

ANNEX 21 – OPERATION AND MAINTENANCE PLAN-CAISAR

Comprehensive information and specific details regarding the Operation and Maintenance (O&M) Manual for irrigation schemes can be found in the O&M guidelines established by the Ministry of Water Resources and Meteorology (MoWRAM) in 2019. These guidelines offer a detailed framework for the effective management and maintenance of irrigation systems.

Following a thorough and robust review and modification process, with the incorporation of three annexes designed to encompass all aspects of O&M the O&M guidelines and manual were finalised and endorsed by the Minister for MOWRAM in September 2024. This endorsement has marked the official adoption and implementation of the revised O&M guidelines, providing valuable guidance and processes for the sustainable operation and maintenance of irrigation schemes in Cambodia.

1. Purpose

The purpose of this manual is to establish a strategy and outline procedures for the sustainable operation and maintenance of irrigation schemes. This manual is intended for use by the Irrigation Agriculture Department (IAD), Farmer Water User Community District (FWUCD), and Provincial Departments of Water Resources and Meteorology (PDWRAMs). It primarily focuses on the management and execution of the Operation and Maintenance (O&M) program as outlined below:

- Management and Implementation of O&M activities
- Budget request modality
- Introduction of Monitoring and Evaluation of O&M and FWUC strengthening and a pilot M&E implementation plan



1. Sector policy and legal framework.

Law on Water Resources Management of Kingdom of Cambodia, June 2007. The Water Law provides the legal basis for water resource management (WRM) under MOWRAM and authorizes four sub-decrees to guide key management activities and provide a legal basis for the Ministry of Economy and Finance (MEF) to provide funds for WRM, conservation, and development activities. These sub-decrees provide the unified legal foundation for a modern water management regime to ensure the sustainable development and use of water in Cambodia. For the irrigation subsector, the relevant provisions of the Water Law are those pertaining to the following:

- Management, conservation and development zones. MOWRAM shall determine policy on water resources management, conservation, and development to meet the needs of each region throughout the whole country in order for there to be sustainable and effective use of water, and to minimize water-related disasters and conflicts. The boundaries of zones for water management, conservation and development will be defined by sub-decree.
- FWUC. Farmers in a state irrigation scheme have a right to establish a FWUC. MOWRAM shall be responsible to establish a FWUC for the purpose of ensuring the efficient and sustainable use and management of irrigation. PDWRAMs shall register the FWUC statute, after that, the FWUC shall be in charge of Implementation. Procedure for FWUC formation and operation shall be arranged in a sub-decree.
- River basin management Inventory and Planning of Water Resources, specifies the activities required to be authorized by sub-decree: procedures for preparing and implementing plans for



management, conservation, development of river basins, sub-river basins, watershed, groundwater and aquifers.

- Licensing and rights of access to water sources. Activities required to be authorized by sub-decree are on (i) Granting, administration, and fees for water use licenses; (ii) Granting extraction licenses for materials within the bed and banks of watercourses, lakes, canals, and reservoirs; and (iii) Filling of watercourses, lakes, canals, and reservoirs. Articles 27-33 provide for rights of access to water sources for owners or occupiers of land which does not adjoin a watercourse.
- Water pricing. The concept of water pricing is embodied in the *Water Law*. While the law recognizes water as a public good, it also recognizes the need for water to be treated as an economic good through provisions on licensing and charging of fees for certain extractive uses, as well as the development of sub-decrees on the establishment of FWUCs and water allocation. However, mechanisms for water pricing have yet to be implemented under the law.



