



Ministry of Public Works and
Housing of Republic of Indonesia

MASTER PLAN REPORT

MAIN REPORT VOLUME 1



Accelerating Infrastructure Delivery through Better Engineering Services Project (ESP)

Project Preparation Consultant (PPC) Firm for Development of the Way Sekampung Irrigation System in
Lampung, Sumatera Island



in association with



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ABBREVIATIONS AND ACCRONYMS

	English	Indonesia
ADB	Asian Development Bank	Bank Pembangunan Asia
AKNOP	Real Need Operation and Maintenance Figures	Angka Kebutuhan Nyata Operasi dan Pemeliharaan
AMDAL	Environmental Impact Assessment	Analisis Mengenai Dampak Lingkungan Hidup
ANDAL	Environmental Impact Analysis	Analisis Dampak Lingkungan Hidup
APW	Agency of Public Works	Dinas Pekerjaan Umum
ASN	State Civil Apparatus	Aparatur Sipil Negara
AWRM	Agency of Water Resource Management	Dinas Pengairan
AWRM	Agency of Water Resource Management	Dinas Pengairan
BAPPEDA	Regional Development Planning Agency	Badan Perencanaan Pembangunan Daerah
BAPPENAS	National Planning and Development Agency	Badan Perencanaan Pembangunan Nasional
BBWS	River Basin Management Organisation	Balai Besar Wilayah Sungai
BIG	Geospatial Information Agency	Badan Informasi Geospasial
BM	Bench Mark	Patok Penanda
BPS	Central Bureau of Statistics	Badan Pusat Statistik
BSN	National Standardization Agency	Badan Standarisasi Nasional
CSRT	High Resolution Satellite Image	Citra Satelit Resolusi Tinggi
DAK	Special Allocation Fund	Dana Alokasi Khusus
DAK	Special Allocation Fund	Dana Alokasi Khusus
DCPT	Dutch Cone Penetration Test	Uji Sondir
DED	Detailed Engineering Design	Desain Rinci/Figure Kerja/Figure Detail
DELH	Environmental Evaluation Document	Dokumen Evaluasi Lingkungan Hidup
DGFC	Directorate General of Food Crops	Direktorat Jenderal Pertanian Tanaman Pangan
DGWR	Directorate General of Water Resources	Direktorat Jenderal Sumber Daya Air

	English	Indonesia
DIL	Directorate of Irrigation and Lowland	Direktorat Irigasi dan Rawa
DIPA	Entry List of Implementation Budget	Daftar Isian Pelaksanaan Anggaran
DOMD	Directorate of Operational & Maintenance Development	Direktorat Bina Operasi dan Pemeliharaan
DOMD	Directorate of Operational & Maintenance Development	Direktorat Bina Operasi dan Pemeliharaan
DPH	Hypothetical Significant Impact	Dampak Penting Hipotetik
DPLH	Environmental Management Document	Dokumen Pengelolaan Lingkungan Hidup
DWRM	Directorate of Water Resources Management	Direktorat Bina Penatagunaan Sumber Daya Air
DWRM	Directorate of Water Resources Management	Direktorat Bina Penatagunaan Sumber Daya Air
DWRND	Directorate of Water Resources Network Development	Direktorat Pengembangan Jaringan Sumber Daya Air
EA	Executing Agency	Instansi Pelaksana
EFA	Economic and Financial Analysis	Analisa Ekonomi dan Keuangan
EGIS	EGIS EAU	EGIS EAU
EIA	Environmental Impact Assessment	Analisis Dampak Lingkungan Hidup
EIRR	Economic Internal Rate of Return	Tingkat Pengembalian Internal Ekonomi
ELM	Elementary	
EOCC	Economic Opportunity Cost of Capital	Biaya Peluang Ekonomi Modal
ESP	Engineering Services Projects	Proyek Jasa Rekayasa
GCC	General Conditions of Contract	Ketentuan Umum Kontrak
GDEM	Global Digital Elevation Map	Peta Global Elevasi Digital
GKG	Milled Dry Grain	
GOI	Government of Indonesia	Pemerintah Indonesia
GP3A	Water User Farmers Association	Gabungan Perkumpulan Petani Pemakai Air
HDI	Human Development Index	Indeks Pembangunan Manusia

	English	Indonesia
HSWRMA	Human Settlement and Water Resources Management Agency	Dinas Pekerjaan Umum dan Pengelolaan Sumber Daya Air
IC	Irrigation Commission	Irrigation Commission
IC	Irrigation Commission	Irrigation Commission
IDR	Indonesian Rupiah	Rupiah Indonesia
IEE	Initial Environmental Examination	Kajian Lingkungan Hidup Awal
IMP	Irrigation Management Plan	Rencana Pengelolaan Irigasi
IMP	Irrigation Management Plan	Rencana Pengelolaan Irigasi
IOL	Inventory of Losses	Daftar Kehilangan Aset
IP	Indigenous Peoples	Masyarakat Adat
IPP	Indigenous Peoples Plan	Rencana Penanganan Masyarakat Adat
IR	Involuntary Resettlement	Pemindahan Penduduk Tidak Suka Rela
ITB	Bandung Institute of Technology	Institut Teknologi Bandung
JV	Joint Venture	Bekerja sama
KA-ANDAL	Terms of Reference for Environmental Impact Analysis	Kerangka Acuan Analisis Dampak Lingkungan Hidup
KEPRES	Presidential Statement	Keputusan Presiden
KESDM	Ministry of Energy and Natural Resources	Kementerian Energi dan Sumberdaya Mineral
KH	PT Kwarsa Hexagon	PT Kwarsa Hexagon
KP	Design Criteria	Kriteria Perencanaan
KPSPI	Committee of Indonesian Appraisal Standards Development	Komite Penyusun Standar Penilaian Indonesia
KRB	Disaster Prone Area	Kawasan Rawan Bencana
LA	Loan Agreement	Perjanjian Pinjaman
LARP	Land Acquisition and Resettlement Plan	Rencana Pembebasan Lahan dan Pemukiman Kembali
LGWP	Local Government Work Plans	Rencana Kerja Pemerintah Daerah (RKPD)
LiDAR	Light Detection and Ranging	Metode Inderaja Menggunakan Pulsa Laser

	English	Indonesia
MAPPI	Indonesian Professional Appraiser Society	Masyarakat Profesi Penilai Indonesia
MMI	Modified Mercalli Intensity	Skala Modifikasi Intensitas Mercalli
MOA	Ministry of Agriculture	Kementerian Pertanian
MOU	Memorandum of Understanding	Nota Kesepahaman
MPWH	Ministry of Public Works and Housing	Kementerian Pekerjaan Umum dan Perumahan Rakyat
MSOHS	Management System of Occupational Health and Safety	Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3)
NSCWR	National Steering Committee for Water Resources	Komite Pengarah Nasional untuk Sumber Daya Air
NWRC	National Water Resources Council	Dewan Sumber Daya Air Nasional
O&M	Operation and Maintenance	Operasi dan Pemeliharaan
P2D2	Regional Government Loans and Decentralization	Pinjaman Pemerintah Daerah dan Desentralisasi
PA	PT Perancang Adhinusa	PT Perancang Adhinusa
PAI	Irrigation Asset Management System	Pengelolaan Aset Irigasi
PAI	Irrigation Asset Management System	Pengelolaan Aset Irigasi
PAM	Project Administration Manual	Manual Administrasi Proyek
PERMENTAN	Ministry of Agriculture Regulation	Peraturan Menteri Pertanian
PLTA	Hydro power plant	Pembangkit Listrik Tenaga Air
PPA	Gate keeper	Petugas Pintu Air
PPC	Project Preparation Consultant	Konsultan Persiapan Proyek
PPK	Commitment Officer	Pejabat Pembuat Komitmen
PPMB	Research Centre for Disaster Mitigation	Pusat Penelitian Mitigasi dan Bencana
PPPK	Government's Employee with Work Agreement	Pegawai Pemerintah dengan Perjanjian Kerja
PPSIP	Development and Participatory Irrigation Management Systems	Pengembangan dan Pengelolaan Sistem Irigasi Partisipatif
PSG	Geological Survey Institute	Pusat Survey Geologi

	English	Indonesia
PT PLN	Electricity State Own Company	Perseroan Terbatas Perusahaan Listrik Negara
PUSKIM	Central of Housing and Settlement Research	Pusat Penelitian Perumahan dan Pemukiman
PVMBG	Central of Volcanology and Geological Hazard Mitigation	Pusat Vulkanologi Mitigasi dan Bencana Geologi
PWRC	Provincial Water Resources Council	Dewan Sumber Daya Air Provinsi
PWRC	Provincial Water Resources Council	Dewan Sumber Daya Air Provinsi
RBI	Indonesia Topographic Map	Rupa Bumi Indonesia
RKL	Environmental Management Plan and	Rencana Pengelolaan Lingkungan Hidup dan
RPJMD	Provincial Medium-Term Development Plan	Rencana Pembangunan Jangka Menengah Daerah
RPL	Environmental Monitoring Plan	Rencana Pemantauan Lingkungan Hidup
SATKER	Work Unit	Satuan Kerja
SCC	Special Conditions of Contract	Ketentuan Khusus Kontrak
SES	Socio Economic Survey	Survei Sosial Ekonomi
SNI	Indonesian National Standard	Standar Nasional Indonesia
SNVT	Certain Non-Vertical Work Unit	Satuan Kerja Non Vertikal Tertentu
SPI	Indonesian Appraisal Standard	Standar Penilaian Indonesia
SPPL	Statement Letter of Ability on and Environmental Management Monitoring	Surat Pernyataan Kesanggupan Pengelolaan dan Pemantauan Lingkungan Hidup
SPS	Safeguard Policy Statement	Pernyataan Kebijakan Perlindungan Sosial
SPT	Standard Penetration Test	Uji Penetrasi Standar
SRI	System of Rice Intensification	Sistem Intensifikasi Padi
TGP	PT Tata Guna Patria	PT Tata Guna Patria
TOR	Terms of Reference	Kerangka acuan
ToT	Trainer of Trainers	Pelatih

	English	Indonesia
TP OP	Co-Administration Task	Tugas Perbantuan Operasi dan Pemeliharaan (TP OP)
UKL	Environmental Management Measures	Upaya Pengelolaan Lingkungan Hidup
UPIM	Modern Irrigation Management Unit	Unit Pengelola Irigasi Modern
UPL	Environmental Monitoring Measures	Upaya Pemantauan Lingkungan Hidup
UPT/D	Technical Implementation Service Unit	Unit Pelaksana Teknis/Daerah
UPTD BPSDA Wilayah II	Regional Technical Implementation Unit Region II Seputih Sekampung	Unit Pelaksanaan Teknis Daerah Balai Pengelolaan Sumber Daya Air Wilayah II
UU	Law	Undang-Undang
UUD	Constitution	Undang-undang Dasar
VAT	Value Added Tax	Pajak Pertambahan Nilai
WRMCT	Water Resources Management Coordination Team	Tim Koordinasi Pengelola Sumber Daya Air (TKPSDA)
WUA	Water Users Association	Asosiasi Pengguna Air
WUAA	Water Users Association Apex	Apex Asosiasi Pengguna Air
WUAF	Water Users Association Federation	Federasi Asosiasi Pengguna Air

EXECUTIVE SUMMARY

Project Purpose and Objective

This project preparation aims to assist Directorate General of Water Resources (DGWR), the Ministry of Public Works and Housing in developing an institutional, management and infrastructure modernization plan for Way Sekampung Irrigation System (WSIS, see Figure 1-1), while adopting the most up-to-date technical modernization guidelines comprising 5 pillars toward modern irrigation system with 45 steps. The output from this preparation project includes document tenders for the implementation of modernization envisaged for Way Sekampung Irrigation System in 2021.

The Latest Conditions

As presented in Table 2-1, Way Sekampung Irrigation System has vastly developed for nearly 70 years, from initially covering 15,680 ha in 1935, expanding to 23,844 ha in 1960, further expanding to 44,661 ha coupled with the construction of Feeder Canal II in 1973 and finally reaching 57,513 ha in 2006.

It is obvious that construction activities in sequential order will make water distribution more complicated and high-level planning and interaction of operator (BBWS Mesuji Sekampung) and users (farmers and WUAs) will be necessary to reach sound water management.

Irrigation Modernization Preparedness Index (IKMI) 2017 review concluded that "According to IKMI assessment to Way Sekampung Irrigation System, this irrigation scheme got "average" score, i.e. at 50 to 80 range. It means Irrigation Modernization of this irrigation sub-system needs delay to give opportunity for improvement for 1-2 years"

Field visit in 2019 and further analysis just confirmed such IKMI score in 2017. With reference to seven sub-systems, canal and structure inspection the existing infrastructure can be categorized as follows:

- Good : Rumbia Barat, Punggur Utara, Sekampung Bunut;
- Satisfactory : Bekri, and Batanghari Utara;
- Reasonable : Sekampung Batanghari, and Raman Utara (only the extension)

Approach

The approach consists of compilation of primary and secondary data collection, field visit, interviews, infrastructure inspection, evaluation and analysis directed towards:

1. The status of 5 modernization pillars both at present and expected in future using 45 steps of Modernization Guidelines in accordance with guides and regulations of the Ministry of Public Works and Housing.
2. Gap analysis to obtain the best solution for WSIS improvement and modernization.
3. Roadmap development of how to materialize the expected situation in future.

Outputs

Pillar 1 – Water Availability: Referring to the results of upstream hydraulic model, water available at present is sufficient to serve more than 200% paddy crop intensity in Way Sekampung Irrigation System. Way Sekampung dam, which is still under construction, will significantly increase paddy crop intensity at 200%. Paddy production will also enhance because of larger irrigation service areas (14,000 ha in Rumbia Extension). From agronomic wise, however, cropping intensity increase under current conditions is relatively limited. This condition is down to some factors, which include: 1) loss of paddy harvest due to brown planthopper attack (*wereng coklat*), 2) low price of rice at farmer level, 3) lack of irrigation water distribution in downstream irrigation network, and 4) recommendation asking WUAs to switch to secondary cropping farming. In light of that, improvement to Rumbia irrigation network (Rumbia Extension) is an appropriate measure to enhance paddy production. Lower water availability is expected to occur in 2021 as a result of more water uses in upstream of Argoguruh weir, more intensive uses of raw water at upstream, higher raw water demands for Bandar Lampung and Metro cities including water for ecological streams. Under such

circumstances Way Sekampung river must appropriately be exploited in a manner that will produce optimum management of the available water. Effects of climate change will not alter the existing conclusions: water is sufficient to meet the demands from Way Sekampung river, particularly with the operation of 2 dams.

Pillar 2 - Irrigation Infrastructure: Inspection to primary and secondary canals in September found no significant damage to the infrastructure or any serious obstacle that will impair the function of water distribution networks. Sediment deposit observed along the canals has no significant impact to the canal discharge capacity. All damages that have been identified result from lack of or delayed maintenance from time to time. Exception is found at Bekri sub-system where a group of people vandalized and stole many parts of gates. It is recommended not to overlook the maintenance of infrastructure and any damaged gate should be immediately repaired. To improve the effectiveness of canals, they should be covered with waterproof seal to reduce the loss of water conveyed along the canals. It is recommended to commence modernization for Punggur Utara and Rumbia Barat sub-system since they have been assessed ready for modernization.

Pillar 3 – Irrigation Management : While Way Sekampung Irrigation System is under the authority of central government represented by the Ministry of Public Work and Housing, the O&M activities for the system are under the responsibility of provincial agencies for implementation by district agencies. It just creates multifunction procedures that to avoid any overlap decision or to prevent any responsibility rivalry in irrigation system management a broad coordination is necessary.

Pillar 4 – Irrigation Management Institution : Technically, Way Sekampung Irrigation System is under the authority of the Ministry of Public Work and Housing in Jakarta and province government and district/city governments. Nonetheless, there are other offices held responsible for the management, operation and maintenance of irrigation network including Irrigation Commission of Lampung Province, BBWS Mesuji Sekampung, Human Settlement Agency and PSDA as Co-Administration Task of O&M (TPOP); UPTD Region II Seputih Sekampung and 15 implementing units of South Lampung District, East Lampung District and Metro City (UPTD / KPD / UPT). Given that, the institutional management becomes complicated and leads to protracted decision making process. It is proposed to set up an implementing organization of *Central Project Management Unit* (CPMU) consisting of Central Planning and Control Unit (CPCU), Central Activity Implementing Unit (CAIU) and Activity Implementation Unit (AIU). If deemed necessary, capacity building for WUAs can be provided in the preparation of irrigation management modernization.

Pillar 5 – Human Resources: Total employees attached to 15 offices (UPTD / KPD / UPT) are to reach 382 persons consisting of 244 civil servants (PNS) and 139 honor paid officials. Out of 299 gate keepers (PPA), 129 persons have non-civil servant status for their employment. They are expected to have civil servant status (PNS). From education background and technical capacity wise, in general these field staff need further improvement to carry out the given duties and responsibilities. Training and capacity building will be necessary to make them capable of adequately and competently performing tasks and duties in irrigation system modernization.

