KINGDOM OF CAMBODIA

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Ministry of Water Resources and Meteorology

Water Resources Management Sector Development Program
ADB Loan 2673-CAM and TA 7610-CAM

TECHNICAL ASSISTANCE FINAL REPORT (Final)

30th June 2015

TA 7610-CAM: Supporting Policy and Institutional Reforms and Capacity Development in the Water Sector

REVISION HISTORY

Version	Date	Written / Revised by:	Checked by:
No. 1	22 June 2015	Ian WOOD (Program Team Leader - Water Resource Expert)	Thierry DELOBEL (Project Director – Egis)
No. 2	30 June 2015	Ian WOOD (Program Team Leader - Water Resource Expert)	Thierry DELOBEL (Project Director – Egis)

PREFACE

This report, the *Technical Assistance Final Report*, has been prepared by the implementation consultants – a joint venture of Egis International (France), Egis Eau (France) and Key Consultants (Cambodia) Ltd. (KCC) – for the Capacity Development Technical Assistance (CDTA 7160-CAM) component of the Water Resources Management Sector Development Program (WRMSDP). The report covers the activities implemented under the Outputs A and B of the program over the duration of the consulting services contract, from 16 January 2012 to 30 June 2015.

This report serves two functions; firstly, it is Attachment 1 of Borrower's Completion Report (BCR) for the Program Loan, and secondly, it is the final report for the consultants, fulfilling report requirements of Contract No. COSO/41-773 with the Asian Development Bank.

With regard to the program loan, it has been the consultant's responsibility – backed by the financial resources of the CDTA – to support the Royal Government of Cambodia (RGC) to achieve the policy objectives of the WRMSDP. Discussion of these achievements with regard to compliance with the Tranche Conditions for the release of loan funds is provided in the BCR. This report focuses on the activities of CDTA consulting team and the achievements with respect to the Design and Monitoring Framework and the amendments agreed during the Mid Term Review.

In addition to the description of achievements and outputs with respect to the program framework, and a discussion of outcome and impact, the report provides information relevant to the delivery of the consulting services and the implementation of the contract. It is noted also that the scope of the CDTA goes beyond the scope of the main consulting services contract. In parallel to the main consulting services contract, ADB separately recruited four individual consultants to address specific issues such as river basin planning, public financial management reform and legal issues. In general, the scope of these activities coincided with the scope of the main consulting services contract, and therefore the general results of the activities of the individual consultants are integrated into this final report.

After the completion of the main consulting services contract on 30 June 2015, the CDTA will continue until 30 December 2018 with the sole activity being the support to the Institute of Cambodia for student scholarships, student field trips and teacher training.

In the preparation of this report, the authors recognize the support and contributions of the Royal Government of Cambodia, the Ministry of Water Resources and Meteorology and the program team, led by His Excellency Veng Sakhon. For their leadership and guidance, recognition and appreciation is also afforded to the donors, the ADB, the Australian Department of Foreign Affairs and the Nordic Development Fund.

Ian Wood, Team Leader
June 2015

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Acronyms and Abbreviations

ADB	Asian Development Bank
AusAID	Australian Agency for International Development (now integrated with DFAT)
BCR	Borrower's Completion Report
BSP	Budget Strategic Plan
CamOHDB	Cambodia Operational Hydrological Database
CCA	Climate Change Adaptation
CDTA	Capacity Development Technical Assistance
CISIS	Cambodian Irrigation Scheme Information System
CNMC	Cambodia National Mekong Committee
CoM	Council of Ministers
D&D	Decentralization and De-concentration
DFAT	Department of Foreign Affairs and Trade (Australia), incorporates the agency formerly known as AusAID
DMF	Design and Monitoring Framework
DPIC	Department of Planning and International Cooperation (of MOWRAM)
FWUC	Farmer Water User Community
HRD	Human Resource Development
IAD	Irrigated Agriculture Department (of MOWRAM)
ISPU	Irrigation Services Program Unit
ITC	Institute of Technology Cambodia
IWRM	Integrated Water Resources Management
KCC	Key Consultants Cambodia
MEF	Ministry of Economy and Finance
MoE	Ministry of Environment
MOWRAM	Ministry of Water Resources and Meteorology
MTR	Mid-Term Review
NCWRM	National Council for Water Resources Management
NDF	Nordic Development Fund
NWRP	National Water Resources Plan
NWSR	National Water Status Report
O&M	Operation and Maintenance
PDA	Provincial Department of Agriculture
PDWRAM	Provincial Department of Water Resources and Meteorology
PMO	Program Management Office
PPAM	Program and Project Administration Manual
RBM	River Basin Management
RRP	Report and Recommendations of the President
SD	Sub-decree
SSrRBP	Strung Sreng River Basin Plan
TA	Technical Assistance
TNA	Training Needs Assessment
TSA	Tonle Sap Authority
TSC	Technical Service Center (of MOWRAM)
WG	Working Group
WRMSDP	Water Resources Management Sector Development Program

EXECUTIVE SUMMARY

Commencing in 2010, the Water Resources Management Sector Development Program (WRMSDP) was designed to improve water resources management in Cambodia by (a) enhancing the capacity of the government to manage water resources, and (b) enhancing the capacity of the Ministry of Water Resources and Meteorology (MOWRAM) to manage and deliver irrigation services.

The implementation structure comprises (i) a program loan for budget support to address national water resources management and irrigation policies issues; (ii) a project to assist MOWRAM to rehabilitate small- to medium-scale irrigation systems and to deliver irrigation services in the Tonle Sap basin, and (iii) a capacity development technical assistance (CDTA) on Supporting Policy and Institutional Reforms and Capacity Development in the Water Sector.

This report, the Technical Assistance Final Report, describes the support to the policy objectives of the Program Loan provided by the CDTA consultants for the activities implemented under the Outputs A and B of the Program over the duration from 16 January 2012 to 30 June 2015.

Output A: Enhanced capacity of government to manage water resources

CDTA activities under Output A covered national level issues on legislation, coordination, water resources planning, climate change, water data management and water resource assessment. Regional issues were considered for the Tonle Sap basin and a pilot river basin. Issues for technical skills development were addressed through support for the Institute of Technology Cambodia (ITC).

The CDTA can claim success with key issues including the drafting of the Strategic Plan for the Tonle Sap Authority and demonstration of a comprehensive integrated water resources management (IWRM) approach to river basin planning in the Stung Sreng river basin. The latter culminating in a river basin plan that sets out clear priorities for critical issues relating to water resources management, water resource development and water sharing. In addition, the program supported capacity strengthening in the sector through the establishment of procedures and guidelines for IWRM processes including consideration of climate change adaptation (CCA) in water resources planning.

With regard to national level legislation, a sub-decree on Farmer Water User Communities (FWUCs) was signed into law by the Council of Ministers (CoM) in March 2015 and a sub-decree on River Basin Planning is at an advanced state of approval. Unfortunately, despite support from the CDTA, insufficient progress has been made on the finalization of sub-decrees for water licensing and water quality. Furthermore, the formal establishment of a national level body with the authority to oversee and coordinate water resources planning at the highest level is yet to be achieved.

The program has supported the preparation of the National Water Status Report (NWSR), which provides a comprehensive assessment of water resource issues for the entire country. The NWSR forms the basis for the setting priorities that have been formulated into a Work Plan for the preparation of a National Water Resources Plan (including investment and implementation plans).

With support from the CDTA, ITC commenced undergraduate and post-graduate degree courses in water resources engineering in 2011-12 and 2012-13 respectively. The new curriculum, which aims to address skill shortages in the sector, includes subjects for IWRM, climate change, and economic, environment and social assessment. As of the 2015-2016 school year, four batches of 30 students have received CDTA funded scholarships and of the 120 scholarship holders, 38 (32%) are female.

Output B: Enhanced capacity of MOWRAM to manage and deliver irrigation services

Output B has a more specific focus on irrigation service delivery in MOWRAM. This includes institutional strengthening and technical support for operations and maintenance (O&M) not only for national and provincial government offices, but also for FWUCs. Recognizing the importance of participatory approaches to irrigation management, the program has supported enhanced security for FWUCs through improving the legal status and, with the benefit of the newly approved FWUC sub-decree, a more robust mechanism for government financial support.

In parallel to the support provided at the farm level, a highly significant output has been the establishment and implementation of budgeting and funding mechanisms for Provincial Departments of Water Resources and Meteorology (PDWRAMs) to provide O&M for headworks and main channel infrastructure in irrigation schemes. With the support of the Ministry of Economics and Finance (MEF), a funded O&M plan budgeted at $8.0 million covering 131 irrigation schemes was approved for the 2015 financial year. The significance of this achievement cannot be overstated because this will be the first year that O&M activities have been implemented at the scheme level in accordance with a coordinated and systematic mechanism.

The CDTA assisted the upgrading of the functionality of the Cambodia Irrigation Scheme Information System (CISIS) through database and software enhancements and training of staff at central and provincial levels. New data collected for 1025 irrigation schemes was combined with existing data in 1351 schemes, representing about 87% of the 2780 schemes across Cambodia.

In accordance with the principles of public financial management reform, assistance was provided to enhance procedures for budget preparation, update and upgrade financial management software, and support an institution-wide shift to program budgeting. These measures will improve accountability and strengthen the ability of MOWRAM and PDWRAMs to better manage funds to effectively deliver results.

As a cross-cutting issue, gender was addressed through support for the unit in MOWRAM responsible for gender mainstreaming. This included updating the Gender Mainstreaming Action Plan and support for surveys, data management and awareness raising.

In support of human resources development in MOWRAM, PDWRAMs and FWUCs, over 2800 person-days of training was provided for a wide range of topics including O&M, accounting, climate change, program planning, gender, CISIS, IWRM, FWUC management, maintenance of major and minor irrigation works.

1. Program description

1.1 Background

Contract No. COSO/41-773 for the provision of consulting services under capacity development technical assistance (CDTA) 7610-CAM was awarded by Asian Development Bank (ADB) to the joint venture of Egis International (France), Egis Eau (France) and Key Consultants (Cambodia) Ltd. (KCC), hereinafter referred to as the Consultant, on 18 November 2011.[1] In accordance with the terms of the contract, the Consultant mobilized the team of international and national specialists and formally commenced its services on 16 January 2012.

CDTA 7610-CAM (Supporting Policy and Institutional Reforms and Capacity Development in the Water Sector) was formulated to assist the Ministry of Water Resources and Meteorology (MOWRAM) to implement the Water Resources Management Sector Development Program (WRMSDP)[2] in Cambodia, being financed under Loans 2672/2673-CAM, Grant 0220, CDTA 7610-CAM and Loan 8253 from the Organization of the Petroleum Exporting Countries (OPEC) Fund for International Development (OFID).

The total budget of the CDTA, estimated at $11.16 million equivalent co-financed on a grant basis by: ADB's TA funding program for $1.0 million (from TASF-IV); the Australian Department of Foreign Affairs and Trade[3] (DFAT) for A$5 million ($4.55 million equivalent); and the Nordic Development Fund (NDF) of €3.0 million ($3.75 million equivalent). RGC was responsible for the balance of the local currency cost, amounting to $1.86 million equivalent, to cover office accommodation, counterpart staff support, facilities for seminars and meetings, and other administrative expenses. Although originally planned to close in September 2015, the CDTA was extended until December 2018 to provide ongoing funding for the scholarship program at Institute of Technology Cambodia (ITC).

WRMSDP comprises a program component to address national water resources management and irrigation policy issues in Cambodia and an investment component to assist MOWRAM rehabilitate small- and medium-scale irrigation systems and deliver irrigation services within the Tonle Sap Basin.

The consulting services under CDTA 7610-CAM are intended to provide specialist support to MOWRAM in relation to the following:

(i) develop MOWRAM's capacity to manage water resources through strengthening the strategy, policy and legal framework for integrated water resources management (IWRM);

(ii) improve coordination and cooperation with other ministries and agencies, and at the river basin level;

(iii) strengthen MOWRAM's technical capacity to promote IWRM and climate change adaptation; and develop human resources capacity.

(iv) strengthen policy, planning and legal framework for irrigation management and service delivery

(v) strengthen MOWRAM's capacity to manage, operate and maintain irrigation schemes.

[1] Notice to proceed was sent to the Consultant on 22 November 2011.
[2] ADB 2010. Report and Recommendation of the President to the Board of Directors on Proposed Loans, Grant, Technical Assistance Grant, and Administration of Loan and Technical Grants to the Kingdom of Cambodia for the Water Resources Management Sector Development Program (Loans 2672-CAM and 2673-CAM). Manila.
[3] Formerly, Australian Agency for International Development (AusAID).

1.2 Basic data

The design of WRMSDP as a sector development program (SDP) grew out of feasibility studies carried out from 2007–2008 (under TA 4848-CAM)[4] for a Water Resources Management Sector Project. Fact-finding for the proposed sector project took place during 4-14 December 2007. However, in view of concerns about difficulties being faced in ongoing projects, and in recognition of the need to address sector-wide policy issues, ADB requested additional TA studies in 2008 on institutional capacity and strengthening of the investment project.

These additional studies led to a decision to adopt a SDP approach. Hence, a major change of scope of TA 4848-CAM was prepared in 2009 and additional TA studies were initiated. Processing of WRMSDP was completed in 2010.

In March 2012 ADB approved a further extension, major change in scope and increase in TA amount for TA 4848-CAM to assist MOWRAM to achieve project readiness for WRMSDP. Key dates for the Program Loan and CDTA are as follows:

- Approval of WRMSDP by ADB Board of Directors: 23 September 2010
- Loan 2673-CAM became effective on 3 June 2011
- CDTA 7610-CAM became effective on 18 May 2011
- Commencement of Program implementation: May 2008[5]
- Loan 2673-CAM closure date as designed: 30 June 2013, extended to 30 June 2015
- CDTA closure date as designed: September 2015, extended to December 2018

1.3 Implementation arrangements

MOWRAM is the executing agency for both the program and project components of WRMSDP. Ministry of Economy and Finance (MEF) monitors use of loan proceeds and counterpart funds generated from the Program Loan. WRMSDP management structure comprises:

a. Program Steering Committee

The Program Steering Committee (PSC) is chaired by the Minister of MOWRAM and its permanent vice chair is the Secretary of State (HE Veng Sakhon) of MOWRAM. The PSC, which contains representatives from 13 ministries and agencies, was intended to be responsible for providing overall direction to WRMSDP, and for interagency coordination and Program monitoring.

b. Program Management Office

The Program Management Office (PMO), established on 16 August 2010, is headed by the Secretary of State of MOWRAM, HE Veng Sakhon as Program Director. PMO acts as secretariat to the PSC and is responsible for coordinating, monitoring and reporting on WRMSDP activities to PSC and ADB.

[4] ADB. 2006. Technical Assistance to the Kingdom of Cambodia to Prepare the Water Resources Management (Sector) Project. Manila (TA 4848-CAM, approved for $1.3 million on 16 October 2006).
[5] In view of the extensive stakeholder consultations (including dialogue with the government on water sector policy issues) conducted during program design and through the Government's Technical Working Group on Agriculture and Water, the Program implementation period is considered by ADB to have begun in May 2008.

The full program management structure of PMO was set out in Decision 320 of 30 December 2011. PMO includes program support units whose role is to manage day-to-day implementation of the program (Outputs A and B) and project (Output C), and to report to PMO:

(i) **Water Resources Program Unit** (WRPU) set up within MOWRAM's Water Resources Management and Conservation Department (WRMCD) to support WRMSDP Output A.

(ii) **Irrigation Services Program Unit** (ISPU) is set up within MOWRAM's Department of Irrigated Agriculture to support WRMSDP Output B.

(iii) **Project Support Unit** (PSU) is set up within MOWRAM's Department of Engineering to support WRMSDP Output C.

(iv) **Project Management and Implementation Monitoring Unit** (PMIMU) is set up within MOWRAM's Department of Planning and International Cooperation (DPIC) and is responsible for overall program monitoring and evaluation (M&E).

c. Technical Working Groups

The working groups (WGs) set up by MOWRAM to support implementation of WRMSDP are shown in Table 1.

Table 1: Working Groups Supporting WRMSDP

	Working Group/ Committees	Date of establishment	Chair
1	Women's Committee within MOWRAM[A]	7 June 2011	Ms. Lim Linda
2	Gender Technical Working Group[B]	28 May 2009	HE Sam Sarit
3	Working Group on Public Financial Management Reform	11 February 2009	HE Chan Youttha
4	Committee on Preparing Sub-decrees Related to the Law on Water Resources Management	8 November 2008	HE Nei Lorn
5	Working Group on Human Resources Development (established under WRMSDP)	8 November 2010	HE Ponh Sachak
6	Inter-ministerial Working Group on Establishment of an Inter-ministerial Committee for Water Resources Management (established under WRMSDP)[C]	1 February 2011	HE Veng Sakhon
7	Technical Working Group for Maintenance of Irrigation Systems within MOWRAM[D]	4 May 2011	HE Em Bun Thoeun
8	Inter-ministerial Working Group for Planning of Creation of Technical Skills (established under WRMSDP)	28 January 2011	HE Veng Sakhon
9	Working Group on Anticorruption within MOWRAM[D]	22 December 2010	HE Sin Vuthy
10	Tonle Sap Authority (TSA) General Secretariat Working Group for the Formulation of the TSA Strategic Plan	3 July 2012	HE So Sophort

Notes:

A. Originally formed to manage tasks related to the 'Cambodia's Women Association for peace and effectiveness development' the WRMSDP had little interaction with this group because the role is filled by the GTWG
B. Later reformed by Decision on 18/10/13, to strengthen it to include 18 members and to be chaired by H.E. (Ms) Seng Vannsay (Secretary of State). In other contexts this group is also referred to as the Gender Mainstreaming Unit (GMU) or the Gender Mainstreaming Action Group (GMAG)
C. WG6 also served as the working group for discussing climate change concerns, after an earlier proposed creation of a separate WG for Climate Change Adaptation (CCA) failed to materialize

D. Reformulated by Decision 245 on 02/12/13 and renamed Technical Working Group Establishment for Repair, Operation and Maintenance of Irrigation Schemes in MOWRAM. Mr Loeung Sothea Channy replaced the deceased HE Bun Thoeun as Working Group Chairman.
E. Group formed but never activated.