Prakas 306/2000. The Implementation Policy for Sustainable Irrigation Schemes, established under Circular No. 1 issued in January 1999, and the Policy for Sustainability of Operation and Maintenance of Irrigation Systems and Steps in the Formation of a Farmer Water Users Community (FWUC) issued in June 2000, provide for FWUCs to share the responsibility for irrigation scheme management and O&M with PDWRAMs. These documents were officially implemented by MOWRAM under *Prakas 306/2000*. It sets out the principles, objectives, policy provisions, environmental protection and human resource development needed for achieving sustainable irrigation systems through FWUCs to be supported by MOWRAM. *Prakas 306/2000* gave effect to the main policy elements of Participatory Irrigation Management and Development (PIMD) adopted by the Government up to the present day with the following main principles:

- Through a sharing agreement, the State will construct (including rehabilitation) the main works of irrigation projects, and the farmers will construct the distribution works and provide for their O&M.
- Upon completion of construction works, projects are to be handed over to the Irrigated Agriculture Department (IAD) of MOWRAM, and O&M responsibilities are to be shared between the concerned Provincial Department of Water Resources and Meteorology (PDWRAM) and FWUC.
- MOWRAM's Irrigated Agriculture Department is assigned overall management responsibility and required to introduce a system of on-going M&E and reporting of scheme performance.
- FWUCs are to receive financial support until they become financially independent.
- PDWRAMs are to provide technical backstopping to FWUCs.
- MOWRAM is to arrange with MEF for government budget for funding routine and periodic maintenance of the infrastructure retained under government control and for providing financial support over the first five years after FWUC formation.
- MOWRAM will authorize the transfer of management responsibility to a FWUC after training and assessment of the FWUC being financially independent.

Sub-decree 31, 2015 on Procedures for Establishment, Dissolution, Roles and Duties of FWUC. This sub-decree confirms the longstanding policy of the Royal Government of Cambodia (RGC) on PIMD as the cornerstone of irrigation scheme development, provides the legal basis for the FWUC Statute and for FWUCs to be in charge of their own affairs, provides the procedures for establishment, abolition, and roles and responsibilities of FWUCs, and provides the legal basis for MEF to provide State budget funding to PDWRAMs for the strengthening of FWUCs. Other documents related to the implementation of the FWUC sub-decree are:

- Proposed Implementation Plan for the FWUC sub-decree;
- Joint *Prakas* on implementation of irrigation service contribution (pending);
- Model FWUC statute (revision pending);



- Guidelines for division of asset responsibility in irrigation schemes; and
- Model responsibility sharing agreement (pending).

Sub-decree 98, on River Basin Management of 24 July 2015. Its objective is to regulate the management, conservation, and development of the river basins in an effective and sustainable manner, as stated in the Water Law. It further states the composition, duties and responsibilities of the National River Basin Management Committee (NRBMC) and its secretariat and of the Provincial River Basin Management Committees (PRBMC) and their secretariats.

Basin advisory committees inform the National Integrated Master Plan (irrigation, hydropower, urban, industry, environmental, floodplain management), individual basin management plans, and project planning. Hazardous aspects of large dams must be brought under active surveillance in accordance with best practice. The *Royal Decree on the Establishment and Functioning of the National Council for Water Resources Management* is pending. The *Sub-decree on Water Licensing*, which is still pending, will provide the basis for allocating water resources rights to schemes and individual farm lands.