Pillar 6 – Implementation Arrangement and Road Map : The implementation will be arranged with focus on revisions required for institutional and human resources management for modernization preparation. Comprehensive description of actions necessary for WSIS improvement and modernization preparation is presented in Tabel 7-2: Way Sekampung Irrigation Network Road Map. This road map considers three stages: 1. Infrastructure, Institutional and Farmer Community Preparation; 2. Physical Works for Water Distribution Control and Management under an automatization system; and 3. Focus on well-established and reliable standard operating procedure: (i) infrastructure, (ii) Institution, (iii) communication, (iv) decision making.

1 - INTRODUCTION

The Way Sekampung Irrigation System is one of several schemes earmarked by the Director General for Water Resources, Ministry of Public Works and Housing, for modernization, a national programme that includes six other irrigation schemes under the authority of the Central Government. To achieve the envisaged target, the GOI utilizes ADB's funding of Loan 3455-INO: Accelerating Infrastructure Delivery through Better Engineering Services Project (ESP) to undertake infrastructure project preparation by engaging technical assistance.

1.1 - Project Description

Way Sekampung Irrigation System has a total service area of 54,000 ha. WSIS is under the authority of central government through a regional river basin organization of Mesuji Sekampung River or *Balai Besar Wilayah Sungai* (BBWS) Mesuji Sekampung. It has been proposed that Way Sekampung Irrigation Project to include the development of Way Sekampung downstream areas, about 80 km from Bandar Lampung, the capital of Lampung province, covering East Lampung District, Central Lampung District and Metro City. Based on the results of Irrigation Modernization Index (IKMI) Review in 2017, the performance of irrigation schemes in Way Sekampung can be seen in the table that follows:

No	Indicator	Weight	Level	Predicate	IKMI
1	Water availability	20	81	Sufficient	16
2	Irrigation Infrastructure	25	84	Sufficient	21
3	Managements	15	72	Fair	11
4	Institutions	20	68	Fair	14
5	Human Resources	20	66	Fair	13
IKMI Score					75

Source: IKMI Study, 2015

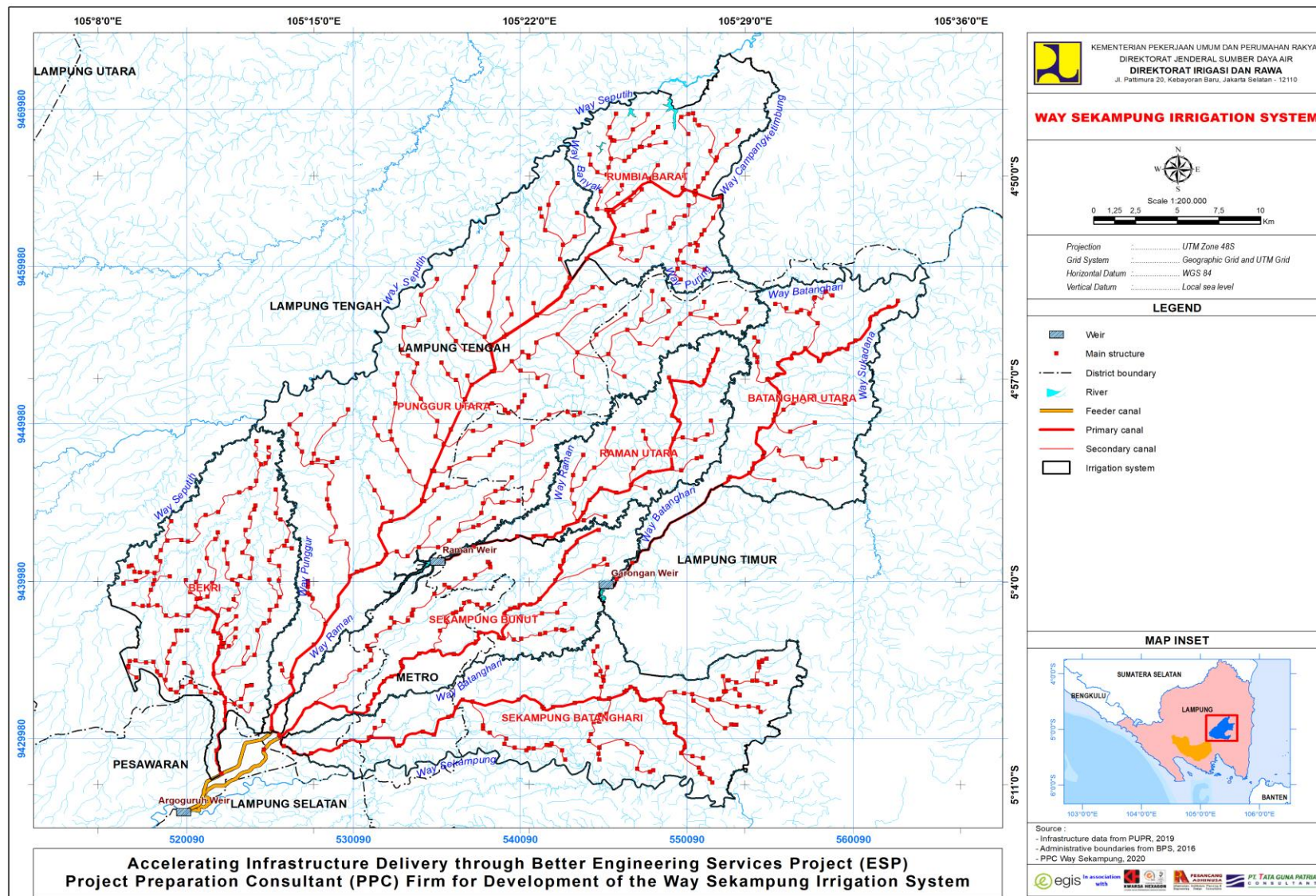
IKMI study reveals some issues requiring:

- Further analysis of water availability, water needs and water balance for irrigation system modernization.
- Betterment planning for irrigation infrastructure, headworks, primary canals, secondary canals, tertiary and drainage canals as well as other facilities. Repairs to water gates as part of modernization including replacement to electromechanical and automated gates, if possible.
- Irrigation operation facility and equipment planning: observation and operational room, offices and warehouses, farm inspection paths, communication system, transportation facilities, O&M facilities and safety facilities.

Way Sekampung Irrigation System management modernization can resolve the above-mention problems, i.e. with solutions and approaches in accordance with the irrigation system management regulations currently applicable. Basically, modernization is to adapt system and infrastructure management to the changing environment and requirements for irrigation and drainase services. Gradual process will become a way to improve the existing system management to meet criteria of new service provisions that include revisions to the present operation and maintenance procedure, institutional and legal frameworks, and facility and infrastructure. Some areas in Way Sekampung Irrigation System need the following improvements:

- Institutional, governance structure and human resources development for participatory irrigation system management in the context of river basin management approach;
- Control and procedure for water computation, allocation and distribution and drainage system as appropriate and the monitoring that should be considered in the context of climate change and land use conversion.

FIGURE 1-1 OVERVIEW OF THE WAY SEKAMPUNG IRRIGATION SYSTEM



Source: PPC Way Sekampung

1.2 - Project Purpose and Objective

1.2.1 - Project Purpose

This consulting service project is to assist Directorate General of Water Resources (DGWR), the Ministry of Public Work and Housing in developing an irrigation institutional, management and infrastructure modernization plan within Way Sekampung Irrigation System adopting the most up-to-date technical irrigation modernization guidelines with 5 pillars towards modern irrigation system using 45 steps.

1.2.2 - Project Objective

The main objective of this consulting service is to assist client in developing a detailed irrigation modernization plan for Way Sekampung Irrigation System covering water availability in the system, comprehensive water management process, institutional development for infrastructure management and development, management information system facility and decision support system to assure compliance to the applicable technical guidelines (Technical Guidelines for Irrigation Modernization). The service of this project includes the preparation of:

- **Master Plan** of Irrigation Modernization (Irrigation System Assessment);
- **Feasibility Study** (Irrigation System Plan); and
- **Way Sekampung Irrigation Modernization Implementation Plan** based on irrigation modernization system plan. This implementation will consist of water management plan, institutional development plan, human resources development plan, and water availability study, Detailed Engineering Design for Infrastructure, Environmental Impact Assessment, Land Acquisition and Resettlement Plan.

Following a tender procedure, a Consulting Service Contract with Contract Number KU.02.10 / Ai / III / 10 was signed on 1 March 2019 between Directorate of Irrigation, the Directorate General of Waater Resources, the Ministry of Public Works and Housing and EGIS Eau-International in Joint Venture with PT: Kwarsa Hexagon, PT. Tara Guna Patria, and PT. Perancang Adhinusa, for Way Sekampung Irrigation System Development in Lampung, Sumatra Island, Indonesia. The Directorate of Irrigation and Lowlands issued Notice to Proceed with reference 40 / ESP Way Sekampung / SPMK / SKDIR / III / 2019, to Egis Eau, dated 21 March 2029. Project Preparation Consultant (PPC) for Way Sekampung Irrigation System commenced to work in April 2019.

1.3 - Scope of Report

The document that has been received include Main Report of Master Plan as per Terms of Reference. This document is Report VOLUME I of Master Plan as integral part of 6 VOLUMES and 9 Annexes.

Master Plan report is the main deliverable that must be sent by Consultant to Client under Contract KU.02.10 / Ai / III / 10, dated 01 March 2019. The submission of this deliverable is to assist Directorate General of Water Resources in modernizing irrigation system under the authority of central government presenting structured process that can be applied for irrigation system modernization while complying with regulations set by the Government and the Ministry of Public Works and Housing in particular. This report will play leading role in dealing with "weak project preparation," which in majority is due to lack of fund sources necessary for project assessment, survey, master plan preparation, feasibility study, design and environmental licenses as well as land acquisition, which all of them are crucial to reach high-level preparation before implementation". ¹

This report is divided into 6 chapters as proposed by ADB and adopted by Client. Scope of individual chapter can be summarized as follows:

CHAPTER 1 : Introduction mentions the location of project, purpose of project, aim of project and scope of work.

CHAPTER 2 : Project Location Overview describes the existing status of five irrigation modernization pillars, potential economic development of agriculture sector and the review and findings relating to the existing conditions.

CHAPTER 3 : Scope of Project and Methodology explains the works to be accomplished as per TOR and provide general description of methodology to be adopted.

CHAPTER 4 : Water Availability and Water Management Practices depicts water availability in upstream of Way Sekampung river from Argoguruh weir. It also presents general description of water management practices in Way Sekampung Irrigation System at present and the expected practices in future and what changes necessary to reach the expected water management system.

CHAPTER 5 : Institution and Human Resources describes institutions managing Way Sekampung Irrigation System, cropping system and human resources composition at present. Gap analysis to assess situation expected in future and the required changes will also be detailed.

CHAPTER 6 : Facility and Infrastructure clarifies all infrastructure and facilities as relevant, their performance and what improvements needed.

CHAPTER 7 : Implementation and Road Map describe implementation arrangement and action plan set out in a Road Map. It is worthwhile noting here that this chapter has been added by Project Preparation Consultant (PPC) to follow TOR of Master Plan.

As further detailed in Chapter 4, this summary report (also known as VOLUME I) is supported with separate VOLUMES for each of five pillars in irrigation modernization and nine annexes as parts of previous reports in accordance with TOR.

2 - PROJECT LOCATION OVERVIEW

This chapter details about the status of five pillars for irrigation modernization and potential economic development of the existing agriculture sector based on primary and secondary data that have already been available or collected.

2.1 - Five Pillars of Modernization

Cambridge English Dictionary describes the word "Modernization" only a "process starting to use method, idea, latest equipment that make something becomes or looks more modern". Thus, it is clear that modernization including irrigation system modernization is a complicated and continual process and has different meaning dependent on the background of irrigation itself. Modernization theories have been developed for several centuries and adopted at various levels of large international organizations and financing institutes, despite no model or implementation that can be applied or accepted universally.

EGIS EAU's technical proposal presents definitions of modernization adopted by three big organizations dealing with water resources development and management, i.e. World Bank, ICID and FAO. Modernization until early of this new millennial has been summarized and defined by:

- World Bank as: "to achieve higher agricultural productivity and to augment the economic conditions of farmers, the challenges to deal with include irrigation management institutional and infrastructure development to get the best, reliable and sustainable irrigation system and other issues relating to lands, water and human resources";
- ICID: "a process of improving the existing project to meet new project criteria. It includes changes to the existing facility operational procedure, management and institutional aspects. Such changes are designed in a manner that will increase the economic and social benefits of project. Different from rehabilitation, modernization is not just to change project features requiring improvement"; and
- FAO: Irrigation modernization is a process of technical and managerial improvements (not only rehabilitation) to irrigation networks combined with institutional reform with a view to maximizing the uses of resources (human resources, water, economic dan environmental sources) and water delivery services to livestock farmers.

Since then, it has been decided by the main responsibilities (e.g. FAO, ICID, CGIAR, UNESCO-IHE) in global sectors that irrigation development or improvement or modernization will face "diverse challenges and requirements, inclusive of:

- (i) The increasing water shortages and competition, requiring more efficient and productive water consumption;
- (ii) Fast farming restructuring and transformation requiring more reliable, flexible and various agriculture water services;
- (iii) The adoption of agribusiness and value change approaches depicting switch from single-headed irrigation to integrated agricultural water management (AWM);
- (iv) The switch from "green revolution" of the first generation to sustainable agriculture intensification focusing on social and environmental sustainability; and
- (v) The increasing pressure to meet demands on meats and dairy products as the result of combination factors of population growth, higher income and urbanization."

The development of new system is not only to expand irrigation services to reach new areas, but also has objectives of improving irrigation water management and minimizing the adverse impacts of irrigation so as to increase water productivity. To enhance the performance of irrigation system and irrigation water management, three types of intervention generally carried out are:

- Rehabilitation consisting of rehabilitation to outperformed infrastructure to restore its function to the original design. While rehabilitation normally refers to physical infrastructure, this intervention can also refer to institutional consensus.
- Process improvement consisting of intervention during the process without changing water management rules, for example, the introduction of modern techniques as improvement process.
- Modernization is more complicated intervention to make fundamental changes in terms of regulations concerning water resources management. It includes intervention in physical infrastructure and the operation.

Modernization has become and will always become element in the first two interventions. However, concept behind the modernization has developed. Modernization has been understood as fundamental transformation in water resources management, on top of the application of new hardware and techniques. Including here is changes to institutional and legal system with regard to water right, water delivery services, accountability and incentive mechanism as well as physical structure of irrigation system.

Irrigation modernization refers to technical and managerial improvements (not only rehabilitation) to irrigation networks to maximize the uses of resources (manpower, water, economic, environmental) and water service to farmers. This modernization has been supported for more than ten years. A series of equipment, publication and training modules have been developed such as series FAO MASSCOTE (Mapping and Service System for Technical Operation of Canals) (FAO, 2007a), which are specifically relevant with large and medium scale irrigation system modernization.¹

2.1.1 - Modernization in Indonesia

In 2013 Ir. Mohammad Zainal Fatah, a representative of Indonesia, during workshop on "Irrigation Revitalization in Asia and Pacific Regions: Technical Approach and Road Map for Future" informed national irrigation transformation strategies for modernization:

- Based on 5 pillars: water availability improvement, better irrigation infrastructure, irrigation management improvement, institutional strengthening; human resources empowerment;
- Whereas implementation and law enforcement and strategies have been already put in place, however implementation and law enforcement remains a problem; and he further noted that;
- While institution have changed but the persons within the institution remain same with same thinking pattern causing insignificant change.

Six years ago, the Director General of Water Resources issued Circular Letter Number 01 / SE / D / 2018, of 28 March 2019, with title Technical Guidelines for Irrigation Modernization. Such Circular Letter 01 / SE / D / 2018 quoted "Article 21 the Regulation of the Minister of Public Works and Housing Number 30 / PRT / M / 2015 concerning irrigation system development and management as the implementation of participatory irrigation management oriented to better irrigation services (Irrigation Service Level) based on complete, effective, efficient and sustainable irrigation management system and to support farming productivity and increase agriculture production and as the implementation of national food resilience it is deemed necessary to carry out irrigation modernization based on 5 (five) pillars of irrigation modernization for which each pillar will have its performance indicators."

Apart from mentioning the legal basis, Circular Letter 01 / SE / D / 2018, informed its application limited to irrigation networks under the authority of central government (the Ministry of Public Work and Housing) with purpose and objective as follows:

The purpose of this Circular Letter is as implementation guide of Irrigation Modernization based on 5 (five) pillars of irrigation modernization.

The objective is to clarify procedure for the implementation of irrigation modernization based on 5 (five) pillars of irrigation modernization for better Irrigation Service Letter through complete, effective, efficient, and sustainable activities.

To expand its range, Circular Letter 01 / SE / D / 2018 has been annexed with four attachments that must be used and obeyed in irrigation modernization process, to wit:

- Attachment 1 : Technical Guidelines for Irrigation Management;
- Attachment 2 : Irrigation Infrastructure Criteria in Irrigation Modernization Preparedness Index (IKMI);
- Attachment 3 : Rapid Assessment Procedure (RAP) for Irrigation Modernization Preparedness Index (IKMI);
- Attachment 4 : Description of Irrigation Modernization Index with 4 Steps (normally referred to as 5 Pillars 45 Steps); and
- Attachment 5: Matrix of Irrigation Modernization Monitoring Synergy and Team Evaluation.

Circular Letter 01 / SE / D / 2018 covers overall irrigation system modernization process as a praiseworthy first step in promoting system performance to higher level, in achieving better infrastructure performance and more efficient uses of water while increasing water productivity.