1.4 Impact, Outcome and Outputs

The impact of the program is expected to be increased economic and social welfare, improved health and sustainability of ecosystems, and reduced poverty and increased food security in the project area. The outcome is expected to be improved management of water resources in Cambodia and more efficient and sustainable irrigation systems in the project area.

Specific expected outcome and outputs from the program are shown in Table 2.

Table 2: Expected Outcome and Outputs

Outcome	Performance Targets
Improved management of water resources in Cambodia and more efficient and sustainable irrigation systems in the proposed project area	By 2013[A] Policy, legal and institutional framework in place to operationalize the Law on Water Resources By 2018 Wet season yield increased from 2010 level of 0.8 t/ha to 1.9 t/ha Dry season yield increased from 2010 level of 1.7 t/ha to 3.6 t/ha Cropping intensity increased from 2010 level of 100% to 160%
Outputs	
A: Enhanced capacity of government to manage water resources	By 2013[A] Four sub-decrees implementing the law on water resources issued by Council of Ministers (CoM), and implementing regulations issued by MOWRAM National water resources committee established, supported by an inter-ministerial secretariat River basin committee established in Stung Sen river basin, with replication initiated in at least one other basin Training plan adopted by the Institute of Technology Cambodia (ITC) offering undergraduate and postgraduate courses in water resources management, with 100 students[B] entering program annually by 2013 (of which 30% are women)
B: Enhanced capacity of MOWRAM to manage and deliver irrigation services	By 2013[A] MOWRAM has assigned rights and responsibilities for irrigation infrastructure to Farmer Water User Communities (FWUCs) within the project area MOWRAM has completed a review of its organizational structure, capacity, systems and staff resources, and demarcated responsibilities for water resource management and irrigation services MOWRAM has prepared, adopted and implemented a comprehensive irrigation operation and maintenance (O&M) plan MOWRAM has developed and delivered training courses through the Technical Services Centre (TSC)[C] on on-farm water management and irrigation practices, and maintenance of irrigation works (target: 45% of beneficiaries to be women)

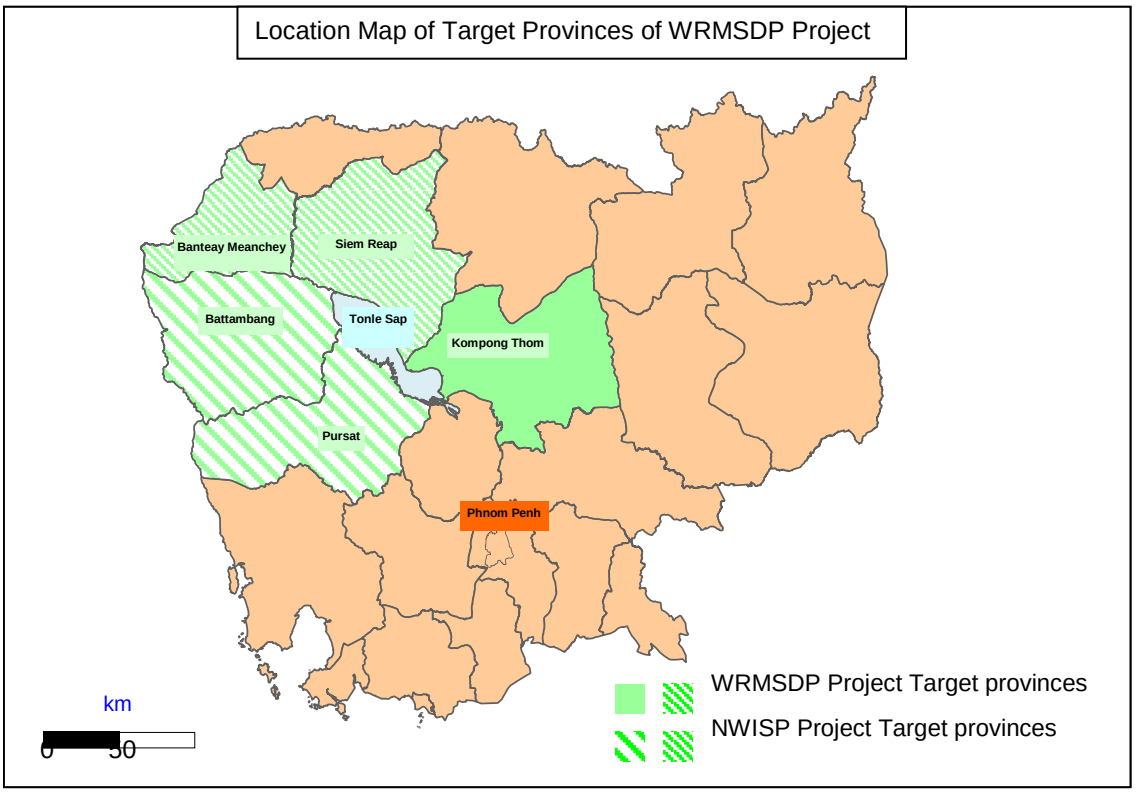
Notes:
A. Year revised from 2013 to 2015 at Mid Term Review (MTR). The original target dates reflect the implementation program described in the Report and Recommendations of the President (RRP) for Loans 2672-2673-CAM, in which it is stated that “the program period is considered to have begun in May 2008” (para. 3). Further, it should be noted that the intended starting date of the program support consultants under CDTA 7610-CAM was September 2010.
B. At MTR this was revised from 100 students annually to 30 students annually.
C. Originally, but incorrectly, shown in the design and monitoring framework as ITC.

The program loan will provide budget support to the Government to finance costs incurred toward achieving Outputs A and B of the sector development program. The investment project (Output C) will be financed through the loan and grant.

Output C, building on experience gained during implementation of the Northwest Irrigation Sector Project (NWISP),[6] will strengthen provincial and district level administrative capacity to implement the Project, rehabilitate and improve about 15,000 ha of existing irrigation schemes (within the provinces of Kompong Thom, Banteay Meanchey, and Siem Reap), enhance skills, livelihood opportunities and capacity of FWUCs within the rehabilitated systems, and support project management.

The project target areas for irrigation development are shown in **Figure 1**.

Figure 1: Project Target Areas



[6] ADB. 2003. Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Kingdom of Cambodia for the Northwest Irrigation Sector Project (Loan 2035-CAM). Manila.

2. Program Implementation

2.1 Overview and approach

In support of the government to achieve the policy objectives the experts of the CDTA team worked in close consultation with each of the working groups. Typically this included a situational assessment leading to the drafting of a work plan. Originally it was understood that the mechanism for program implementation would be that once the working groups had obtain government approval for their work plans then the working groups would manage their own activities using funds from the CDTA and the government directly. In reality, this mechanism proved to be problematic as ADB managed funds were required to remain under the control of the CDTA consultants, and the delivery of Government funds via MEF proved difficult and slow. Notwithstanding these issues, the situational assessment and the framework of the work plan remained useful during implementation.

2.2 Activities, outputs, outcome and impact

The activities and outputs of the program in-line with the overall program framework are summarized in Table 3. An assessment is also made with regard to outcome and impact. Further discussion on program impact is provided in Section III, Part E of the BCR.

The reports referred to in Table 3 are also listed in **Appendix A** and copies are available of the Program Website (wrmsdp.org).

Table 3: Activities, implementation tasks, outputs and discussion on outcome and impact

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
A.1. Strengthening Strategy, Policy and Legal Framework for IWRM A.1.2 The legal framework for Water Resources finalized and an implementation plan adopted and launched. The legal framework for FWUCs, river basin management, water allocation and water quality approved. Sub-decree(s) and Prakas approved and implemented	• Support to WG4 to prepare plan on legal framework for water resources and implementation plan • Support to WG4 for revising and enhancing sub-decrees (SDs) on FWUCs, river basin management (RBM), water licensing & water quality • Support to WG4 and WG7 to prepare implementation plan for FWUCs sub-decree	Achievements and outputs: • Plan on legal framework for water resources and implementation plan (Work Plan for Working Group 4). • FWUC sub-decree (SD) approved 12/03/15 • RBM SD (as of 22/06/15) waiting final approval by CoM. • Revised drafts for Licensing & Water Quality SDs • Implementation plan for FWUC SD, 2015 • Inter-ministerial Prakas for procedures and formula for irrigation service contribution under FWUC SD drafted (as of 22/06/15 are still awaiting approval). Reports: • Report on "Critique of the current and proposed legal framework for water management in Cambodia", 2014	FWUC SD, Prakas and implementation plan provides improved legal basis for irrigation management at the local level. RBM SD enhances the legal basis for river basin approach for IWRM; formally authorizes procedures for RB committees to form; establishes National River Basin Management Committee (NRBMC)[7] to be chaired by the Minister of MOWRAM and with representation at Secretary of State level from at least 13 other Ministries. Revised drafts of Licensing & Water Quality SDs[8] have progressed next steps for MOWRAM in legal reform.
A.1.3 National Water Resources Plan (NWRP) developed and adopted	• Facilitating discussion on national water management issues with the Inter-ministerial Working Group on Establishment of an Inter-ministerial Committee for Water Resources Management (WG6). • Commissioning 10 special study contracts to provide nationwide assessment on water issues • Prepare National Water Status Report • With WG6, prepare work plan on (i) priority national water sector issues to be addressed, (ii) the process for revision and update of the existing National Water Resources Policy	Achievements and outputs: • Comprehensive framework developed for water resources planning at the national level Reports: • Work plan for National Water Resources Plan and Implementation and Investment plan • Cambodian National Water Status Report • National Water Sector Indicator Report • Special study reports on Irrigation and drainage; Industry; Urban water supply and sanitation services; Rural supply and sanitation services; Groundwater; Hydropower development; Aquaculture; Inland navigation; Surface water resource management functions; Water for the environment.	As agreed at the MTR, development of a full NWRP was deemed infeasible at this stage. In lieu, a comprehensive framework was developed for water resources planning at the national level, including National Water Status Report and work plan for preparing the NWRP.

[7] According to the SD the role of the NRBMC is to "manage, conserve and develop river basins in the Kingdom of Cambodia in an effective and sustainable manner"
[8] As of June 2015, Licensing & Water Quality SDs remain with Minister MOWRAM

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
A.2. Improving Coordination and Cooperation Framework for IWRM A.2.1 Ministerial level committee for coordination of national water resources management and an inter-ministerial secretariat established.	• Supported national workshop on "Institutional and organizational arrangements for coordination of water resources management in Cambodia", National • Support for WG6 to draft Royal Decree for National Council for Water Resources Management[9] and sub-decree on Secretariat to National Council for Water Resources Management (NCWRM).	Achievements and outputs: • Consultations facilitated and documents drafted Reports: • Report on National Workshop on "Institutional and organizational arrangements for coordination of water resources management in Cambodia", 2013 • Royal Decree for NCWRM and Sub-decree on Secretariat to NCWRM (draft)	The RBM SD provides the basis for establishment of National River Basin Management Committee (NRBMC), to *"manage, conserve and develop river basins in the Kingdom of Cambodia in an effective and sustainable manner".* The secretariat of the NRBMC is based in MOWRAM. Legal framework for inter-ministerial coordination on river basin management established.
A.2.2 Strategic plan for Tonle Sap Authority (TSA) to be developed	• Support provided to TSA General Secretariat Working Group for the Formulation of the TSA Strategic Plan (WG10) to prepare work plan. • Commissioned national consultant to support WG10 for preparation of TSA Strategic Plan • Facilitated workshops and discussion forums.	Achievements and outputs: • Extensive stakeholder consultation with government (national and provincial) and non-government stakeholders. • Strategic Plan prepared to draft stage by 30/06/2015 Reports: • TSA Strategic Plan for 2015-2020 (Draft) • Work plan for Working Group 10	Strategic Plan for TSA enhances governance at TSA with respect to transparency, accountability, predictability, and participation. TSA can seek government and donor support for specific initiatives under the plan which will support development and resources management in the Tonle Sap.
A.2.3 Pilot operation of river basin coordination forum or committee established in Stung Sen river basin and water management plan for pilot river basin prepared; river basin coordination and management initiated in at least one other	• Activities for Stung Sen conducted by TSA with support of International Office of Water • Facilitated workshops and discussion forums for the comprehensive approach to river basin planning in Stung Sreng • Undertook analyses and assessment of the river basin to support technical aspects on water management, climate change, economics, environment and	Achievements and outputs: • Decision on Stung Sen river basin committee, 06/04/2015 • Prakas[10] on Stung Sreng river basin committee, 27/10/2014 Reports: • Stung Sreng River Basin Plan, 2015 • Interim reports prepared in development of SSrRBP - Stung Sreng Resources and Options Analysis Paper - Stung Sreng River Basin: Issues, Objectives and	Establishment of the Stung Sreng River Basin Committee and River basin management plan strengthens accountability, predictability, and participation in water resources for the river basin.

[9] Near the conclusion of the program, the proposed for a Royal Decree and NCWRM was dropped in favor of using the structure for the National River Basin Management Committee under the RBM SD

[10] Note that Decision notices are for interim committee arrangements pending the approval of the RBM SD.

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
	social issues.	Strategy Options - Stung Sreng River Basin Status Report - Water resources profile of the Stung Sreng River Basin - Proposal for upgrading the hydromet data collection network of the Stung Sreng River Basin - Report on Farmer and Industry Engagement Water Resource Management Survey for Stung Sreng River Basin - Report on Potential Economic Value of Irrigation investments within Stung Sreng River Basin: Initial Estimates - Report on the status of rural and urban water supply and sanitation in the Stung Sreng River Basin • Working Paper – Cambodia: requirements for minimum flows in rivers	
A.3 Strengthening capacity of MOWRAM for IWRM and Climate Change Adaptation A.3.1 Water resources assessed at a nationwide scale	• Information gathering and assessment for water resources at national level • Consultation with inter-ministerial working group	Achievements and outputs: • National Water Resources Profile prepared and endorsed Reports: • National Water Resources Profile Report • Cambodia Hydro-Meteorological data compilation report	Knowledge enhanced at the national level on the status of water resources. Issues identified with water data availability.
A.3.2 Improved water data management plan prepared, approved and implemented	• Facilitated discussion water data management issues with relevant MOWRAM departments and WG6 • Preparation of the Water Data Management Plan, including assessment of existing data, capacity and resources, identification of future needs, and development of a structured approach to planning. • Developed and conducted in data management tool, Cambodia Operational Hydrological Database, CamOHDB	Achievements and outputs: • Water Data Management Plan prepared and endorsed Reports: • Water data management plan, 2015 • Cambodia Operational Hydrological Database, CamOHDB training materials	Framework established and road map developed for improved water data management in Cambodia. Implementation remains pending allocation of sufficient resources.

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
A.3.3 Improved plan for flood and drought forecasting system prepared, approved and implemented	This item was re-assigned to ADB financed GMS Flood and Drought Risk Management and Mitigation Project		
A.3.4 Coordination and cooperation between MOWRAM and Ministry of Environment (MoE) improved to mainstream adaptation to climate change in IWRM plans and actions and vice-versa	• Climate change analysis conducted for a suite of climate parameters with statistical and dynamic downscaling techniques. • Climate change database including GIS data toolkit prepared for Cambodia. • Training provided with MOWRAM, MoE and ADB CARM. • Database installed in 19 locations in MOWRAM, MoE, other programs. • MOWRAM climate change action plan reviewed and recommendations provided. • Guidelines approved for mainstreaming of climate change adaptation in IWRM plans; and IWRM in climate change adaptation plans and actions. • Training conducted with WG6 on application of guidelines. • Climate change issues incorporated into guidelines and procedures for water planning incorporating IWRM.	Achievements and outputs: • Complete data set available for downscaled climate data available for Cambodia • Capacity building provided on climate data outputs and application of data in CCA • Strengthened linkages with MoE and Cambodia Climate Change Network (CCCN) achieved through sharing of information and comments on MOWRAM CC action plan. • Tools developed integration of CCA and IWRM in water resources planning. Reports: • Procedures to mainstream climate change adaptation in IWRM plans and actions, IWRM in climate change adaptation plans and actions • Guidelines for IWRM in the preparation of river basin plans, including climate change • Report on Development of a high–resolution climate change database and GIS toolkit for Cambodia • Report on GIS Mapping of high–resolution climate change projections for mid-century based on nine statistically downscaled global climate models • Report on GIS Mapping of high–resolution climate change projections for frequency of extreme events based on dynamically downscaled echam4 global climate model • Data base, Application for processing modeling data • Various presentations on climate change adaptation and use of model data.	Information updated on climate change effects on climate parameters across Cambodia. Knowledge enhanced in MOWRAM, MoE and other stakeholders on climate change impacts. Capacity enhanced for the application of CCA in water resources planning. Guidelines and demonstrated application have enhanced capacity enhanced at national and provincial levels for IWRM approaches for RB management.