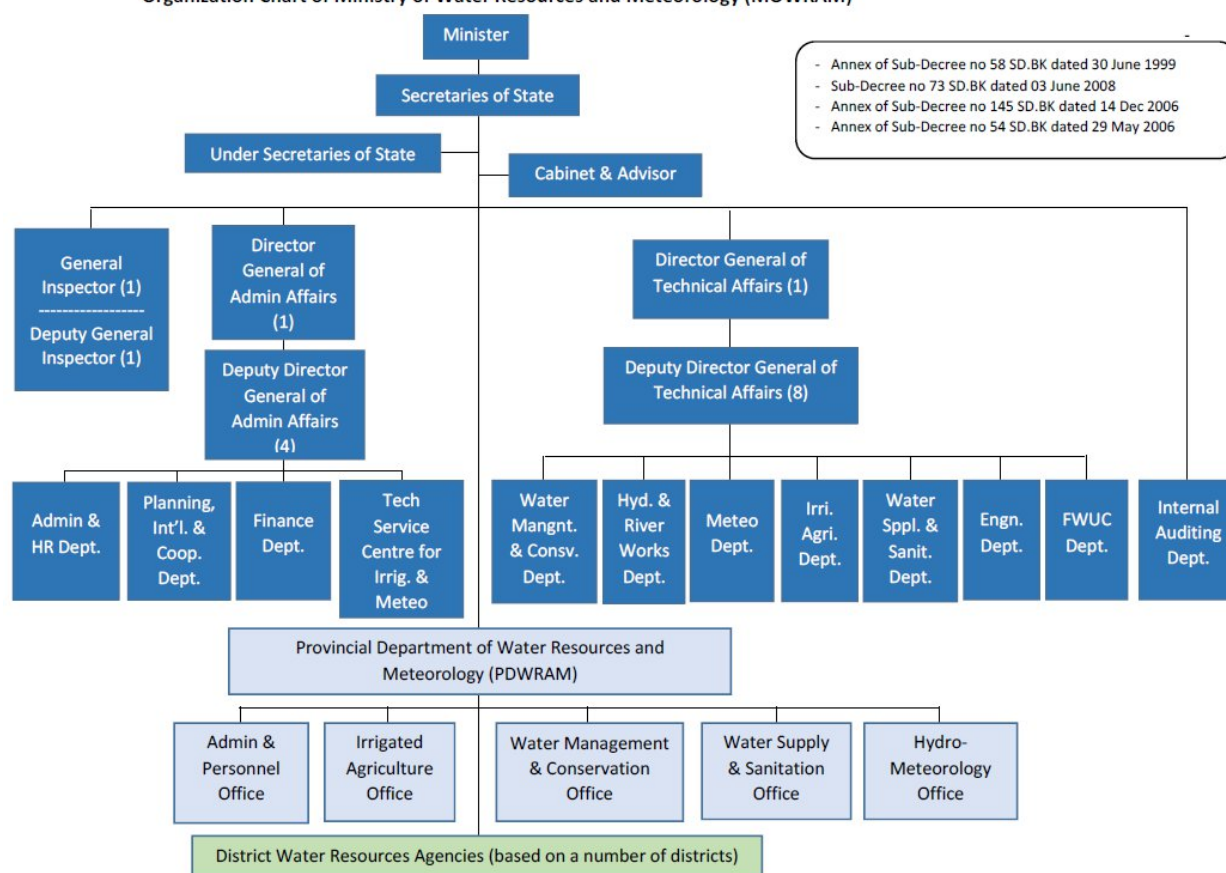
In addition, to ensure long-term sustainable institutional strengthening and capacity building support, the Cambodian government issued a decision (No. 169) on appointment of national river basin management dated 30 November 2023, clarifying roles and responsibilities of the national body to effectively and efficiently manage and coordinate the RBM-related development activities across the country.

Institutional Arrangements for Water Resource and Irrigation Management

National Level - MOWRAM. MOWRAM is the principal agency for irrigation and WRM in Cambodia. Established on 30 June 1999 under *Sub-decree No. 58*, MOWRAM is a technical ministry responsible for the provision of irrigation services, flood and drought control, hydrology, and meteorology, among others. Based on the *Water Law* (2007) and the *FWUC Sub-decree No. 31* (2015), the main responsibilities of MOWRAM are: (i) water resources planning and development; (ii) regulation of the use and O&M of irrigation schemes; and (iii) establishment of FWUCs to share the management of irrigation schemes with MOWRAM. MOWRAM is the implementing agency for CAISAR Component 2.