A prerequisite to achieve this goal is substantial participation of farmers in decision making process at all levels relating to irrigation system operation, management, and maintenance. Modernization is believed to bring changes in interaction between irrigation system operators and water users, i.e., Water Resources Agency at one side and farmers on the other side. Only if the nominal owners and irrigation infrastructure operators work together to actively engage the participation of farmer community in decision making process for any issue important to them, then the objective of the proclaimed modernization will be reached. Balanced approach in decision making on the significance of modernization for every main stakeholder – farmer population and irrigation system operator – can create sustainable improvement with better interaction arrangement, which is instrumental in pursuing higher agriculture production, and will sustain longer.

2.1.2 - Five Pillars of Modernization in Way Sekampung

Modernization initiatives taken by the Ministry of Public Works and Housing have been set out in standards and regulations applicable in Indonesia, including the above Circular Letter 01 / SE / D / 2018.

2.1.2.1 - Brief History of Construction

Way Sekampung Irrigation System has evolved since 1935 when the Dutch colonialist government put up Argoguruh Weir and headwork, which is now called as Feeder Canal I, serving Sekampung Batanghari and Sekampung Bunut. In 1953, the Government of Indonesia constructed Raman weir complete with primary distribution canals, followed with Garongan Weir and primary canals in 1959. Primary Punggur Utara Takeoff extracts water from Feeder Canal I, and secondary canals were constructed in 1973. After nearly 30 years, the development was resumed in 2002 with service expansion.

Primary Punggur Utara canal has been extended to the so-called Rumbia Barat extension. In the same year, Bekri sub-system was developed, from Feeder Canal II and its construction continued until 2006.

As indicated in Table 2-1, Way Sekampung Irrigation System has developed for nearly 70 years, with original service areas of 15,680 ha in 1935, and expanded to 23,844 ha in 1960, and reached 44,661 ha coupled with the construction of Feeder Canal II in 1973 and finally 57,513 ha in 2006.

TABLE 2-1 SUB-SYSTEM ESTABLISHING WAY SEKAMPUNG IRRIGATION SYSTEM

No	Sub-system	Feeder Canal	Primary Canal (km)	Secondary Canal (km)	Served Areas (ha)	Year of Construction
1	Rumbia Barat	2	21,000	58,929	5,892	2002
2	Punggur Utara	2	38,472	206,342	20,871	1973
3	Batanghari Utara	Weir	31,900	27,620	3,957	1959
4	Raman Utara	Weir	28,192	22,199	4,207	1953

No	Sub-system	Feeder Canal	Primary Canal (km)	Secondary Canal (km)	Served Areas (ha)	Year of Construction
5	Bekri	2	16,127	97,806	6,906	2002-2006
6	Sekampung Bunut	1	48,425	38,433	5,543	1935
7	Sekampung Batanghari	1	41,622	52,658	10,137	1935
	Total		225,738	503,987	57,513	

Source: Master Plan report, VOLUME 3

2.1.2.2 - System used for operational

It is obvious that development in sequential order will make water distribution system become more complicated requiring high-level planning and interaction between operator (BBWS Mesuji Sekampung) and users (farmers and WUAs) for successful water management. Meanwhile, the development of seven sub-system has created vast irrigation networks with gross area around 114,000 ha. The current irrigation infrastructure shows no comprehensive or long-term plan for the system with such huge perimeters. Amendment will be necessary whenever there is assignment to develop every unit of infrastructure. Out of gross area 144,000 ha in Way Sekampung, the focus will mainly be directed to 57,513 ha with possible additional 20,000 ha that may be farmed under rain-fed system or irrigation network system. Irrigation system modernization promoted by the Ministry of Public Works and Housing disregards non-paddy farms.

The operation of Way Sekampung network is more complicated with the need of water distribution from primary canals through natural drainage to water storage associated with Raman and Garongan weirs. These two water storage structures are reported to receive return flow from the excess of irrigation water supplied to paddy fields, which also receive water from natural drainage in the surroundings.

The development of seven sub-systems will not make everything become easy (Table 2-1) since they are independent each other in terms of operational, meanwhile there are only secondary units both from Feeder Canal I or II.

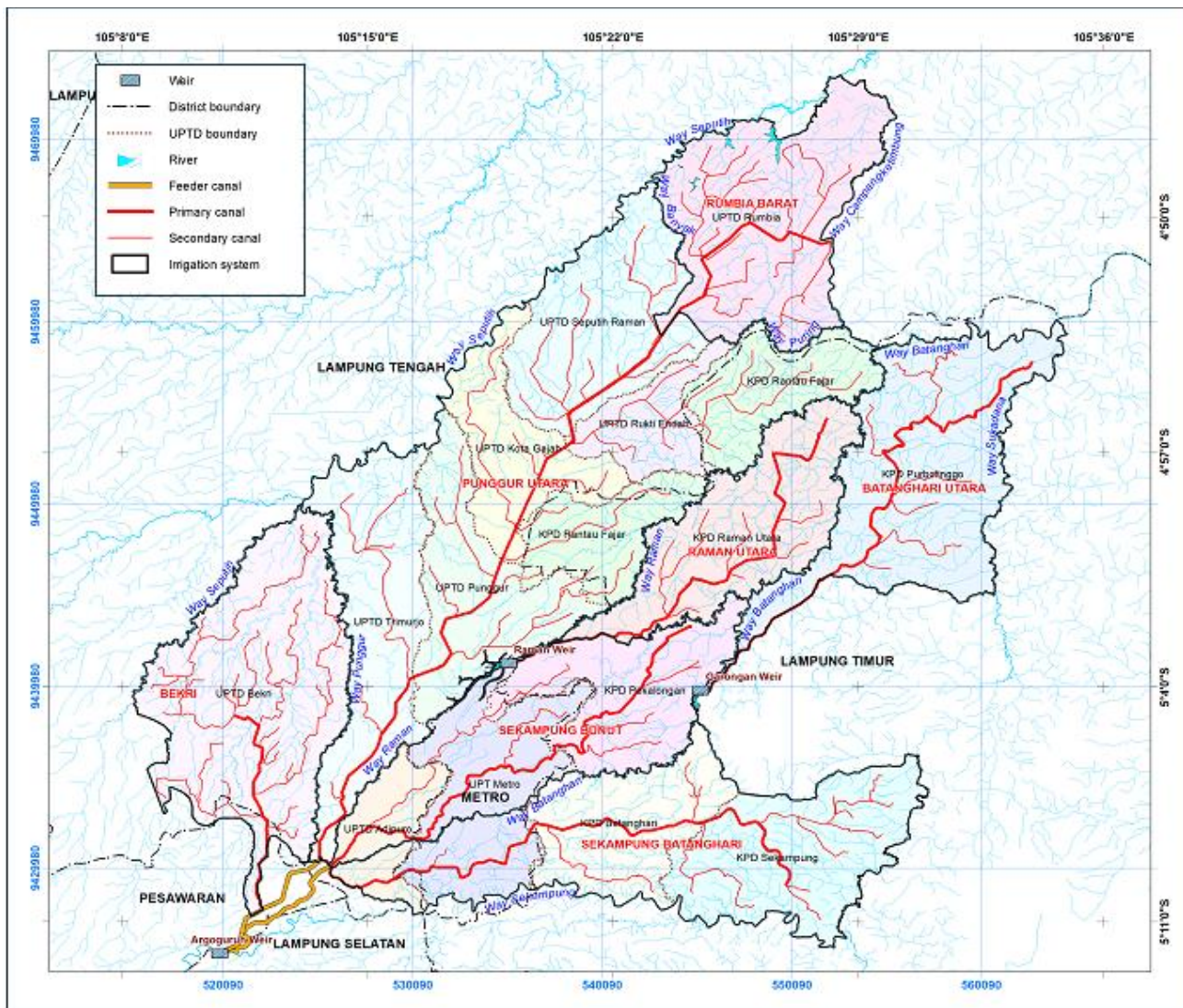
2.1.2.3 - Institutional Arrangement for Operational System

Regardless the distribution, the service areas of these seven sub-systems are divided into 15 operational units (UPTD) under the authority of District Water Resources Agency for O&M activities in cooperation with UPTD Region II Human Settlement Agency and PSDA of Lampung province. BBWS Mesuji only retains insignificant operational authority or responsibility in operation.

Way Sekampung Irrigation System as seen in Figure 2-1 shows complete Way Sekampung Irrigation System including service area boundaries of seven sub-system and administrative borders of 15 UPTDs.

The present operational arrangement for Way Sekampung Irrigation System shows that BBWS Mesuji has main role in major rehabilitation works and O&M monitoring. Meanwhile, the entire roles for maintenance works and water delivery function are played by UPTD and UPTD Region II. It is, therefore, clear that operation mode of Way Sekampung Irrigation System is that of upstream-controlled mode. Thus, farmers must comply with the specified cropping production pattern.

FIGURE 2-1 UPTD OF WAY SEKAMPUNG IRRIGATION SYSTEM



Source: Appendix 4, Annex 4, Master Plan Report

Way Sekampung Irrigation System is irrigation network managed by the government for which communication between operator and users will be limited during early stage of paddy cultivation and water distribution for irrigation. The challenge is how to change this communication mode to invite greater participation of farmer community in all O&M aspects of the system to achieve higher water productivity.

2.1.2.4 - IKMI 2017 and Inspection System 2019

Consultants received copy of summary report of IKMI 2017 from the Client despite no cover, information of the author(s) and field data collected by the author(s). From there, Consultants reviewed IKMI 2017. The overall assessment report is based on information contained in IKMI 2017 report for any findings of consultants and information used for the preparation of main report.

2.1.2.4.1 - IKMI 2017 Conclusions

IKMI 2017 review in Section 4.2 (Survey Results based on IKMI Scores) concludes that "Based on IKMI Assessment, Way Sekampung Irrigation System is assessed sufficient with score point at 50 to 80 range. With such status, Irrigation Modernization should be delayed to give opportunity for irrigation system improvements for another 1-2 years.

"The main findings of IKMI 2017 review are presented in Annex 5 as indicated below:

1. Irrigation Modernization Preparedness Index (IKMI) scores are values depicting the conditions of a particular irrigation scheme from its preparedness aspects towards modern irrigation. The scores

consist of preparedness index in terms of water availability, irrigation infrastructure, irrigation management institutional and irrigation human resources pillars.

2. IKMI score for Way Sekampung Irrigation Scheme is 75. The score for each pillar is as follows: water availability 81 (adequate), irrigation infrastructure 84 (adequate), irrigation management system 72 (sufficient), irrigation management institutional 68 (sufficient), and human resources 66 (sufficient). Water supply reliability in this scheme is very good, thanks to Batutegi weir and sound water management.

3. Water availability in irrigation networks is also hampered by sedimentation causes damage to the network preventing water from reaching downstream areas. Irrigation infrastructure in Way Sekampung is categorized in good conditions, despite some damaged infrastructure due to lack of maintenance or vandalism of local people. Irrigation management in Way Sekampung involves various agencies of Central Government, Lampung Province, Central Lampung District, East Lampung District, and Metro City.

4. Irrigation management institutions in Way Sekampung irrigation scheme have some duties, particularly at district level being the field operators, weir manager and UPTD PSDA Region II tasked to lead irrigation operation and maintenance activities. Despite somfore of irrigation network maintenance and operation, the operators are demanded to perform the given duties maximally.

5. Human resources in irrigation management at all levels of agencies both at central government and regional government not yet master adequate competency due to lack of competency building through training.

2.1.2.4.2 - Inspection 2017 Conclusions

While numeric data and information have been compiled by Consultants during field inspection, it is not yet possible to conduct review with IKMI 2017 scores. Details of the review can be seen in Chapter 2, Annex 5, Master Plan Report, the conclusions are:

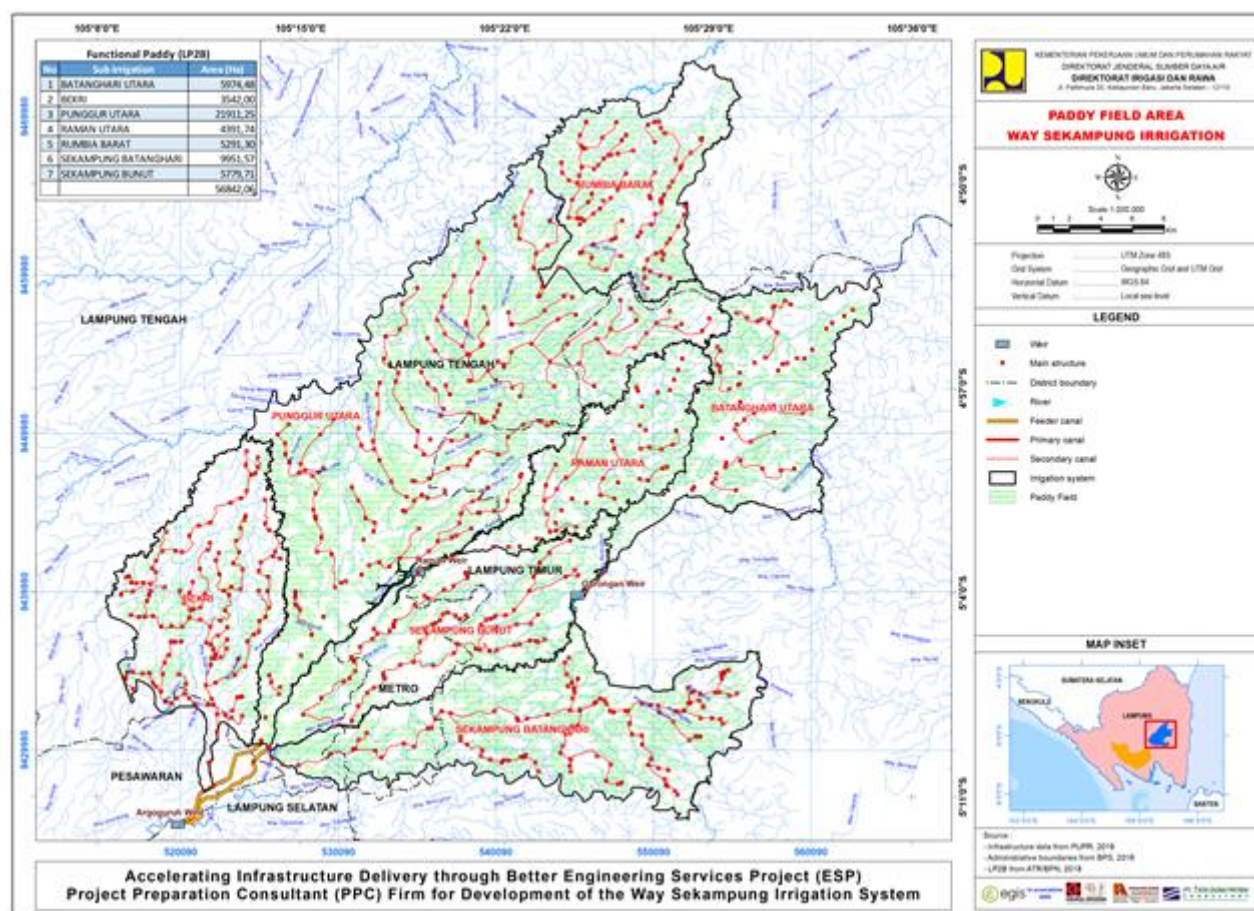
Pillar 1: Water Availability	IKMI 2017 conclusions relating to water availability and water reliability of Batutegi Weir is within the specified criteria and acceptable based on assessment to Way Sekampung Watershed and field visit by Consultants to the catchment of Batutegi Weir (see Sub-Chapter 6.3.1, Annex 7, Way Sekampung Master Plan). However, it is worthwhile noting here that the number of rainfall stations to measure runoff from Weir sub-catchment areas are not evenly distributed in river basin, thus additional rainfall stations are necessary to ensure accurate prediction of surface flows in sub-catchment and in Way Sekampung. The completion of Way Sekampung dam development will increase overall retention volumes within river basin and it is informed that such dam will be complete by end of 2020.
Pillar 2: Irrigation Infrastructure	<p>Inspection to primary and secondary canal networks in September 2019 found no significant infrastructure damage or serious obstacle in water distribution networks. Sediment deposit was observed along the canals without any significant impact to discharge capacity of the canals. Based on the existing conditions of sub-system during the inspection, the inspected canals and structures can be categorized as follows:</p> <ul style="list-style-type: none"> • Good : Rumbia Barat, Punggur Utara, Sekampung Bunut; • Satisfactory : Bekri, and Batanghari Utara; • Reasonable : Sekampung Batanghari, and Raman Utara. <p>All damages observed are basically down to lack of maintenance or inadequate maintenance from time to time. Exception is for Bekri sub-system where the damage is due to vandalism by the local community causing damage to or the loss of parts of water</p>

	control structures. The results of this network inspection and assessment are discussed in more details in Volume 3, Pillar 3: Irrigation Infrastructure.
Pillar 3: Irrigation Management	<p>Meanwhile Way Sekampung Irrigation System is under the authority of Central Government represented by the Ministry of Public Works and Housing, responsibility for O&M of the system has been delegated to province and district agencies creating multi-function procedures for which broad coordination will be required. The role of BBWS Mesuji Sekampung, the nominal owner of network has no any responsibility on O&M matter but obliged to rehabilitate the system, monitor and evaluate the network.</p> <p>While the laws and regulations have been issued to guide any implementation of O&M to the system, there is no any directives that lead towards effective and efficient irrigation system management. Too many parties engaged in irrigation management are indication of fragmented or overlapped management system. Additionally, limited participation of farmer communities in overall O&M activities of the system shows that there is still a lot of areas requiring improvement within system management to reach higher performance and productivity.</p>
Pillar 4: Irrigation Institutional	<p>Technically, Way Sekampung Irrigation System is under the authority of the Ministry of Public Works and Housing in Jakarta and some provincial and district agencies in Lampung. However, there are other offices that take responsibility for the management, operation and maintenance of the network including Irrigation Commission of Lampung Province and District Irrigation Commission, BBWS Mesuji Sekampung and Water Resources Management Agency (Dinas Ciptakarya and PSDA) tasked to implement O&M activities.</p> <p>(TPOP); UPTD Region II Seputih Sekampung and 15 Implementing Units of South Lampung District, East Lampung District and Metro City (UPTD / KPD / UPT).</p> <p>Institutional arrangement becomes complicated and not conducive for streamlined management structure since many horizontal structures will be engaged in decision making process, meanwhile hierarchical decision making model will be more appropriate for this management structure. Decision making process becomes protracted and inefficient in the context of production areas, which are enormous.</p>
Pillar 5: Human Resources	<p>Total employees in 15 field offices (UPTD/KPD/UPT) are to reach 383 persons. They consist of 244 civil servants and 139 honor paid officials. The majority of gate keepers, (299), have non-civil servant status for their employment.</p> <p>In general, these honor paid officials expect that they will be appointed as civil servant. From education background and technical capacity wise, it is likely that these field operators will find difficulties in adequately and diligently performing the given duties and responsibilities relating to irrigation modernization.</p>

2.2 - Potential Economic Development of Agriculture Sector

2.2.1 - Cropping Pattern in Way Sekampung Irrigation System

FIGURE 2-2 PADDY FIELDS IN WAY SEKAMPUNG IRRIGATION SYSTEM BY SCMES



At present the cropping pattern in WSIS are as follows:

- Double paddy during *Rendeng* (rainy) season, i.e. from November to April dependent on types and during *Gadu* (dry) season from May to October
- Double paddy with maize in dry season – found in several locations with particular soil type
- Single or double paddy with maize in dry season, in small part of paddy fields already in operation

The above cropping pattern shows very standard cropping system in WSIS i.e. double paddy in a relatively small areas. The average cropping intensity for paddy and maize from 2016 to 2019 is to reach 183%.