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
A.4 Human Resources Capacity Development to Promote IWRM A.4.1 Technical skills development – tertiary level training through the Institute of Technology Cambodia (ITC): training curriculum to be established by 2013; and annual intake of 100 students into program by 2015[11].	• Needs assessment conducted to examine education needs and demands for water engineering across government and private sector at central and provincial levels. • Audit of the water engineering curricula in the five-year undergraduate course in ITC's Rural Engineering Department, including assessment of existing capacity and teaching resources. • Preparation of an enhanced curriculum, with improved emphasis on IWRM, climate change, economic assessment, and environment and social issues. • Assessment of formal training needs of teaching staff members and resource requirements at ITC. • Support to the management team of ITC to secure agreements with ADB and MOWRAM, and to support initial administrative processes.	Achievements and outputs: • ITC commenced undergraduate and post-graduate degree courses in water resources engineering in 2011-12 and 2012-13 respectively. • New curriculum was introduced to Year 3 students as they commenced the specialized water resources engineering stream. • Approximately 80 students are enrolled each year in the water resources engineering degree course. • Four batches of 30 students have CDTA funded scholarships. Of the 120 scholarship holders, 38 (32%) are female. • Equipment for the soils, survey and surveying laboratories purchased and installed. Fully equipped computer laboratory installed, including GIS software. • In addition to student scholarships and equipment, the support under the CDTA includes funds for visiting lecturers, training of ITC at locations in the region, and site excursions for students. Reports: • Report on Education Needs Assessment and Training Plan • Report on Development of a Water Resources Engineering Curriculum for Institute of Technology of Cambodia	Greatly strengthened water resources engineering program at ITC, with a more balanced curricula including components of IWRM, climate change, economic, environment and social assessment. Scholarship program provides incentives for attracting top quality students (including a greater proportion of women) to water resources engineering. Teacher training and modern laboratory equipment supports the sustainability of the enhanced profile of water resources engineering. The influx of graduates with higher standards will have long term impact to address current gaps in the sector which desperately lacks appropriately qualified staff.

[11] The review of the DMF at MTR recommended the target for ITC students be reduced from 100 students annually to 30 students annually

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
B.1 Strengthening Policy, Planning and Legal Framework for Irrigation Management and Service Delivery B.1.1 Government prepares and adopts a plan to develop financially independent farmer user groups to operate and maintain irrigation schemes by 2013; Government reviews and clarifies legal status of irrigation works, assigns rights to FWUCs by 2013	• Special study implemented for assisting with developing the plan for financially independent FWUCS • In cooperation with FWUC Department, preparation of Policy and implementation guidelines for sustainable FWUCs, including: - FWUC policy and principles - FWUC budgeting guidelines - FWUC expenditure guidelines • Guidelines prepared for the division of asset responsibility between MOWRAM, Provincial Department of Water Resources and Meteorology (PDWRAMs) and FWUCs • Drafted a modality for the government provision of technical and financial support to FWUCS, by matching grant mechanism, in preparation for preliminary discussions with MEF • Conducted National Workshop on Sustainable FWUCs • Conducted a seminar with development partners and government stakeholders on Implementation of the FWUC sub-decree and review of the Policy for Sustainability of O&M in Irrigation Schemes.	Achievements and outputs: • Documentation of implementation guidelines for sustainable FWUCs[12] is an important step towards improved institutional arrangements for FWUCs. • Enhanced clarity with regard to the legal status of irrigation works is provided by the recently approved FWUCs sub-decree and the supporting document *"Guidelines on the division of asset responsibility in Irrigation Schemes"*, approved 06/04/2015. • On the basis of the new sub-decree and the FWUC guidelines, the existing policy for FWUCs[13] was reviewed in cooperation with government stakeholders. Issues were identified for where the old policy needs to be updated to address new and emerging issues (for example, the operation of the new, large Chinese funded schemes) • The next step for MOWRAM is to work with stakeholders to update the formal policy on FWUCs. Reports: • Guidelines for Division of Asset Responsibility in Irrigation Schemes, 2015 • Nationwide Plan to Develop Financially Independent Farmer Water User Communities, 2015 • Policy and Implementation Guidelines for Sustainable FWUCs, 2015 • Report on Seminar on Implementing FWUC Sub-decree and Reviewing the Policy on Sustainable Management and O&M of Irrigation Schemes, 2015 • Summary report on a Nationwide plan to Develop Financially Independent Farmer Water User Communities • Report on Workshop on Sustainable FWUCs, April 2015	The activities of the program have strengthened the legal and institutional framework for FWUCs, providing an improved enabling environment in which they can operate. The implementation guidelines, improve the institutional arrangements with respect to transparency, accountability and predictability. Clarification of the policy for government support to FWUCs prepared in line with the recently approved FWUC sub-decree, will provide the modality which has been lacking to the funding of FUWCs. Additional work remains to not only finalize and formally approve the new Policy, but also to support initial stages of implementation. Greater certainty about the funding as well as legal responsibilities of FWUCs will greatly enhance delivery of irrigation services and improve the likelihood of sustainability.

[12] The document on Policy and Implementation Guidelines for Sustainable FWUCs was endorsed at the National Workshop on Sustainable FWUCs, 29/04/2015
[13] Circular 1, Policy for sustainability of O&M of irrigation schemes, 2000

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
		• Report on Progress of 5 FWUCs to achieving Financial Independence and Suggested approach to developing a Nationwide Plan for Developing Financially Independent FWUCs	
B.2. Improve Organizational Structures and Administrative and Technical Capacity of MOWRAM, PDWRAMs and District Offices B.2.1 Prepare a plan, adopted by MOWRAM, to strengthen planning, budget and financial management systems in line with the public financial management reform program by 2013	• Working with WG3 (Public Financial Management) support was provided for the plan for PFM reform (known as the Ministry Action Plan, MAP) which was subsequently approved by MOWRAM and MEF[14]	Achievements and outputs: • Establishment of the MAP was an achievement. • Achievements with respect to over PFM reform program is reported below for Activity B.2.2. Reports: • Ministry Action Plan (MAP) for PFM reform (includes plan for strengthening planning, budget and financial management systems)	For discussion on impact of PFM reform see Activity B.2.2.
B.2.2 Strengthen management information systems for administration and finance at national, provincial, district levels and consolidated at central level	Administration and financial management: • On-the-job training[15]: provided for an extended system to include the new 2015 chart of accounts, departmental and provincial reporting, and extended reporting capability. • Support provided to enhancements to accounting system tools, including systems and forms for O&M expenditure control and recording. Training in new systems with staff of Irrigated Agriculture Department (IAD) of MOWRAM.. • Extensive training (including TOT) provided to MOWRAM and PDWRAMs in the newly adopted Sage 50 accounting package and financial reporting	Achievements and outputs: • Modernizing the accounting system with new forms, procedures and state-of-the-art accounting system was a major achievement for MOWRAM and the PDWRAMs. • The strengthening of the accounting also included specific procedures for accounting of O&M which helps consolidate the reforms achieved in other aspects of the program • The establishment of functioning arrangements for Program Budgeting in MOWRAM is a significant improvement that strengthens transparency and accountability as well as the ability to manage and monitor central and provincial level activities in a results-based framework. Reports: • Training report/program for SAGE50 • Report on Workshop on Program Budgeting and Budget Entities , December 2014	The impact of strengthened accounting and management systems not only in MOWRM, but also in the PDWRAMs, the TSA and the Cambodia National Mekong Committee (CNMC), will be greatly improved transparency and accountability in each organization. Better financial management, both from the point of view of accounting practices as well as for the planning, management and monitoring of funds will lead to greater efficiencies and therefore opportunities for more effective use of funds to serve the functions of each organization.

[14] The activities for PFM reform under WRMSDP were conducted in close cooperation with the ongoing program for ADB Grant 0222-CAM
[15] The initial activities for strengthening financial management systems were led by an international and a national consultant engaged by ADB

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
	Program budgeting • Prepared a framework for program budgeting, including support for identification of entities and assessment of capacity development needs • Supported establishment of naming system and objectives for programs and sub programs • Provided training and direct guidance in defining activities and linkage with outcomes and outputs, including guidance on cost estimation for BSP • Training workshop held MOWRAM & PDWRAMs for programs, sub-programs and budget entities.	• Status report on Program Budgeting and Budget Entities in MOWRAM	
B.2.3 Strengthen MOWRAM's internal links between line departments and examine options for reorganization of MOWRAM line departments so they can effectively deliver water resource management and irrigation service delivery	• In consultation with WG6, a review was conducted on the institutional arrangements for the management of water resources in Cambodia. This also examined MOWRAM's organizational structure with respect to the separation of responsibilities and the delivery of services. • Consultation on report findings conducted with inter-ministerial working group.	Achievements and outputs: • The achievement was that a process of discussion was instigated on the organizational structure of MOWRAM in consideration of advantages of a separation at a high level between water resources management and irrigation service delivery. • The conclusion of the review was that while improvements could be made, in general, the separation of responsibilities is clear under present arrangements. No further action taken at this stage. Reports: • Report on Institutional Arrangements for the Management of Water Resources (including Review of MOWRAM organizational structure), 2015	In the absence of concrete uptake by government on the recommendations of the review, tangible outcome and impacs are difficult to measure. The general conclusion was that while further separation of responsibilities has merits, additional re-organization of MOWRAM is not a high priority at this time.

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
B.2.4 Strengthen PDWRAMs, district offices, and links to Provincial Departments of Agriculture (PDAs)	• In general, this is a cross-cutting issue supported the government program of De-concentration and Decentralization (D&D) • Several activities under the CDTA serve to strengthen PDWRAMs and local level management, including B.1.1, B.2.1, B.2.2, B.2.3, B.3.1, B.3.2., B.3.3, B.4.1, B.4.2, and B.4.3. • Local level representation (including PDRAMs, district offices and PDAs) features strongly in training for the preparation of O&M in irrigation systems.	Refer to other activities (B.1.1, B.2.1, B.2.2, B.2.3, B.3.1, B.3.2., B.3.3, B.4.1, B.4.2, and B.4.3) for results relating to strengthening at local levels. Systems for the demarcation of responsibilities between MOWRAM and PDWRAMs are addressed in the Policy and Implementation Manual (including Guidelines) for O&M of Irrigation schemes. Training provided to PDWRAMs, district offices and PDAs on O&M systems in February and March 2015. The development of linkages between PDWRAMs and PDAs is an element embedded in the Policy and Implementation Guidelines for Sustainable FWUCs	Refer to other activities (B.1.1, B.2.1, B.2.2, B.2.3, B.3.1, B.3.2., B.3.3, B.4.1, B.4.2, and B.4.3) for results relating to strengthening at local levels.
B.2.5 Create a gender mainstreaming unit in MOWRAM with appropriate resources and staffing; facilitate and advocate recruitment of women in MOWRAM (an assurance in the financing agreement), with a recruitment target of 20% women	• A unit responsible for gender mainstreaming dates back to the establishment of the MOWRAM Working Group on Gender on 29/04/2005. This unit was then re-organized as the Gender Technical Working Group[16] (GTWG) on 28/05/2009 and then again by Decision on 18/10/13. • The final format strengthens the group to include 18 members and chaired by H.E. (Ms) Seng Vannsay (Secretary of State) and receives funding annually from MOWRAM budget. • Work Plan for the group was approved by MOWRAM in December 2013 and then by MEF on 13 March 2014. • Support provided to revise and update the Gender Mainstreaming Action Plan (GMAP). Actions implemented from the Work Plan	Achievements and outputs • The approval of the Work Plan and implementation of activities such as the updating of the GMAP, data collection, training and awareness raising events all contribute to raising the profile of gender issues in MOWRAM and PDWRAMs, not only with the officer level, but also in senior management. • The outcome in terms of MOWRAM recruitment since 2012: i. 2012: 46 persons recruited, 11 female (24%) ii. 2013: 47 persons recruited, 16 female (34%) iii. 2014: 78 persons recruited, 29 female (37%). Reports: • Decision on creation of Working Group on Gender • Work plan for the Working Group 2 (Gender Technical Working Group) • Gender Mainstreaming Action Plan, Update in Water Resources Sector for 2014-18 • Report on pilot study on Review the gender roles and issues	The statistics for recruitment in MOWRAM not only indicate significant growth in recruitment numbers year on year, but also an increasing proportion of female recruits. The newly recruited women in MOWRAM cover a spectrum of roles from the more traditional roles in administration and finance, to the more complex roles in other technical departments. Impacts are likely to be long-term. The mainstreaming unit in MOWRAM has strong political support at a high level and is likely to be sustainable. Increasing awareness of gender issues in MOWRAM (as reflected in trends in recruitment) is a positive sign that more attention will be given to equality issues. MOWRAM, however, is still very much as male-dominated organization, particularly in the technical engineering fields. Ongoing attention on gender issues is required to ensure that current

[16] In other contexts, the Gender Technical Working Group is referred to as the Gender Mainstreaming Action Group (GMAG) and the Gender Mainstreaming Unit.

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
	• Survey of gender issues conducted in three pilot province, including training and awareness raising • Database prepared to track gender and report on related information • Website and Facebook page prepared to promote awareness in MOWRAM and general information on gender issues. • Forum held for all women in MOWRAM held on May 2015 to promote awareness of gender issues • Training held with gender focal points from all departments of MOWRAM and from all PDWRAMs • Training held with FWUCs in five provinces on gender issues and management of irrigation schemes	in the water sector in Kampong Thom, Siem Reap and Banteay Meanchey provinces and to conduct awareness raising and training • Report of Training on Gender Mainstreaming and Water Resource Management to PDWRAM Gender Focal Points and Gender Task Forces in the Water Resources Sector (2015) • Report on establishing a database and website for gender in water sector in MOWRAM (2015)	momentum does not falter.
B.3. Strengthen MOWRAM's Ability to Manage, Operate and Maintain Irrigation Systems B.3.1 MOWRAM to prepare, adopt and implement a comprehensive irrigation O&M Plan	• Meetings with stakeholders, (Incl FWUCs and PDWRAMs and Local Authorities), inspections of irrigation schemes, analysis of findings, problem / solution tree analysis. • Study on economics of O&M compared with rehabilitation without O&M. • Prepared strategy and work plan to complete development and ensure sustainability of Irrigation Schemes • Prepared Comprehensive O&M plan • Prepared Policy and Implementation Manual (including Guidelines) for O&M of Irrigation Schemes prepared, includes: - O&M Policy principles - O&M Technical manual and guidelines - O&M Budgeting guidelines - O&M expenditure guidelines	Achievements and outputs: • Comprehensive O&M plan completed and integrated with Policy and Implementation Manual (including Guidelines) for O&M of Irrigation schemes. Approved 06/04/2015. • Implementation of the Manual commenced from early 2014 • PDWRAMs trained for implementation of O&M Reports: • Strategy and work plan to complete development and ensure sustainability of irrigation schemes, 2014 • Report on Comprehensive O&M Plan • Policy and Implementation Manual (including guidelines) for O&M of Irrigation Schemes • Report on National Workshop on sustainable irrigation schemes, January 2014 • Report on provincial training to Strengthen Readiness for Commencement of O&M, 2015 • Irrigation Scheme Management and O&M in Cambodia –	By strengthening MOWRAM's O&M policy and implementation procedures, the outcome is that staff of IAD, FWUCD and PDWRAMs have a comprehensive understanding of regular practices for irrigation scheme management and O&M. The combined impact of this activity and the activity for funding mechanisms (see activity B.3.3 below) will be greatly enhanced organizational capacity for managing MOWRAM's and provincial level responsibility for O&M. The tools provided, including the O&M plan implementation manual, equip the organization at different levels with an approach to O&M that has never been available previously. As was demonstrated in the study on economics, the economic impact of functioning and well-maintained irrigation schemes is considerable.

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
	- M&E of the O&M program & guidelines - Supervision and Inspection - M&E of procurement and financial management • Conducted National Workshop on Policy and Implementation Manual (including Guidelines) for O&M of Irrigation Schemes. • Conducted round table meeting of stakeholders on implementation of sustainable O&M. • Conducted training of PDWRAM's staff on implementation of sustainable O&M.	Current Situation Report, 2013 • Report on MOWRAM's O&M planning and practices, 2014 • Report on economic study of O&M of irrigation systems, 2014 • Report on Round Table Meeting on Sustainable O&M, 2014	O&M plan implementation is set to commence as a result of an approved budget for 2015 of $8.0 million for O&M in 131 irrigation schemes[17] [18]. While some training was provided to support PDWRAMs, risks remain due to lack of capacity and inexperience with O&M.
B.3.2 MOWRAM to adopt and operationalize an asset management system to manage, operate and maintain irrigation systems	• Software for Cambodian Irrigation Scheme Information System (CISIS) data base upgraded to improve functionality and user interface • Training with MOWRAM Department of Planning and International Cooperation (DPIC) staff. • English language survey forms formatted to match database data entry forms and translated to Khmer • Equipment purchased including dedicated server for CISIS database • GIS Web Page training provided to CISIS Administrator (along with illustrated Administrator Manual) • Documentation completed, including user and administrator manuals and glossary of	Achievements and outputs: • Through the improvements in the CSIS software, the provision of documentation, hardware and training, DPIC and provincial staff are now proficient at collecting and entering data, producing reports and maintaining the system. • Data on schemes includes infrastructure, its condition and functionality, command area and actual area cropped and irrigated and functionality of FWUC. • Budgeting module can assist DPIC in setting national budget for scheme O&M. • Summary reports for irrigation schemes can be hosted online along with GIS web map of a given scheme. Reports: • Report on CISIS Data Entry Training and Review of Field Data Collection Questionnaire	With a greatly expanded set of good quality data providing complete coverage in 13 provinces and partial coverage in 12, MOWRAM has an effective tool to assist asset management and the planning of O&M. The data collected under the CDTA for 1025 schemes combines with existing data in 1351 schemes, meaning that of the 2780 schemes across Cambodia, only about 404 schemes remain without data in CISIS. Combined with the other activities to support the management, planning and funding of O&M, the overall impact will be greatly enhanced capacity for selection of schemes for rehabilitation and O&M. It is understood MEF welcome CISIS as a first step by MOWRAM towards establishing

[17] The investigations conducted under the program reveal that nationwide the financial demands for irrigation scheme O&M for irrigation are enormous. The allocation of funds in 2015 for only 131 schemes is a starting point. Requests for O&M budget are expected increase annually in a phased approach.
[18] As of June 2015, government approved funding was yet to reach PDWRAM level. It would appear that this is related to budgetary issues in Government.