The Irrigated Agriculture Department (IAD) in MOWRAM is mandated, by *Ministerial Decision No. 228* dated 30 December 2008, to perform the following duties: (i) project planning and development for the rehabilitation of all irrigation systems (large, medium, and small); (ii) management of the O&M of all existing irrigation and drainage (I&D) systems; (iii) monitoring and evaluation (M&E) of the activities of underground water to serve PDWRAMs, which are responsible for implementing O&M and FWUC strengthening under supervision of IAD and DFWUC; and (iv) implementation of basic requirements for sustainable irrigation scheme management needs, such as assessment of hydrology and river basin management.

Organization Chart of Ministry of Water Resources and Meteorology (MOWRAM)



Source: Dept. of Admin & HR, MOWRAM, 09 May 2018, C/O Ms. Vanny Chin, Fin Specialist, IAIP TRTA

Figure 1. Organization Chart of MOWRAM

Other government institutions with important roles in water management are the following: Ministry of Agriculture, Forestry, and Fisheries (MAFF), which is MOWRAM's strategic partner in WRM; Ministry of Rural Development (MRD), which is tasked to provide clean water to rural areas; Ministry of Industry, Mines, and Energy (MIME), which is tasked to provide drinking water supply to cities and towns; Ministry of Environment (MOE), which is in charge of wastewater treatment in cities and town; Ministry of Land Management, Urban Planning, and Construction (MLMUPC); Ministry of Health (MOH); National Disaster Management Committee (NDMC); and Natural Resources and Environment Unit (NRE) of the Cambodia Development Resource Institute (CDRI). Most of these Ministries are represented in the National Development Commission of Cambodia (NDCC), which is assigned as the implementation agency for CAISAR Component 1.

River Basins - RBMC. The development of river basin management authorities in Cambodia has been significantly progressed. To combat floods and droughts, to provide adequate water services and to ensure effective use of the current development of hydraulic infrastructure like multipurpose reservoirs, flood protection and irrigation and drainage systems, an acceleration of integrated planning is called for based on clear agreed rules by a competent and adequately staffed and facilitated river basin management authority.



Initial steps have been made. The National River Basin Management Committee (NRBMC) has been set up with the Prime Minister's Decision dated October 5, 2015 and its secretariat has been organized with the MOWRAM Minister's Prakas dated October 21, 2015. Furthermore, the Cambodian government recently issued a decision requiring mandatory establishment of provincial river basin management committees that have been well progressing, with some of key provinces, including Pursat in which is one of the 4 targeted provinces under the CAISAR project, successfully established its PRBMC chaired by the Provincial Governor.

The two RBMC established in a pilot project financed by JICA: RBMC Pursat in which the Ou Ta Paong irrigation system located, and the Boribo-Bamnak RBMC in which the Lum Hach system located are required to be fully integrated into the PRBMC for efficiency purpose. The PRBMC is chaired by the provincial governor with the deputy governor and Director of PDWRAM as vice-chairpersons. Members are relevant PDWRAM directors, town/district Governors, relevant Commune chiefs and relevant FWUC Chairpersons. In case the basin covers more than one province, like the Boribo-Bamnak basin, the chair is the Governor of the major province in the basin and the other provinces vice-governor(s) are vice-chairs.

The duties and tasks of the Pilot PRBMC/SP were formulated as follows:

- To prepare the internal regulations, plans for the management, conservation, allocation, rehabilitation and development of river basins in line with the national policies in the field of water resources;
- To submit the plans to the National River Basin Management Committee (NRBMC) for review and approval;
- To monitor and coordinate the activities of ministries and institutions related to the implementation of plans for the management, conservation and development of river basins;
- To provide guidance on measures for water environment protection, water resources exploitation, use and development of water resources, and measures for the prevention and mitigation of risks caused by water in river basins;
- To provide guidance on measures to specialized agencies in response to activities causing contamination to water environment;
- To timely communicate to local residents in the event of water-related catastrophes;
- To provide coordination and resolve conflicts within its competence; and
- To implement other tasks delegated by the NRBMC.

The activity of the PRBMCs have slowed down after the termination of the pilot project with the associated funding of their activities. An essential funding mechanism needs to be put in place in order to secure effective and efficient planning and implementation of the elementary water resource management tasks.