TABLE 2-2 CROPPING AREA AND INTENSITY FOR PADDY AND MAIZE FROM 2016 TO 2019

Year	Functional Area (ha)	Cropped Areas (ha)	Cropping Intensity (%)
2019	55,373	81,682	148
2018	55,373	108,243	195
2017	55,373	94,282	170
2016	55,373	121,587	220
Average	55,373	101,448	183

Source: Balai PSDA Wilayah II Seputih Sekampung oleh KPD/UPTD dan BPS

The time series data of paddy field areas for the last ten years, i.e. from 2010 to 2019 and cropping intensity in 7 sub-systems are presented in Table 2-3. the cropping intensity trend is shown in Figure 2-3.

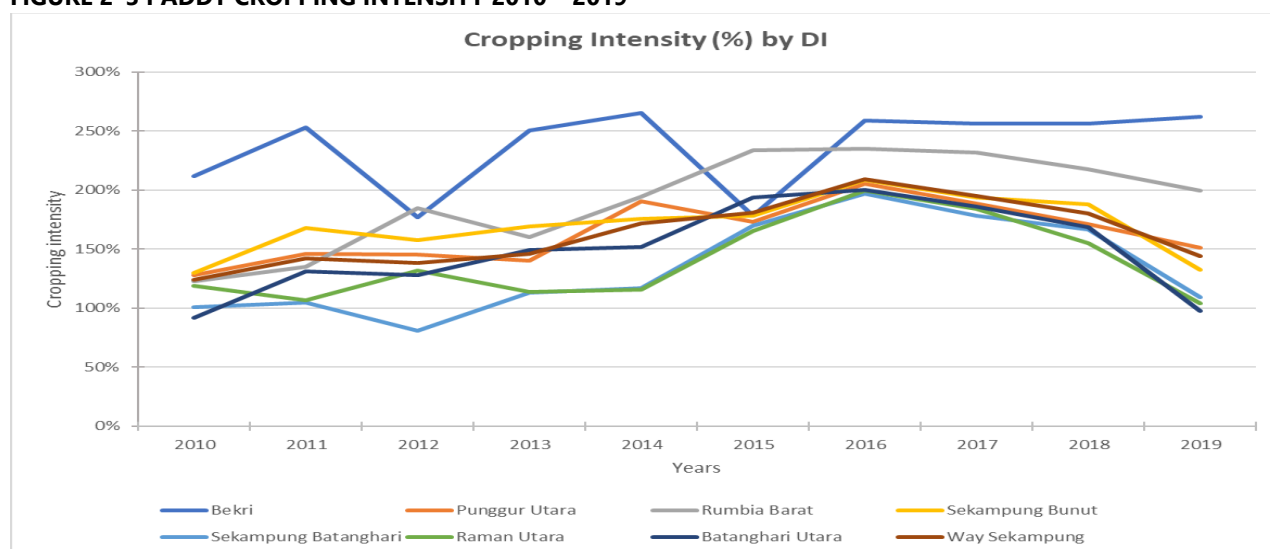
TABLE 2-3 HARVEST AREA AND CROPPING INTENSITY OF PADDY

Sub-system	Area harvested (ha) by year and DI											Functional area (ha)
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average	
Bekri	7,741	9,247	6,450	9,132	9,688	6,495	9,451	9,365	9,363	9,571	8,650	3,651
Punggur Utara	28,084	32,035	31,904	30,773	41,799	37,986	45,014	41,363	37,496	33,121	35,957	21,911
Rumbia barat	6,500	7,133	9,786	8,477	10,276	12,366	12,431	12,263	11,517	10,561	10,131	5,291
Sekampung Bunut	7,489	9,698	9,101	9,785	10,158	10,296	12,063	11,203	10,866	7,635	9,829	5,779
Sekampung Batanghari	10,044	10,398	8,060	11,251	11,628	16,899	19,602	17,731	16,577	10,887	13,308	9,952
Raman Utara	5,223	4,690	5,777	4,982	5,085	7,272	8,772	8,074	6,793	4,557	6,122	4,392
Batanghari Utara	5,495	7,827	7,643	8,910	9,083	11,562	11,947	11,121	10,051	5,847	8,949	5,975
Way sekampung Irrigation System	70,577	81,027	78,721	83,309	97,716	102,875	119,280	111,120	102,662	82,179	92,947	56,951

Sub-system	Cropping intensity by year and DI											Functional area (ha)
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average	
Bekri	212%	253%	177%	250%	265%	178%	259%	256%	256%	262%	237%	3,651
Punggur Utara	128%	146%	146%	140%	191%	173%	205%	189%	171%	151%	164%	21,911
Rumbia barat	123%	135%	185%	160%	194%	234%	235%	232%	218%	200%	191%	5,291
Sekampung Bunut	130%	168%	157%	169%	176%	178%	209%	194%	188%	132%	170%	5,779
Sekampung Batanghari	101%	104%	81%	113%	117%	170%	197%	178%	167%	109%	134%	9,952
Raman Utara	119%	107%	132%	113%	116%	166%	200%	184%	155%	104%	139%	4,392
Batanghari Utara	92%	131%	128%	149%	152%	194%	200%	186%	168%	98%	150%	5,975
Way sekampung Irrigation System	124%	142%	138%	146%	172%	181%	209%	195%	180%	144%	163%	56,951

Source: BPS, 2020

FIGURE 2-3 PADDY CROPPING INTENSITY 2010 – 2019



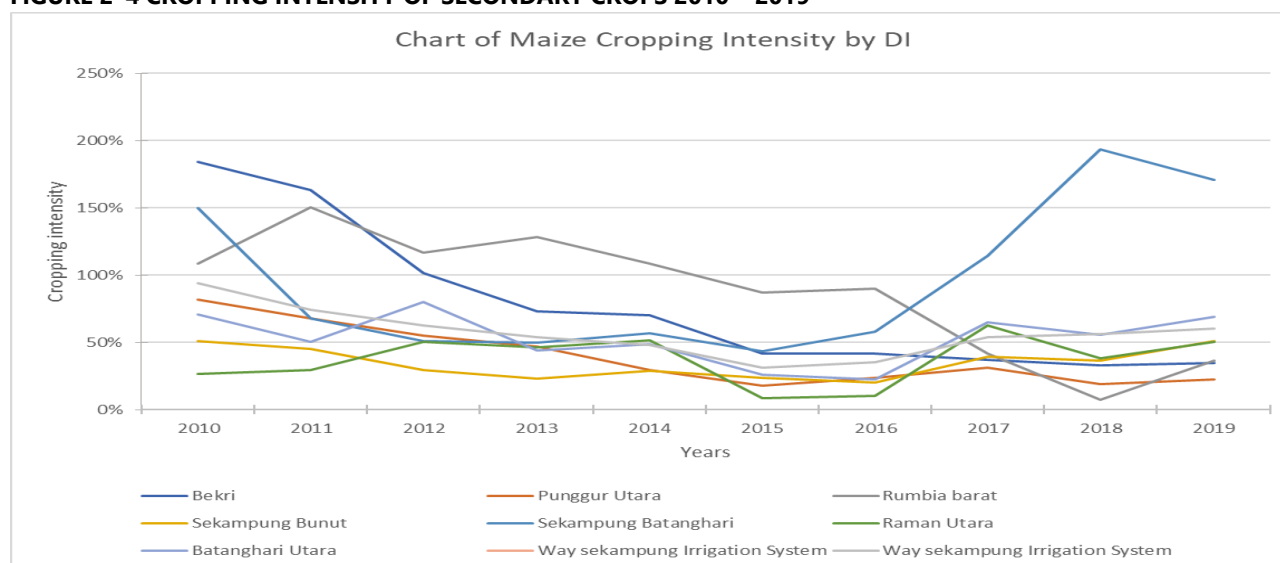
Data on maize cropping areas during the last ten years, i.e. from 2010 to 2019 and cropping intensity in 7 Sub-System are presented in Table 2-4 with the cropping intensity trend can be seen in Figure 2-4.

TABLE 2-4 HARVESTED AREAS AND CROPPING INTENSITY OF PADDY

Sub-system	Area harvested (ha) by year and DI											Average 2016-2019	Maize field area ha
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average		
Bekri	6,714	5,947	3,716	2,672	2,552	1,516	1,530	1,360	1,209	1,274	2,849	1,343	3,651
Punggur Utara	17,969	14,808	12,081	10,299	6,421	3,942	5,195	6,861	4,183	4,877	8,664	5,279	21,911
Rumbia barat	5,738	7,969	6,176	6,773	5,744	4,618	4,768	2,209	378	1,916	4,629	2,318	5,291
Sekampung Bunut	2,944	2,609	1,717	1,339	1,688	1,358	1,161	2,270	2,120	2,961	2,017	2,128	5,779
Sekampung Batanghari	14,887	6,728	5,094	4,985	5,657	4,338	5,766	11,372	19,263	16,994	9,508	13,349	9,952
Raman Utara	1,163	1,289	2,202	2,042	2,259	388	448	2,761	1,678	2,222	1,645	1,777	4,392
Batanghari Utara	4,243	3,006	4,795	2,629	2,917	1,538	1,346	3,872	3,316	4,118	3,178	3,163	5,975
Way sekampung Irrigation System	53,657	42,356	35,781	30,740	27,239	17,698	20,215	30,705	32,148	34,363	32,490	29,358	56,951

Sub-system	Cropping intensity by year and DI											Average 2016-2019	Maize field area ha
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average		
Bekri	184%	163%	102%	73%	70%	42%	42%	37%	33%	35%	78%	37%	3,651
Punggur Utara	82%	68%	55%	47%	29%	18%	24%	31%	19%	22%	40%	24%	21,911
Rumbia barat	108%	151%	117%	128%	109%	87%	90%	42%	7%	36%	87%	44%	5,291
Sekampung Bunut	51%	45%	30%	23%	29%	24%	20%	39%	37%	51%	35%	37%	5,779
Sekampung Batanghari	150%	68%	51%	50%	57%	44%	58%	114%	194%	171%	96%	134%	9,952
Raman Utara	26%	29%	50%	47%	51%	9%	10%	63%	38%	51%	37%	40%	4,392
Batanghari Utara	71%	50%	80%	44%	49%	26%	23%	65%	56%	69%	53%	53%	5,975
Way sekampung Irrigation System	94%	74%	63%	54%	48%	31%	35%	54%	56%	60%	57%	52%	56,951

FIGURE 2-4 CROPPING INTENSITY OF SECONDARY CROPS 2010 – 2019



The two tables and figures above give the following synthesis:

Crops	Average Cropping Intensity (%)	
	2010 - 2019	2016 - 2019
Paddy	163	182
Maize	57	52
Total	220	234

These synthesis figures show strong indication that:

- The existing Cropping Index (IP) in Way Sekampung >220%.
- IP for paddy in 2019 shows the lowest index during the last four years (2016-2019), i.e. only 144%.
- Discussion between RRA and WUAA East Lampung and WUAA Metro indicates that:
 - a. UPSUS in 2019 could not be implemented because farmers representatives in WUAA/WUAF rejected to approve paddy cropping in MT-2 on the ground of brown planthopper attack for the last 3 years (2016-2018)
 - b. The farmers proposed the replacement of UPSUS paddy with UPSUS secondary crops.
 - c. Revision to cropping pattern in UPTD Region II from paddy to secondary crops in MT-2.
 - d. Farmers expected revision to cropping pattern due to the impacts of climate change for cropping in MT-1 in September or October.
 - e. According to the farmers, the price of unhulled paddy grains was relatively low at range Rp 3700/kg – Rp 4500/kg gkp.

2.2.2 - Annual Yields

Rice production records slow growth at 1% per annum for the last decade, particularly due to expansion in irrigation areas, and a bit higher cropping intensity. However, this grow is stagnant due to some reasons, including: (i) damaged irrigation infrastructure; (ii) low seed replacement rate and relatively same varieties; (iii)

limited application of best farming practices; (iv) inappropriate irrigation water delivery; and (v) excessive, inadequate or inappropriate application of fertilizer and pesticide.

Fast adoption of hybrid maize varieties with high harvest in Indonesia has significantly increased maize cropping in rain-fed field and irrigation network. Maize production and harvest in Indonesia record steady increase, even though this country still imports one million ton of maize every year for the last five years. The productivity of paddy and maize from 2017 to 2019 can be seen in Table 2-5.

Paddy and maize cropping productivity from 2017 to 2019 is presented in Table 2-5.

TABLE 2-5 PADDY CROPPING PRODUCTIVITY 2017 – 2020 WAY SEKAMPUNG

TABLE 2-5 PADDY CROPPING PRODUCTIVITY 2017 – 2020 WAY SEKAMPUNG							
Ref.	Kabupaten	Crop	Yield (ton/ha)				
			2017	2018	2019	Average	2020
A. Kabupaten Lampung Tengah							
	Rice Yields		5.45	6.06	5.30	5.60	5.30
	Maize Yields		5.74	6.12	4.02	5.06	7.78
B. Kabupaten Lampung Timur							
	Rice Yields		5.14	4.87	5.52	5.23	5.71
	Maize Yields		4.61	5.02	4.79	4.88	5.84
C. Metro							
	Rice Yields		5.09	5.57	6.89	5.85	5.83
	Maize Yields		4.99	5.75	4.74	5.16	6.00
D. Way Sekampung							
	Rice Yields		5.33	5.61	5.51	5.46	5.49
	Maize Yields		5.22	5.21	4.18	4.96	6.44

Source; Dinas Pertanian Kabupaten dan Badan Pusat Statistik Metro Central Lampung dan East Lampung; UPTD Balai PSDA Wilayah II Sepuluh-Sekampung.

2.2.3 - Farmers Demands

Two main factors impelling the increasing food demands are population and income growths. Food and Agriculture Organization of United Nations projected that at global scale, the farmers must boost food production by 70 percent from realization in 2007 to meet this ever-growing population. Increase in food demands will also be triggered by higher income. Farmers will be afford to expand their consumption volumes, which contain more protein. When the income grows higher, in stages the preference of customers will switch from rice and cereals to lentils, and then to meats including chicken and beef. Based on the current trend, it is expected that in 2050 agriculture will drastically change.

2.2.4 - Agriculture Economic Status

Indonesia is the main producer of various tropical produces at global level. This country produces and exports rice, palm oil, coffee, rubber, cacao and spices (nutmegs, cinnamon and cloves), which are important in international markets. Agriculture sector in Indonesia consists of:

Large scale plantation (owned by the state and private). It is more focused on commodities of export products (oil palm and rubber). Meanwhile, smallholder farmers more focus on rice, secondary crops, vegetables and fruits.

Smallholder farmers are responsible for the majority of food production. In light of that it is important to understand social-economic status, factors influencing food resilience and agriculture sector, from which an appropriate and applicable technology and policy can be taken. The characteristics of farmers in WSIS are presented in Table 2-6.