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
	irrigation technical terms (to guide data entry). • Contracts completed for CISIS data collection in 1025 schemes. • Workshop on CISIS operationalization conducted in March 2015	• Report on Conduct of a survey of 30 Irrigation Schemes in Siem Reap Province • Reports on Conduct of a Survey of Irrigation Schemes in 20 Provinces (Package P1, P2, P3, P4) • Report on workshop for operationalizing CISIS, March 2015 • CISIS Administrator's Manual • CISIS User's Manual • CISIS WebGIS Manual	formal management of irrigation assets leading into assessment of investment effectiveness.
B.3.3 MOWRAM to establish a sustainable funding mechanism for O&M	• The Policy and Implementation Manual (including Guidelines) for O&M of Irrigation Schemes prepared, developed in cooperation with WG7, includes specific procedures for the assessment of O&M needs, estimation of budget and preparation of budget strategic plan (BSP) • Consultation conducted with MEF and MOWRAM to establish clear mechanism for irrigation scheme O&M budget allocation. • Training provided to MOWRAM and PDWRAMs in the application of these guidelines lead to a draft budget strategic plan for O&M worth $12.5 million for 125 schemes, which was submitted to by MOWRAM to MEF in July 2014. • Support provided to MEF and MOWRAM Inter-ministerial coordination committee for development projects and irrigation scheme management program, established since July 2014 Developed guidelines for regular supervision and joint inspection (MEF and MOWRAM) of O&M work outputs and expenditures compared with budget requests and work plans.	Achievements and outputs: • MOWRAM Budget Strategic Planning (BSP) for 2015-16 approved by MOWRAM and MEF in August 2014. • In a highly significant achievement, MEF approved a budget of $8.0 million for O&M in 131 irrigation schemes for routine and periodic O&M and emergency flood repair for the 2015 financial year. • Capacity building on budget planning and O&M, including training, undertaken with staff of MOWRAM and PDWRAMs in 2014 and 2015. Reports: • Report on the Assignment for Budget Strategic Plan for O&M 2015 – 2017 • Report on Training Workshop for Budget Strategic Planning for O&M 2015 - 2017, Phnom Penh, May 2014. • Report on Training Workshops for Budget Strategic Planning for O&M 2015 - 2017, Kampong Cham and Kampot, May 2014.	Two significant outcomes are that: • MEF and MOWRAM agreed on a sustainable funding mechanism, which has been operationalized. • MEF have decentralized the management of O&M expenditure to PDWRAMs As described above for Activity B.3.1, the impacts of establishing a functioning system for O&M, including a sustainable funding mechanism, are profound. The impact, while considerable, will be emerge over a number of years as MEF have indicated a progressive increase in the funding for O&M based on the absorption capacity demonstrated by MOWRAM and PDWRAMs.

Activity	Implementation tasks conducted by consultant team	Achievements, outputs and reports	Assessment of outcome and impact
B.4. Develop Human Resources Capacity to Manage, Operate and Maintain Irrigation Systems (Government and FWUCs) B.4.1 Human Resource Development (HRD) plans developed for MOWRAM, PDWRAMs, district offices and FWUCs B.4.2 Technical skills development — vocational training courses developed and offered at MOWRAM's Technical Services Centre B.4.3 Capacity of FWUCs and PDWRAMs enhanced through timely vocational and on-the-job training (an assurance in the financing agreement), with a target that at least 45% of female staff attend technical skill development	• Training needs assessment (TNA) conducted for MOWRAM and PDWRAMs and for FWUCs • HRD plans prepared for MOWRAM and PDWRAMs and for FWUCs • During the period of the WRMSDP, through an ongoing support program by JICA, training courses on on-farm water management and irrigation practices, and maintenance of major and minor irrigation works have been developed and conducted by the TSC. During this period direct support from CDTA was called upon by MOWRAM and the TSC was not including the working group responsible (WG5). • Via Component C, training delivered at provincial level in the project area (Battambang, Banteay Meancheay, Pursat and Kampong Thom) from 2012 to 2014. • Training on O&M budget preparation, accounting, climate change, CISIS, IWRM and gender issues conducted with CDTA. • Training conducted for MOWRAM, PDWRAMs and FWUCs, for on-farm water management and irrigation practices, maintenance of major and minor irrigation works, FWUC management, program planning, gender and CCA.	Achievements and outputs: • The establishment of the HRD plans provides a roadmap for future capacity development in MOWRAM. • The training provided met with positive response from participants and will serve to enhance capacity at the functional level in MOWRAM and PDWRAMs. • As with all training, risks remain with sustainability. Training which is not immediately applied to day-to-day work practices can be forgotten over time. Training provided to government officers who are then reassigned or leave the organization will also fail to generate results. Reports: • Report on farmer water user community training needs assessment in 5 provinces, Cambodia • Training needs assessment report for MOWRAM and PDWRAMs • Training needs assessment report for 33 FWUCs • Human Resource Development Plan for MOWRAM and PDWRAMs • Human Resource Development Plan for FWUCs	Across the whole Program, capacity building targeted an integrated approach with tools, procedures, equipment, and training – including both on-the-job and class-room methods. The impact of the capacity building is likely to be most noticeable in the most applied areas, such as in the day-to-day activities of government and FWUC officers in O&M of irrigation schemes. In this case the impact is increased agriculture productivity from a more reliable water supply. Training in other areas like gender, CCA or IWRM, which may be less immediately applicable (but no less important) , will likely generate less immediately obvious impacts. In general, the improved knowledge as acquired though training will, in the long term, improve the overall functional capacity of MOWRAM and PDWRAMs.

3. Program Operations

3.1 Consulting contract

The CDTA team, formed from a joint venture of Egis International (France), Egis Eau (France) and Key Consultants (Cambodia) Ltd. (KCC), mobilized on 16 January 2012 originally for a 3-year contract. In January 2015, the contract was extended by five-and-a-half months to complete on 30 June 2015.

The initial contract included 85 person-months of international consultants and 182 person-months of national consultants. Through 19 contract variations, and in response to demands of the Program, contract inputs were increased to 120 and 292 person-months of international and national consultants respectively. Table 4 lists essential details of each contract variation. Through these variations, the contract value was increased from an initial amount of $3,195,800 to $4,892,390.

The two most significant variations are Variation VO#7 which provided re-organization and re-structuring following the Mid-Term Review, and Variation VO#16 for the extension of the consulting services contract.

Table 4: List of Contract Variations

Variation No.	Date approved	Revised contract value (USD)	Revised person months expert input		Explanatory notes
			International	National	
0	18/11/2012	$3,195,800	85.0000	182.0000	Original contract
1	20/03/2012	$3,195,800	85.0000	182.0000	Two national staff replaced
2	11/05/2012	$3,195,800	85.0000	182.0000	Two national staff replaced
3	23/07/2012	$3,195,800	84.0000	192.2500	Reorganization of international & national inputs according to program needs
4	09/01/2013	$3,195,800	84.0000	192.2500	Replace irrigation specialist, adjust related out-of-pocket expenses
5	26/02/2013	$3,195,800	84.0000	192.2500	Replace international economist, adjust related out-of-pocket expenses
6	10/06/2013	$3,195,800	84.4333	192.5832	Increase of time for international & national training specialists
7	28/08/2013	$3,722,220	103.2133	238.6932	Major adjustment of expert inputs following recommendations from the MTR
8	11/10/2013	$3,780,000	103.2133	266.6932	Addition of national experts; water resources planner and river basin planner
9	23/12/2013	$3,780,000	103.2133	267.2932	Replacement of Team Leader, increase inputs for national education specialist
10	16/01/2014	$3,780,000	103.4433	265.2932	Small increase for international educational specialist, replace river basin planner
11	05/02/2014	$3,780,000	103.4433	265.2932	Redistribute some inputs to Home Office. Adjustments to out-of-pocket expenses
12	24/04/2015	$3,780,000	103.4433	265.2932	Increase inputs for Team Leader, other minor adjustments to out-of-pocket expenses
13	27/06/2014	$3,885,350	104.0033	265.2932	Increase budget for Studies, Surveys & Reports in response to program

Variation No.	Date approved	Revised contract value (USD)	Revised person months expert input		Explanatory notes
			International	National	
					needs
14	03/10/2014	$3,911,139	106.0033	265.2932	Increase inputs for international irrigation specialist. Increase budget for Studies, Surveys & Reports in response to needs
15	28/11/2014	$3,915,939	106.0033	265.2932	Reallocation of time to field inputs. Other minor adjustments
16	12/01/2014	$4,848,000	118.4033	291.0532	Extension of contract to 30 June 2015. Increases to expert inputs and budgets for studies and training/workshops
17	11/03/2015	$4,892,390	120.4563	291.0532	Addition of International Public Financial Reform and Accounting Specialist
18	18/05/2015	$4,892,390	120.4563	292.4366	Minor readjustment of expert inputs to respond to program needs
19	16/06/2015	$4,892,390	120.4563	292.4366	Adjustment to budget lines for various Other Payments to respond to program needs

3.2 International and National Experts

Inputs from international and national consultants under the main consulting service contract (the Egis contract) are shown in Tables 5 and 6 respectively and the personnel schedule for the program is shown in Table 7.

It is noted that in addition to the Egis contract, ADB directly recruited five specialist consultants: international water resources management advisor (2 months), senior international water and environment governance advisor (1.5 months), international water resources planner (16 months), international public financial management and accounting specialist (6 months), and national public financial management and accounting specialist (6 months).

Table 5: Inputs of International Experts, as initially contracted and as of final variation

No.	Position/Expertise	Name	Person months	
			Initial contract	Final variation
1a	Program Team Leader/ Water Resources Specialist	Ian Boyd FOX	36.0000	21.0033
1b	Program Team Leader/ Water Resources Specialist (replacement)	Ian Ferguson WOOD	-	14.0833
2	Policy and Institutional Specialist	Des CLEARY	6.0000	12.5200
3	Climate Change Adaptation Specialist	Ramon ABRACOSA	8.0000	10.4500
4	Hydro-meteorologist	Jean-Marc ROUSSEL	8.0000	5.2000
5a	Irrigation Specialist	Abraham KOSTER	7.0000	2.7367
5b	Irrigation Specialist (replacement)	John Douglas FLANDERS	-	19.8000
6	IT and Data Management Specialist	Gregory REGAN	6.0000	10.1363
7	Training Specialist	Vincent DAVID	6.0000	9.2300
8	Education Specialist	Kosgallana Duwage NANDALAL	4.0000	4.000
9a	Economist	Laurent VANDOME	4.0000	2.0700
9b	Economist (replacement)	Richard Rudy CORSEL	-	7.0600

No.	Position/Expertise	Name	Person months	
			Initial contract	Final variation
10	Public Financial Reform and Accounting Specialist	Kerry Maxwell BLANCH	-	2.000
TOTAL			85.0000	120.4563

Table 6: Inputs of National Experts, as initially contracted and as of final variation

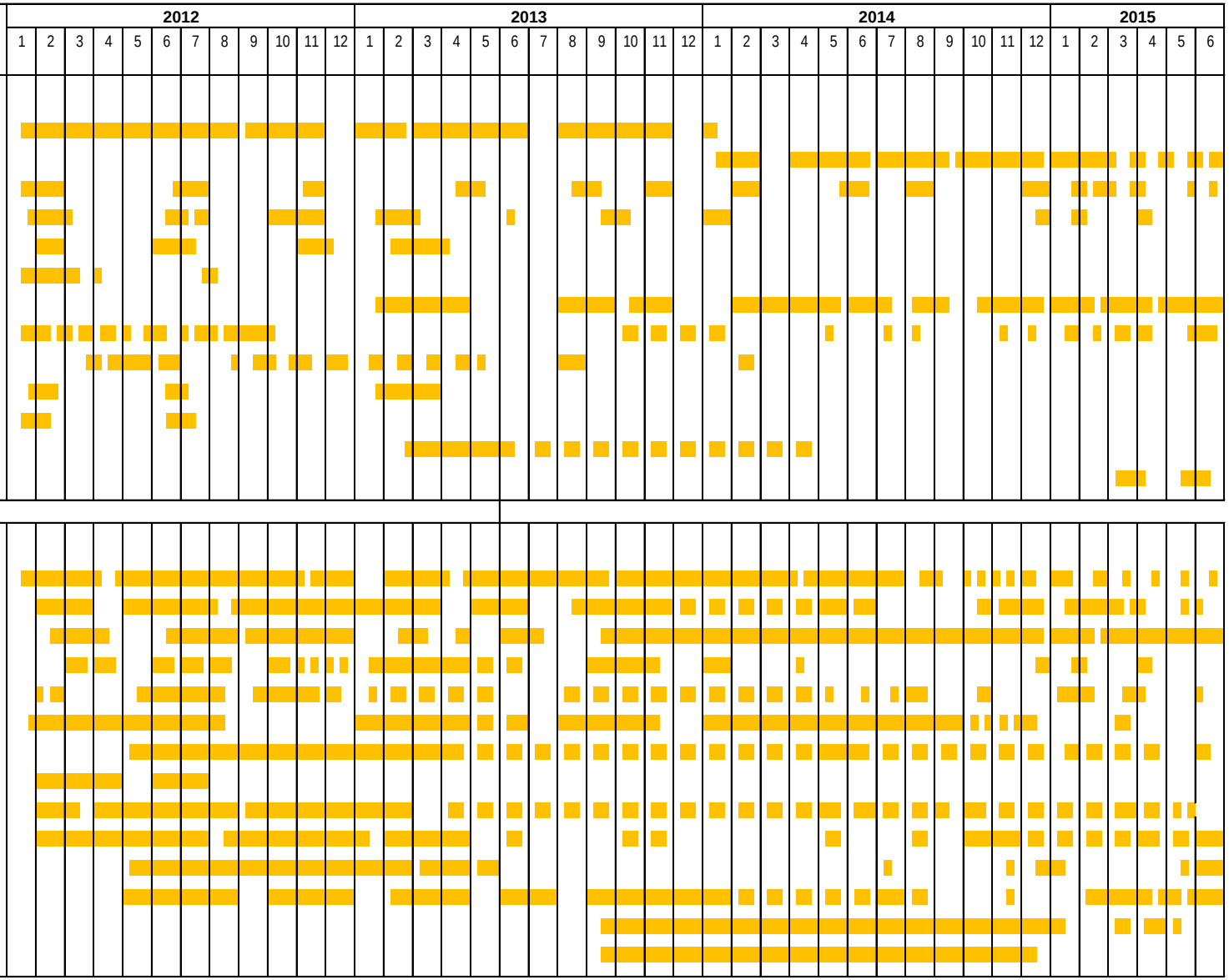
No.	Position/Expertise	Name	Person months	
			Initial contract	Final variation
1	Deputy Program Team Leader	SAM Chhomsangha	36.0000	28.8300
2	Water Resources Specialist	SOK Saing Im	36.0000	30.3300
3a	Policy and Institutional Specialist	KHOY Khim	12.0000	0.0000
3b	Policy and Institutional Specialist (replacement)	KHUON Komar	-	31.8667
4a	Climate Change Adaptation Specialist	MAO Vanchann	12.0000	0.0000
4b	Climate Change Adaptation Specialist (replacement)	TAING Sophanara	-	13.0000
5	Hydro-meteorologist	TES Sopharith	12.0000	16.3332
6	Irrigation Specialist	TAK Virekvath	12.0000	27.6800
7a	IT and Data Management Specialist	AYNAR Len	12.0000	0.0000
7b	IT and Data Management Specialist (replacement)	HOUT Savorn	-	25.9300
8	Legal Specialist	LIM Heng	6.0000	5.0000
9	Gender Specialist	Navy HAP	12.0000	25.6700
10	Training Specialist	CHEAP Sam Oeurn	12.0000	20.0000
11a	Education Specialist	KEO Pheakdey	10.0000	0.0000
11b	Education Specialist (replacement)	HENG Meng[A]	-	17.1967
12	Economist	CHAN Vannak[B]	10.0000	25.2000
13	Water Resources Planner	SOK Bun Heng	-	14.9000
14	River Basin Planner	SO Im Monicoth	-	10.5000
TOTAL			182	292.4366

Notes: A. From March 2015 (VO#17) the role of Mr Heng Meng changed to take more responsibility for training rather than education specialist.

B. From January 2015 (VO#16) the role of Mr Chan Vannak changed to take more responsibility as irrigation specialist rather than economics specialist.