One of the CAISAR objectives is to enhance water use efficiency. A more precise balancing of demands and supplies is now made possible with the new reservoirs in the PURSAT basin. Such management of water resources needs, as input, an adequate stream of information on actual water flows and water demand. At present in Pursat River Basin the information is recorded manually and communicated by phone or email. An assessment needs to be made how basin management can enhance water security and the water supply to the scheme, the necessity to reviving the basin committees and their secretariats, and to what extent installing a SCADA system is a necessity for a good future of the project scheme. These activities are envisaged to be implemented under CAISAR sub component 2.3.

Provincial Level - PDWRAM. At the implementation level, MOWRAM carries out this mandate through its central agencies and provincial departments (PDWRAM) in line with the Government's decentralization policy. Every PDWRAM is led by a Director with support of two or three Deputy Directors. In general, each PDWRAM has five offices: 1) Office of Admin & Staffing; 2) Office of Water Resource Management & Conservation; 3) Office of Irrigated Agriculture; 4) Office of Water Supply and Sanitation; 5) the Office of Hydrology and Meteorology. The irrigation systems in the CAISAR project are located in four provinces:



Kampong Chhnang, Kampong Speu, Kendal and Pursat. As delegated by MoWRAM, it is the responsibility of the provincial departments of water resources and meteorology (PDWRAM's) to annually prepare for each of the incorporated schemes an O&M work plan and budget for their implementation in the following year, and include:

- Planning and organizing development programs of the Ministry at the sub-national level;
- Operating and maintaining major irrigation works;
- Providing support for operation and maintenance of irrigation schemes to FWUCs and other farmer mechanisms;
- Overseeing construction works of irrigation and flood protection at provincial level; and
- Conduct of small procurement and disbursements related to construction projects.

PDWRAM needs capacity strengthening and resources at the national and provincial levels to: (i) improve irrigation operations; (ii) upgrade and strengthen engineering and project management human resource capacity and competencies in irrigation and drainage O&M; and (iii) improve administration, financial, and business processes in line with the Government's public financial management reform program.

System Level - FWUC. Traditionally irrigation and drainage are managed by the communes. As part of the decentralization policy for irrigation O&M, MOWRAM adopts participatory irrigation management and development and irrigation management transfer (IMT) to Farmer Water User Communities (FWUCs) as prescribed in the *Water Law*. FWUCs are supposed to represent all Farmer Water User Groups (FWUGs) or Communes located in one irrigation system.

A Government order issued in March 2015 on farmers' participation in the O&M of irrigation systems provides the basis for forming these FWUCs and involving them in the design, implementation, and O&M of irrigation projects. The FWUC will be governed by the FWUC Committee and has the following roles and obligations:

- Preparation of the FWUC Statute, contracts, internal regulations, agreement on the transfer of the irrigation system, and the irrigation service plan;
- Preparation of the irrigation system management plan for the FWUC;
- Maintenance of the irrigation system in good condition to enable the irrigation water supply;
- Management and allocation the water fairly to all members of the FWUC;
- Build up capacity in the field of water use, maintenance, and development of the irrigation system;
- Prepare reports on FWUC works and send them to MOWRAM for consideration and assessment;
- Resolution of conflicts arising within the community;
- Collection of contribution within the irrigation system, including other revenue from other exploitation activities within the FWUC irrigation system for the purpose of sustainable O&M of the irrigation system; and
- Imposition of administrative punishment on any FWUC member, any member of the FWUC Committee, and the Chairperson of the FWUC based on the FWUC Statute.