TABLE 2-6 THE CHARACTERISTICS OF FARMERS IN WAY SEKAMPUNG IRRIGATION SYSTEM

Farmer characteristics		Irrigation System (DI)						
		Punggur Utara	Rumbia Barat	Bekri	Sekampung Batanghari	Sekampung Bunut	Raman Utara	Batanghari Utara
Age (years)	a. <30	2%	0%	0%	0%	0%	0%	0%
	b. 30-50	42%	11%	25%	25%	59%	67%	33%
	c. >50	56%	89%	75%	75%	41%	33%	67%
	d. average (years)	52	57	58	55	52	50	54
Education	a. SD	19%	44%	33%	38%	12%	0%	22%
	b. SMP-SMA	75%	56%	67%	58%	88%	89%	67%
	c. D1-S1	7%	0%	0%	4%	0%	11%	11%
Areas (ha)	a.<0.5 ha	29%	22%	33%	38%	41%	33%	22%
	b. 0.5-1 ha	63%	78%	58%	54%	59%	67%	78%
	c. >1 ha	8%	0%	8%	8%	0%	0%	0%
	d. average (ha)	0.70	0.61	0.72	0.67	0.51	0.53	0.74

Source: RRA August 2020

Meanwhile, agriculture sector in Indonesia historically records sound performance with significant contribution in generating employment opportunities and poverty alleviation. However, productivity of crops is currently to diminish significantly. The majority of farmers is classified as smallholders farmers with farm lands less than half of hectare which only generate subsistence income for rural households. Revitalization of agriculture sector will be crucial to support new and robust economic growth and become key component for rural development strategy of the Government.

2.2.5 - Price and Marketing Chain

Marketing efficiency for rice production and processing will enhance in line with higher collaboration among the main actors of paddy field owners, farming labors, milling, wholesalers and retailers. Personal label for rice retail recently and strong customer segmentation at retail markets between the prices of premium and medium rice have incited tight competition of traders.

Trends of smaller agriculture size and lower price have caused movement towards subsistence agriculture as competitive strategy at household level in some regions. After completing training and advocacy program, the farmers generally fail to apply technology requiring more production input, better time management and broad know-hows. This behaviour is based on logics of allocating the limited resources to their livelihood to produce greater benefits.

The farmers encounter a number of constraints in marketing chain. They lack of technical knowledge; and access to better varieties, even farming chemicals, and post-harvest handling technology. Lack of access to credit also prevent them from optimizing their resources and cause lower yields.

Marketing chain in agriculture sector is limited by a number of factors, including: (i) lack of capital of the farmers; (ii) lack of transparent information concerning rice price composition, costs and margin, which gives inadequate market signal to the actors engaged in this agricultural marketing chain; (iii) untransparent decisions taken by wholesalers and retailers with regard to the sales and purchase to farmers; and (iv) rice import and lack of capability of the Government to deal with illegal rice import, and failure to manage the price of rice. The positive side is that long-term business relation based on mutual-trust, norms and roles of respective actors is normally acceptable.

Marketing chain for maize production is limited by lack of equipment and facilities to dry out corn in effective way, and to measure water contents. Farmers have no access and receive no training on appropriate storage methods and production technology. Subsistence farmers may suffer loss until 30% because of poor post-harvest storage condition including harvest damage due to beetle attack. Animal food producers get difficulties in demanding quality specifications for the corns they buy. Labor shortages during harvesting, poor rural road conditions and limited irrigation are also reported as obstacles hampering efficient corn value chain.

2.2.6 - Promoting farming diversification and high-value crop production

When the irrigation networks have been rehabilitated/improved and capable of delivering better and more timely water supplies to the farmers as beneficiaries of project, they can manage irrigation water in their lands in more appropriate way taken from tertiary canals, which are now available in more quantity and better quality. This kind of water management is necessary for crops of maize, soybeans and vegetables (HVC), for which flood-irrigation is not suitable.

The objective of farming diversification is to augment the income of farmers and maximize benefits from project investment in irrigation infrastructure, which also include command area management. In addition, some farmers who are more progressive may be available to allocate small parts of their irrigated lands as HVC belt areas to plant seasonal vegetables.

Frequently the farmers complain about damages during land preparation by uncontrolled herds (ruminants) during day season, when they not farm paddy. Indeed, such period can be used to farm secondary crops. This general problem has innovatively been dealt with by the farmers. They combine livestock feeding with HVC production during dry season.

2.2.7 - Smart Agriculture Modernization Program

Destructive effects of climate to agriculture and irrigation sector have forced many parties to take some adjustments in farming practices and investments in infrastructure and management such as to set water saturation for non-paddy cropping, to shorten the duration of puddling during paddy cropping. The activities to take include crop management as well as pilot non-paddy cropping in irrigation system, humidity monitoring, knowledge center and products along with technical supports and additional operational budget for Agriculture Development System. AWD-SRI is currently promoted by many rice producing countries and capable of reducing puddling duration in irrigation fields, methane emission, saving water and perhaps decreasing nitrous oxide emission. It is proposed to carry out these activities through technical assistance program by similar research agency or entity experienced at national context and in smart agriculture.

Climate change and its impacts to the agriculture becomes hot topic throughout the world and actions to be taken to mitigate such impacts are under development. One approach is that of SRI that has been tried in WSIS despite limited application since thus far majority of farmers in WSIS never experience water shortage. More radical approach is called Patbo developed by BTPT and will be tried in WSIS. SRI and Patbo are methods to reduce water needs and further confirm the facts that paddy will suitably grow in aerobic soils and have capacity to grow in flooded fields, in which weeds can't favourably grow.

This framework describes study on how to deal with climate change in WSIS from overall review of agriculture sector and irrigation networks. This issue seems not yet professionally assessed for many years since everything has been taken for granted. This study will prepare "Agriculture Modernization Program" with the introduction of small agriculture. However, only few outcomes have been produced from this study and tryout. For significant application, this new smart climate technology needs medium-term investment. And it must be designed in fully-integrated agriculture modernization context.

Farming system remains conventional starting from land preparation, seed selection, water uses, cropping interval to traditional fertilizing method preventing maximum outcomes. The latest cropping system is that of System Rice Intensive (SRI). This method is able to increase paddy production until 8-10 ton/ha. However, it is not yet socialized to all farmers both irrigation farmers and rain-fed farmers. Rice production therefore remains not optimum.

2.2.8 - Water Conservation Management at Farmer Level

Water conservation process closely relates to water consumption reduction through strategic interventions in water management at farm areas in WSIS. Water management currently practiced for irrigation paddy farming is as follows:

- Cropping season, depth of irrigation water at 0-2 cm
- Vegetative and reproductive periods, depth of irrigation water is maintained at 5-10 cm.

- During fertilizer and pesticide application, no irrigation water.
- 10-14 days before harvest, irrigation will be stopped.

If water discharge in canal reduces until 60%, irrigation will be made in rotation. However, to maintain optimal growth and yields, water required during this critical growing stage of plants must be provided. To facilitate water conservation management, the crops planted in quaternary/tertiary blocks must be homogenous and follow cropping calendar as specified while applying the following system:

a. Alternate Wetting and Drying - AWD

AWD is a water saving technology that can be applied by the farmers to reduce irrigation water consumption at their fields without compromising the yields. Under AWD method, irrigation water is applied several days after the floods disappear. The fields will be in flooded and not-flooded conditions alternately. Total days of not-flooded condition may vary from 2-3 days to more than 10 days dependent on several factors of soil type, weather and growing stage of the plants (Rice knowledge bank: IRRI).

After application of irrigation water, the depth of water will gradually be decreased. If elevation of water goes down until 15 cm below soil surface, water must be irrigated to flood the field until reaching depth around 5 cm. From one week before and one week after flowering, the fields must be flooded or added again until 5 cm deep as necessary. After flowering, during seed filling and maturation, water can be lowered until 15 cm below soil surface before draining water irrigation again.

b. System Rice Intensification (SRI)

Water management under SRI is as follows: during cropping until 1 week before planting the soil must be saturated (water flood 0-5 mm). Thereafter, until 2 weeks before harvest, apply water until reaching 2-3 cm deep. During fertilizer application, weeding and pest control irrigation must be stopped. In some SRI practices, sometimes the fields are dried out every 1-3 weeks for 3-5 days dependent on soil texture (except during flowering and seed maturation) until the soils crack. When the saplings reach maximum heights (around 45-47 hst), the fields must be drained out for 10 days. It aims to retard vegetative growth process, store humus that otherwise will be used for unproductive buds and prevent the plants from growing too high.

2.2.9 - The Proposed Water Allocation and Order System

Annual water allocation schedule for WSIS must follow Agriculture Development Plan (ADP) with the sequential process as follows:

1. Discuss general cropping pattern as requested by WUAs through WUAA
2. Prepare annual water allocation plan between Agriculture Agency and BBWS Mesuji Sekampung.
3. Discuss annual water allocation plan in River Basin Forum of Way Sekampung
4. Recommend water allocation for Way Sekampung River Basin by BBWS
5. Prepare and integrate general cropping pattern and Water Allocation Plan by UPIM
6. Irrigation Committee to discuss cropping pattern and water supply and distribution
7. Legalize and determine cropping pattern for WSIS and Annual Water Supply Plan
8. Socialize the Proposed Cropping Pattern to Agriculture Agency
9. Socialize WSIS' Annual Water Supply and Distribution to UPIM
10. Implement Cropping Pattern and Water Supply and Distribution Plan
11. Implement Annual Irrigation Supply and Distribution Plan for WSIS at WUAs level

2.2.10 - Farmer Exchange Rate

Farmer Exchange Rate (FER) is understood as purchasing power index based on the price accepted by the farmers when selling their produces and price paid by the farmers when purchasing/consuming products expressed in percentage.

The nationwide FER during 2014 – 2018 is to fluctuate with upward trend at 0.04% per annum. As comparison, FER of Lampung province shows increase of 0.40% per annum on average. This figure indicates the increasing income earned by farmers to their spending (see Table 2-7 and Table 2-8).

TABLE 2-7 FARMER EXCHANGE RATE (FER) OF LAMPUNG 2014 – 2018 (2012 = 100)

Source: Project Economic Report, Appendix III, Way Sekampung Master Plan Report, November 2019

TABLE 2-8 AVERAGE FARMER EXCHANGE RATE (FER) INDEX OF LAMPUNG PROVINCE, 2014 - 2018 (2012 = 100)

NO	Description	2014	2015	2016	2017	2018	GROWTH
1	price accepted by farmer index	115.62	121.41	127.00	131.67	136.94	4.32%
2	price paid by farmer index	110.98	117.67	122.22	125.21	129.38	3.91%

2.3 - Findings and Other Reviews

2.3.1 - Population

Total population in three districts/city is reported to reach 2,472,952 persons consisting of 1,258,372 (50.9%) male and 1,214,580 (49.1%) female with population density 243 persons/km³ on average with 782,071

No	Description	2014	2015	2016	2017	2018	Growth
1	National FER *)	102.03	101.59	101.65	101.28	102.25	0.04%
2	Lampung Province FER	104.17	103.17	103.90	105.16	105.84	0.40%
3	Food Crop FER	101.00	102.42	101.05	104.20	116.10	3.54%
4	Horticulture FER	104.31	101.74	100.90	96.32	94.98	-2.32%
5	Plantation Crop FER	102.32	98.45	101.98	104.16	96.49	-1.46%
6	Livestocks FER	111.57	113.03	114.07	113.99	115.12	0.79%
7	Fishery FER	101.76	99.20	98.38	99.92	99.71	-0.51%

households. One household consists of 3 members on average. Population growth in these three districts is to record 1.19% with the highest growth found in Metro City (1.6%) and the lowest in other two districts at 1.0%, which indicates urbanization pressure in such regions.

Population living in the surroundings of Way Sekampung Irrigation System is reported to reach 1,251,116 persons with growth rate 1.54% per annum. It is predicted that in 2033 this population will increase to 1,535,215 persons or 24% higher than total population at present.

2.3.2 - Human Development Index (HDI)

Human Development Index (HDI) is to measure the realization of human development based on three dimension approach, which includes long and healthy life, knowledgeable life and decent standard of living. HDI for Lampung province was 63.7 in 2010 and increased to 69.0 in 2018, yet still below national HDI at 71.4 in 2018.

However, HDI reached in 2018 by three districts in WSIS was as follows 69.0 for East Lampung District, 69.7 for Central Lampung District and 76.0 for Metro City. The main contributing factors for this higher HDI included longer life expectancy, better education quality and higher purchasing power of communities in 2018.

2.3.3 - Poverty

BPS adopts affordability of an individual in satisfying basic needs from his livelihood as basis for poverty measurement. Total low-income population in these three districts varied from 12.9% of total population in Central Lampung District, 15.7% in East Lampung District, and 9.1% in Metro City in 2018. During 2013-2018, poverty rate was to decline by 1% to 2.5% per annum.

The Government of Indonesia launched several programs to deal with this poverty issue such as Hopeful Household Program, Health Insurance Program, Rice for the Poor Program and Community Empowerment-based Poverty Alleviation Program, National Community Empowerment Program and many more.

The government of Lampung province also participates in this National Poverty Alleviation Program by expanding employment opportunities, empowering labor force, and providing social protection focusing on skill development, education and training for jobseekers, and labor intensive infrastructure development program.

3 - METHODOLOGY AND SCOPE OF PROJECT

The government of Lampung province also participates in this National Poverty Alleviation Program by expanding employment opportunities, empowering labor force, and providing social protection focusing on skill development, education and training for jobseekers, and labor intensive infrastructure development program.

3.1 - Scope of Services

Irrigation Modernization Master Plan (Irrigation System Review), page(s) 7-6 and 7-7 of TOR clarifies that PPC shall:

“Melakukan “Review irrigation system to identify the strengths, weaknesses, opportunities and threats of irrigation system modernization aiming to improve the productivity of Way Sekampung Irrigation System.

Following such review, Consultants must prepare an irrigation modernization road map that shall include but not limited to:

- a. Evaluate and elaborate Irrigation Preparedness Modernization Index (IKMI) of Way Sekampung Irrigation System that shall cover actual conditions of irrigation management process and analyse the correlation with irrigation sub-systems;
- b. Evaluate the existing irrigation plan including the layouts of tertiary canals, primary canals and other infrastructure;
- c. Evaluate and analyze water availability at present and the expected changes in terms of quality and quantity while taking the increasing competition in water usage, degradation in catchments, land use conversion and climate change into account by identifying the constraints, problems and shortcomings and proposing options for improvements;
- d. Evaluate actual and expected system management with regard to water management, legal frameworks, institutional and human resources;
- e. Trends of farming practices and culture, land ownership and land use, particularly potential conversion in future to non-agriculture functions, social-economic development in the regions and the expected improvements in irrigation services;
- f. Analyze industrial development in the surroundings of fields, young farmers and farmer availability trend to identify farmer sustainability;
- g. Conditions and functionalities of facilities and infrastructure;

Modernization roadmap will depict steps that must be taken to reach complete irrigation modernization. This roadmap will be harmonized with or prepared based on steps as indicated in Irrigation Modernization Guidelines. The steps will explain what actions to be done according to the conditions of irrigation areas.”

Irrigation System Assessment is further detailed in TOR page(s) 7-11 to 7-13 as follows:

“Irrigation system assessment consists of review and analysis to management practices at present (how the system is actually managed) and in future (how the system should be managed), and environmental management and management style currently practiced. Here, Way Sekampung Irrigation System has tasks as follows:

(i) Water Availability and Water Management

- a. Evaluate, review and describe Irrigation Modernization Preparedness Index (IKMI) for Way Sekampung;
- b. Evaluate and review the conditions of watershed and the relating activities, potential land use conversion;
- c. Evaluate and review water availability in the rivers being the sources of water, including the impacts of climate change that may occur;
- d. Evaluate water availability and water demands and water usage in Way Sekampung Irrigation System including the impacts of climate change;
- e. Review the existing weir operation pattern and the impacts to the availability of irrigation water (if relevant);
- f. Review the present official operation and maintenance policy and manual ("expected"), and the value applied in reality ("actual"), analyse the contributing factors of, sources, adaptation to and solution for water shortages;
- g. Assess effectiveness of irrigation management practices at present by comparing the expected services to actual services at all levels of the system including assessment to:
(i) water provision process for irrigation; (ii) water allocation and its existence and formal / informal rights of using water for irrigation and golongan system; (iii) distribution system with rotation method; (iv) water conveyance and measurement at various levels of management; (v) drainage. Identify problems and constraints revealing difference of the expected services from actual services and propose options for improvement; (vi) Identify the involved informal actors and the impacts to the performance and productivity of Way Sekampung system; (vii) review illegal water extraction from the canals and prepare (institutional/social/technical) recommendations to abate the problems;
- h. Review and analyse data collection, processing and information system in terms of hardware, software and procedures for data observation, collection, processing, reporting, filing and distribution as basis for management decision making and set water allocation, distribution, delivery and monitoring system and prepare maintenance plan;
- i. Evaluate cropping intensity, and productivity to identify capacity in providing irrigation and drainage services and analyse budget requirements for agriculture sector, cost and benefits of farming in dry season.

