The Kingdom of Cambodia

Nation Religion King

Ministry of Industry, Science, Technology and Innovation

Guideline for Drought Resilient Measures for Water Supply

Prepared by: Department of Technical Affairs and Project Management of General Department of Potable Water Supply

Supported and participated by: UNICEF and Cambodia Water Supply Association

2022

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Ministry of Industry, Science, Technology and Innovation
No. 098 MISTI / 2022

Prakas

On

Implementation of Guidelines for Drought Resilient Measures for Water Supply

Senior Minister, Minister of Ministry of Industry, Science, Technology and Innovation

- Having seen the Constitution of the Kingdom of Cambodia;
- Having seen Royal Decree No. NS/RKT/0918/925 dated September 6, 2018, on the Appointment of the Royal Government of Cambodia;
- Having seen Royal Decree No. NS/RKT/0320/421 dated March 30, 2020, on the Appointment and Adjustment of the Composition of the Royal Government of Cambodia;
- Having seen Royal Kram No. NS/RKM/0618/012 dated June 28, 2018, promulgating the Law on the Organization and Functioning of the Council of Ministers;
- Having seen Royal Kram No. NS/RKM/0320/009 dated March 26, 2020, promulgating the Law on the Establishment of the Ministry of Industry, Science, Technology and Innovation;
- Having seen Sub-decree No. 48 ANKr.BK dated April 6, 2020, on the Organization and Functioning of the Ministry of Industry, Science, Technology and Innovation;
- Pursuant to the request of the Ministry.

Hereby Decides:

Article 1.-

The Guidelines for Drought Resilient Measures for Water Supply is introduced for implementation to participate in the prevention and immediate resolution of various risks posed by drought and ensure the sustainability of water supply services, as detailed in the Annex of this Prakas.

Article 2.-

This Prakas applies to all water supply services under the Ministry of Industry, Science, Technology, and Innovation's jurisdiction, especially those with production and distribution facilities situated in areas prone to drought.

Article 3.-

The Guidelines for Drought Resilient Measures for Water Supply specify necessary measures to be implemented pre-drought, during drought, and post-drought, beginning from water sources, water treatment systems, and potable water networks, including collaboration with local authorities and stakeholders.

Article 4.-

Any regulations that contradict this Prakas will be deemed invalid.

Article 5.-

Director of Cabinet, Under Secretary of State, Secretary General, Director of Center, chiefs of all entities under the Ministry, at both national and sub-national levels, and involved water supply operators shall be responsible for implementing this Declaration from the date of signing.

Phnom Penh, May 04, 2022

Senior Minister

Minister of Ministry of Industry, Science, Technology and Innovation

H.E. CHAM Prasidh

CC:

- Office of the Council of Ministers
- Ministry of Interior
- Ministry of Economy and Finance
- Capital/Provincial Administrations
- Provincial Departments of Industry, Science, Technology and Innovation
- Cambodia Water Supply Association
- As mentioned in Article 5
- Archive

Preface

“Water” serves as the foundation for growth in all sectors and sustains human livelihoods. Hence, the Royal Government of Cambodia consistently prioritizes water sector development among its four priority areas - human, roads, electricity, and water. Moreover, the Royal Government's water supply policy states, *"Extend urban water supply coverage to 90% by 2023 and 100% to cater to the essential needs of the people as well as various productions and services through the development and extension of both public and private water supply systems, focusing on four conditions* - ***water quality, safety, sustainability, and affordability***."

Due to the escalating demand for water resources, natural factors, and climate change, especially during droughts, water sources are becoming scarce and insufficient, which can also impact the quality of these sources. Droughts significantly negatively affect clean water supply services' treatment operation and sustainability. Therefore, to align with the above policies, ensure the sustainability of water supply services, and mitigate risks during droughts, the Ministry of Industry, Science, Technology and Innovation has implemented the **"Guidelines for Drought Resilient Measures for Water Supply"** to participate in preventing and promptly addressing various risks caused by droughts and ensuring the sustainability of clean water supply for the populace. **The guidelines delineate various measures for water operators to adopt before, during, and after a drought,** starting from water sources, water treatment systems, and clean water networks. These measures also embody the cooperation of local authorities and all relevant stakeholders at each stage.

I firmly believe that this beneficial guideline will achieve widespread dissemination and application, with complete cooperation from all relevant stakeholders, both public and private sectors, to minimize potential impacts caused by droughts for the common benefit of all Cambodian people.

Finally, on behalf of the Ministry of Industry, Science, Technology, and Innovation, I would like to express my gratitude to the UNICEF team, Cambodia Water Supply Association (CWA), and all stakeholders for their technical and financial support in preparing This guideline. I would like to express my appreciation and high evaluation of the technical officials, management of the General Department of Potable Water Supply, and all management of the Ministry of Industry, Science, Technology and Innovation who have made significant efforts in preparing these crucial Guidelines for Drought Resilient Measures for Water Supply.

