation and adaptation measures.						
5.4. Establish a regional learning forum platform dedicated to drought management and adaptation, aimed at fostering the exchange of best practices and innovative mitigation strategies among stakeholders in the Mekong region and ASEAN.						

-  Activity Progress
-  Output Progress
-  Milestone

4.2.2. Implementation Mechanism

a) Implementation structure

MOWRAM will act as the leading Ministry for the action plan implementation who will coordinate with other line Ministries and Departments for consultation workshops, capacity buildings, and study exchanges. The drought unit, who are the main implementers of the 5-year national action plan of drought management and adaptation, will be working under the authority of MOWRAM. The implementation structure of the national action plan is summarized in the figure below.

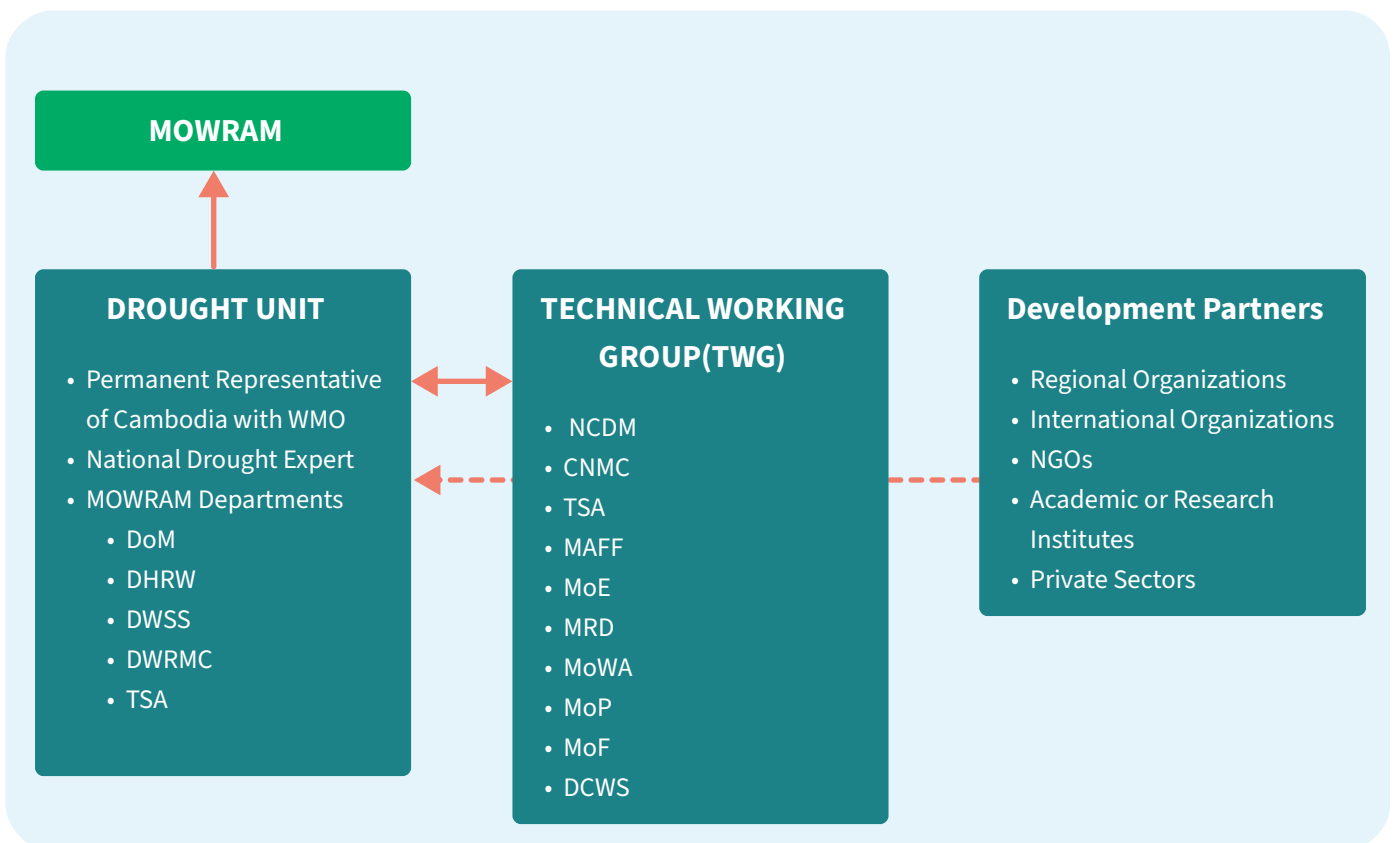


Figure 9. Overall National Action Plan implementation structure

b) Roles and responsibilities

The National Action Plan on Drought Management and Adaptation (NAP-DMA) for 2025-2030 is managed and executed by the Drought Unit under MOWRAM and will be financially supported by Development Partners. MOWRAM will coordinate with the potential Development Partners for fund raising and the action plan is implemented by this ministry who plays a significant role in coordinating with all relevant line Ministries and Departments as participating stakeholders as well as Technical Working Group (TWG).

- MOWRAM is responsible for coordinating with relevant line Ministries and Departments and providing technical and managerial review and approval on the action plan activities to ensure smooth and effective implementation of the national action plan with active participation of all related stakeholders and a fully technical contribution by the TWG. The Ministry is in charge of issuing official invitations and necessary notification to the stakeholders to participate in the proposed actions and events.
- Drought Unit is the main body of the action plan who is responsible for managing and implementing the national action plan through consultative approach with the Technical Working Group from different relevant Ministries and Departments. The Drought Unit consists of the Permanent Representative of Cambodia with WMO, Representatives of some Departments from MOWRAM, and Drought Consultants.
- Technical Working Group (TWG) is responsible for providing technical review and recommendations on certain documents through participating consultation workshops and communication channel and report to their own General Department and Ministry on the progress and achievements made for the implementation of NAP-DAM. The Technical Working Group should establish a leadership structure responsible for final decision-making. This can be initiated by MOWRAM first as leading agency, then this leadership role could be rotated on a regular basis. The TWG consists of Representatives from relevant Ministries and Departments working with water resources and drought management including:
 - National Committee for Disaster Management (NCDM)
 - Cambodia National Mekong Committee (CNMC)
 - Tonle Sap Authority (TSA)
 - Ministry of Agriculture, Forestry and Fisheries (MAFF)
 - Ministry of Environment (MoE)
 - Ministry of Rural Development (MRD)
 - Ministry of Women Affairs (MoWA)
 - Ministry of Planning (MoP)
 - Ministry of Economy and Finance (MEF)

The Technical Working Group will be officially established by the MOWRAM Minister's Decision "Sechkdey Samrech", and is composed of Chair (Permanent Representative of Cambodia to WMO), three Vice Chairs who are Office level from MOWRAM, NCDM and MAFF, and Members who are Representatives from the Line ministries above.

- NCDM and PCDM are responsible for collecting drought conditions and impacts from districts and commune levels of Cambodia and exchange with the Drought Team for verification on drought condition monitoring and forecasting.

4.3 Monitoring, Reporting and Evaluation

A monitoring, reporting and evaluation mechanism for the implementation of NAP-DMA will cover the following procedures:

a) Annual reporting

An annual report on the progress of activities and outputs of NAP-DMA will be prepared by the Drought Unit through coordination with the donors. The report will be submitted to the donors for review and approval.

b) Mid-term review

A mid-term review is proposed to be carried out during the third year of the implementation of NAP-DMA. It will report the progress and impacts of the implementation against the indicators of the national action plan. Challenges encountered during the first-half period of implementation and recommended solutions will be addressed in the mid-term review report. The report will be prepared by the Drought Unit through coordination with the donors.

c) Final evaluation

A final evaluation report will be carried out by the end of the implementation period. It will detail the overall outcomes against the set indicators. It is a mandatory task required by the Development Partners of the National Action Plan on Drought Management and Adaptation. This final evaluation report may be carried out the National Drought Consultant through coordination with the donors.