(ii) Institutional and Human Resources :

- a. Assess institutional and legal frameworks regulating the governance, planning, financing and implementation of irrigation service provision;
- b. Assess coordination and task allocation mechanism of the related institutions with regard to irrigation management in Way Sekampung Irrigation System at primary, secondary, sub-secondary and tertiary levels;
- c. Evaluate the availability and effectiveness of management and technical and operational staff in the field;
- d. Assess the effectiveness of Irrigation Commission in Way Sekampung region;
- e. Assess irrigation management funding mechanism, funding adequacy and effectiveness and budget allocation process for various management activities in Way Sekampung Irrigation System;

- f. Coordinate with Component 3.2 relating to methodology developed for pilot project to assess and adapt the roles of WUA/WUAF and Irrigation Commission in determining:
 - Diagnosis and design of effective modernization and the agreed specifications of irrigation service level
 - Effective participatory development in irrigation infrastructure modernization at secondary level
 - Evaluate the existence and need of irrigation extension agents

(iii) Facility and Infrastructure

- a. Evaluate and review the effectiveness of irrigation infrastructure to its design criteria;
- b. Update data inventories of infrastructure conditions of irrigation and drainage system and include infrastructure of primary and secondary canals into (GIS-based) asset register information system including DGWR Manual;
- c. Review and evaluate flow control system and water measurement system at utilities, including their functions, management and condition, and conditions of assets;
- d. Review and evaluate implementation at present and assess the performance of facilities, manage the sedimentation and provide options for sedimentation management at irrigation system, the use of mud transportation modelling in primary canal networks;
- e. Review and assess the present needs, function and condition of communication, data collection and information system and human resources, financial capability for sound operation and maintenance"

However, reviewed from TOR, the description of report to be submitted according to the schedule has yet to comply with the first two specifications of Master Plan / Irrigation System Evaluation. Page 7-39 through 7-41 explain report and its contents for submission during project Master Plan phase as follows:

	REPORT
1	Topographical, Geology and LiDAR surveys by sub-consultants. Consultants will prepare other specific TOR for these surveys. + TOR for Strip Survey + TOR for Stript Survey + TOR for Geological Survey + TOR for LiDAR Survey
2	Geodetic Survey Data Report and the Figures. This report has broad contents covering: 1. The existing Topographical Data Report and additional data identification report as necessary ; 2. TOR and tender documents for topographical survey including LiDA Survey and tender process for sub-consultant recruitment ; 3. Sub-contract implementation supervision report and product inspection.

	REPORT
3	<p>Spatial Planning Report. This report contains complicated contents and covers:</p> <ol style="list-style-type: none"> Regional Spatial Planning (RTRW) Evaluation Report for the work areas and the surroundings. Land Use Management Manual relating to Irrigation Modernization at Work Areas. Predicted Land Use Conversion Report from irrigated lands into residential areas, and the recommended solutions to prevent further land use change. RDTR Review Report and local government regulations concerning Irrigation Modernization zoning.
4	<p>Project Economic Report. This report has complicated contents and covers:</p> <ol style="list-style-type: none"> Detailed Assessment by Sector and Feasibility Study for the proposed project. Economic and Financial Analysis (EFA). Develop general economic and financial spreadsheet model in accordance with conventional financial modeling standar. Conduct additional financial/fiscal analysis to assess the financial capacity of project beneficiaries and governments in allocating budget for routine and periodic O&M financing.
5	<p>GIS Map Supporting Report. This report is complicated and covers:</p> <ol style="list-style-type: none"> GIS survey and investigation that have been carried out at project location or its surroundings : topographical elevation references, locations, number, and BM point elevation, topographical maps and soil type conditions, water elevation Topographical map scale 1 :50,000 from the latest satellite images Survey planning and supervision report on the implementation of satellite topographical image survey during Identification Survey stage Topographical inventories and survey report during Identification Survey and detailed design stage Lowland hydrology analysis report based on Lowland hydrology unit Situation map scale 1:20,000 for Identification Survey Topographical survey report using LiDAR technology during System Planning stage Topographical survey and analysis with LiDAR technology during System Planning. Situation map planning with scale 1 :2,000 until detailed design preparation

	REPORT
6	<p>Program Implementation Report. This report is complicated and covers:</p> <ol style="list-style-type: none"> Review of previous IKMI report, Short, Medium and Long-Term Implementation Framework for the introduction and implementation of irrigation management modernization concept that has been approved and physical adaptation of facilities and infrastructure, irrigation sub-system scheduling for modernization ; Public awareness and consultation process in line with PPSIP principles ; Implementation arrangement with clear-cut definition regarding the roles and responsibilities of stakeholders during modernization process ; Equipment to monitor and evaluate modernization process, the outputs, outcomes and impacts of modernization process ; <ol style="list-style-type: none"> Design. Planning (effective and efficient method according to the needs).
7	<p>Geological Report consisting of:</p> <ol style="list-style-type: none"> The existing report of geological information and data; Investigation report of geological conditions that may compromise the stability of weir / other structure
8	<p>Hydrology Report. This report has complete contents and covers:</p> <ol style="list-style-type: none"> Rainfall, Flood debit analysis and water need calculation, Climate projection study from climate change model at small scale as available for adaptation to the design criteria,
9	<p>Hydraulic Model System Report/Manual. This report has complete contents and covers:</p> <ol style="list-style-type: none"> Hydraulic Structure Design Manual Report applying the best methods and international standards to design the canals, hydraulic water gates, and measurement structures. Hydraulic structure design report to ascertain the the structure will be easily managed, capable of minimizing headloss, delivering discharge as required, computing sediment loads that include also the design, requiring minimum maintenance and safe. Report of detailed hydraulic model calibrated from primary irrigation system of Way Sekampung that has been fully developed. Rainfall-runoff model report in details and calibrated from irrigation system.
10	<p>Master Plan Report. This report has complete contents and covers:</p> <ol style="list-style-type: none"> IKMI report Evaluation of the Existing Irrigation Infrastructure The existing water availability The existing Actual and Planned Management Report Agriculture Repor Facility and Infrastructure Condition and Function Report New road map

According to ADB's table of contents Master Plan must be divided into three main topics as prescribed in pages 7-11 to 7-13 of TOR, meanwhile Modernization Guidelines adopts approach based on five pillars. It is then decided to combine these two approaches to prepare the main report VOLUME I, i.e. three main topics of ADB and Table of Contents as proposed by ADB supported with detailed VOLUMES for every pillar and 9 reports that have been prepared previously as annexes. Under this approach, it is assumed that all requirements in TOR have been considered and complied with.

Based on such approach, Master Plan Report shall consist of six VOLUMES as follows:

■ VOLUME I Main Report

To summarize details in report volume II to volume VI and Annex 1 to 9, present overview of modernization according to international organizations and as per directives contained in Circular Letter of the Minister of PUPR 01 / SE / D / 2018, compare the conclusions of IKMI 2017 review and Consultants' findings, present project with reference to 5 pillars, plus implementation arrangement and environmental – economic reviews of Say Sekampung regions. This report adopts ABD's table of contents and divided into three main topics.

■ VOLUME II: Pillar 1 – Water Availability

To summarize the findings and recommendations of Annex 7; provide general overview of water availability in the past and at present in Way Sekampung Irrigation System, and review water availability in Argoguruh Weir in short and long term perspectives;

■ VOLUME III: Pillar 2 – Irrigation Infrastructure

To present irrigation infrastructure conditions for primary hydraulic unit, inform infrastructure process that meets requirements for modernization and identify priority works that must be taken in addition to options for modernization, including present complete database;

■ VOLUME IV: Pillar 3 – Irrigation Management

To review the standards and procedures applied, comment to the operation of primary and secondary systems followed with water distribution management to soil surface and infrastructure maintenance before detailing sub-system ready for modernization;

■ VOLUME V: Pillar 4 – Irrigation Management Institutional

To present clear review on agencies engaged in irrigation system management from central level to WUA level, identify the roles and functions of entities and recommendations for institutional adaptation to modernization process.

■ VOLUME VI: Pillar 5 – Human Resources

To assess personnel status employed by BBWS Mesuji Sekampung attached to offices nominally responsible for O&M of Way Sekampung System followed with review on education and technical training of the staff and comment the needs of capacity building including for members of WUA and WUAA management..

Meanwhile Master Plan report submitted to Client consists of proposal and options prepared by Consultants for Way Sekampung Irrigation System modernization, presents additional information of conclusions and recommendations as annexed to Master Plan Report. The subjects of report are as contained in TOR, Annex A. Contract KU.02.10 / Ai / III / 10 as follows:

■ Annex 1: Geologic and Geodetic Survey

To present the conditions of survey preparation using LiDAR and strip survey and additional proposal for geotechnical investigations in three locations of weirs relevant to Way Sekampung Irrigation System;

■ Annex 2: Spatial Planning Report

To review spatial planning policies for three districts, predict urbanization and land use in future and identify risks of agriculture land conversion followed with the preparation of manual for land use management in irrigation areas, and close with recommendations;

■ Annex 3: Project Economic Report

To present basic economic parameters in Lampung Province and for Way Sekampung Irrigation System, review funding and costs for O&M by the government using water, present financial and economic analysis model, comment on investment costs and project benefits and prepare conclusions for consideration;

■ Annex 4: GIS Map Report

To inform data collected and provided by Client and describe potential for the use of thematic maps by Client and needs of improved database for mapping works that consist of around 53 maps;

■ Annex 5: Implementation Framework Report

To review IKMI 2017 results, present in details the contents, methodology, schedule and communication procedure for modernization implementation, lists of pillars, and discuss implementation arrangement, and closed with outlines of monitoring and evaluation, process and success criteria;

■ Annex 6: Geologic Conditions in Way Sekampung

To present in details geologic report based on desk study to review three main headworks, i.e. Argoguruh, Raman and Garongan weirs – and assess potential risks relating to safety.

■ Annex 7: Hydrology Report

To present review of hydrology condition in downstream of Argoguruh Weir while taking Batutegi and Way Sekampung dams into account;

■ Annex 8: Hydraulic Model

To inform basic hydraulic modelling including the use of Mock Method to compute rainfall-runoff, discuss various hydraulic structure in irrigation canals, present in details hydraulic computation for three scenarios using all data used and presented in annexes;

■ Annex 9: Environmental and Social Safeguarding

To compare provisions concerning national protections with provisions applied by financing institutes, assess the gap of these provisions and propose mitigation actions for any adverse event occurring during modernization.

3.2 - Comprehensive Master Plan

This Section describes overview of methodology used in three main aspects of project:

1. Water Availability and Water Management
2. Institutional and Human Resources
3. Infrastructure and Facility

It is prepared in sub-item list in a table.

3.2.1 - Water Availability and Water Management

Item	Approach/Methodology
(i) Evaluate and review the conditions of Watershed and activities in the surroundings, potential land use change, erosion and sedimentation rate analysis	Combine land use data, spatial planning of districts and provinces, prepare land use change projection, spatial model, collect ISLE erosion data and critical land data. Reported in Annex 2 – Spatial Planning Report

Item	Approach/Methodology
(ii) Evaluate and review water availability in the rivers as water sources including the impacts of climate change	Prepare hydraulic model (see Annex 8) coupled with rainfall-runoff calculation using Mock Model (see Annex 7), calculate water demands for DMI, irrigation, reservoir operation rule for the two dams. Prepare scenarios of climate change impacts including rainfall and evaporation in future. Attached in Report VOLUME II.
(iii) Assess water availability to meet water demands of the system including the impacts of climate change.	Water demands to transfer water from Argoguruh weir will be calculated in accordance with KP01 and used in preparing hydraulic model in Argoguruh Weir to determine water availability. Please note that water availability is part of cropping pattern and harvest dates. There are two dams in downstream. Reported in VOLUME II.
(iv) Review the existing reservoir rule curve and correlate it with irrigation water availability (if relevant).	Reservoir rule curve is taken from Batutegei weir report provided by BBWS, the similar approach is applied also for Way Sekampung dam
Irrigation operation and reporting system	Replace form 12-0 with computer software SIPASI
Calculate irrigation water demands	Use the actual quantities obtained from observation in the field covering effective rainfall, percolation, water losses in canals and tertiary blocks
Cropping pattern plan and calendar set under Decision Letter of Governor	Farmers' proposals will be discussed at sub-district, district and province level Role sharing of government agencies to support the implementation of cropping pattern and calendar contained in Decision Letter of Governor
Water distribution inside tertiary blocks	Tertiary network layout follows KP-05 Quaternary block borders and canals distinctively delineated Cropping pattern and calendar in quaternary blocks prepared simultaneously

3.2.2 - Institutional and Human Resources

Item	Approach/Methodology
Assess legal and institutional frameworks regulating irrigation service governance, planning, financing and provision	Conduct literature review and collect regulations concerning water resources, irrigation management and water resources management institutional. Review regulations starting from legal level, ministerial regulations until procedures and guidelines for regulation implementation. Reported in VOLUME V.
Review coordination and role sharing mechanism of the related agencies in irrigation management at primary, secondary, sub-secondary and tertiary irrigation systems	Identify and analyse institutional aspects in all levels within Way Sekampung Irrigation System. Specifically focus on analysis to implementation coordination and role sharing of stakeholders at every level of irrigation system. The analysis is reported in VOLUME V.
Evaluate the availability and effectiveness of management and technical staff as well as operational staff in the field	The evaluation is made based on modernization requirements from technical operational aspects as contained in the regulation covering also competency gap analysis, interviews with technical staff as preparation for further analysis. Questionnaires for interviews have been prepared. Reported in VOLUME V.
Assess the effectiveness of Irrigation Commission	Evaluation is made based on modernization requirements. Reported in VOLUME V.
Review funding mechanism for irrigation management, its adequacy and effectiveness and budget allocation process for various management activities in irrigation system.	The review is made as part of Annex 3: Economic Report: <ul style="list-style-type: none"> Investment costs allocated for the construction of new infrastructure or rehabilitation, particularly for irrigation infrastructure Investment can be initially concentrated in a one-year project, and other costs that will influence the feasibility of project Routine operation and maintenance cost and additional budget for project management and capacity building
Coordinate the preparation of methodology to be developed in pilot project to assess and revise the roles of WUAs/WUAFs and Irrigation Commission to ascertain (a) effective diagnosis and modernization design and specifications of service level, (b) effective participatory development in irrigation infrastructure modernization at secondary level, (c) evaluate the existence and needs of irrigation extension agents etc.	The evaluation is made based on modernization requirements. Reported in VOLUME V. Evaluation will be focused on the existing membership conditions of organizations, legal bodies and the implementation of roles and duties given to WUAs/WUAFs/WUAs and Irrigation Commission.

3.2.3 - Facility and Infrastructure

Item	Review/Methodology
Evaluate and review the effectiveness of irrigation infrastructure according to design criteria	In irrigation system, the ratio of irrigation areas (functional) and planned areas (design) to reach particular percentage is defined as effectiveness. It indicates that all target areas will be irrigated, only small part will not be irrigated. It shows that the effectiveness of irrigation system records good performance with high effectiveness. To enhance the effectiveness of the existing infrastructure, repair and rehabilitation will be necessary.
Update inventory data on the conditions of infrastructure at main irrigation system and drainage and include primary and secondary infrastructure in (GIS-based) asset register information system as prescribed in DGWR's guidelines	Field infrastructure inspection to obtain and collect information on the existing conditions of irrigation infrastructure. The focus is directed on the quantities of damages taking place after 2009 when PAI survey by BBWS Mesuji Sekampung was conducted. From inspection results, it can be determined the preparedness of the system concerned for modernization process.
Review and evaluate water flow control system and water measurement system in utilities, including their functionalities, management and conditions as well as asset condition assessment	At present water release is controlled from gate of weir. Under this control system, regulator will maintain water level in upstream constant. It is called as "upstream control." According to 45 steps of irrigation modernization, downstream control must be applied to make sure that water demands asked by farmer groups will be met.
Review and evaluate practices at present and assess the performance of sediment excluder facility and options for improvement in sediment removal from irrigation system, the use of sediment rate modelling in primary canal network.	Some excluder/removal structures in primary canals are ineffective due to relatively huge volumes of sediment, especially in Rumbia Barat. PPC proposed the construction of sediment trap in Rumbia Barat and increase the existing sediment removal capacity including to prepare its operation manual.
Review and assess the present demands, functionalities and conditions of communication, data collection and information system and human resources, financial capacity to operate and maintain such properties, etc.	Included in initial analysis of SCADA/DSS system application. Reported in Main Report VOLUME I

3.3 - Way Sekampung Irrigation System Modernization Project

Chapter 3 presents the objectives and outcomes of irrigation modernization according to the concept of international communities and as promoted by the Ministry of PUPR in Indonesia. For irrigation modernization in Indonesia Circular Letter of DGWR 01 / SE / D / 2019 as described in Sub-chapter 2.2 will be referred to. Below are steps and activities of irrigation modernization in accordance with Circular Letter DGWR.