Presence and level of activity of FWUC in envisaged irrigation systems. As the sustainability of irrigation services is highly dependent on the capabilities and responsibilities of farmers, a national program to strengthen their ability to manage minor irrigation schemes through FWUCs has been in place since 1999. However, additional investments as foreseen in the CAISAR project are needed to: (i) expand FWUCs and training of farmers in on-farm water management and O&M of irrigation systems; (ii) put in place legal mechanisms to enable farmers, through elected FWUC Committees, to cover the costs of O&M independently, with appropriate incentives; and (iii) extend vocational and on-the-job training to FWUCs, with matching grants for FWUCs so they can access funds for works and capacity building. The table below presents the presence and level of activity of the FWUC in the proposed CAISAR irrigation systems:

Table 1 Status of FWUC in CAISAR irrigation systems (WAPCOS 2024)

Irrigation System	Basin	Province/ District	No of Communes	FWUC	Activities needed under current policy
Sub Project 1					
Ou Ta Paong	Pursat	Pursat/ Bakan	6	no	None Needs establishment of FWUGs at commune level and FWUC at system level
Sub-Project 2					
Lum Hach	Boribo	Kampong Chhang/ Baribo, Rolea B'ier, Tuek Phos	11	no	None Needs establishment of FWUGs at commune level and FWUC at system level
Sub-Project 3					
Krapeu Troum	Krang Ponley	Kampong Speu/ Odongk, Samraong Tong	3	FWUC Krapeu Trom	High performance Regular collection of ISF Transformation into FWUG under FWUC Anlong Chrey proposed
Yotasast	Krang Ponley	Kampong Speu	1	no	None Needs establishment of FWUGs at commune level and FWUC at system level
Krang Bat	Krang Ponley	Kendal Ponhea Lueu	2	No	None FWUG establishment under FWUC Anlong Chrey proposed
Brambei Mom	Krang Ponley	Kampong Speu Thpong, Odongk	12	FWUC Brambei Mom	Operate Brambei Mom outlet, connection canal to Anlong Chrey reservoir, and main canal Transformation into FWUG under FWUC Anlong Chrey proposed

Responsibilities Sharing Agreement (Or Irrigation Management Transfer)

PDoWRAM and FWUC enter into a “responsibility sharing agreement” to jointly manage the scheme. PDoWRAM take the lead role to unify the scheme management and ensure sustainable irrigated production potential is achieved. MOWRAM and PDWRAM coordinate the budget request process for FWUC’s share of responsibilities through the 3 years rolling budget plan and the joint 5-year work plan. IAD also are a party to these agreements in large scale schemes.



Financing O&M:

Funding Purpose. O&M activities have to be distinguished between (i) those that are the direct responsibility of MOWRAM and implemented through the PDWRAM, and (ii) those that are the direct responsibility of the FWUCs. A review of roles and responsibilities of MOWRAM, PDWRAM and FWUCs for irrigation and drainage assets is urgently required, considering the limited capacity of the FWUCs and the increasing complexity of infrastructure and information systems required to provide reliable irrigation services and to ensure efficient use of water. This is to be taken care of in CAISAR components 2 and 3 and should result in irrigation service agreements in conjunction with O&M funding from national budget and ISF collection by and for the FWUCs.

Funding sources. For the operation and maintenance of irrigation and drainage systems two sources are available: National budget (category 61) of MOWRAM that can be made available for regular maintenance, renovation, community work and yearly maintenance (table 1) and the collected irrigation service fees by and for the FWUCs. The national budget contains the allocations for both the MOWRAM managed assets as well as the contributions to FWUC management.

The collection of ISF in the projected irrigation systems is non-existing with the exception of the Krapeu Troum irrigation system. Reasons for non-collection given are the insecurity of water supply due to absence of water and the poor condition of irrigation systems. Other reasons may be the relative high cost compared to the marginal yields of agriculture production. Enhancement of productivity through introduction of climate smart agriculture and crop diversification combined with improved irrigation and drainage infrastructure and enhanced capacity of FWUCs and PDWRAMs are the basic elements in the CAISAR project to enhance ISF collection.