5. Budget Plan



Dried up river bed
Photo Credits: Markus Spiske
Source: www.unsplash.com

The total budget estimated for all 5 outputs is **US\$16,716,630.00** for 6 years implementation including 5% for contingency, as well as the operational cost for two years upon completion of the project. Below is list of detailed estimated cost per action.

In the initial phase of the NAP-DMA implementation, spanning from 2025 to 2030, MOWRAM will contribute in-kind by leveraging its own resources from relevant departments. However, to ensure long-term sustainability, MOWRAM is strategically planning to transition towards self-financing by integrating the NAP-DMA budget into the Ministry's Annual Budget.

Table 4. Estimated cost by actions

Output	Action	Estimated Cost (US\$)
Output 1		3,522,600.00
	Action 1.1	308,000.00
	Action 1.2	189,600.00
	Action 1.3	3,025,000.00
Output 2		1,479,200.00
	Action 2.1	191,600.00
	Action 2.2	1,237,600.00
	Action 2.3	50,000
Output 3		9,978,800.00
	Action 3.1	900,000.00
	Action 3.2	399,200.00
	Action 3.3	4,500,000.00
	Action 3.4	2,500,000.00
	Action 3.5	304,600.00
	Action 3.6	125,000.00
	Action 3.7	1,250,000.00
Output 4		82,000.00
	Action 4.1	32,000.00
	Action 4.1	50,000.00
Output 5		368,000.00
	Action 5.1	60,000.00
	Action 5.2	180,000.00
	Action 5.3	128,000.00
Others		1,336,030.00
	Audit	300,000.00
	Operation Cost	240,000.00
	Contingency (5%)	798,530.00
	TOTAL	16,769,130.00

Percentage of the estimated cost per output is displayed in the graph below:

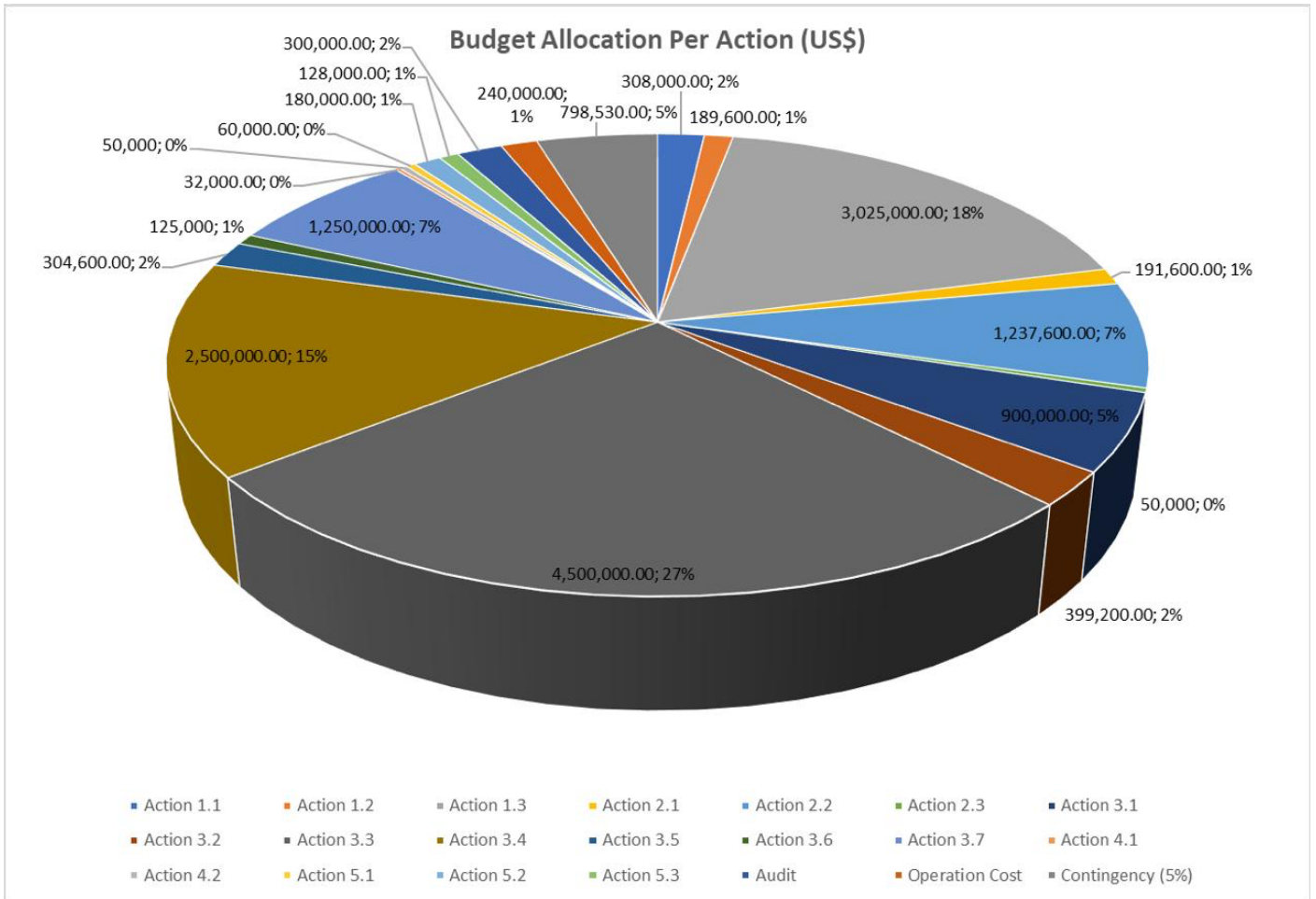


Figure 10. Percentage of Estimated Budget for Each Action

6. Conclusion and Next Steps



Dried river bed: The Mekong river is very low at the end of the dry season.
Prek Ta Am Village; Bos Leary Commune; Jit Borey district

Photo Credits: Arantxa Cedillo

Source: UNDP Cambodia

The National Action Plan on Drought Management and Adaptation is the first strategic document formulated for Cambodia. The action plan is well in line with the The ASEAN Regional Plan of Action for Adaptation to Drought 2021-2025 and reflects well the MRC Drought Adaptation Guidelines 2024 to implement sustainable management of drought by (a) developing a national drought early warning system, (b) developing a drought risk data collection mechanism, (c) implementing drought adaptation measures, (d) carrying out response and recovery, (e) strengthening coordination between relevant agencies, and (f) building national capacity and institutional capability to better manage and adapt to drought. It also creates a chance for Cambodia to adopt national drought management and adaptation policy to start formulating its national strategic actions, contributing to the operationalisation of the NAP-DMA.

While drought impacts occur across multiple sectors, the effectiveness and efficiency of NAP-DMA implementation will rely largely on the coordination role of MOWRAM with all line Ministries through the Technical Working Group, which will need close communication and cooperation among the TWG members when implementing the national action plan.

The availability data for drought risk assessment in Cambodia is still limited which need to be enhanced and made available for further improvement. Drought risk shall be updated every 10 years when drought conditions and other involved indicators change due to the changes of climate and socioeconomic status of the country.

Through implementation of this NAP-DMA, Cambodia will have an effective Drought Early Warning System (DEWS) consisting of monitoring, forecasting and early warning services with a robust network of drought risk data collection from the drought impacted areas nationwide.