Phnom Penh, May 02, 2022

Senior Minister

Minister of Ministry of Industry, Science, Technology and Innovation

H.E. Kitti Setha Bandith **Dr. CHAM Prasidh**

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1. Introduction

Climate change is a significant global concern, with nations striving to address it worldwide. As a developing country, Cambodia is identified as one of the most climate-vulnerable nations both regionally and globally due to its limited adaptive capacity and underdeveloped infrastructure, particularly in rural regions. Cambodians have already endured exacerbated flooding, droughts, and escalating temperatures. Since 2016, Cambodia's climate change has resulted in damage to multiple crops, while other regions have grappled with water scarcity issues.

2. Objectives

This guideline has been developed to assist in preventing and immediately resolving drought risks to ensure the sustainability of clean water supply by all water operators in the Kingdom of Cambodia under the supervision of the Ministry of Industry, Science, Technology and Innovation.

The objectives of this guideline are to:

- Implement preventive initiatives and mitigate impacts before droughts that could disrupt water supply.
- Inspect, monitor, and take swift remedial actions during droughts.
- Inspect, plan, and recover post-drought.

3. Scope

This guideline applies to water supply services under the jurisdiction of the Ministry of Industry, Science, Technology and Innovation, particularly water supply services with production and distribution facilities situated in drought-prone areas such as Banteay Meanchey, Siem Reap, Kampong Thom, Kampong Cham, Kampong Speu, Kandal, Prey Veng, and Svay Rieng provinces.

The primary components of the water supply system that need to be inspected and addressed under this guideline are:

1. Water sources and raw water pumping stations
2. Water treatment plants
3. Treated water reservoirs and
4. Water supply networks and distribution.

4. Responsibilities

Droughts present significant challenges to water supply, primarily:

- Insufficient raw water quantity for treatment and supply or complete dryness under severe drought conditions
- Deterioration of raw water quality due to increased number of moss and other aquatic life

To mitigate the impacts of droughts on water supply, operators should identify these challenges and prepare a specific action plan, including budget plans to address these issues. Moreover,

water supply operators should seek cooperation from local authorities and residents in maintaining and protecting the water distribution system, including saving water for everyday use and finding new water sources when necessary for the mutual benefit of all.

5. Measures

5.1. Pre-drought Preparation

Proactive preventive measures and impact mitigation should be promptly undertaken before the drought, upon receiving advisory notice or public announcement from the Royal Government about impending drought, and/or before the drought starts from the end of the rainy season and, at the latest, the onset of the dry season. Necessary measures to be implemented pre-drought include:

5.1.1. Safeguarding Water Sources

- Monitoring weather forecast information on potential drought impacts in the service areas through:
    - Previous drought experiences
    - Radio and television broadcasts
    - Ministry of Water Resources and Meteorology's Facebook page
    - Provincial Departments of Water Resources and Meteorology's Facebook pages
    - Other social media outlets
- Monitor and document variations in water levels in water sources using water level gauges to estimate remaining water volumes.
- Compare the volume of water produced to the remaining volume in the source (see Annex 1: pond/lake water volume record form) and estimate potential raw water shortages during the drought season, reporting to provincial authorities and provincial departments of industry, science, technology, and innovation on emerging water shortage issues in their water supply operations.
- Prepare for or identify additional water sources if the forecast indicates risks of raw water shortage during the drought season.
- Enhance monitoring and inspection of changes in source water quality parameters such as temperature, pH, turbidity, total dissolved solids, and presence of moss and other aquatic life as a basis for testing to determine the proper chemical dosage.
- Inspect and implement protection measures against various pollution activities around water sources that could impact raw water quality, and report and request intervention from related institutions and local authorities when necessary.
- Inspect and halt any polluting activities that could affect water sources, such as livestock, pesticide use in agriculture, discharge of wastewater or sewage from households, littering

of trash or waste, and report and request intervention from local authorities and related institutions (Annex 2: Sample request letter for intervention)

5.1.2. Preparing Water Treatment

- Assess the feasibility of reusing filter backwash water when necessary.
- Maintain and/or enhance chemical dosing systems to ensure water treatment efficiency, including pre-chlorine dosing systems (for water treatment plants with pre-chlorination).
- Prepare appropriate and sufficient chemical tanks for water treatment.
- Increase focus on recording and documenting monthly unaccounted water data (Annex 3: Unaccounted water loss form).
- Evaluate the feasibility of saving water during operations (such as reducing filter backwash water flow, etc.) (Annex 4: Water saving options).
- Prepare power generators and fuel in anticipation of power outages.