Table 7: Schedule of inputs for all program experts

NO.	NAME	POSITION
INTERNATIONAL		
1	Ian FOX	TL/WR Specialist
2	Ian WOOD	TL/WR Specialist (R)
3	Des CLEARY	Policy and Inst Specialist
4	Ramon ABRACOSA	CCA Specialist
5	Jean-Marc ROUSSEL	Hydro-Meteorologist
6	Ab KOSTER	Irrigation Specialist
7	Doug FLANDERS	Irrigation Specialist (R)
8	Gregory REGAN	IT / Data Specialist
9	Vincent DAVID	Training Specialist
10	K.D.W. NANDALAL	Education Specialist
11	Laurent VANDOME	Economist
12	Ruud CORSEL	Economist (R)
13	Kerry BLANCHE	PFR Specialist
NATIONAL		
1	SAM Chhomsangha	Deputy Team Leader
2	SOK Saing Im	WR Specialist
3	KHUON Komar	Policy and Inst Specialist
4	TAING Sophanara	CCA Specialist
5	TES Sopharith	Hydro-meteorologist
6	TAK Virekvath	Irrigation Specialist
7	HOUT Savorn	IT / Data Specialist
8	LIM Heng	Legal Specialist
9	HAP Navy	Gender Specialist
10	CHEAP Samoeurn	Training Specialist
11	HENG Meng	Education Specialist
12	CHAN Vannak	Economist
13	SOK Bun Heng	WR Planner
14	MONICOTH So Im	RB Planner



3.3 Engagement of Local Service Providers

Following ADB Procedures the CDTA consultants engaged consulting services in 24 special study sub-contracts with a value in excess of $530,000. Table 8 shows the details of each consulting service package. All study sub-contracts were completed to an acceptable standard.

Table 8: Consulting Service Packages

No.	Title	Contract Award Date	Value	Service Provider
1	Training Needs Assessment of FWUCs in Five Provinces	21-11-12	$7,700	Irrigation Service Center (ISC)
2	Gender Mainstreaming Action Plan Update in Water Resources Sector 2013-2017	30-11-12	$25,000	Royal University of Agriculture
3	Compilation of Information on Inland Navigation for Cambodia	24-01-13	$8,750	Mr. Sin Chay
4	Compilation of Information on Aquaculture in Cambodia	29-05-13	$9,200	Inland Fisheries Research and Development Institute (rep by Mr Cheng Phen)
5	Compilation of Information on the Water Environment in Cambodia	29-05-13	$15,500	Dr. Mak Solieng
6	Compilation of Information on Groundwater Resources in Cambodia	30-05-13	$10,700	Mr. Toch Sophon
7	Compilation of Information on Rural Water Supply and Sanitation Services for Cambodia	30-05-13	$12,600	Mr. Kim Sreang Bouy
8	Conducting an Educational Needs Assessment in the Water Resources Sector	10-06-13	$14,500	Mr. NHEM Chanthea
9	Compilation of Information on Hydropower in Cambodia	19-06-13	$9,900	Mr. Sok Bun Heng
10	Compilation of Information on MOWRAM's Surface Water Resources Management Functions	13-08-13	$12,000	Mr. Dok Doma
11	Compilation of Information on Irrigation and Drainage in Cambodia	07-08-13	$13,000	Mr. Phai Sokheng
13	Compilation of Information on Urban Water Supply and Sanitation Services for Cambodia	06-08-13	$8,600	Mr. May Simorn
14	Compilation of Information on the Industrial Sector in Cambodia	03-09-13	$9,600	Mr. Mak Sithirith
15	Conduct a Survey of 30 Irrigation Schemes in Siem Reap Province	02-Sep-13	$9,300	Mr Sous Saly
16	Prepare Budget Strategic Plan (2015 – 2017) for Operation and Maintenance of Irrigation Schemes	11-02-14	$23,420	Mr Ouk Sota
17	Prepare a Strategy and Plan to Establish Financially Independent FWUCs	12-08-14	$11,960	Mr Ouk Sota
18	Conduct a Survey of 155 Irrigation Schemes in 5 Provinces (CISIS Package P1)	01-07-14	$46,000[A]	Mr Sous Saly
19	Technical Services for Formulating the TSA Strategic Plan	13-08-14	$24,950	Dr. Mak Solieng
20	Undertake Review of Gender Roles and Issues in the Water Sector in Kampong Thom, Siem Reap And Banteay Meanchey and to Conduct Awareness Raising and Training	12-09-14	$20,050	Dr. Kang Kroesna
21	Establish Database and Website for Gender in Water Sector in MOWRAM	17-02-15	$8,500	Mr. Chim Kosal
22	Report on Quick-Action Plans for O&M Implementation Issues and Establishing and Strengthening FWUCs and Report on Actionable Modalities for Management and Completion of Large Scale Irrigation Schemes	10-02-15	$19,500	Mr Ouk Sota

No.	Title	Contract Award Date	Value	Service Provider
23	Conduct a Survey of 282 Irrigation Schemes in 3 Provinces (CISIS Package P2)	23-01-15	$68,000	Mr Sous Saly
24	Conduct a Survey of 278 Irrigation Schemes in 5 Provinces (CISIS Package P3)	23-01-15	$72,700	Mr Chorn Nareth
25	Conduct a Survey of 281 Irrigation Schemes in 5 Provinces (CISIS Package P4)	23-01-15	$72,400	Mr. Kem Borivan
	TOTAL		**$533,830**[C]	

Notes: A. Contract variation approved to increase total value to $48,480
B. Contract variation approved to decrease total value to $17,020
C. Total including all variations = $533,830

3.4 Procurement of Equipment

The equipment procured under the TA, as listed in Table 9, total in value to over $105,000. In addition to standard equipment for the establishment of the consulting office, equipment was purchased and supplied to DPIC and the PDWRAMs in support of CISIS. This included a dedicated server and other computing hardware at the central level plus equipment to be used in the field for data collection – both data collection for now, plus in the future as the CISIS database is maintained.

Separately, using CDTA funds (but not via the Egis contract), ITC procured equipment for the refurbishment of the computer, hydraulic, survey and soils laboratories in ITC, totaling in value about $234,000.

Table 9: Equipment

Item	Quantity	Amount (USD)
Office Equipment		
Aurora Shredder AS-1610B	1	$88.00
Multi-Function Printer Kyocera fs-C8020MFP	1	$4,000.00
LCD Projector NEC NP-V260G	1	$630.00
Flatbed Scanner	1	$1,880.00
Desktop Computer Dell inspiron 620MT	1	$1,300.00
Desktop Computer Dell inspiron 620MT	1	$1,235.00
UPS Power Tree 650VA	2	$72.00
Monitor Dell 24'ST2420L Wide Screen Black Color	3	$735.00
Laser Printer, Brother HL-2250DN	1	$189.00
Water cooler & vacuum cleaner	2	$243.00
Printer HP Laserjet Pro 400M401dne	1	$368.50
Software		
PDF factory Pro 4	1	$203.89
Office Furniture		
Office desk (1.20m)	22	$1,826.00
Office desk (1.50m)	1	$110.00
Long table (2.40m)	1	$195.00
4 Drawer filling cabinet	2	$290.00
Crono	2	$300.00
Office chair (Grey)	22	$660.00
Photocopy and coffee table	2	$100.00

Item	Quantity	Amount (USD)
IBC Mobile board 150*95	1	$125.00
Book binding machine	1	$115.00
CISIS Equipment		
IBM Server x3250	1	$2,475.00
UPS Power T 1KVA online	1	$286.00
WinSvrStd 2012R2 SNGL OLP NL 2pro (P73-06285)	1	$1,006.50
SQLSvrStd 2014 SNGL OPL NL (228-10344)	1	$999.90
SQLCAL 2014 SNGL OPL NL UsrCAL (359-06098)	5	$1,094.50
WinSrCAL 2012 NSGL OPL NL UsrCAL (R18-044281)	5	$214.50
Service Configuration Fee (Software server)	1	$330.00
Diamond Rack 15U (600 x 800 x 800)	1	$400.40
3.5 External HHD Adata 3.5" 2TB SATA USB 3.0 NH03	1	$143.00
Desktop Dell Inspiron 3000 (3847)	3	$3,725.70
UPS Tru Power 1250VA	3	$214.50
License: Windows Pro 8.1	3	$511.50
License: Microsoft Office 2013	3	$1,171.50
Kaspersky Internet Security Anti-Virus	3	$49.50
SHARP Digital Laser MX-M453N Copier/Printer/Scanner	1	$8,679.00
Laptop Dell Inspiron 5547 (Silver)	23	$28,336.00
Laptop Dell Vostro V3560	8	$10,252.00
Laptop MacBook Pro 13.3/MD102ZP/A	2	$3,212.00
3.6 SONY TX 20 Digital Camera, 8GB Micro SD & bag	13	$4,433.00
3.7 SONY TX 20 Digital Camera, 8GB Micro SD & bag	4	$1,394.80
3.8 SONY TX 20 Digital Camera, 8GB Micro SD & bag	2	$700.00
GARMIN GPS MAP 62sc (with Cambodia map)	23	$13,340.00
GARMIN GPS MAP 62sc (with Cambodia map)	8	$5,192.00
GARMIN GPS MAP 62sc (with Cambodia map)	3	$1,800.00
Printer HP Laserjet Pro 200 MFP M276N color 4-in-1 A4	1	$577.50
TOTAL		**$105,204.19**

3.9 Capacity Building and Scholarship Program at ITC

In response to a clear need to increase the number of technical professionals trained in water resources engineering, not only in MOWRAM, but also in the wider sector, support is being provided for capacity development in ITC. This includes support to orientate its existing degree course in Rural Engineering to a degree course in Water Resources Engineering. Under the CDTA, a review of needs and capacity was undertaken as well support provided to redesign the curriculum and to prepare a program for capacity building, which includes upgrading facilities and equipment and training for the teaching staff. In addition, to promote water resources engineering and to attract the brightest students, a scholarship program is being offered, financed with CDTA funds. The scholarship program consists of 30 students per year in four batches commencing in 2011-12 school year to pay for tuition fees as well as allowances for living and incidentals for the full five years of the degree course. Details of the CDTA support to ITC are provided in a letter of agreement between ITC and ADB signed on 21 July 2014.

Specifically the support program under the CDTA provides for:

- Scholarships to cover tuition fees, incidentals and part of living expenses for up to 30 new students each year, for four successive annual intakes (September 2011 to September 2014). No less than 10 of the 30 scholarships are to be awarded each year to female students. Student scholarships cover tuition fee ($450 for first batch, $500 for the second batch and $550 for following batches per year), living expenses at $2,100 per year and $200 per year for books and stationery.
- Field visits and practical training for scholarship-holders to be conducted once each year for each student. The program funds field trip expenses including per diems for accommodation and living expenses and travel expenses.
- Training for ITC teaching staff of the water resources engineering department. Generally this is to involve four groups of up to five teachers to participate in two-week training courses at a regional institution.
- Visiting lecturers from appropriate overseas educational institutions once per year to provide special lectures to train staff.
- Procure new and upgraded equipment for classrooms and laboratories including (i) new classroom furniture for 90 students; (i) a GIS laboratory with suitable equipment and facilities; (iii) a computer center with 35 sets of computers together with LAN facilities, printers, furniture, and air conditioners (iv) soil and irrigation laboratory equipment; and (v) field survey equipment.

Under this program, ITC commenced undergraduate and post-graduate degree courses in water resources engineering in 2011-12 and 2012-13 respectively. The new curriculum including components of IWRM, climate change, economic, environment and social assessment was introduced to Year 3 students as they commenced the specialized water resources engineering stream. While each year contains 30 scholarship holders, approximately 80 students are enrolled each year in the water resources engineering degree course. As of the 2014-2015 school year, four batches of 30 students have received CDTA funded scholarships. Of the 120 scholarship holders, 38 (or 32%) are female. In 2014 a fully equipped computer laboratory was installed and equipment for the soils, survey and surveying laboratories was purchased. Table 10 provides the breakdown of the fund commitment by year.

Table 10: Fund commitment for ITC program

Budget Item		Fund Commitment by Calendar Year ($US)								Total Amount
		2011	2012	2013	2014	2015	2016	2017	2018	
I	Scholarships	41,250	124,500	209,250	294,750	337,500	296,250	213,000	171,000	1,687,500
II	Field Visits	-	-	-	-	12,900	12,900	9,675	9,675	45,150
III	Teacher Training	-	-	-	-	20,350	20,350	20,350	20,350	81,400
IV	Visiting international lecturers	-	-	-	-	15,470	15,470	15,470	15,470	61,880
V	Equipment for computer room, GIS, soils, survey and hydraulic lab	-	-	233,943	-	-	-	44,757	-	278,700
VI	Contingency	-	-	-	15,000	20,000	30,000	30,000	13,370	108,370
	TOTAL	41,250	124,500	443,193	309,750	406,220	374,970	333,252	229,865	2,263,000

As of 30 June 2015, the program is on-track and the total disbursement of CDTA funds for the ITC program is $1,066,843.23 (comprising $233,943.23 for equipment and $832,900 for scholarship costs). It is noted that delays in establishing the Letter of Agreement meant that the disbursement

of funds to students commenced in December 2014. Table 11 lists the equipment purchased by ADB using CDTA funds and Table 12 lists the disbursement of scholarship funds to June 2015.

Table 11: Disbursement for Equipment Purchase

Equipment items	Supplier	Amount (US$)
Computers and accessories for the IT Laboratory	T.C. Computer	$75,243.00
GIS software	Aruna Technology	$5,220.00
Survey equipment for the surveying laboratory	B. Scientific Instrument	$15,600.00
Soil sampling and testing equipment for the soils laboratory	Europ Continents	$133,978.00
Repair and upgrading of the hydraulic modeling flume	Panhchaksela Construction	$3,902.23
TOTAL for Equipment Purchase		**$233,943.23**

Table 12: Disbursement of Funds for Scholarship Program

No.	Description	Date disbursed	Amount	Cumulative
01	Tuition fees and scholarship allowances, Batches 1, 2 & 3. School years 2011/12 to 2013/14	27-Nov-14	$495,250	$495,250
02	Tuition fees and scholarship allowances, Batches 1, 2 & 3. School year 2014/15	12-Feb-15	$252,150	$747,400
03	Tuition fees and scholarship allowances, Batch 4 for School year 2014/15	25-May-15	$85,500	$832,900

3.10 Commitment of TA Funds

An estimate is made of the total CDTA fund (in Table 13) and the current commitment on the available CDTA funds (in Table 14). The objective of showing this information is to provide a general update on the status of committed funds. Overall it would appear that of the $9.6 million in grant funds from donors, approximately $2 million remains uncommitted (or less if recent exchange rates are applied).

Table 13: CDTA Funds Available
(As per Program and Project Administration Manual)

Available CDTA funds	Estimated Amount (USD)
ADB (TA fund)	1,000,000
Australia Aid, 5 million AUD (@ 0.91 AUD/USD)[A]	4,550,000
3.11 NDF, 3 million Euro (@ 1.25 Euro/USD)[B]	4,050,000
Government counterpart funds	1,860,000
Total estimated CDTA fund	**11,160,000**[C]

Notes: A. The exchange rate of 0.91 AUD/USD was valid at the time of the PPAM (April 2011), Current exchange is about 0.78 AUD/USD

B. The exchange rate of 1.25 AUD/USD was valid at the time of the PPAM (April 2011), Current exchange is about 1.14 AUD/USD

C. Using current exchange rates, the total funds would be about US$10,180,000

Table 14: Estimate of Funds Committed

Estimate of committed funds	Amount (USD)
Egis contract	$4,892,390
ADB consultant contracts (approximate)	$400,000[A]
Funds to support ITC capacity building and scholarship program	$2,263,000
Funds committed to TSA for Stung Sen river basin planning	$50,000
Total funds committed (approximate)	**$7,605,390**

Notes: A. Estimate based on assumed consulting service rates. The actual rates are not known to the author of this report

3.12 Enhancing the performance of CISIS

In response to the need to improve the functionality and user friendliness of CISIS as a management tool for rehabilitation and O&M of irrigation schemes, support was provided for strengthening data collection and entry as well as improving the hardware and software. At project commencement some 1351 schemes in 25 provinces had data collected and entered (starting from 2008 but of variable quality). By June 2015 the project had contracted the collection of data for some 1026 schemes in 14 provinces.

The project carried out its support in 3 phases. The pilot phase of 30 schemes in one province was implemented in the third quarter of 2013. It was used to develop an improved data collection protocol and to assess a field data collection training course for PDWRAM staff. The second phase in the third quarter of 2014 incorporated the lessons learned and scaled up to 155 schemes in 5 provinces. The final phase proposed 5 additional collection contracts to complete all remaining schemes during first semester of 2015 but 2 contracts could not be implemented during that time. Data was collected for 841 schemes in this third phase. Some 404 schemes in 12 provinces remain to have data collected. **Appendix B** provides a summary report on “Collection of Irrigation Scheme Data and Operationalization of CISIS”.

CISIS data on each scheme includes infrastructure components and their condition and functionality, command area and actual area cropped and irrigated and functionality of FWUC. The new decentralized O&M budget request modality endorsed by MEF for use by MOWRAM’s Irrigated Agriculture Department has superseded the need for use CISIS for annual O&M budget request preparation but the O&M module in CISIS still provides the best means for assessing an overall perspective of the national total estimated cost of rehabilitation and O&M.

The project held a workshop in March 2015 to familiarize national stakeholders in the status of CISIS. The workshop findings confirmed the important role of CISIS and the urgent need for opening CISIS for use in a transparent manner. Protocols for accessing CISIS data were outlined. The workshop also outlined modalities for keeping the data on schemes up-to-date focusing on schemes that have been rehabilitated and schemes that come under the new O&M budget funding.