A national capacity and institutional capability will be enhanced and developed on drought risk assessment, drought forecasting and early warning, drought early preparedness and planning, and drought adaptation measures. New national policies on drought adaptations, and a national activity on strengthening the cooperation and utilization of the existing emergency food reserve mechanism to mitigate the impact of drought on food security across the nation will also be developed and implemented.

MOWRAM is actively seeking financial and technical support from development partners, including WMO, UNDP, the World Bank, and others, to facilitate the implementation of the NAP-DMA.

References

1. ASEAN (2021). ASEAN regional plan of action for adaptation to drought 2021–2025.
1. Bargaoui, K. (2021). Methodology for drought hazard: Assessment, modelling, and mapping for Georgia. UNDP.
1. Carrao, H., Van Lanen, H. A. J., & Naumann, G. (2016). Mapping global patterns of drought risk: An empirical framework based on sub-national estimates of hazard, exposure, and vulnerability. *Global Environmental Change*, 39, 109–124. <https://doi.org/10.1016/j.gloenvcha.2016.05.002>
1. European Commission (2018). JRC technical report: Drought risk assessment and management.
1. European Drought Observatory (2019). EDO indicator factsheet: Combined drought indicator (CDI).
1. Heng An, L. (2014). *Country Report of Cambodia Disaster Management*. Retrieved from https://www.adrc.asia/countryreport/KHM/2013/KHM_CR2013B.pdf
1. Jürgen, B., & Thomas, M. (2018). Drought risk assessment and management: A conceptual framework. European Commission.
1. Ministry of Environment (2016). Climate change action plan 2016–2018.
1. Mekong River Commission (2024). Drought adaptation guidelines for the Lower Mekong Basin.
1. Naumann, G., Rojas, R., & Cammalleri, C. (2014). Exploring drought vulnerability in Africa: An indicator-based analysis to be used in early warning systems. *Global and Planetary Change*, 123, 66–81. <https://doi.org/10.1016/j.gloplacha.2014.09.007>
1. NCDM & UNDP. (2014). *End User Manual of the Cambodia Disaster Loss and Damage Database (CamDi)*.
1. Nong, M. .. (2021). *The Impacts of Climate Change on Agriculture and Water Resources in Cambodia: From Local Communities' Perspectives*. Retrieved from ResearchGate: https://www.researchgate.net/publication/354372115_The_Impacts_of_Climate_Change_on_Agriculture_and_Water_Resources_in_Cambodia_From_Local_Communities'_Perspectives
1. UNDP. (2019). *Drought Planning Cambodia*. Retrieved from UNCCD: https://www.unccd.int/sites/default/files/country_profile_documents/1%2520FINAL_NDP_Cambodia%255B1157%255D.pdf
1. WB and ADB (2021). Climate risk profile: Cambodia (2021).
1. WFP (2024). Cambodia country strategic plan (2024–2028).

7. Annexes

Annex 1: Drought Risk Assessment

Methodology

The assessment of exposure and vulnerability requires a diverse array of data types. The absence of such data can significantly restrict the level of complexity a country can apply to numerical computations. To address this challenge, the European Commission's Joint Research Centre (JRC) recommends a cascading approach, transitioning from a data-rich environment to a data-poor environment, enabling countries to select the most suitable methodology based on the availability of data, quality, geographic coverage, and duration².

Drought risk is characterized by an interaction between three key factors: (1) the severity and likelihood of drought occurrence, (2) the assets and/or people exposed to drought, and (3) the vulnerability or capacity to mitigate the effects of drought hazards³.

Drought risk can be assessed through the following equation:

$$\text{Drought Risk} = f(\text{Hazard}, \text{Exposure}, \text{Vulnerability})$$

Where:

Drought hazard is defined by “the frequency of occurrence of drought at various levels of intensity and duration. The return period of a drought is related to the severity of the impacts therefore provide vital information for drought risk management”⁴.

Exposure is defined as the situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas. Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability and capacity of the exposed elements to any hazard to estimate the quantitative risks associated with that hazard in interest.

Vulnerability is defined as the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.

² European Commission 2018. “JRC Technical Report: Drought Risk Assessment and Management”. Available at: <https://publications.jrc.ec.europa.eu/repository/handle/JRC113937>

³ MRC, 2024. “Drought Adaptation Guidelines for the Lower Mekong Basin”.

⁴ Karim Bargaoui, 2021. *Methodology for Drought Hazard: Assessment, Modelling, and Mapping for Georgia*. UNDP 2021.

a) Hazard

Hazard here is the drought frequency that took place in the past tense. Based on the availability of the data, two main drought indicators including meteorological and agricultural indicators are used to assess the drought hazard. The combined drought indicator/index is the overall drought indicator used to quantify drought hazard for Cambodia.

- **Meteorological indicator:** The standardized Precipitation Index (SPI) is the main indicator for meteorological drought assessment for this study. Historical rainfall data from both the ground stations and CHIRPS satellite from 1981 to 2023 are used to calculate SPI. And the last 24 years of SPI from 2000 to 2023 are selected for drought hazard assessment to be consistent with the agricultural indicator.
- **Agricultural indicator:** The Normalized Different Vegetation Index (NDVI) data from the MODIS for the period covering 2000 to 2023 are used to calculate agricultural indicator and NDVI anomaly is processed to quantify drought severity.
- **Combined drought Index:** The Combined Drought Index (CDI) was developed by Sepulcre-Canto et al. (2012) and is obtained by combing three main drought indicators including the Standardized Precipitation Index (SPI), the Soil Moisture Anomaly (SMA), and the FAPAR Anomaly. It is a drought index used to identify areas affected by agricultural drought and the areas with potential to be affected by agricultural drought⁵. In this assessment study, CDI is derived by combing the two main indicators, SPI and NDVI.
- **Drought frequency (hazard):** Drought frequency is calculated based on CDI values from 2000 to 2023. The CDI value smaller or equal to -1 is considered drought. When drought occurs from 1 to 2 times during the 24 years, it is considered moderate frequent drought, from 3 to 5 times it is considered severe frequent drought, and from 6 to 11 times considered extreme frequent drought.

Table 5. Drought frequency and severity level

Drought Occurrence (Times)	Severity Level	Weighting Value
0	No drought	1
1-2	Moderate	2
3-5	Severe	3
6-11	Extreme	4

⁵ European Drought Observatory. 2019. EDO Indicator Factsheet: Combined Drought Indicator (CDI)

b) Exposure

Drought, as a slow-onset hazard, has distinct characteristics when it comes to exposure, unlike other hazards like floods, earthquakes, or storms. While droughts rarely result in recorded fatalities, as documented in international disaster databases, they often have significant and far-reaching economic and social consequences. (Carrao et al, 2016)⁶.

This drought risk assessment proposes a non-compensatory model of drought exposure to estimate the potential losses from different types of droughts which takes into account the spatial distribution of population, cropping areas, and water stress. The cropping area represents agricultural drought, industrial/domestic water stress refers to hydrological drought, while human population defines socio-economic drought.

- **Human population per square kilometre:**

The high-resolution geospatial data of population in 2020 by the WorldPop Hub with 1km resolution is used to define exposure level to drought in the Lower Mekong Basin. The exposure levels are defined per number of people in a square kilometre.