Project has been proposed based on Attachment 4 of Circular Letter 01 / SE / D / 2018, describing Irrigation Modernization Level with 45 Steps (nomarily called as 5 Pillar 45 Steps). In Way Sekampung Irrigation System context, it is assumed that this modernization process will take 10 years covering seven sub-systems as pointed out below, and particularly in VOLUME III, and Annex 5, Master Plan Report. It is however stressed that modernization should be understood as sustainable process to reach the goals set for irrigation operational system and for satisfaction of farmer communities against the performance of system. The project has been proposed based on the following assumptions:

1. All 45 Steps and 5 Pillars must be implemented from time to time to reach modernization level expected by DGWR, subject to adjustments to particular conditions of the sub-systems.
2. Modernization process is expected to continue for ten years for each sub-system. To prepare system operators and users for modern irrigation infrastructure and to implement the associated activities it is expected to take 5 to 6 years.
3. To realize structured and long-term modernization, 45 steps have been grouped for implementation in stages as indicated in Annex 5. Implementation Framework Report, Annex 5, Master Plan Report and consist of:
 - (i) Short-term activities to prepare infrastructure, institution and farmer communities in dealing with changes resulting from physical modernization; take any step as necessary and develop interaction / collaboration format between irrigation infrastructure users and operators including commissioning dependent on system management procedure applied for real-time measurement and automated control of primary structure. In overall, this process is assumed to take 2 years.
 - (ii) Medium-term activities focusing on the implementation of physical actions for modern control and water control in primary canals, and make institutional adjustment, format and procedure of interaction between users/operators, and to reach full operation of real-time data collection system that has been modernized and automated gate control procedures. The process will take two years.
 - (iii) Long-term activities with focus on the realization of reliable system operating standards (infrastructure, institutional, communication, decision making). It will be coupled with satisfaction index measurement and high performance of users (farmers). Two years will be deemed sufficient for operators and users for initial adaptation after physical works complete and operation system procedures prepared (real-time, telemetry, automated control), and to practice interaction format of users/operators and decision making in effective way. Minimum time of two years will be necessary for project under international financiers before funded routinely by the government.

In light of that, three-stage implementation process is proposed as detailed in Sub-Chapter 4.2 with assumption that the first implementation of modernization for sub-system with "good" category and sub-system of "satisfactory" category must have been completed before handling sub-system with "reasonable" category. The next three chapters discuss sub-chapter in three topics as required for TOC. Actually, these topics cover five pillars of modernization. If necessary, the topics can be further divided by pillars to maintain consistent general description in all pillars.

4 - WATER AVAILABILITY AND WATER MANAGEMENT

This chapter clarifies the findings and analysis of water availability and water management in the target areas as follows:

1. Evaluate, review, and describe Irrigation Modernization Preparedness Index (IKMI).
2. Evaluate and review the conditions of watershed and other related activities performed in the surroundings watershed, potential land use change.
3. Evaluate and review water availability in the rivers being the sources of water including the impacts of climate change.
4. Assess water availability and water demands and uses including the impacts of climate change.
5. Review the present implementation and its impacts to the availability of irrigation water (if relevant).
6. Review the present operation and maintenance policy and manual ("planned") and assess its implementation in the field ("actual"), analyse the contributing factors, sources, adaptation and solutions for water shortages.
7. Assess the effectiveness of irrigation management practices at present by comparing the planned services and actual services at all system levels including against: (a) water extraction process for irrigation, (b) allocation and location of water sources and water uses and right to use water for formal/informal purposes, (c) rotation water distribution system, (d) water distribution and measurement at various management levels, (e) drainage; identify complaints and constraints revealing the gap of what actually happens and what is expected to happen including options for improvements, (f) identify informal actors engaged and the impacts to system performance and productivity, and (g) review vandalism to water structures and make recommendations of interventions to take (institutional/social/technical) to lessen problems.
8. Review and analyse data collection, processing and information system in terms of hardware, software, and procedures for data observation, collection, processing, reporting, filing and dissemination as basis for decision making in water management including water allocation, distribution and monitoring system and maintenance plan.
9. Evaluate cropping intensity and productivity as adequacy and equity functions in irrigation and drainage service provision, assess cropping pattern trend, crop selection and land farming intensity and analyse farming business budget and farming cost and benefit during dry season.

4.1 - Findings and Analysis of Water Availability and Water Management

4.1.1 - Pillar 1: Water Availability

Water availability relates to Pillar 1 Attachment 4, Circular Letter 01 / SE / D / 2018, stating five components of modernization, to wit:

- a) Upstream – Downstream Network Harmonization,
- b) Environmental preservation, watershed and irrigation canals,
- c) Water allocation,
- d) Water provision and storage,
- e) Additional water supply

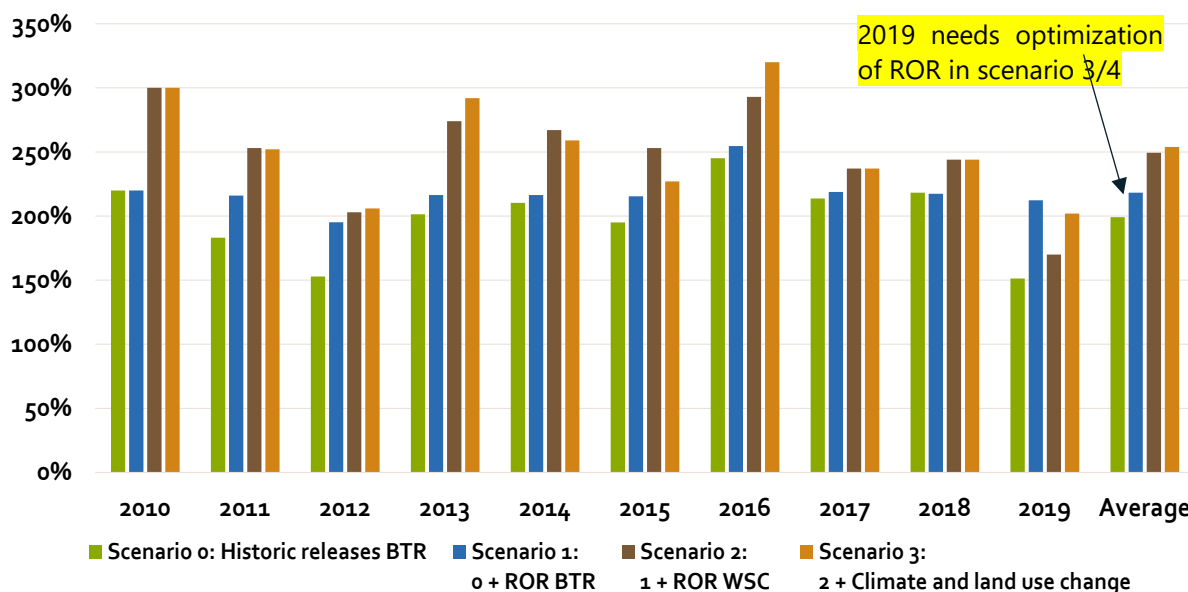
The main information of water availability can be found in VOLUME II, Annex 2, Annex 7 and Annex 8 of Master Plan Report.

The main conclusions with regards to water availability are:

- Water availability at the Argoguruh weir cannot be expressed as Q80 value that is normally used due to the fact that the releases from the reservoirs are based on the irrigation water demand at Argoguruh weir. Hence any change in start date or in cropping intensity will directly influence the available water. In reality whenever water is needed at Argoguruh weir the operator will call operator of the Batutegi reservoir to release water.
- There is enough water in the Batutegi reservoir for two dry years in a row given the 80% dependable runoff in the three catchments of Batutegi, Way Sekampung and Argoguruh.

- The uncertainty in the runoff as calculated with the Mock model is still high (5.4 m³/s or about 4000 ha more or less land that can be irrigated) and it is recommended to add more reliable rainfall measurements stations to reduce this uncertainty. And for catchments of Way Sekampung and Argoguruh the calibration is not possible, given some uncertainty in measured flows at the Argoguruh weir.
- It is urgently needed to measure percolation rates in the field as this uncertainty is clearly higher than other uncertainties such as for example the limited accuracy of the rainfall-runoff modelling.
- The resulting crop intensities and first season start date as calculated with the Hydraulic model are shown in the figure below.

FIGURE 4-1 OVERVIEW OF WATER AVAILABILITY BY SCENARIO EXPRESSED AS CROPPING INTENSITY



- An important lesson is that it is needed to improve the water management. Water is sufficiently available at Argoguruh weir so when real harvests are lower it is likely caused amongst others by improper operation of the gates.

To achieve sustainable irrigation modernization needs active actions of reforestation while preventing deforestation at Way Sekampung basin. Section 2.6.1, Annex 2 shows forest cover 5.2% at catchment of Argoguruh weir upstream. This forest varies from 2.0% in Argoguruh watershed and 46.2% in Batutegi watershed. To slow down catchment degradation, it is recommended to provide coordination supports for initiatives of promoting environmentally friendly management at three sub-watersheds as follows:

- Working group with members from Forestry, Agriculture and Fishery Agencies responsible to the management of catchment in Argoguruh upstream;
- "Acceleration Team" tasked for agriculture, forestry and fishery development set by Lampung province government focusing on the recovery / reforestation of catchments at Batutegi dam (Tanggamus);
- Social forestry programs that award rights to the communities to manage forests to bring about positive results of more secured and sustainable land management and less land conflicts.

Recommendations in irrigation modernization context:

- Place additional rainfall observation station in upstream catchment to monitor runoff flowing to dams and rivers in more accurate way during climate change in future;
- Place Automatic Water Level Recorder (AWLR) at upstream and downstream of Argoguruh Weir and Batutegi dam and Way Sekampung Dam;
- Improve the operation of Batutegi Dam and Way Sekampung Dam to optimize 1) water availability for irrigation to meet actual water demands, 2) maintain constant and high water release of the two dams, and 3) minimize runoff entering the dams.

- Training and capacity building for management staff of dams in hydrology and hydrometry;
- Mount water level gauge and calibrate water release gate combined with the installation of measurement gate in case of no accurate discharge monitoring.

4.1.2 - Pillar 3: Irrigation Management

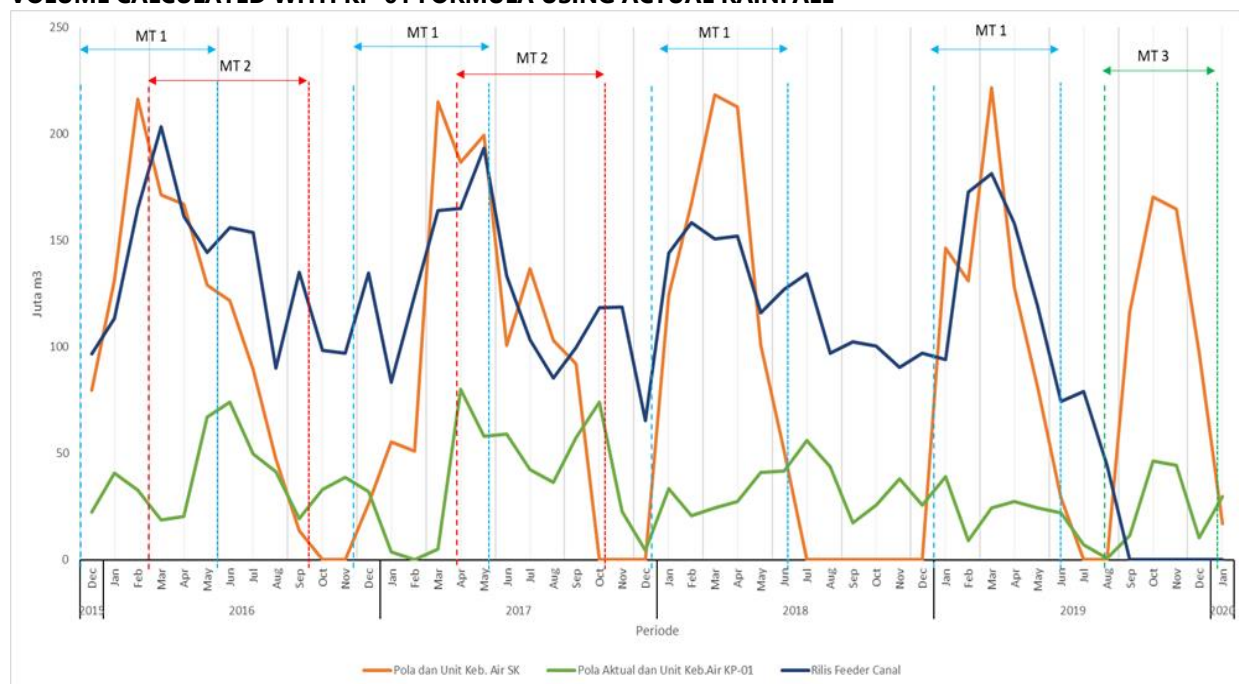
Irrigation network operation and maintenance manual is indicated in the Regulation of the Ministry of PUPR No. 12/PRT/M/2015 concerning Irrigation Network Exploitation and Maintenance. Operation for irrigation water distribution uses 12 forms and 10 maintenance forms for irrigation network maintenance.

These 12 operation forms consist of cropping pattern and calendar proposed by Farmers (form 01 and 02), cropping areas (form 04), water distribution at turnout gates based on water demand computation l/sec/ha (form 05), discharge measurement at turnout structure and division structure (form 06 and 07), river discharge recording (form 08), K factor calculation (form 09), monitoring and evaluation of water distribution operation performance shown in realized cropping areas and released discharge (form 10, 11 and 12).

Farmers' proposal of such cropping pattern and calendar will be used as basis for annual water distribution management plan during discussion in Irrigation Commission. The results will be approved in decision letter of Governor as reference in distributing water in the fields for every cropping season.

There is a problem in this Planning stage. Cropping pattern and calendar that have been approved in decision letter of Governor (SK Gubernur) are not fully applied in the field by famers (see Report Volume 4 Pillar 3 Irrigation Management Chapter 3.1.) In addition, water demand unit l/sec/ha indicated in SK Gubernur uses as basis for the calculation of discharge to be released from Argoguruh weir and water delivery to tertiary blocks have been simplified into a single constant figure, not following crop growth periods as mentioned in formulas of KP-01. Consequently, the discharge volume released from Argoguruh weir is higher than discharge calculated using formula in KP-01 (see Report Volume 4 Pilar 3 Irrigation Management Chapter 3.1.). The discharge released from Argoguruh follows debit indicated in SK Gubernur, however in the period which in SK Gubernur the discharge from Argoguruh weir is nil (according to SK Gubernur no cropping is planned), there is cropping in the fields and water is therefore released. The realized discharge released from Argoguruh weir is also higher than the volume calculated from cropping pattern and water demand unit in KP-01. According to the collected data, this excessive water discharge has continued for 4 years 2016 – 2019 as indicated in Figure 4–2.

FIGURE 4–2 THE DIFFERENCE OF DISCHARGE FROM ARGOGURUH WEIR BETWEEN VOLUME IN SK GUBERNUR AND VOLUME CALCULATED WITH KP-01 FORMULA USING ACTUAL RAINFALL



Source: Report Volume 4 Pillar 3 Irrigation management Chapter 3.1

Contributing factors of Farmers' disobedience to follow cropping pattern set in SK Gubernur:

- They adopt traditional mechanism in determining cropping calendar differentiated into 'gadu' (dry season) in April – September and 'rendeng' (rainy season) in October – March. They will allocate their financial resources to start cropping in such months.
- They are worried about harvest failure if violating traditional cropping calendar. It is difficult for them to accept clarification that cropping pattern and calendar are dependent on water availability in Argoguruh weir and farming facilities such as mechanical farming facilities, seeds, fertilizers and pests.
- Delay in starting cropping from cropping calendar in SK Gubernur is frequently due to lack of equipment to cultivate the lands. This condition is due to no database available in Agriculture Agencies both at province and district as input in preparing cropping calendar. Cropping calendar has yet to consider the adequacy of farming facilities.

The above problems need the following solutions:

- Hold meeting at farmer level in intensive and systematic way as an attempt to change their tradition in cropping calendar. This farmer meeting may consist of PSETK (Social Economic Technical and Institutional Profile) or PKM (Community Consultation Meeting). Facilitors from government institutions will be necessary to provide advocacy during the meeting.
- Need of facilitators from government institutions and WUAAs with technical experienced in computing water availability at Argoguruh weir and farming facilities. Facilitators need training. Government officials that can be appointed as facilitators include Mantri of UPTD/KPD/UPT under District Public Works Agency and agriculture extension agents (PPL) under District Agriculture Agency.
- Need of database on farming facilities at Agriculture Agencies of province and district to give input in setting cropping pattern and calendar.

Apart from issue relating to cropping pattern and calendar, there is also problem regarding water demand unit l/sec/ha in SK Gubernur that causes excessive discharge to paddy fields and water release from Argoguruh weir. Solution of this problem should be focused on competency building of officials in Irrigation Commission Secretariat. They need training to enhance their skill in calculating water demand unit using formulas in KP-01 and water balance between water demands from Argoguruh weir and discharge from such weir.

For water distribution along the primary networks, water demand unit l/sec/ha (form 05) and the discharge at turnout structure and division structure (form 06 and form 07) must be measured. It is the main weaknesses of field operators, mantri, gate keepers (PPA) including officials at UPTD PSDA Region II office. They have lack of competency in calculating water demand unit l/sec/ha and how to compute discharge with formulas set for measuring structure/gate. This discharge measurement is more impossible to take because of the conditions of measuring structure (mostly flumes) and water gates (mosly Crump de Gruiter type), which their measuring gauges (peilschal and rules of gate opening) are missing or damaged or illegible. In addition, nearly all sliding gates are not completed with measuring structure. Water distribution along the primary network is therefore made based on experience of field operators without rational figures. Interval for gate opening change is also uncertain. This interval is decided based on communication between operators at upstream and downstream. Any information about discharge change at upstream will be followed by operators at downstream accordingly.