5.1.3. Safeguarding Treated Water Reservoirs

- Regularly inspect and maintain treated water reservoirs to prevent water spill-over, corrosion, and seepage.
- Inspect, maintain, or repair the post-chlorine dosing system for optimal operations.

5.1.4. Preparing Water Distribution

- Review significant water consumers through monthly billing records (begin with the top 10% of users) who are crucial in minimizing usage.
- Educate customers about water saving and unnecessary usage reduction. The awareness should include information on production and supply status.
- Increase focus on preventing all forms of leakage and water losses.
- Increase attention to recording, monitoring, and comparing daily distributed water volumes (through bulk meters).

5.2. During Droughts

Monitoring, inspection, and prompt action are necessary during droughts when impacts on water sources occur, usually late in the dry season between March and May. Necessary measures to implement during droughts include:

5.2.1 Water Sources

- Prioritize water sources – determining which source will be used as primary, secondary, etc.
- Water sources need to be safeguarded from pollution. In the case of public water sources,
- Request assistance from local authorities and related institutions for protection.

- Enhance monitoring and inspection of changes in source water quality parameters such as: temperature, pH, turbidity, total dissolved solids, presence of algae, and other aquatic life as a basis for testing to determine the proper chemical dosage. The COD (chemical oxygen demand) parameter must be checked if pollution is suspected.
- Precisely calculate the required source water volume as a basis for deciding to add new sources promptly.
- If the inspection reveals insufficient water sources for supply, promptly request cooperation and intervention from local authorities and related institutions.

5.2.2. Water Treatment Plants

- Renovate or repair any seepage from the reservoir wall and valves.
- Enhance maintenance or repair of chemical dosing systems for water treatment (alum, PAC, chlorine) and pre-chlorine.
- Increase inspection and protection against treated water reservoir seepage and leakage from mud discharge valves and reservoir walls on a regular basis and take immediate corrective actions.
- Increase technical inspection in production to prevent water spillage (the reservoir is congested due to the amount of sand or starting operation with closed clarifier valves, etc.).
- Minimize filter and clarifier washings as much as possible to conserve water.
- Pay extra attention to implementing water storage options as in Annex 5.
- Reuse filter backwash wastewater for retreatment.
- Minimize unnecessary water use within the plant area.

5.2.3. Treated Water Reservoirs

- Enhance regular inspection and maintenance of treated water reservoirs to prevent cracking, and seepage.
- Inspect the post-chlorine dosing system for optimal operations.
- Refrain from washing treated water reservoirs during water shortages if not necessary.

5.2.4. Water Distribution

- If necessary, reduce water pressure and implement water schedule supply hours by zones.
- Decrease supply to significant water users (begin with the top 10% of users)
- Monitor for leakage, seepage, and pipe bursts in the water supply networks and take immediate repair actions.
- Record produced water, distributed water, and billed water to monitor water losses.

- Record daily water shortage volumes and the number of days short to prepare for future years.

5.2.5. Collaboration with Local Authorities

- Collaborate with local authorities to educate and raise public awareness among customers to store clean water safely for use, understand the impact of drought on water supply, and encourage the public to store water and reduce unnecessary usage.
- Notify customers of the decision to reduce supply hours and advise them to store water according to the schedule.
- In the event of severe impacts on water sources, water operators should inform customers about the drought disaster causing disruptions to the water supply.
- If the water supply system can no longer function, report and request permission from the provincial Department of Industry, science, technology, and Innovation and cooperate with local authorities to inform customers about the suspension of the water supply.

5.3. Post-Drought Period

Inspection, planning, and recovery from all drought impacts should occur after the drought, divided into urgent tasks to be implemented promptly and non-urgent tasks to be undertaken later.

Necessary measures to implement after droughts include:

5.3.1. Water Sources

- Calculate the required raw water volume, produced water volume, supply volume, loss rate, demand growth, customer growth, shortage volume, etc., for at least five years as indicators to decide on adding new sources for future years.
- Develop a water source development plan with the capacity to meet 5-year water supply requirements, starting from rehabilitation, maintenance, and improvement of available sources.
- Add new water sources such as natural sources (rivers, lakes, ponds, etc.), drilling new boreholes, raising dams, etc.
- Seek expert advice for solutions and plans to improve and mitigate future impacts.
- Seek support from related institutions, development partners, or funding sources to develop and protect water sources.

5.3.2. Water Treatment Plants

- Clean any treatment plants that were overlooked and return to regular cleaning schedules.
- Maintain chemical dosing systems to ensure optimal water treatment efficiency.

5.3.3. Treated Water Reservoirs

- Perform regular reservoir cleaning as per schedule.
- Maintain and repair treated water reservoirs to prevent cracking and seepages.
- Inspect the post-chlorine dosing system for regular operation.