Table 6. Population and exposure level

Number of people/km ²	Exposure level	Weighting Value
0-5	Mild	1
6-10	Moderate	2
11-20	Severe	3
>20	Extreme	4

⁶ Carrao et al, 2016. *Mapping global patterns of drought risk: An empirical framework based on sub-national estimates of hazard, exposure and vulnerability*. Available at: <https://www.sciencedirect.com/science/article/pii/S0959378016300565>

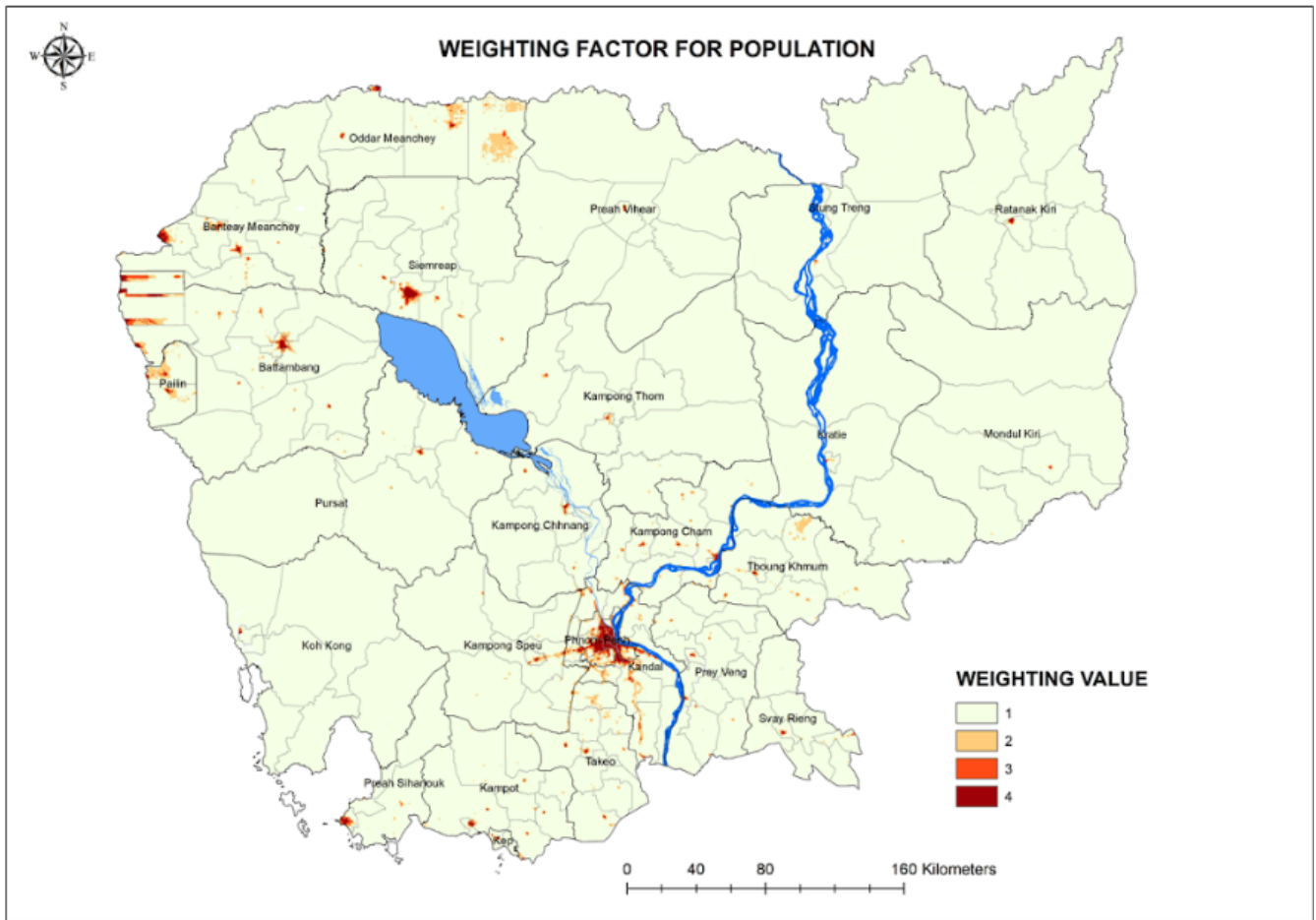


Figure 11. Weighting factor for population (MOWRAM, 2024)

- **Land cover/land use**

The exposure levels are defined by the impact of drought on each specific land use type which would affect economic value. The higher economic value a land use type brings, the more severe is the exposure level. Land cover 2023 map produced by the Asian Disaster Preparedness Center (ADPC) is used to identify land use types in Cambodia. A combination of Landsat satellites 5,7,8, and 9 is used to interpret the land covers of the whole Cambodia from June 2023 to June 2024. There are 15 classes of land use types being adopted for the landcover data. Exposure levels and weighting factor values are properly analysed and presented in the table below.

Table 7. Landcover types and exposure level

No.	Land cover/land use type	Code	Exposure level	Weighting Value
1	Waterbody	4	Mild	1
2	Wetland	11	Mild	1
3	Shrubland	5	Mild	1
4	Deciduous forest	10	Mild	1
5	Evergreen forest	9	Mild	1
6	Semi-evergreen forest	14	Mild	1
7	Flooded forest	13	Mild	1
8	Other plantations	3	Mild	1
9	Grass land	8	Mild	1
10	Mangrove	2	Moderate	2
11	Rubber plantation	12	Moderate	2
12	Built-up area	1	Severe	3
13	Village	15	Severe	3
14	Cropland	7	Extreme	4
15	Rice	6	Extreme	4

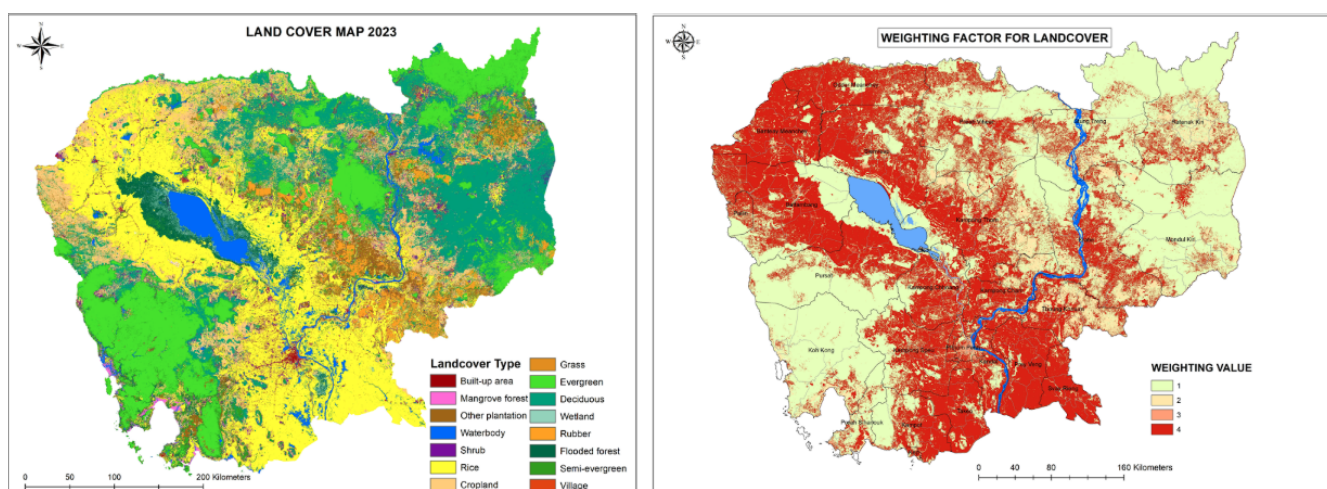


Figure 12. Maps of land cover 2023 (left) and its weighting factor (right) (MOWRAM, 2024)

c) Vulnerability

Drought vulnerability is measured by a multidimensional model including social, economic and infrastructural factors. Social vulnerability is related to how well individuals, communities, and societies are doing. Economic vulnerability is closely tied to the economic status of individuals, communities, and countries. Infrastructural vulnerability is about the basic things people need to produce goods and sustain their way of life.