When operationalized, CISIS will be used for selection of schemes for rehabilitation and major maintenance, officially recording command areas and actual areas irrigated and functionality of FWUCs. It will also provide the basis for MOWRAM reporting each year on the status of irrigation development and management of the National investment in irrigation infrastructure.

4. Conclusions and Recommendations

4.1 Conclusions

On the basis of relevance, effectiveness, efficiency, and likely sustainability, the program is considered to be mostly successful. Program formulation resulted in an ambitious design to address the recognized short-comings in institutional and technical capacity in water resources management and irrigation management in Cambodia. While gains were made in some areas, less than expected progress in other areas constrained the overall success. Ongoing delay on key elements of legislation is a disappointment given the technical expertise available to support this under the CDTA. On the other hand, however, the CDTA is considered to have made significant positive steps in relation to the government's capacity to manage water resources. Awareness of the need for a comprehensive IWRM approach has been well-promoted through demonstration, training and the development of tools.

Although delayed, significant success was achieved for enhancing capacity to manage and deliver irrigation services. While clear, tangible results were achieved for funding of O&M, the updating of policy remains ongoing. Follow-up action to consolidate and strengthen the more recent reforms remains a priority.

The main lesson learned has been that it is importance to build from the existing strengths of an organization. In particular, this is demonstrated with the significant success in capacity development and institutional strengthening in O&M. In areas such as in water resource management where existing capacity is poor and financial resources have not yet been made available, progress is slower and patience is required in order to produce significant reform.

It is of concern that the activities of the program are drawing to a close while time and funds remain available. The original CDTA, established with over $11 million in funding, envisaged a program much larger than could be delivered by one main consulting services contract. The model that was proposed, but eventually proved problematic to implement, was for the CDTA funds to be made available directly to government staffed Working Groups via an advance payment facility. It is recommended that the donors work together with the RGC to explore workable options to make use of the remaining uncommitted funds.

4.2 Recommendations

MOWRAM should continue the legislative reform agenda in the water sector for Cambodia. The program failed to achieve approval of all four sub-decrees that have been part of the agenda in the water resources since the approval of the Law on Water Resources in 2007. The need for the sub-decrees for water licensing and water quality remains present. The landscape in water resources is changing with pressure from an emerging private sector and ever increasing demand for water. Security in water by way of a legal right is required both to attract investors, and to protect the rights of others and the sustainability of water systems. Security can only be assured if there is a rigorous and enforceable legally-backed way to manage the resource.

MOWRAM should continue to support integrated water resource management initiatives in Cambodia. The piloting work, which demonstrated an IWRM approach to preparation of a river basin plan and establishment of a river basin committee, provides only the starting point. Sustainable resourcing is required to support implementation of priority actions and to deliver the promised benefits of an IWRM approach.

MOWRAM should continue to support reform to enhance capacity for the management and delivery of irrigation services. Considerable progress has been made to strengthen systems for O&M management both at the government level (MOWRAM and PDWRAMs) and at the farmer level (FWUCs) however, significant risks remain. There remains an enormous potential to provide cost effective interventions which break the current vicious cycle of rehabilitation, neglect, decay

followed by system collapse and farmer mistrust. For the new systems to be sustainable considerable follow-up support is required to address capacity issues as well as human resources deficiencies.

Consideration should be given to supporting cooperation between donors and the RGC to target the 'low-hanging fruit' investments for rehabilitation and major repair. The activities of the Program have identified the large number of schemes which perform sub-optimally because of the need for backlog maintenance. The current need for backlog maintenance to restore partly operating schemes is well beyond the current means of government. A diversified program for funding of minor rehabilitation works accompanied by technical assistance in modernizing scheme infrastructure and management would restore many schemes to full-operating status and bring significant economic returns to farmer communities.

The RGC should respond to the issues emerging from large scale Chinese investment in irrigation infrastructure. According to the MOWRAM's Strategic Development Plan, approximately $1 billion of Chinese investment is expected for irrigation development in the next five years. Typically the Chinese investment provides only the headworks (reservoirs, river diversions and main channels) which leaves much work to be done to make effective use of this investment. Many individual irrigation blocks within the "Chinese schemes" are larger than all but the biggest irrigation schemes elsewhere in the country. Access to water and impacts on existing users appear not to be considered. Additional support is required to complete these Chinese schemes, to establish the needed FWUCs, and to modernize scheme management.

APPENDIX A – List of CDTA Reports, Decisions, other documentation

Activity	Report, Decision, other documentation
A.1.2 Legal framework for Water Resources	• Sub-decree (a) FWUCs ,(b) River basin management (draft), (c) Water Licensing (draft), (d) Water Quality (draft) • Work plan Working Group 4 (Committee on Preparing Sub-decrees Related to the Law on Water Resources Management), 2015 • Implementation plan for FWUC SD, 2015 • Report on "Critique of the current and proposed legal framework for water management in Cambodia", 2014
A.1.3 National Water Resources Plan	• Work plan for National Water Resources Plan and Implementation and Investment plan • Cambodian National Water Status Report 2014 • National Water Sector Indicator Report 2014 • Special study reports on water resource issues: – Irrigation and drainage, 2013 – Industry, 2013 – Urban water supply and sanitation services, 2013 – Rural supply and sanitation services, 2013 – Groundwater, 2013 – Hydropower development , 2014 – Aquaculture, 2013 – Inland navigation, 2013 – MOWRAM's surface water resource management functions, 2013 – Water for the environment, 2013
A.2.1 National committee for coordination of water resources management	• Report on National Workshop on "Institutional and organizational arrangements for coordination of water resources management in Cambodia", 2013 • Royal Decree for National Council for Water Resources Management (NCWRM) and Sub-decree on Secretariat to NCWRM (draft)
A.2.2 Strategic plan for Tonle Sap Authority	• TSA Strategic Plan (Draft), 2015 • WG10 Work Plan, 2013
A.2.3 River basin Planning for Stung Sen and Stung Sreng	• Guidelines for IWRM in the preparation of river basin plans, including climate change (2015) • Decision on Stung Sen river basin committee, 2015 • Decision on Stung Sreng river basin committee, 2014 • Stung Sreng River Basin Plan, 2015 • Interim reports prepared in development of Stung Sreng River Basin Plan – Stung Sreng Resources and Options Analysis Paper, 2015 – Stung Sreng River Basin: Issues, Objectives and Strategy Options, 2015

Activity	Report, Decision, other documentation
	– Stung Sreng River Basin Status Report, 2014 – Water resources profile of the Stung Sreng River Basin, 2014 – Proposal for upgrading the hydromet data collection network of the Stung Sreng River Basin, 2015 – Report on Farmer and Industry Engagement Water Resource Management Survey for Stung Sreng River Basin, 2014 – Report on Potential Economic Value of Irrigation investments within Stung Sreng River Basin: Initial Estimates, 2014 – Report on the status of rural and urban water supply and sanitation in the Stung Sreng River Basin, 2014 • Working Paper – Cambodia: requirements for minimum flows in rivers (draft)
A.3.1 Water resources assessed at a nationwide scale	• Cambodian Water Resources Profile, 2014 • Cambodia Hydro-Meteorological data compilation report, 2014
A.3.2 Water data management plan	• Water data management plan, 2015 • Cambodia Operational Hydrological Database, CamOHDB. (Training presentations in Khmer)
A.3.4 Mainstreaming CCA and IWRM	• Procedures to mainstream climate change adaptation in IWRM plans and actions, IWRM in climate change adaptation plans and actions (2015) • Development of a high–resolution climate change database and GIS toolkit for Cambodia, 2014 • GIS Mapping of high–resolution climate change projections for mid-century based on nine statistically downscaled global climate models, 2013 • GIS Mapping of high–resolution climate change projections for frequency of extreme events based on dynamically downscaled echam4 global climate model, 2013 • Data base, Application for processing modeling data, 2013 • Presentations on climate change issues: - Assessment of present climate variability and weather extremes in Cambodia, based on public perception surveys - Current Status of meteorological and hydrological monitoring network in Cambodia - Climate change science and modeling - Sources of information on downscaled climate change data for Cambodia - Data processing by using CDTA climate change data processing toolkit - Climate change modeling results downscaled for Cambodia - Sources of information on climate risk assessment toolkit for adaptation planning - Climate change risk assessment for Cambodia

Activity	Report, Decision, other documentation
	- Framework for climate change adaptation planning - Next Steps for mainstreaming CC adaptation in water resources management
A.4.1 Technical skills development at ITC	• Report on Education Needs Assessment and Training Plan, 2014 • Report on Development of a Water Resources Engineering Curriculum for Institute of Technology of Cambodia, 2013
B.1.1 Plan for financially independent FWUCs	• Guidelines for Division of Asset Responsibility in Irrigation Schemes, 2015 • Nationwide Plan to Develop Financially Independent Farmer Water User Communities, 2015 • Policy and Implementation Guidelines for Sustainable FWUCs, 2015 • Report on Workshop on Sustainable FWUCs, April 2015 • Report on Seminar on Implementing FWUC Sub-decree and Reviewing the Policy on Sustainable Management and O&M of Irrigation Schemes, 2015 • Report on Progress of 5 FWUCs to achieving Financial Independence and Suggested approach to developing a Nationwide Plan for Developing Financially Independent FWUCs • Summary report on a Nationwide plan to Develop Financially Independent Farmer Water User Communities • Notes on paddy production
B.2.1 Plan to strengthen planning, budget and financial management systems	• Ministry Action Plan (MAP) for PFM reform (includes plan for strengthening planning, budget and financial management systems)
B.2.2 Strengthen management information systems for administration and finance	• Training report/program for SAGE50 • Report on Workshop on Program Budgeting and Budget Entities • Status of Program Budgeting and Budget Entities in MOWRAM
B.2.3 Strengthen MOWRAM's internal links between line departments	• Report on Institutional Arrangements for the Management of Water Resources (including Review of MOWRAM organizational structure), 2015
B.2.4 Strengthen PDWRAMs, district offices, and links to PDAs	• Refer to B1.1:
B.2.5 Create a gender mainstreaming unit	• Decision on creation of Working Group on Gender • Work plan for the Working Group 2 (Gender Technical Working Group) • Gender Mainstreaming Action Plan, Update in Water Resources Sector for 2014-18 • Report on pilot study on Review the gender roles and issues in the water

Activity	Report, Decision, other documentation
	sector in Kampong Thom, Siem Reap and Banteay Meanchey provinces and to conduct awareness raising and training • Report of Training on Gender Mainstreaming and Water Resource Management to PDWRAM Gender Focal Points and Gender Task Forces in the Water Resources Sector (2015) • Report on establishing a database and website for gender in water sector in MOWRAM (2015)
B.3.1 Comprehensive irrigation O&M Plan	• Comprehensive Irrigation O&M plan (2015) • Report on Mission to 5 provinces - Kampong Thom, Siem Reap, Banteay Meanchey, Battambang and Pursat, July, 2012 • Report on Suggested approach to Developing a Comprehensive O&M Plan for MOWRAM, 2013 • Irrigation Scheme Management and O&M in Cambodia – Current Situation Report, 2013 • Strategy and work plan to complete development and ensure sustainability of irrigation schemes, 2014 • Report on MOWRAM's O&M planning and practices, 2013 • Report on economic study of O&M of irrigation systems, 2014 • Policy and Implementation Manual (including Guidelines) for O&M of Irrigation Schemes, 2015 • Report on Preparation of Quick Action Plans for dealing with Implementation Issues for O&M, 2015. • Report on Workshop on sustainable operation and maintenance of irrigation schemes, 2014 • Report on Developing a Plan for Irrigation scheme completion, adaption and modernization, 2014 • Report on Round Table Meeting on Sustainable O&M, 2014 • Information sheet on Improving Management and delivery of Irrigation services in Cambodia, 2015 • Information sheet on Study of Economics of O&M and Rehabilitation of Irrigation Schemes in Cambodia, 2014 • Report on provincial training to Strengthen Readiness for Commencement of O&M, 2015
B.3.2 MOWRAM's Asset management system to manage, operate and maintain irrigation systems (CISIS)	• Report on CISIS Data Entry Training and Review of Field Data Collection Questionnaire • Report on Conduct of a survey of 30 Irrigation Schemes in Siem Reap Province • Report on Conduct of a Survey of 155 Irrigation Schemes in 5 Provinces (Package P1) • Report on workshop for operationalizing CISIS, March 2015 • Reports on packages P2, P3, P4 • CISIS Administrator's Manual • CISIS User's Manual

Activity	Report, Decision, other documentation
	• CISIS WebGIS Manual
B.3.3 MOWRAM to establish a sustainable funding mechanism for O&M	• Report on Training Workshop for Budget Strategic Planning for O&M 2015 - 2017, Phnom Penh, May 2014. • Report on Training Workshops for Budget Strategic Planning for O&M 2015 - 2017, Kampong Cham and Kampot, May 2014.
B.4.1 HRD plans developed for MOWRAM, PDWRAMs, district offices and FWUCs	• Report on farmer water user community training needs assessment in 5 provinces, Cambodia • Training needs assessment report for MOWRAM and PDWRAMs (2012) • Training needs assessment report for 33 FWUCs (2012) • Human Resource Development Plan for MOWRAM and PDWRAMs (2015) • Human Resource Development Plan for FWUCs (2015)

APPENDIX B – Collection of Irrigation Scheme Data and Operationalisation of CISIS

Background

In 2008, MOWRAM established the Cambodia Irrigation Schemes Information System (CISIS) with support from AFD which financed consulting services and data collection surveys of irrigation schemes throughout the country. Data collection relied on two forms – one a questionnaire and the other a map. The storage of data recorded during the field surveys is managed in CISIS using *shapefiles* – a geographic information system (GIS) storage format that was introduced by Esri[19] in its ArcGIS software in the 1990s and has since been adopted by many GIS software programs – to which tables of data representing various attributes can be attached.

When coded into CISIS, a structure is represented by a point *shapefile*, canals and dikes by line *shapefiles*, and areas (irrigation command areas, areas under crops in either the wet or dry season, reservoir surfaces, etc.) by surface or polygon *shapefiles*.

The CISIS database is established in and managed by MOWRAM's Department of Planning and International Cooperation (DPIC). In 2012, the database stored data on 1,197 irrigation schemes out of a total 2,731 schemes. This data was collected partly by Handicap International[20] under contract to AFD in 2008 and partly from other sources including surveys done by Phnom Penh Municipal Department of Water Resources and Meteorology, PDWRAMs, JICA, ADB and AusAID. By 2015 the number of schemes in Cambodia had increased to 2781. 6 of the smaller provinces have all, or almost all, schemes with data collected and inputted into CISIS (Stung Treng, Kep, Pailin, Sihanoukville, Koh Kong and Kampot) under previous data collection exercises.

The RGC strategy for agriculture and water emphasizes the importance for Cambodia to have an up-to-date information system to be able to effectively plan the development and management of the agricultural water infrastructures. Indeed, there are widely differing estimates of the total area under irrigated agriculture that range from around 1 million ha (MOWRAM) to 284,172 hectares by FAO. Furthermore, the distinction between the various classifications and potential for improvement and intensification is even less clear. The need for precise data on irrigated areas, the condition of each scheme, their spatial distribution and the functionality of their FWUCs is imperative in understanding water resources distribution and allocation, irrigation planning, food production, global food trade, and studies related to water economics.

Scope and Objectives

Under the WRMSDP, Task B3.2, CISIS data base was to be:

- Modernized and its functionality improved and made user friendly

[19] Esri's ArcGIS is a system for using maps and geographic information in a range of applications, and for managing geographic information in a database.
[20] Handicap International is an independent international aid organization.

- Populated with data from the remaining schemes.

Approach to data collection

Individual service providers were contracted to carry out surveys of irrigation schemes (initially for a pilot survey of 30 schemes and subsequently, depending on the success of that pilot, an expanded survey of about 1,500 schemes). The individual service providers worked in close liaison with PDWRAM staff and the CISIS team based in DPIC. The contracts were administered by the CDTA 7610-CAM consultants (Egis in association with Key Consultant Cambodia Ltd).

The program provided equipment for data collection as well as new data base hardware to ensure the security of the system.

A one-day National workshop on operationalization of CISIS (26 March, 2015) was conducted and concluded that the CISIS concept has wide support, the security of the system is well founded and that access to CISIS data will be transparent.

A CISIS Administrator's Manual, User Manual and Web-GIS Manual were prepared and DPIC CISIS team trained in their use.

Key Findings and Conclusions

The pilot phase for 30 schemes conducted in 2013 in Siem Reap province resulted in the data collection questionnaire being amended to better aligned with the input tables in the data base and the production of a set of standard operation procedures for data collection and entry. Based on this experience, a plan for collection of data for all the remaining schemes in Cambodia under 6 contracts was prepared and endorsed by MOWRAM and ADB. The first package was for 155 schemes (average 30 schemes per province) in 5 provinces. The contract was let in July 2014, reported in December 2014 and successfully field-tested the improvements resulting from the pilot and completed collection in Battambang province. Packages P2, P3 and P4 for data collection for 841 additional schemes, providing for complete data collection in 13 provinces, were contracted in January 2015. The work was completed and three reports were submitted to the CDTA and approved in June 2015. A synthesized summary of these 5 reports is attached (*Attachment 1*).