5.3.4. Water Distribution Network

- Replace old pipes based on their ages or quality.
- Consider switching old PVC pipes to HDPE pipes.
- Regularly implement water loss management.
- Develop an improvement plan based on the information above.

6. Water Source Improvement Planning

Effective management and accurate calculation of water usage data can enable water operators to understand the water volume necessary for producing clean water and prepare for additional water source options for future years.

The water source improvement plan should be developed based on data and information recorded during drought. The water source improvement plan should consider the produced water volume, supply volume, loss rate, demand growth, and customer usage volume (Annex 3: Action Plan Template). The improvement plan should specify the following:

- Encountered problems and their solutions.
- Individuals responsible for implementation.
- Activities to be undertaken.
- The timeframe for implementing activities.
- Expected outcomes.
- Estimated budget and sources of funding.

7. Definitions

- ❖ Drought is characterized by a water deficiency problem over an extended period that affects human activities or the environment and a lack of water to meet the normal demands of the majority of users.
- ❖ Climate change refers to long-term continuous changes in weather patterns, including temperature, precipitation, winds, water currents, etc. These changes occur due to natural factors and human activities.
- ❖ Resilience is the capability of a social-ecological system to cope with or adapt to disturbances or damage in a way that retains essential functions, identity, and structure while maintaining the capacity for adaptation, learning, and creativity.

8. Annexes

Annex 1: Pond/Lake Water Volume Record Form

Annex 2: Sample Request Letter for Intervention

Annex 3: Action Plan Template

Annex 4: Water Loss Record Form

Annex 5: Water Saving Options

Annex 6: Daily Distributed Volume Record Table

Annex 1:

Pond/Lake Water Volume Record Form

No.	Record Date	Average Produced Volume		Average Billed Volume		Water Loss Volume		Remaining Raw Water Volume					Supply Duration	
								Length	Width	Depth	Volume			
		500	cubic meters	450	cubic meters	10	percent	100	50	5	25.000	cubic meters	50	days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days
			cubic meters		cubic meters		percent					cubic meters		days

Annex 2: Request for Intervention

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Sample Request Letter for Intervention

I, Mr./Ms. _____, sex _____, age _____, a water supply operator in _____ village, _____ commune, _____ district, _____ province.

Respectfully to

Commune Chief.....

Subject: Request for intervention on case of _____ located at _____

Reference: Letter No. _____ dated _____ of the Ministry of Industry, Science, Technology and Innovation on Business Licensing of Water Supply Service

As stated in the subject and reference above, I respectfully would like to inform the Commune Chief that: The Ministry of Industry, Science, Technology and Innovation licensed me to operate water supply business in _____ villages located in _____ commune, _____ district, _____ province, utilizing _____ water source. However, currently, the water source is being polluted/threatened by _____, which could impact the sustainability, safety, and health of the people.

Therefore, I would like to request the Commune Chief to kindly intervene and resolve the above issue.

Please accept my highest respect and regards.

Date: _____

Done at: _____ Date: _____

Name and thumbprint

Annex 3: Action Plan Template

No.	Issue	Activities/Solutions	Expected Outcomes	Estimated Cost	Implementation Timeframe	Responsible Persons
1	**Water sources**					
1.1						
1.2						
1.3						
2	**Treatment system**					
2.1						
2.2						
2.3						
3	**Water storage**					
3.1						
3.2						
3.3						
4	**Water distribution**					
4.1						
4.2						
4.3						

Annex 4:

Water Loss Record Form

No.	Date	Average Billed Volume		Average Produced Volume		Water Loss Volume			
		1		2		3=2-1		4 = (1-2) *100/1	
		500	cubic meters	450	cubic meters	(50)	cubic meters	10	percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
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			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent
			cubic meters		cubic meters		cubic meters		percent

Annex 5: Water Saving Options

Options	Techniques
1. Reduce seepage, leakage or overflow	• Implement automatic opening and closing ballcock systems when the treatment plant, treated water reservoir, and aeration tank are fully pumped. • Inspect and close all valves at the treatment plant. • Repair leakage spots at valves and treatment plant pipelines
2. Filter cleaning efficiency	• Set regular filter cleaning schedules/and or based on actual conditions. • Use mud pumps (if possible)
3. Reuse backwash, drain and wash water	• Build pond or tank to collect water for retreatment. • Allow solids to settle and only pump upper clear layer for retreatment

Annex 6:

Daily Distributed Volume Record Table

Month,..... Year.....

No.	Date	Recorder's Name	Old Meter Reading	New Meter Reading	Volume Supplied	
			-	-	-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
					-	Cubic Meters
	Total Volume Supplied for the Month					Cubic Meters