The UNISDR (2004) framework states that vulnerability is a reflection of the current state of social, economic, and infrastructural factors in a specific area. Factors that help reduce the risk of crops being affected by droughts, such as irrigation systems and access to water, are also important for adapting to these hazards. These factors can be considered part of the overall vulnerability of a region (Naumann et al, 2014).

In this risk assessment, two indicators are selected for vulnerability assessment, namely, groundwater potential and irrigation areas with surface water and reservoirs. The irrigated areas, surface water or reservoirs are considered less vulnerable to drought hazard as the agricultural crops can easily be supplied by the connected irrigation channel. While the non-irrigated areas are more vulnerable to drought.

- **Groundwater potential**

Groundwater potential produced by MRC in 2001 is used to quantify groundwater extraction rate in Cambodia. The less groundwater rate an area has, the higher is the level of vulnerability for that area.

Table 8. Groundwater rate and vulnerability level

Groundwater rate	Level of vulnerability	Weighting Value
>20cu.m/hr	Mild	1
10-20 cu.m/hr	Moderate	2
3-10 cu.m/hr	Severe	3
<3 cu.m/hr	Extreme	4

- **Surface water and irrigation area**

Surface water and irrigation areas 2020 from the National Irrigation Database of Cambodia are used to identify the areas with adaptive capacity or vulnerability level. The irrigated areas are the least vulnerable while the non-irrigated areas are the most vulnerable.

⁷ Naumann et al, 2014. Exploring drought vulnerability in Africa: an indicator-based analysis to be used in early warning systems. Available at: <https://hess.copernicus.org/articles/18/1591/2014/>

Table 9. Surface water and irrigated area and vulnerability level

Type of Area	Level of vulnerability	Weighting Value
Surface water	No drought	1
Irrigated area in dry season	Mild	2
Irrigated area in wet season	Moderate	3
None-irrigated area	Extreme	4

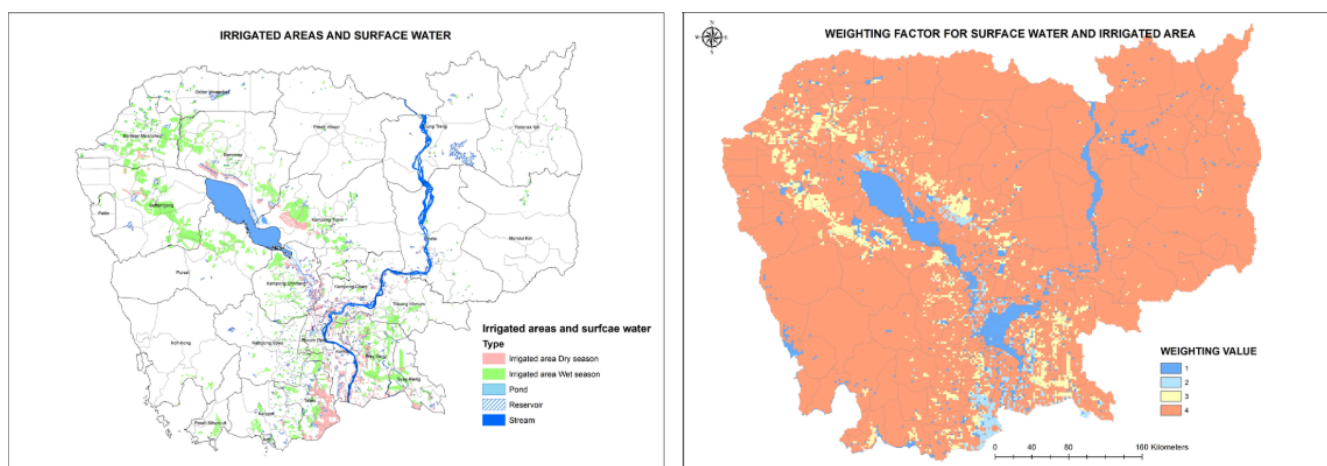


Figure 13. Map of surface water and irrigated areas (left) and the weighting factor (right) (MOWRAM, 2024)

Below is a summary table of drought risk analysis adapted from Van Lanen et al. (2017)⁸

DROUGHT RISK COMPUTATION

Drought risk equation can be computed by any GIS software that is capable of performing the pixel calculation function. In this exercise we use ArcGIS’s ArcToolbox to calculate drought risk based on the abovementioned equation. Drought risk can be computed by the following method:

$$\text{Risk} = \text{hazard} \times \frac{(\text{pop} + \text{landcover})}{2} \times \frac{(\text{groundwpot} + \text{irrigateda})}{2}$$

Where *pop* is population factor, *landcover* is land cover factor, *groundwpot* is groundwater potential factor, and *irrigateda* is irrigated area factor.

The actual values of drought risk for the assessment are listed in the table below:

⁸ Van Lanen et al. (2017). Climatological Risk: Droughts. July 2017

Table 10. Drought risk classifications

Risk Level	Value
Mild/no risk	0-8
Moderate	8.01-16
Severe	16.01-24
Extreme	24.01-36

Note: In this model, adding more parameters or factors under the three main indicators—hazard, exposure, and vulnerability—results in a more detailed drought risk pattern. However, removing one or two parameters may not significantly affect the overall results. The maximum drought risk value in this exercise is 36. If additional parameters are included, the maximum risk value could increase to 64.

Level of drought risk can be visualised through the following combination of the three indicators:

Indicator	RISK															
	Mild		Moderate				Severe				Extreme					
Hazard	Mild	Mild	Mild	Mild	Mod	Mod	Mod	Mod	Sev	Sev	Sev	Sev	Ext	Ext	Ext	Ext
Exposure	Mild	Mild	Mod	Mod	Mild	Mod	Sev	Sev	Mod	Sev	Ext	Ext	Sev	Sev	Ext	Ext
Vulnerability	Mild	Mod	Mild	Mod	Mod	Mod	Mod	Sev	Sev	Sev	Sev	Ext	Sev	Ext	Sev	Ext

While Mod = moderate, Sev = severe, and Ext = extreme.

Annex 2: Drought related Projects Implemented by International Organizations and NGOs

Project	Implementing Agencies	Duration	Focus
Cambodia Climate Change Alliance (CCCA)	Ministry of Environment (MoE), UNDP, European Union	Phase I (2010–2015), Phase II (2016–2019), Phase III (2020–2024)	Strengthening institutional capacity, policy development, and community-based adaptation to climate change, including drought resilience.
Promoting Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia	Ministry of Agriculture, Forestry and Fisheries (MAFF), UNDP, Green Climate Fund (GCF)	2020–2025	Improving water infrastructure, promoting drought-resistant crops, and strengthening community-based adaptation.
Disaster Risk Reduction and Climate Change Adaptation in Rural Cambodia	National Committee for Disaster Management (NCDM), NGOs, and development partners	Ongoing since 2015	Building community resilience to droughts and other climate-related disasters.
Tonle Sap Sustainable Water Management Project	Ministry of Water Resources and Meteorology (MOWRAM), World Bank	2020–2025	Improving water resources management in the Tonle Sap Basin, including drought mitigation and sustainable irrigation.
Oxfam’s Drought Resilience Program	Oxfam, local communities	Ongoing since 2016	Community-based water management, drought-resistant crops, and capacity building for farmers.
ActionAid Cambodia’s Climate-Resilient Agriculture Initiatives	ActionAid Cambodia	Ongoing since 2018	Empowering smallholder farmers to adopt drought-resistant farming practices and improve water management.
Climate Risk and Early Warning Systems (CREWS)	WMO, UNDRR, WB/ GRDRR in collaboration with Ministry of Water Resources and Meteorology (MOWRAM)	2019–2023 (extended)	Establishing risk-informed early warning services and increasing access to early warning systems.