Status of Budget Category 61 From Year 2019 To 2022

Ministry of Water Resource and Meteorology

(In USD)

(in USD)

No.	Description	Category 61								Grand Total
		Regular Maintenance		Urgent Renovation		Community Work		Yearly Maintenance		
		Amt. of sites	Total Amt.	Amt. of places	Total Amt.	Amt. of irrigation	Total Amt.	Amt. of places	Total Amt.	
1	2017	189	8,380,661	55	3,106,162	65	1,362,683	0	-	12,849,506
2	2018	205	10,494,866	41	1,946,073	104	1,804,878	2	457,573	14,703,390
3	2019	206	11,210,579	58	2,625,041	129	2,195,122	4	1,129,746	17,160,488
4	2020	167	10,996,472	45	2,133,065	132	1,951,220	10	4,319,720	19,400,475
5	2021	169	10,090,464	37	1,703,959	140	1,660,569	11	5,815,381	19,270,372
6	2022	166	11,888,202		1,073,171	147	1,951,220	8	4,902,859	19,815,451
TOTAL		1,102	63,061,244	236	12,587,470	717	10,925,691	35	16,625,278	103,199,683

Noted: 1\$ = 4,100Riel

Table 2. National O&M Allocations 2017-2022

Note: MOWRAM to provide the budget allocation plan to CAISAR schemes prior the project completion date.

Monitoring O&M

Principles for Monitoring:

- setting of service objectives, targets and indicators (MOWRAM)
- defining observation network, processing system and reporting of outcomes (MOWRAM)

With support from MOWRAM and PDWRAM, the FWUC will be responsible for O&M monitoring, reporting and planning.

Basis for M&E. Monitoring of operation and maintenance is basically the assessment to which extent the planned delivery of irrigation and drainage services is realized under which hydro-meteorological and infrastructural conditions. Development of water accounts, rules for water allocation and distribution probably associated with water use rights or water use licenses and effective data collection and



information management systems are preconditions for effective management of water resources and irrigation and drainage systems.

The Cambodian Irrigation Scheme Information System (CISIS). This database was developed in **2021** to assist MOWRAM to monitor the condition of irrigation assets and manage and maintain irrigation schemes in all the 25 provinces of Cambodia. The CISIS database collects the following data: (i) location of scheme (province, district, commune, X and Y coordinates, and river basin); (ii) history, including year of construction and rehabilitation; (iii) area being served (potential and actually receiving water during wet and dry seasons); (iv) management of the system (by FWUC or not); (v) size of the scheme (small, medium, or large); (vi) physical condition of the canal system (in %); (vii) infrastructure details, including reservoir surface area, length of dam or dike, capacity, number and length of main, secondary, and tertiary canals; (viii) water delivery (through gravity, pumping, or a mix of both); and (ix) yields during wet and dry seasons. The data describe the overall condition or performance of the schemes but do not specifically elaborate the structures like condition of reservoir, head regulators, cross regulators, check structures, inlets, outlets, and check structures. In many cases, details of tertiary channels are not given, and the number of structures is also not included. In a few cases, the number of channels is given, but length is missing. Updating and continued actualization of CISIS for the participating irrigation systems will be part of CAISAR component 3. This updating will be used as a basic procedure to prepare for the annual O&M plans and budget support requests from FWUC to MOWRAM and PDWRAM.

Supervisory control and data acquisition (SCADA). Introduction of a SCADA system in the Pursat basin, and the Damnak Ampil main canal is envisaged under CAISAR component 2.3, to assist PDWRAM in the operation and monitoring of irrigation water supplies from the Pursat reservoirs and Damnak Ampil barrage. Introduction of SCADA requires the development of a sound basis of rules and regulations, data collection and information management systems, as well as competent and adequate human resources. A plan for this development is part of the CAISAR Component 2.3.

REFERENCES

ADB

MORWAM's O&M Guidelines and Manual issued September 2024

UIWRMSP 2019; *Review of Irrigation O&M in Cambodia* (ADB Loan 3289-CAM)

WAPCOS 2024 Feasibility Study CAISAR project