With a greatly expanded set of good quality data providing complete coverage in 20 provinces (6 existing provinces plus 14 assisted by ADB) and partial coverage in the 5 remaining provinces, MOWRAM now has a basic tool for asset management and planning for rehabilitation and O&M. The data collected for 1026 schemes under the CDTA combined with previously collected data for 1351 schemes means that, of the 2781 schemes across Cambodia, only 404 schemes remain without data in CISIS across 5 provinces.

The data collection questionnaires include key fields such as; command area, crops grown, scheme physical condition (%), functionality of FWUCs.

Combined with the other activities to support the management, planning and funding of O&M, the overall impact of CISIS will enhance capacity of MOWRAM to plan and manage current and future investments in rehabilitation of irrigation schemes as well

as O&M and to weed out the schemes that are badly designed and deteriorated beyond the stage where rehabilitation is feasible.

Up-dating of scheme data will be systematized including modalities for PDWRAMs to provide a data entry up dating form after schemes are rehabilitated and each year as an adjunct to the O&M budget process.

Reporting of the overall situation in 20 provinces is now possible. For example, data on the condition of each scheme can be extracted in various categories such as:

80% – 100% condition (routine O&M);

60% – 80% condition (backlog / periodic O&M);

30% – 60% condition (candidates for rehabilitation); and

<30% condition (write off).

Based on value-for-money schemes with condition 80% – 100% receive highest priority for O&M funding (average $50/ha in 2015). As most schemes have not received any O&M, considerable funding for "backlog" maintenance is needed ($200 to $1000/ha). Rehabilitation costs are currently around $1500 /ha.

Recommendations

- Appoint a person in each Province as the contact person for CISIS(PDWRAMs have appointed Provincial "focal points" for CISIS)
- Because many schemes are in a deteriorated condition it is important that the CISIS team review the reporting of "current area irrigated". (Rain grown paddy was being included as "irrigated production" even in schemes that were less than 40% condition. The CISIS team has addressed this issue in the surveys for 841 schemes and is taking action to ensure more accurate reporting of "current area irrigated" for all schemes in CISIS).
- MOWRAM should move quickly to operationalize CISIS by formulating, authorising and implementing protocols for stake holders to make enquiries to obtain data from CISIS (DPIC advised that, currently, approval of the minister is required to provide data to stakeholders).

Attachment 1

KINDOM OF CAMBODIA

National Religion King

Ministry of Water Resources and Meteorology

Water Resources Management Sector Development Program
ADB Loan 2673-CAM and TA 7610-CAM

SUMMARY* of SERVICE PROVIDERS' REPORTS ON CONDUCT of SURVEYS of 1026 IRRIGATION SCHEMES in CAMBODIA

(* Synthesized by CDTA from the reports presented by the service providers)

June 2015

egis International KEY CONSULTANTS (CAMBODIA) LTD. egis eau

Figure 1: Locality map of schemes surveyed in Pilot study

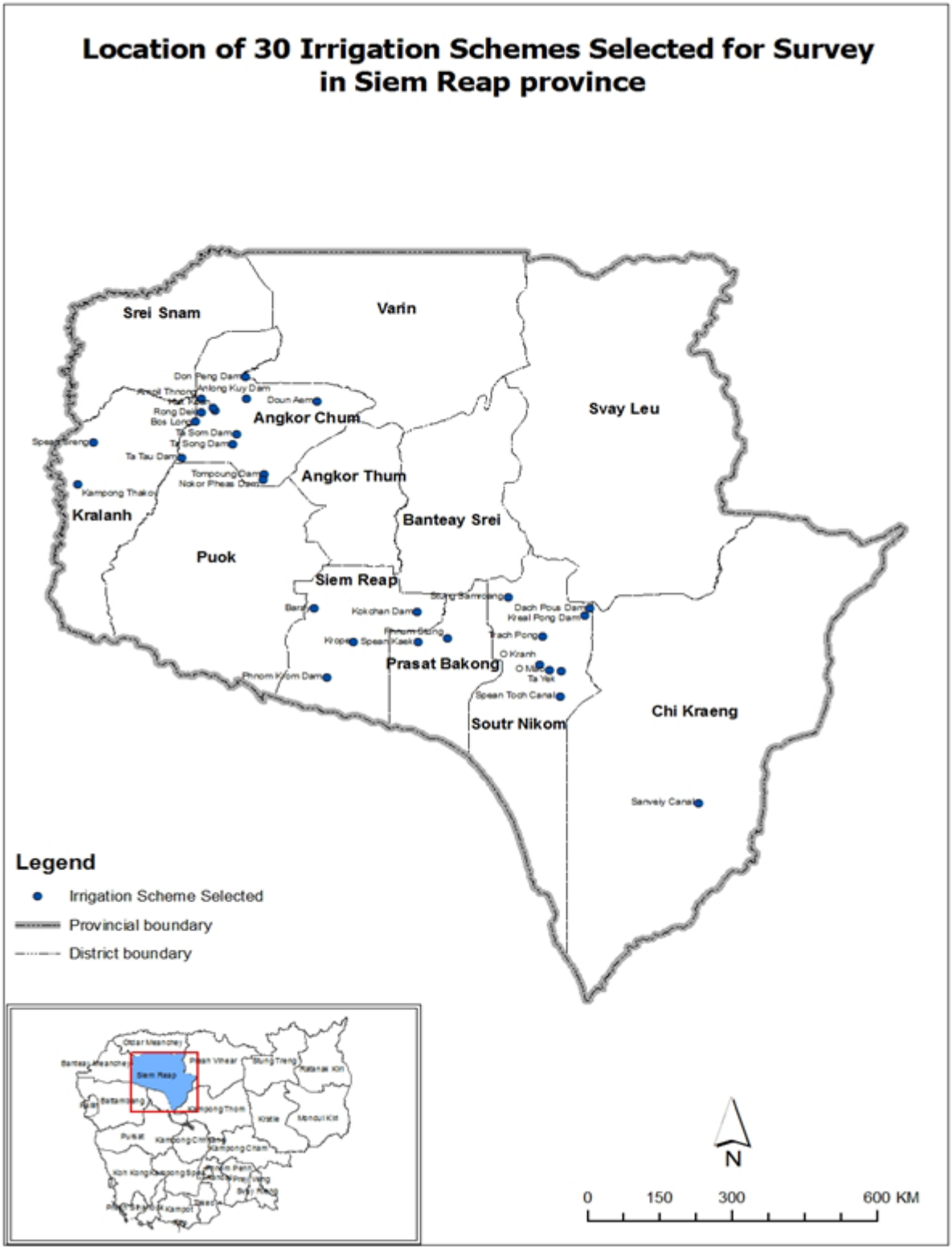


Figure 2: Locality map of schemes surveyed in Package P1

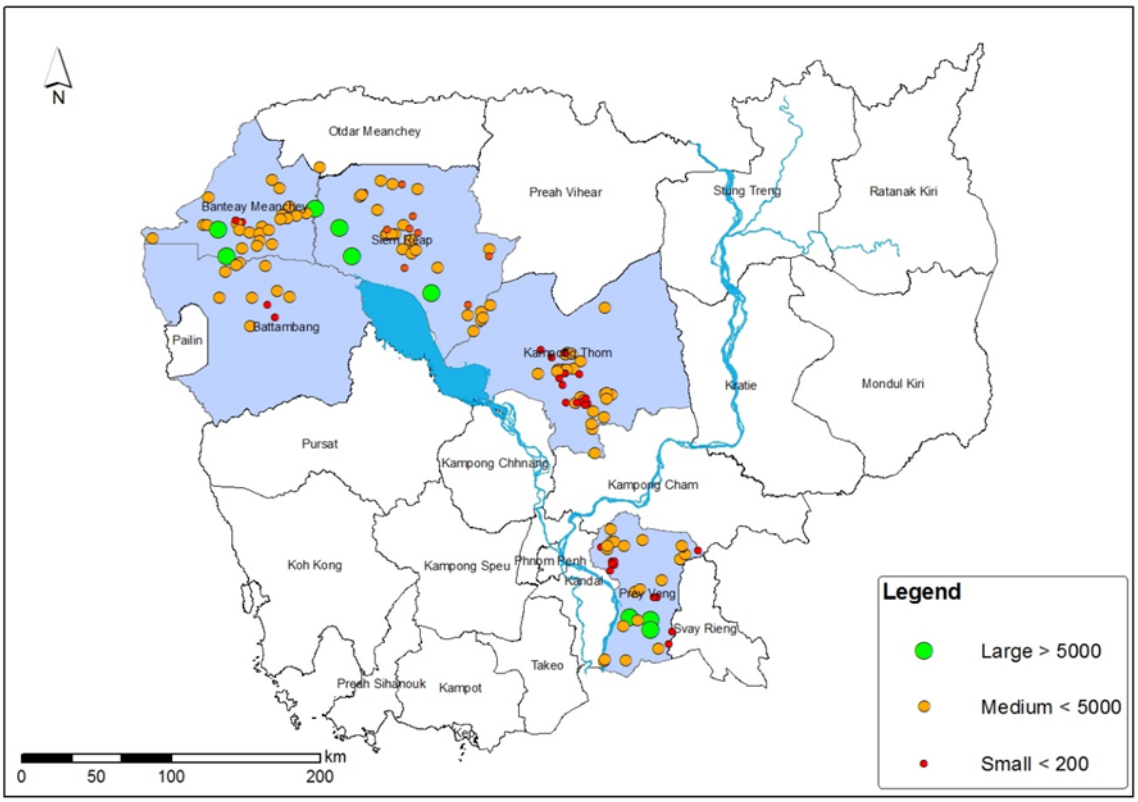


Figure 3: Locality map for schemes surveyed in Package P2 (3 provinces)

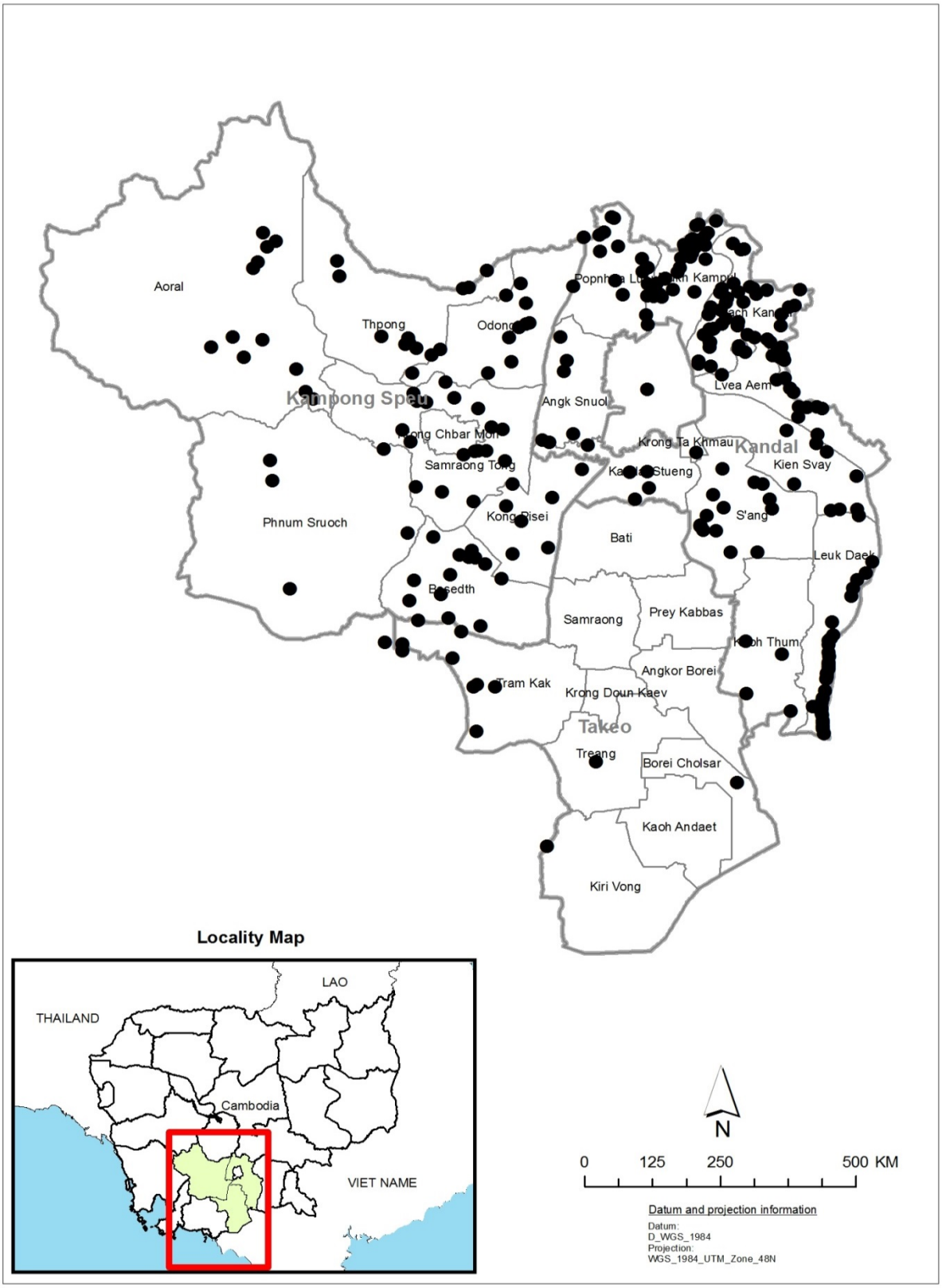


Figure 4: Locality map of schemes surveyed in Package P3 (5 provinces)

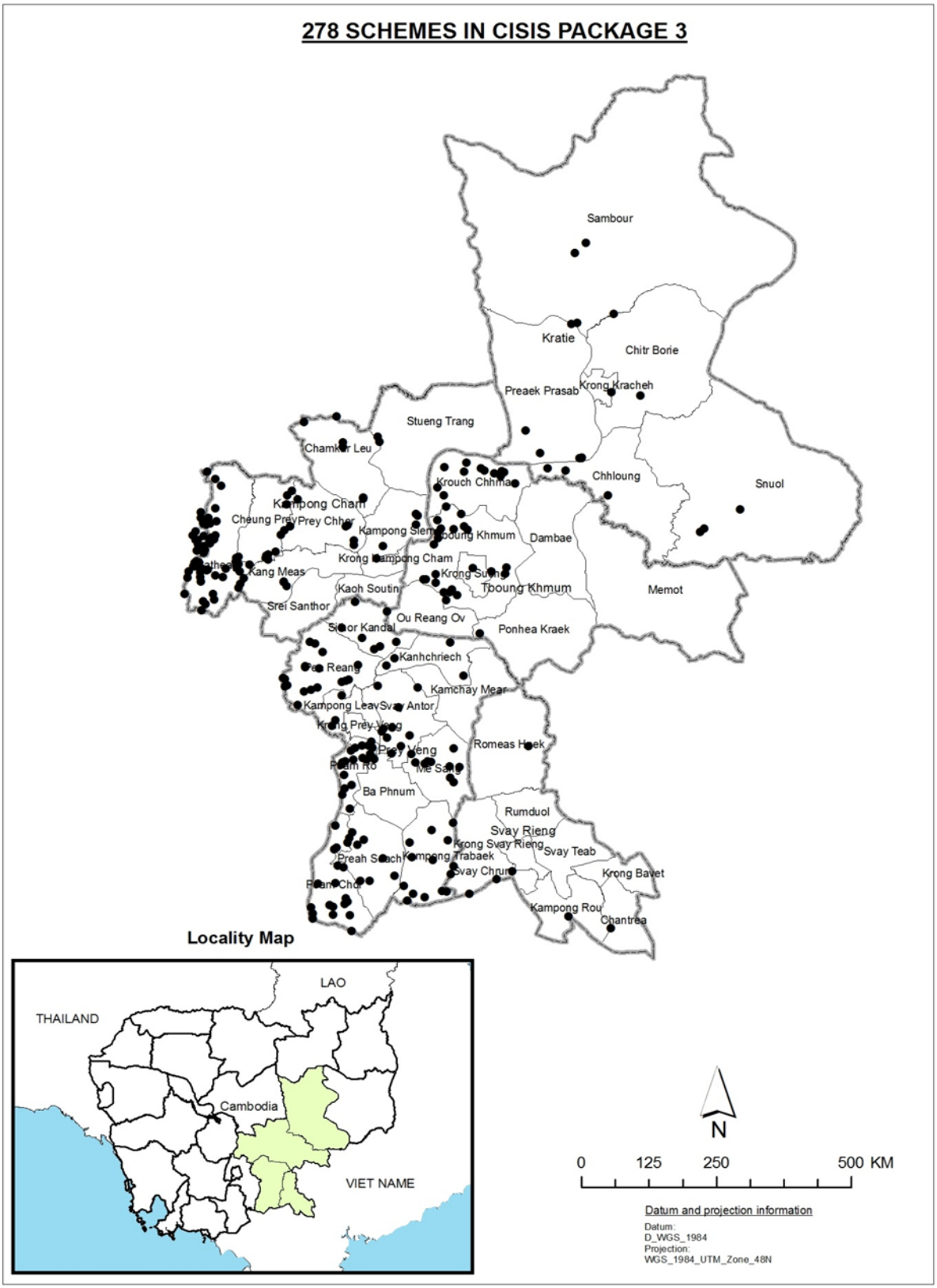
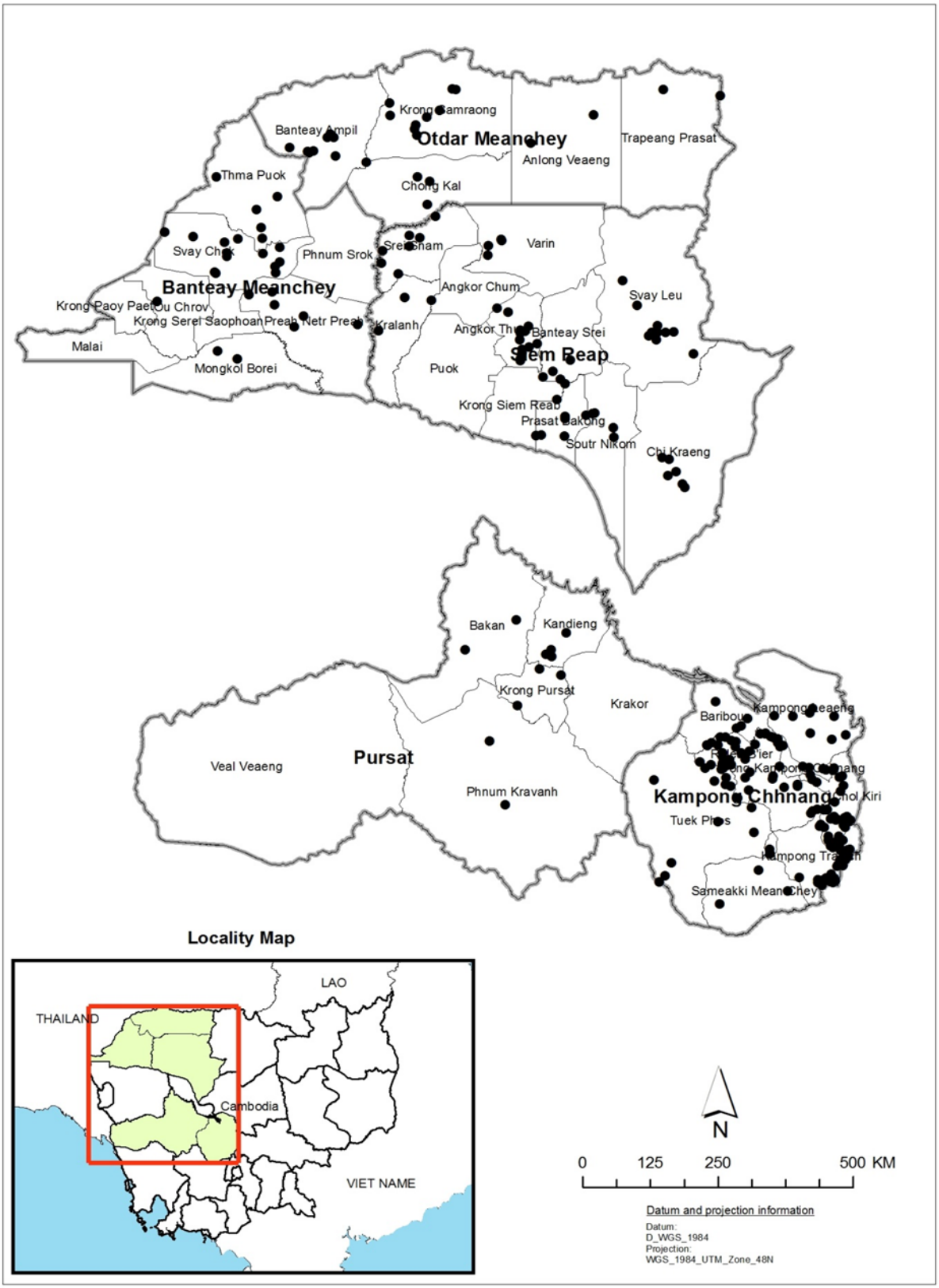