Project	Implementing Agencies	Duration	Focus
Drought Management Activity	Mekong River Commission Secretariat (MRCS) in collaboration with the Cambodia National Mekong Committee (CNMC)	2010–present	Monitoring and forecasting drought and building national and regional capacity on drought management.
ASEAN Agreement on Disaster Management and Emergency Response (AADMER)	ASEAN, Cambodian government	Ongoing since 2009	Regional efforts to enhance disaster risk reduction, including drought management.
Mekong-Lancang Cooperation (MLC)	Mekong countries, including Cambodia	Ongoing since 2016	Water resources management and drought mitigation in the Mekong River Basin.

Annex 3: Logical framework for NAP-DMA 2025-2030

Output & Objective	Actions	Indicators	Risks and Assumptions
<p>Output 1: Drought risk data collection and communication network developed and operationalized</p> <p>Objective: To develop a national drought risk data collection and communication network between the national and local communities and collect near-real time information on drought conditions nationwide to support the drought early warning system and water allocation planning at the national level through a mobile communication channel or application</p>	<p>1.1. Develop and operate a national real-time drought risk data collection from the drought risk areas through mobile application or the existing mobile program to support the drought early warning</p>	<ul style="list-style-type: none"> • National real-time drought risk data collection and communication network developed and operational. • At least 80% of daily drought risk and impact from local communities during drought period collected through mobile application. 	<p>Risks:</p> <ul style="list-style-type: none"> • Less than half the population of local communities or stakeholders adopt the mobile application due to lack of awareness, training, or trust in the technology. • Limited participation from the local communities and their limited willingness to participate regularly and sustainably. <p>Assumptions:</p> <ul style="list-style-type: none"> • Awareness building, and technical instruction will be provided to the local communities to enhance their continuous participation and support.
	<p>1.2. Build connection between the National Committee for Disaster Management (NCDM) at all levels (national, provincial, district and commune) with the Drought Early Warning System (DEWS) centre and enable the communication channel from the commune level to the DEWS centre.</p>	<ul style="list-style-type: none"> • Communication channel from the commune level to the DEWS centre sustainably operational and functional. • All collected daily drought risk and impact from the local communities during drought period shared with DEWS centre by NCDM. 	<p>Risks:</p> <ul style="list-style-type: none"> • Communication channel can be unsustainable due to technical or/and financial problems. • Difficulties in operating the mobile application due to inadequate infrastructure or internet connection, particularly in remote areas. <p>Assumptions:</p> <ul style="list-style-type: none"> • A good coordination is made between DEWS Centre and NCDM at different working levels on maintaining on-going operations and functions of the communication channel.

Output & Objective	Actions	Indicators	Risks and Assumptions
	<p>1.3. Formulate a robust and detailed implementation plan for data collection and analysis and carry out a nationwide data update aimed at enhancing the drought risk assessment for Cambodia upon the conclusion of the NAP-DAM Phase-I (2025-2030). This initiative might include assessing groundwater potential in rural areas and developing a comprehensive and/or updating the existing irrigation database through integrating all existing irrigation data from different line Ministries and Departments.</p>	<ul style="list-style-type: none"> • A robust and detailed implementation plan for data collection and analysis to support the update of drought risk assessment formulated and ready to be implemented. • 80-90% of groundwater potential dataset in Cambodia rural areas developed and the national irrigation database fully updated and available for the update of drought risk assessment. 	<p>Risks:</p> <ul style="list-style-type: none"> • Limitations regarding the availability and quality of existing data from various ministries and departments and in the ground. <p>Assumptions:</p> <ul style="list-style-type: none"> • A good cooperation is made between all relevant ministries, departments, and local authorities in providing access to existing data required and in collecting the newly required data for comprehensive analysis and integration.
<p>Output 2: Drought Early Warning System (DEWS) formulated and operationalized</p> <p>Objective: To develop a national Drought Early Warning System (DEWS) with end-to-end early warning services which consists of drought condition monitoring, forecasting and an early warning system, using advanced technology.</p>	<p>2.1. Carry out assessment study on the existing drought monitoring, forecasting and early warning system currently being adopted by relevant national agencies and identify the main responsibilities of the agencies with their existing drought monitoring, forecasting, or early warning activities.</p>	<ul style="list-style-type: none"> • All existing drought monitoring and forecasting system conducted by different water resources management agencies and their responsibilities assessed and recommendations for development of DEWS made available. 	<p>Risks:</p> <ul style="list-style-type: none"> • Limited financial resources may restrict the scope of the assessment or the implementation of subsequent recommendations based on the findings. • The agencies involved may possess limited technical expertise or resources to effectively participate in the assessment, resulting in incomplete evaluations or inadequate recommendations. <p>Assumptions:</p> <ul style="list-style-type: none"> • Funding resources are made available and secure for the assessment study on the existing drought monitoring, forecasting, and early warning system. • Training and support will be provided to enhance the technical expertise of involved agencies, ensuring comprehensive evaluations and actionable recommendations are achieved.

Output & Objective	Actions	Indicators	Risks and Assumptions
<p>Output 2: Drought Early Warning System (DEWS) formulated and operationalized</p> <p>Objective: To develop a national Drought Early Warning System (DEWS) with end-to-end early warning services which consists of drought condition monitoring, forecasting and an early warning system, using advanced technology.</p>	<p>2.2. Develop and implement a national standardized Drought Early Warning System and activity which consists of the following component (a) weekly drought monitoring, (b) weekly and monthly drought forecasting, (c) seasonal outlook, and (d) early warning system, and (e) weekly drought bulletin. An integration between the ground monitoring stations (hydro-meteorological and agricultural parameters) might be substantially needed to bring the monitoring and forecasting accuracy to high standard, while considering regional monitoring and forecasting systems from ASEAN and MRC as lesson learnt is significantly important.</p>	<ul style="list-style-type: none"> • Daily operation of the DEWS's national drought monitoring, forecasting, bulletin, and seasonal outlook under MOWRAM for public available by weekly and monthly basis. • Weekly/monthly forecast bulletin distributed with Line Ministries and Departments working on drought management for early drought analysis information and trends for the next coming seasons, 3-6 months. • The drought forecasting tools regularly updated to improve the quality of drought forecasting results. • Data from the ground monitoring stations including hydro-meteorology and soil moisture fully used and integrated with the drought monitoring, forecasting, and early warning work. • At least 90% of the Drought Unit staff capable in performing the weekly and monthly DEWS's drought monitoring, forecasting, and early warning work effectively. 	<p>Risks:</p> <ul style="list-style-type: none"> • A lack of trained personnel proficient in drought monitoring and forecasting, as well as in the interpretation of data from multiple sources, including regional systems from ASEAN and MRC may lead to unsuccessful forecasting results. • Limited funding could hinder development, maintenance, or expansion of the system and restrict necessary training for staff. • Insufficient engagement from key stakeholders, including local communities, government agencies, and private sector partners, which could undermine the uptake and effectiveness of early warning mechanisms. <p>Assumption:</p> <ul style="list-style-type: none"> • Technical personnel, drought forecasters, working on DEWS are well trained and are capable in handling with the data inputs from ASEAN and MRC drought forecasting works. • Funding resources are made available and secure for the development and maintenance of the system including capacity building of the staff. • A good collaborative approach among government agencies, local actors, and regional bodies is made, fostering a collective commitment to drought management. • Proactive engagement strategies will be developed to ensure active participation of key stakeholders for uptaking the forecasting and early warning results and participating in preparedness and response activities.

Output & Objective	Actions	Indicators	Risks and Assumptions
<p>Output 3: Drought Adaptation and Response Actions Formulated and Implemented.</p> <p>Objective: To reduce drought risk, mitigate impacts, and build adaptive capacity and resilience to local communities, particularly women and vulnerable groups</p>	<p>3.1. Carry out a pilot project on drought adaptation and mitigation for the 3 most drought prone provinces by using the recommended drought adaptation measures of the MRC's DAG document.</p>	<ul style="list-style-type: none"> • 3 pilot projects on drought adaptation in the 3 most drought prone provinces successfully conducted with effective results. 	<p>Risks:</p> <ul style="list-style-type: none"> • Inadequate involvement of local communities, stakeholders, or government entities may hinder project implementation and acceptance of the proposed measures. <p>Assumption:</p> <ul style="list-style-type: none"> • Proactive engagement strategies will be developed to ensure meaningful participation of local communities, stakeholders, and government entities throughout the entire process of the pilot projects.
	<p>3.2. Formulate a 10-year Drought Risk Reduction and Adaptation Guidelines and Action Plan taking into account lessons learnt from the pilot project aiming to build adaptive capacity and strengthen drought resilience for vulnerable communities.</p>	<ul style="list-style-type: none"> • A national drought risk reduction and adaptation guidelines for 10-year strategic period addressing all national and sub-national drought risks and vulnerabilities for all drought impacted sectors in Cambodia developed and endorsed by MOWRAM. • Drought adaptation options in the MRC's Drought Adaptation Guidelines reviewed and some are adopted in the national drought risk reduction and adaptation guidelines. • A comprehensive action plan on drought risk reduction and adaptation intervention planning successfully developed considering all drought impacted sectors aiming to build resilience to drought and minimize the risks for the impacted sectors and vulnerable communities including women and children. 	<p>Risks:</p> <ul style="list-style-type: none"> • Inadequate involvement of local communities, stakeholders, or government entities may hinder the development and implementation of the drought risk reduction and adaptation guidelines. <p>Assumption:</p> <ul style="list-style-type: none"> • Proactive engagement strategies will be developed to ensure meaningful participation of local communities, stakeholders, and government entities throughout the entire process of formulating and implementing the drought risk reduction and adaptation guidelines.

Output & Objective	Actions	Indicators	Risks and Assumptions
	<p>3.3. Develop and implement a drought adaptation programme utilizing nature-base solutions for small scaled water infrastructures including rehabilitation of agricultural ponds, artificial lining for small and medium sized agricultural ponds for community-based rain water harvesting, and interconnecting natural water resources system to improve agricultural irrigation and fisheries production in rural communities.</p>	<ul style="list-style-type: none"> • A comprehensive nature-base-solution drought adaptation programme developed. • Small scaled water infrastructure projects for drought adaptation including rehabilitation of agricultural ponds, artificial lining for small and medium sized agricultural ponds for community-based rain water harvesting, and interconnecting natural water resources system to improve agricultural irrigation and fisheries production in rural communities successfully conducted. 	<p>Risks:</p> <ul style="list-style-type: none"> • Inadequate involvement of local communities, stakeholders, or government entities may hinder project implementation and acceptance of the proposed measures. <p>Assumption:</p> <ul style="list-style-type: none"> • Local communities, government agencies, and other stakeholders will be supportive of and engaged in the pilot project, actively participating in planning and implementation through coordination support by MOWRAM's Drought Unit.
	<p>3.4. Closely coordinate with MAFF to implement an agro-ecology programme to increase use of drought resilient crops in the most drought prone provinces.</p>	<ul style="list-style-type: none"> • An agro-ecology programme developed and implemented through a good coordination with MAFF. 	<p>Risks:</p> <ul style="list-style-type: none"> • Convincing local farmers to adopt new drought resilient crops may be difficult due to fear, lack of awareness, or previous negative experiences, skewing the findings. <p>Assumption:</p> <ul style="list-style-type: none"> • Local farmers will be actively engaged in the agro-ecology programme and understand well the benefits of the drought resilience crops introduced by the Drought Unit.

Output & Objective	Actions	Indicators	Risks and Assumptions
	<p>3.5. Carry out a national assessment study on adaptive capacity and resilience of the most vulnerable groups, including women, children, elderly people and people with disabilities.</p>	<ul style="list-style-type: none"> Adaptive capacity and recovery ability to drought of the most vulnerable groups comprehensively assessed and studied and a comprehensive study report developed. 	<p>Risks:</p> <ul style="list-style-type: none"> Vulnerable groups may be difficult to reach or may not participate in the study due to fear, lack of awareness, or previous negative experiences, skewing the findings. The data collection methods are not carefully designed and implemented, leading to biases that misrepresent the needs and capacities of different groups. <p>Assumption:</p> <ul style="list-style-type: none"> Vulnerable groups will be actively engaged in the assessment, providing honest and accurate information about their circumstances and needs. The legitimacy and effectiveness of the assessment will be enhanced through a well prepared and carefully designed data collection method which include good collaboration techniques with local communities, civil society organizations, and relevant government agencies.
	<p>3.6. Develop a national technical team comprising national focal points from relevant agencies and (i) evaluate post-drought economic, social and technical damage by the severe drought hazards at the national and subnational levels with comprehensive reports, and (ii) provide technical assistance and guidance to the severely impacted communities, especially women and children in urgent need of support.</p>	<ul style="list-style-type: none"> A national technical team comprising representatives from different line Ministries and Departments formed. National economic losses by different drought impacted sectors for the most recent drought years, specifically 2015-2016 and 2019-2020, evaluated by the technical team with official acceptance by relevant line Ministries. 	<p>Risks:</p> <ul style="list-style-type: none"> Existing data on drought impacts for 2015-2016 and 2019-2020 may be insufficient and the quality is not acceptable for evaluation. <p>Assumption:</p> <ul style="list-style-type: none"> Necessary data on drought impacts for 2015-2016 and 2019-2020 are available and accessible and can be analyzed effectively for the evaluation. The evaluation process and the associated technical assistance efforts will be fully supported by relevant government institutions.

Output & Objective	Actions	Indicators	Risks and Assumptions
	<p>3.7. Formulate and implement a community-based capacity building programme on drought adaptation measures including drought resilient crops, particularly those being implemented by relevant Ministries and institutions such as MAFF, WFP, MRD, and others with the aim of strengthening local farmers' resilience to water scarcity.</p>	<ul style="list-style-type: none"> A community-based capacity building programme on drought adaptation measures developed and successfully implemented and at least 50% of local communities' adaptive capacity to drought impacts nationwide enhanced. 	<p>Risks:</p> <ul style="list-style-type: none"> Low engagement or interest from local farmers may hinder participation in the capacity-building program. <p>Assumption:</p> <ul style="list-style-type: none"> The capacity building programme has active participation by local farmers and drought resilient crops and new agricultural techniques are adopted.
<p>Output 4: Coordination between relevant Ministries strengthened.</p> <p>Objective: To build coordination and communication networks among line Ministries with the aim of strengthening and developing close cooperation between relevant sectors working on drought and water resources for implementing the National Action Plan on Drought Management and Adaptation</p>	<p>4.1. Develop Technical Working Group for implementing the Drought Management Action Plan with agreed institutional mechanism and coordination.</p>	<ul style="list-style-type: none"> Technical Working Group composed of relevant line ministries established with institutional mechanism, roles and coordination process in place. 	<p>Risks:</p> <ul style="list-style-type: none"> The Technical Working Group members might have limited skill in communication and coordination works, leading to poor communication and ineffective results. <p>Assumptions:</p> <ul style="list-style-type: none"> Communication and coordination knowledge and skill of the Technical Working Group members are significantly improved through capacity building and strengthening activities.
	<p>4.2. Organize regular coordination meetings with members of the Technical Working Group to report on progress, make any improvement required, and address any issue and challenge faced.</p>	<ul style="list-style-type: none"> Regular coordination meetings taken place at least once a month, with reporting, and implementation of actions identified. 	<p>Risks:</p> <ul style="list-style-type: none"> Coordination meetings may not take place regularly due to limited time and budget. <p>Assumptions:</p> <ul style="list-style-type: none"> Sufficient budget will be planned and allocated to ensure regular coordination meetings. A good communication and coordination is well facilitated through the Coordinator of the Technical Working Group to ensure a smooth coordination work of all activities.