Figure 5: Locality map of schemes surveyed in Package P4 (5 Provinces)



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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AFD	Agence Française de Développement
CDTA	Capacity Development Technical Assistance
CISIS	Cambodian Irrigation Scheme Information System
DPIC	Department of Planning and International Cooperation
DS	Dry Season
GIS	Geographical Information System
GPS	Global Positioning System
IS	Irrigation Scheme
O&M	Operation and Maintenance
PDWRAM	Provincial Department of Water Resources and Meteorology
MOWRAM	Ministry of Water Resources and Meteorology
WRMSDP	Water Resources Management Sector Development Program
WS	Wet Season

SUMMARY REPORT

Background

This summary report covers 1026 schemes in the 15 provinces. Service providers carried out the surveys and data entry under the contract package shown in Table1 at the locations shown in Figures 1 to 5. The work was carried out under the Capacity Development Technical Assistance (CDTA) 7610-CAM which is assisting MOWRAM to implement the Water Resources Management Sector Development Program (WRWSDP). This assistance includes the full development of the CISIS asset management system. The purpose of CISIS is to; (i) develop a nationwide information system referencing all irrigation and water management infrastructures which will be managed by MOWRAM, and, (ii) provide easily accessible data for all stakeholders involved in water resources development and management.

Table 15: Targeted provinces and number of irrigation schemes

No	Provinces	No. of Schemes
Pilot Study		
1	Siem Reap	30
	Sub-TOTAL	**30**
Package P1		
1	Banteay Meanchey	30
2	Battambang	10
3	Kampong Thom	40
4	Prey Veng	35
5	Siem Reap	40
	Sub-TOTAL	**155**
Package P2		
1	Kampong Speu	87
2	Kandal	183
3	Takeo	12
	Sub-TOTAL	**282**
Package P3		
1	Kampong Cham	100
2	Kratie	19
3	Prey Veng	117
4	Svay Rieng	7
5	Tbong Khmum	35
	Sub-TOTAL	**278**
Package P4		
1	Banteay Meanchey	35
2	Kampong Chhnang	147
3	Otdar Meanchey	27
4	Pursat	10
5	Siem Reap	62
	Sub-TOTAL	**281**
	Grand TOTAL	**1,026**

Scope and objective

The project *"Supporting Policy and Institutional Reforms and Capacity Development in the Water Sector"* (CDTA 7610 - CAM) has been formulated to assist the Ministry of Water Resources and Meteorology (MOWRAM) with implementing the Water Resources Management Sector Development Program (WRMSDP). This program comprises 2 components addressing national water resources management and irrigation policy issues, and an investment component related to MOWRAM's rehabilitation of small and medium-scale irrigation systems.

The scope of work related to CISIS data collection is as follows:

i. Conduct of a pilot study on 30 schemes in Siem Reap province to test and confirm training, data collection and entry protocols;

ii. Conduct of data collection by contracted service providers including on-the-job training for the DPIC CISIS team and PDWRAM staff in data collection, data entry and CISIS administration;

iii. Provision of equipment for data collection and data base hardware; and

iv. Overseeing the quality of collection of data on irrigation schemes and its entry into CISIS.

The objective of contracted packages P1 to P4 was to complete the data collection for 996 schemes in 14 key provinces and input it into the CISIS system so that the CISIS system can be used for informing the water resource planning and development in Cambodia.

MOWRAM's ultimate target is to complete the data collection to cover all the irrigation schemes in Cambodia. This will allow CISIS to be fully operational for national, provincial and river basin planning as it will cover all the existing irrigation schemes and not partial picture of what exists.

Approach

The following activities were conducted by the contracted service providers working in close consultation with staff of the PDWRAM and under the guidance of MOWRAM's DPIC:

i) Conduct of a pilot phase to develop and test protocols

ii) A preparatory to phase refine the list remaining schemes in the selected provinces to be accessed within the framework of CISIS. This phase would include training to the PDWRAM's staff in the selected provinces;

iii) An implementation phase to carry out the CISIS data collection for 996 irrigation schemes with questionnaires, sketches, photos, GPS points, and detailed location maps.

iv) Working with DPIC to monitoring the first stage of data collected 996 including (completed questionnaires, maps, sketches and photos).

v) Compilation of information about irrigation scheme at provincial level, with recommendations on how to improve the data collection;

vi) Assisting PDWRAM staff (under DPIC guidance) transfers relevant data collected into the computer files of CISIS.

vii) Continue to work with DPIC and PDWRAMs to complete the final stage of data collection and data encoding, and complete all work and reports by 30 June 2015.

Key findings and observations

After completing the pilot study:

1) The Planning and International Cooperation Department (DPIC) under the Ministry of Water Resources and Meteorology (MOWRAM) is the main government office in charge of the CISIS database. Base on result of this pilot survey it was confirmed most original documents of irrigation design have been lost due to the prolonged civil war. The DPIC and PDWRAMs therefore have to rebuild the basic information on each irrigation scheme.

2) A total of 30 irrigation schemes have been visited in order to complete the maps and sketches provided with the questionnaires filled during the survey within the framework of the WRMSDP.

3) At the end of December 2013, 30 schemes have been entered into the CISIS database. In order to check the system operation, some tests were conducted at random, to check the accuracy of the information in the database and the capacity of the system to respond to various requests.

4) After the pilot data collection survey, the Siem Reap PDWRAM staff is now in position to improve the quality of the questionnaire and the GIS data prepared as well as the corresponding maps and sketches.

5) ADB Specialists conducted a pilot review workshop and produced a data collection standard operating procedure and revised the data collection questionnaire to exactly mirror the data entry tables in CISIS.

6) The CISIS is now at mid-way of data collection and the MOWRAM target is to complete the data collection to cover all the irrigation schemes in Cambodia. This will allow CISIS will be operational for national, provincial and river basin planning only if it covers all the existing irrigation schemes and not partial picture of what exist. To achieve this target, the MOWRAM CISIS team proposes to adopt this new approach for planning the CISIS data collection.

7) The MOWRAM CISIS team approach should focus on completion of data collection for all medium scale irrigation schemes and to start covering the small scale irrigation schemes province by province. Indeed, the MOWRAM inventory of irrigation schemes shows that large and medium scale irrigation schemes account for about 40% of the number of schemes but covers about 85% of the irrigated area in Cambodia.

After completing Package P1:

1) 155 schemes have been surveyed

2) The irrigation schemes was divided within 3 command area categories; (i) small scale from 50 ha to 200ha, (iii) medium scale from 200 ha to 5000 ha, and (iii) large scale from 5000 ha to 12,000 ha. On this basis 44 small scale and 101 medium scale and 10 large scale schemes were identified;

3) Furthermore, 66 out of 155 irrigation schemes functioning in both seasons, 74 are supplementary irrigation in wet season and 15 are functioning in dry season providing a planned ability to irrigate a command area of about 222,612 ha.

4) Many irrigation systems that were constructed during the Khmer Rouge regime in the late 1970s tend to be poorly designed. However, some of the irrigation structures built during those years were technically inappropriate, poor quality construction and with a decade of social unrest left Cambodia with low financial and technical capacity to properly manage its existing water resources management infrastructure.

5) With the completion of data collection in Battambang province, 7 provinces have all or nearly all their schemes' data surveyed and entered into CISIS. These provinces are Battambang, Stung Treng, Kep, Pailin, Sihanoukville, Koh Kong and Kampot.

After completing Package P2:

1) 282 schemes have been surveyed;

2) The irrigation schemes was divided within 3 command area categories; (i) small scale from 50 ha to 200ha, (iii) medium scale from 200 ha to 5000 ha, and (iii) large scale from 5000 ha to 12,000 ha. On this basis 92 small scale and 190 medium scale scheme were identified;

3) Furthermore, 37 out of 282 irrigation schemes functioning in both seasons, 91 are supplementary irrigation in wet season and 154 are functioning in dry season providing a planned ability to irrigate a command area of about 66,660 ha. Out of this area, only wet season command area was of about 17,767 ha and dry season cultivated area was of about 38,009 ha and both season area was about of 10,884 ha.

4) Many irrigation systems that were constructed during the Khmer Rouge regime in the late 1970s tend to be poorly designed. However, some of the irrigation structures built during those years were technically inappropriate, poor quality construction and with a decade of social unrest left Cambodia with low financial and technical capacity to properly manage its existing water resources management infrastructure.

5) 3 additional provinces have all their schemes' data surveyed and entered into CISIS

After completing Package P3:

1) 278 schemes have been surveyed;

2) The irrigation schemes was divided within 3 command area categories; (i) small scale from 50 ha to 200ha, (iii) medium scale from 200 ha to 5000 ha, and (iii) large

scale from 5000 ha to 12,000 ha. On this basis 163 small scale and 115 medium scale scheme were identified;

3) Furthermore, 51 out of 278 irrigation schemes functioning in both seasons, 66 are supplementary irrigation in wet season and 161 are functioning in dry season providing a planned ability to irrigate on the command area of about 74,332 ha. Out of this area, only wet season command area was of about 27,910 ha and dry season cultivated area was of about 29,571 ha and both season area was about of 16,851ha.

4) Many irrigation systems that were constructed during the Khmer Rouge regime in the late 1970s tend to be poorly designed. However, some of the irrigation structures built during those years were technically inappropriate, poor quality construction and with a decade of social unrest left Cambodia with low financial and technical capacity to properly manage its existing water resources management infrastructure.

5) 5 additional provinces have all their schemes' data surveyed and entered into CISIS

After completing Package P4:

1) 281 schemes have been surveyed;

2) The irrigation schemes was divided within 3 command area categories; (i) small scale from 50 ha to 200ha, (iii) medium scale from 200 ha to 5000 ha, and (iii) large scale from 5000 ha to 12,000 ha. On this basis 169 small scale, 110 medium scale and large 2 scheme were identified;

3) Furthermore, 54 out of 281 irrigation schemes functioning in both seasons, 133 are supplementary irrigation in wet season and 94 are functioning in dry season providing a planned ability to irrigate on the command area of about 115,728 ha. Out of this area, only wet season command area was of about 68,337 ha and dry season cultivated area was of about 16,262 ha and both season area was about of 31,129 ha.

4) Many irrigation systems that were constructed during the Khmer Rouge regime in the late 1970s tend to be poorly designed. However, some of the irrigation structures built during those years were technically inappropriate, poor quality construction and with a decade of social unrest left Cambodia with low financial and technical capacity to properly manage its existing water resources management infrastructure.

5) 5 additional provinces have all their schemes' data surveyed and entered into CISIS

A summary of key data from the survey of 1,026 schemes from the pilot study and the 4 packages (P1 to P4) is included as Table 2. The average scheme condition is around 50% (this means depreciation has consumed about 50 % of the investment value. Only 3 of the 841 schemes surveyed in P2, P3, P4 have a functioning FWUC.

Through the support from the ADB project 14 Provinces now have data sets for all their schemes in CISIS and 6 other provinces, with a small number of schemes, are already completed (In total there are 2,136 schemes in these 20 provinces, comprising 76 % of Cambodia's total number of 2,781 irrigation schemes).

This data not only improves knowledge about the status of irrigation infrastructure in Cambodia but it also provides a benchmark for measuring improvements in irrigation planning and management capacity of MOWRAM and PDWRAMs.

Recommendations

The following recommendations are made based on the actual findings:

- To overcome some organizational problems at the level of the provincial technical counterparts in charge of the CISIS data collection: One staff member should be assigned as the focal point by the Provincial Director to be responsible for the data quality and data management in order to be able to explain the possible errors included in the maps or in the questionnaires and to ensure consistency in the quality of the maps/data.

- The focal point to have a job description for their duties including, for example, to pay more attention to the selection of the Irrigation Schemes to be surveyed and to make sure that: the scheme is functional, the scheme is not already included in the GIS/database with a different name (this issue will be partially solved with the update of the MOWRAM irrigation system inventory); the scheme is not a sub component of a larger system already included into the GIS/database.

- The job description should also specify that PDWRAM should provide Quarterly (if not Monthly) reports on the progress status of ongoing Construction/Rehabilitation projects specifying the name of the irrigation scheme(s), the nature of the project activities and the financial aspects in order to inform the DPIC about the update to be done on the database. Ideally, a CISIS database update should be done for the concerned irrigation scheme only at the completion of the construction/rehabilitation work.

Table 2: Summary of key data for 1,026 schemes surveyed with assistance from ADB

Package / No of Schemes	Scale			Area Irrigated			Scheme condition	FWUC functionality
	Small	Medium	Large	Measured scheme commanded area	Wet season	Dry season		
Pilot / 30	4	25	1	29,202 ha (details of actual area irrigated were not reported)	25 +4* schemes	1 + 4* schemes	0 – 50% 9 schemes 50 – 100% 21 schemes	Not reported
P1 / 155	44	101	10	222,612 ha (details of actual area irrigated have not been reported)	74 +66* schemes	15 + 66* schemes	0 – 50% 31 schemes 50 – 100% 124 schemes	Not reported
P2 / 282	190	92	0	66,660 ha	91 + 37* schemes	154 +37* schemes		
				Due to poor asset condition area actually irrigated is 31,421 ha	7009 + 5917* ha	18,495 +5917* ha	0 – 40 % 104 schemes 50 – 100% 178 schemes	8 schemes have a registered FWUC but only 3 are functional
P3 / 278	163	115	0	74,332 ha	66 +51* schemes	161 + 51* schemes		
				Due to poor asset condition area actually irrigated is 36,680 ha	16,948 + 4,512* ha	15,220 +4512* ha	0 – 40 % 50 schemes 50 – 100% 228 schemes	3 schemes have a registered FWUC but none are functional
P4 / 281	169	110	2	115,728 ha	133 + 54* schemes	94 + 54* schemes		
				Due to poor asset condition area actually irrigated is 53,204 ha	32,751 + 10,346* ha	10,107 +10,346* ha	0 – 40 % 143 schemes 50 – 100% 138 schemes	5 schemes have a registered FWUC but none are functional

* Double cropped