Output & Objective	Actions	Indicators	Risks and Assumptions
<p>Output 5: Capacity building on drought management and adaptation enhanced.</p> <p>Objective: To build and enhance drought management and adaptation capacity, and institutional capability, including sophisticated technology, on drought forecasting and early warning system for the national relevant Ministries and Departments.</p>	<p>5.1. Develop and implement national capacity-building programmes on drought risk assessment and drought early warning systems to support drought preparedness and drought management. All capacity-building programmes need to promote the participation and leadership of women, youths and persons with disabilities.</p>	<ul style="list-style-type: none"> Capacity need assessment on drought management, drought risk assessment, and early warning system conducted and capacity development plan developed. A minimum of 70 Government Officials from different line Ministries and Departments are trained on drought management, drought risk assessment, and drought early warning system. 	<p>Risks:</p> <ul style="list-style-type: none"> Limited budget could be a challenge to implement the training programme. <p>Assumptions:</p> <ul style="list-style-type: none"> Funding resources are made available and secure for the need assessment and capacity building programme.
	<p>5.2. Initiate six-month on-the-job training programmes at the DEWS centre to enable young professionals from relevant Departments to learn and exchange their knowledge on advanced science, technology and innovations to improve national capacity to: (i) Prepare and respond to drought through the use of meteorological, hydrological and agricultural drought forecasts, leading to more effective risk assessment, monitoring and early warning, sound policy formulation for drought response and relief, appropriate early action, and promotion of resilience; and (ii) recover from recurrent and future drought through innovative risk financing opportunities.</p>	<ul style="list-style-type: none"> A minimum of 25 Young Government Officials from different line Ministries and Department trained under on-the-job training programme on Drought Early Warning System and all capable of handling the drought monitoring, forecasting, and early warning work. 	<p>Risks:</p> <ul style="list-style-type: none"> Limited access to modern technologies or tools may restrict the training's effectiveness in equipping participants with the skills needed to utilize meteorological, hydrological, and agricultural drought forecasts. <p>Assumptions:</p> <ul style="list-style-type: none"> The DEWS Centre has the necessary infrastructure and resources in place to facilitate effective training, including appropriate technological tools and training materials.

Output & Objective	Actions	Indicators	Risks and Assumptions
	<p>5.3. Develop study tours to the ASEAN Member States and other regional drought-prone areas. The objective of such study tours would be to enable them to enhance national capacity as well as share lessons learnt from national best practices on drought forecasting and early warning, drought impact mitigation and adaptation measures.</p>	<ul style="list-style-type: none"> • At least 3 study tours to the drought prone countries in ASEAN or other region carried out for the representatives from line Ministries and Departments to exchange experiences with the partner country on drought management and adaptation. 	<p>Risks:</p> <ul style="list-style-type: none"> • Insufficient financial resources may limit the scale and scope of the study tours, affecting the number of participants or the quality of the learning experience. <p>Assumptions:</p> <ul style="list-style-type: none"> • Sufficient financial resources will be made available from governmental or Development Partners to support the study tours during the NAP-DMA implementation period.
	<p>5.4. Establish a regional learning forum platform dedicated to drought management and adaptation, aimed at fostering the exchange of best practices and innovative mitigation strategies among stakeholders in the Mekong region and ASEAN. This platform will serve as a collaborative hub for knowledge-sharing, facilitating effective responses to environmental challenges posed by drought.</p>	<ul style="list-style-type: none"> • A regional learning platform aiming to share practical experiences of drought management and adaptation within the Mekong and ASEAN regions established and operational. 	<p>Risks:</p> <ul style="list-style-type: none"> • The Technical Working Group members might have limited skill in communication and coordination works with the regional experts, leading to poor communication and ineffective results of the platform. <p>Assumptions:</p> <ul style="list-style-type: none"> • Communication and coordination, knowledge and skill of the Technical Working Group members are significantly improved through capacity building and strengthening activities.

Annex 4: Potential Risk of Action Plan Implementation and Proposed Mitigation Measures

As outlined in the logical framework above, several potential risks could hinder the successful implementation of the programme. These risks primarily include insufficient funding from the local government or development partners, a lack of trust from local communities stemming from insufficient awareness of the NAP-DMA's or the action's objectives, poor coordination between the implementers and the relevant ministries and departments, as well as challenges in collaboration with local authorities who are directly engaged with communities and vulnerable groups. Such issues could significantly impede the execution of planned actions, ultimately jeopardizing the project's success.

To mitigate these identified risks effectively, the following recommended measures are proposed to proactively address and prevent these challenges from arising:

1. Insufficient funding from the local government or development partners:
 - Develop a comprehensive funding strategy that includes multiple funding sources and contingency plans.
 - Establish a strong relationship with potential donors to ensure a clear understanding of the objectives of NAP-DMA and the potential impact.
 - Identify and prioritize funding streams from local government such as the funding pipeline of the Ministry of Environment and development partners that align with the goals of the NAP-DMA.
 - Regularly review and update the estimated budget of NAP-DMA to reflect changing funding requirements and available resources.

1. Lack of trust from local communities due to insufficient awareness of the NAP-DMA's programmes and their objectives:
 - Develop a comprehensive communication strategy that targets local communities, stakeholders, and beneficiaries.
 - Design and implement a community engagement plan that fosters awareness, understanding, and participation in the programme or NAP-DMA implementation.
 - Establish a community feedback mechanism to ensure that concerns and questions are addressed in a timely and transparent manner.
 - Engage with local influencers, leaders, and traditional authorities to promote the programme's objectives and benefits.

1. Poor coordination between the implementers and the relevant ministries and departments:
 - Develop and implement a coordination plan that facilitates regular communication and collaboration among implementers, ministries, and departments.
 - Conduct a stakeholder analysis to identify potential points of conflict or overlap and develop strategies to mitigate these risks.
 - Regularly review and update the NAP-DMA's institutional arrangements to ensure they remain effective and responsive to National Action Plan's evolving needs.

1. Challenges in collaboration with local authorities who are directly engaged with communities and vulnerable groups:
 - Develop a partnership strategy that prioritizes building trust, understanding, and shared goals with local authorities.
 - Establish a regular dialogue with local authorities to ensure their concerns and perspectives are integrated into the NAP's design and implementation.
 - Develop and implement a community-based planning approach that empowers local communities and authorities to take ownership of the NAP-DMA's objectives and outcomes.
 - Provide training and capacity-building support to local authorities to enhance their capacity to implement the NAP-DMA's interventions effectively.