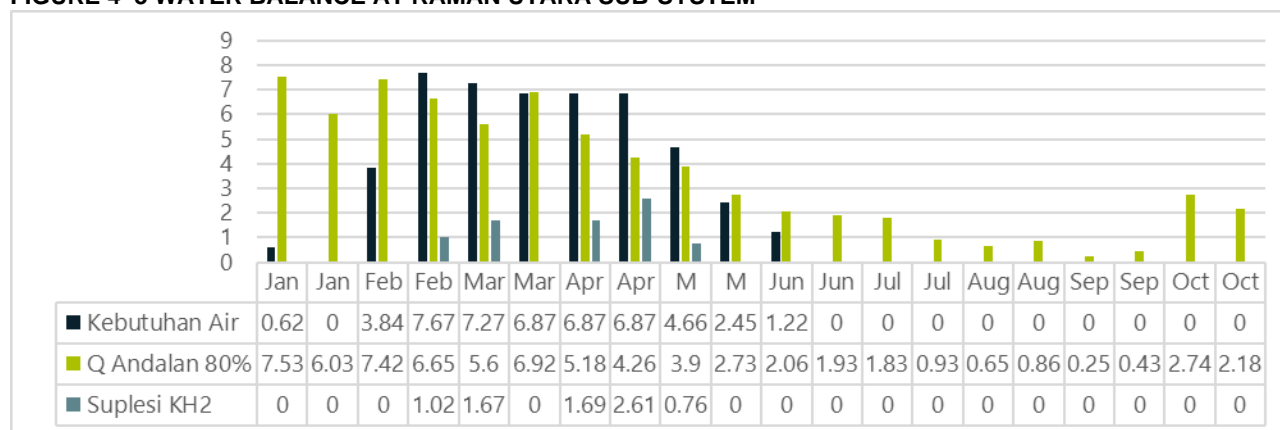
Distribution water operation is made without rational figures that should be recorded in 12 forms. Given that, it is impossible to evaluate the performance of irrigation water distribution process from form 10, which actually can be used to evaluate water losses. However, based on Figure 4.2 showing water actually released from Argoguruh weir, which is higher than the calculated water demands, this water surplus indicates water losses and becomes indicator of inefficient water use at Way Sekampung scheme.

Another indicator of inefficient water allocation to tertiary blocks from primary network is water drained to natural stream Raman collected in Raman weir for irrigation at Raman Utama sub-system and natural stream Batanghari collected at Garongan weir for irrigation to Batanghari Utara sub-system. Water in natural stream Raman comes from the disposal of excessive water at Punggur Utara sub-system and Sekampung Bunut sub-system, meanwhile for water at natural stream Batanghari, it comes from the disposal of water surplus at Sekampung Bunut sub-system and Sekampung Batanghari sub-system. This condition is indicated by water balance graph for Raman Utara sub-system and Batanghari Utara sub-system as prescribed in SK Gubernur and

presented in Figure 4-3 and Figure 4-4. In these figures it is evident that during 9.5 months irrigation water for Raman Utara sub-system is from the disposal of water surplus (2.5 months supplied from division structure KH.2). Accordingly, at Batanghari Utara sub-system, water supply for 11 months comes from the disposal of excessive water (1 month supplied from division structure KH.2).

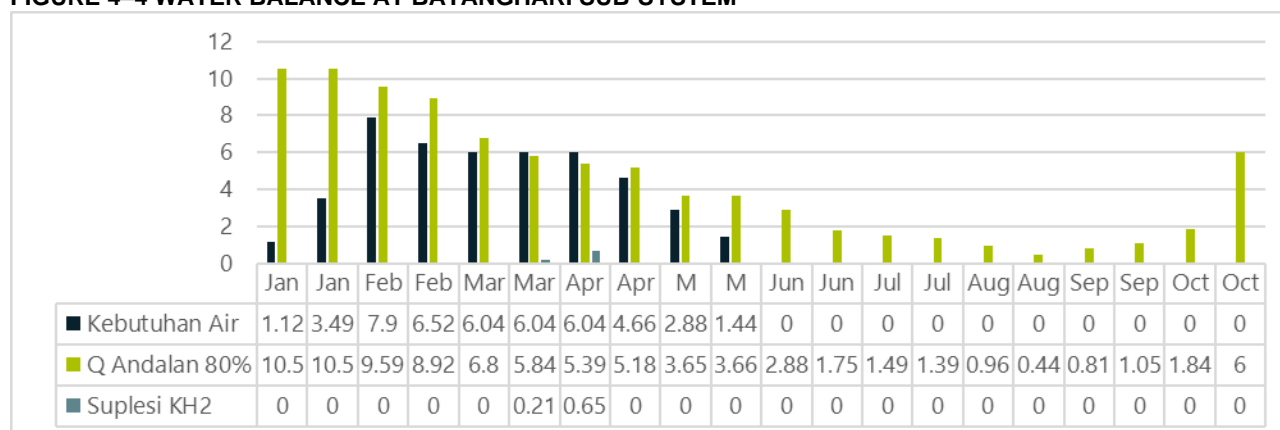
Water distribution in rotation for each turnout structure is introduced during MT 1 and MT 2 in 7 sub-dystems. However, the realized discharge released from Argoguruh weir is higher than the calculated water demands. It indicates that water allocated in blocks is higher than the calculated water demand unit l/sec/ha for the cropping.

FIGURE 4-3 WATER BALANCE AT RAMAN UTARA SUB-SYSTEM



Source: Report Volume 4 Pillar 3 Irrigation Management Chapter 3.1

FIGURE 4-4 WATER BALANCE AT BATANGHARI SUB-SYSTEM



Source: Report Volume 4 Pillar 3 Irrigation Management Chapter 3.1

For irrigation modernization the Director General of Water Resources has issued Circular Letter Number 01/Se/D/2019 concerning Technical Guidelines for Irrigation Modernization. To support its implementation, Directorate of Irrigation and Lowlands in cooperation with the University of Gadjah Mada (UGM) developed the so-called SIPASI computer software to replace 12 forms for irrigation operation.

SIPASI has been designed to calculate water demand unit l/sec/ha to set cropping pattern and calendar during Planning stage and calculate water demand for individual tertiary blocks including gate opening at turnout structure according to the specified discharge formula in implementation stage. The introduction of SIPASI is expected to deal with problems of unskilled operators in calculating water demand unit l/sec/ha and in determining gate opening at the measuring structure according to the specified discharge formula.

SIPASI supported with telemetry equipment is the main device in irrigation modernization. To apply this system, field operators especially Mantri and gate keepers (PPA) must acquire certain skills that enable them to follow the operational activities of SIPASI, which is different from their traditional work method thus far. Mantri and PPA need to adapt and gradually perform activities according to SIPASI system. Punctuality in delivering input to SIPASI (discipline) is a tradition that must be developed since basic principle of SIPASI is that of real-time nature. Activities to be performed by Mantri and PPA for SIPASI operation are as follows:

- Report Farmers' plans of each tertiary block with regard to cropping pattern and calendar in MT 1 and MT 2 as input to SIPASI, upon which water balance will be calculated in Planning Stage.
- Report the start date of cropping (land cultivation) for every tertiary block as input to SIPASI, upon which the volume of discharge and gate opening at turnout structure of tertiary block concerned will be calculated.
- Regulate gate opening at turnout structure and division structure according to the output of SIPASI at 5-day interval for water distribution to the tertiary block concerned.
- Report the realized water level at measuring structure (sliding gate) or upstream side of measuring gate (Crump de Gruiter) at 5-day interval for input to SIPASI in determining the gate opening.
- Report harvest yield ton/ha in every tertiary block and the price of unhulled rice at the end of MT 1 and MT2 as input for SIPASI in reporting water productivity of cropping season.

Farming practices of farmers must also adapt to real-time SIPASI work method to optimize irrigation efficiency. They need to follow the specified cropping calendar at quarternary blocks and water distribution along tertiary networks through quarternary canals.

The design of tertiary network layout should as far possible follow instructions in KP-05 regulating distinctive boundaries of quarternary blocks (8-15 ha) and the serving quarternary canals. Cropping calendar for individual quarternary blocks can be prepared simultaneously to set quarternary blocks as water distribution unit in a tertiary block. Any different cropping calendar in quarternary blocks can be resolved with arrangement following 5-day interval of discharge calculation to turnout gate by SIPASI. Each quarternary block will be served by its quarternary canals. Water distribution to individual quarternary block can be made through tertiary network without necessarily trespassing other quarternary block.

In areas served by primary and secondary canals passing through 2-3 districts, potential unequal water distribution is likely to occur. This condition is found in primary canal segment BPU 11 – BPU 22, secondary canals KH2 – KR5 and secondary canal segment KH2 – KBH16. District at upstream side will receive more water allocation than district at downstream side because operators operating division structure of such canal segment come from district at upstream side. Thus, turnout gate at downstream district receives less attention. This is a cross-district problem. It is therefore necessary to change the employment status of operators in division structure of primary canal segment BPU 11 – BPU 22, secondary canal segment KH2 – KR5 and KH2 – KBH16 and officials of UPTD/KPD/UPT of districts to become officials of UPTD PSDA Region II as an institution of province government.

Water allocation in Feeder Canal 1 and 2 is frequently not consistent with the areas of its service areas because of "informal actors" intervention. These persons are highly respected in the areas served by Feeder Canal 1 and 2. They can decide water allocation in these two feeder canals. This practice is potential to lead water waste or otherwise to cause water shortage in areas served by Feeder Canal 1 and 2. To cope with this problem it is necessary to hold a periodic meeting between WUAs. WUAAs, WUAFs and sub-district heads to discuss Weir Operators (POB) of Argoguruh weir.

Illegal off-takes can be seen along primary network using pumps, plastic pipes, or otherwise from primary and secondary canals. No sanction is imposed for this illegal practice. It is just considered as a social issue. To deal with illegal off-takes, it is necessary to revise Regional Regulations at district or province concerning irrigation by including article of sanctions against illegal off-takes.

Tertiary network is already available but it remain unclear whether such network is rational as prescribed in KP-05, which basically regulates distinctively the boundaries of quarternary blocks and the corresponding quarternary canals. No tertiary network layout design is available. Clear quarternary blocks and the quarternary canals are necessary to establish systematic water distribution in tertiary blocks based on cropping calendar for individual quarternary blocks. Effective and efficient water distribution will be difficult to reach if cropping calendar is simultaneously applied in a number of rice fields in widely-scattered locations within a tertiary block since there is no canal serving individual fields. To reach a rice field, water must be delivered from block to block where cropping may not be started yet which mean water waste. Draining water to blocks not yet cultivated has been running for long time and this practice has been taken for granted in Way Sekampung system. To cope

with this issue, it is necessary to prepare tertiary layout design to assist farmers in making their construction. In addition, it is also to give advocacy to the farmers. They should construct tertiary network according to the prepared design. Advocacy should be directed to enhance the knowledge of farmers about the benefits of quarternary blocks and canals and to reach consensus in land provisions necessary to build additional quarternary or tertiary canals.

Inventories of damaged structures and canals compiled from walkthrough survey in September – Oktober 2019 and February 2020 show insignificant damage of structures (only 6% in overall). Damages to measuring structures consist of missing peilschal and lack of maintenance. However, physically the structures are in good condition. Damaged canals are mostly found in primary canal Raman (61%) and Batanghari Utara (42%), secondary canal Raman (34%), Batanghari Utara (38%), Sekampung Batanghari (34%) and Punggur Utara (24%). In overall, 18% of canals are in damaged condition. Damages to water gates is mostly found in respectively secondary canal Bekri (57%), Sekampung Batanghari (21%), primary canal Bekri (20%), Sekampung Batanghari (19%). Other gates just experience minor damage. In overall, this damage only reaches 17% of total structures and canals.

Such damages resulting from accumulation of lack of maintenance every years and lack of budget for TPOP for Province PSDA Agency. To repair this accumulated damage, primary network must be rehabilitated for which maintenance fund from PTOP will be necessary.

After rehabilitation, the irrigation networks will look new and maintenance works should be carried out following 10 forms of Maintenance. It can be initiated with walkthrough survey to collect data inventories of damages as performed in September – October 2019 and the findings must be recorded in form 01 and 02 as basis for fund proposal. To start this activity, officials of Province PSDA agency, UPTD PSDA Region II and 15 implementing units UTPD/KPD/UPT should receive training for refreshing.

4.2 - Implementation Arrangement

Irrigation Management will require activities to cope with problems as detailed in Table 4-1 and Table 4-2.

TABLE 4-1 ACTION PLAN

No	Key Gap	Proposed Action	Indicator	Responsible Agency	Time Frame	Budget Source
1	In future the farmers are expected to follow cropping pattern and calendar in SK Gub	Hold intensive and systematic farmer meeting facilitated by facilitator to change their tradition in preparing cropping calendar	Farmers are available to change their traditional cropping calendar to follow the schedule set in SK Gubernur	BBWS MS, Prov. PSDA Agency, Province Agriculture Agency, District Agriculture Agency	2021 - 2025	APBN
		Select facilitators from Mantri, PPL and WUAA	Facilitator for each sub-district selected			
		Provide training for facilitators relating to water availability in weirs and water balance and the availability of farming facilities	Facilitators understand of how to measure discharge at weir, water demand unit for cropping, water balance and the availability of farming facilities			
		Make farming facility availability database	Database of farming facility availability at Province and District Agriculture Agencies	Province and district agriculture agencies		
		Include role sharing of agencies into the meeting agendas of Irrigation Commission	Role sharing mentioned in SK Gubernur	Bappeda, BBWS MS, Prov. PSDA Agency, Province Agriculture Agency, District Agriculture Agency and WUAFs		
2	The operation of SIPASI for distribution water at primary networks	Socialization of irrigation modernization through workshop at province, district and sub-district level covering (i) balance water, (ii) water allocation with computerized, telemetry and electromechanical operation (iii) improved	Province and District Bappeda, Province and District PSDA Agencies, Province and District Agriculture Agencies, WUAA and WUAFs understand irrigation modernization including SIPASI	BBWS MS	2021	APBN

		performance of field operators and WUAs				
		Provide training for officials of UPTD PSDA Region II and UPTD/KPD/UPT about their duties relating to SIPASI operatio	Officials of UPTD PSDA Region II, Mantri and PPA understand their during in SIPASI operation			
		Install telemetry equipment at WOC connected to climate, rainfall, river discharge stations and the house/office of Mantri	Telemetry equipment installed in WOC connected to climate, rainfall, river discharge station and house/office of Mantri			
3	Tertiary network layout consistent with KP-05 showing clear boundaries of quarternary blocks and the serving quarternary canals	Prepare tertiary network layout design consistent with KP05 showing clear boundaries of quarternary blocks and the serving quarternary canal	Tertiary network layout design consistent with KP-05 available	BBWS MS	2021	APBN
		Hold farmer meeting in the form of PSETK and Public Consulataion Meeting (PKM) with advocacy from facilitators to make farmers understand the benefits of tertiary networks and available to change the existing tertiary network layout	Farmers understand the benefits of tertiary networks and available to change the existing tertiary network layout		2022-2025 for Punggur Utara and Rumbia Barat, 2026-2030 for Bekri, Sek.Bunut, Sek.Batanghari 2031-2035 for Raman Utara and Batanghari Utara	The fund collected from farmers

4	Water distribution at tertiary blocks	Hold farmer meeting in the form of PSETK and Public Consulatation Meeting (PKM) with advocacy from facilitators to make farmers understand how SIPASI work and available to set simultant cropping calendar in quarternary blocks	Cropping calendar within quarternary blocks is simultaneous	BBWS MS, Prov. PSDA Agency, Province Agrilculture Agency, District Agriculture Agency	2022-2025 for Punggur Utara and Rumbia Barat, 2026-2030 for Bekri, Sek.Bunut, Sek.Batanghari 2031-2035 for Raman Utara and Batanghari Utara	State Budget
5	Sanction for illegal off-takes perpetrators	Prepare or revise Regional Regulation (Perda) concerning irrigation at province and district level to include articles concerning sanctions to illegal off-takes perpetrators	Regional regulations (perda) on irrigation at province and district include articles of sanctions for illegal off-takes perpetrators	Province and District Bappeda, BBWS MS, Province PSDA agency, District PU agency	2022 - 2025	Province or district budget
6	No problem is found among villages within one tertiary block and among districts in primary networks	Hold periodic meeting of WUAs, WUAF and WUAA, and sub-district head, change employment status for operators of division structure from staff of UPTD/KPD/UPT (district) into staff of UPTD PSDA Region II (province)	No problem is found among villages within one tertiary block and among districts in primary networks	Province and District Bappeda, BBWS MS, Province PSDA agency, District PU agency	2021 - 2025	Province or district budget
7	Maintenance works for primary networks using 10	Provide training to officials of Province PSDA Agency, UPTD PSDA Region II and 15 offices of UPTD/KPD/UPT concerning maintenance works for primary	10 maintenance forms implemented for the maintenance of primary networks	Province PSDA agency	2023	State Budget TPOP

	maintenance forms	networks using 10 maintenance forms especially network walkthrough using form 01 and 02 as basis for funding proposal				
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TABLE 4-2 RESULTS FRAMEWORK

Results Indicators	Baseline Value	Baseline Year	Target Values of Results Indicators				
			2021	2022	2023	2024	2025
Facilitators for each sub-district selected	No facilitator	2020	Facilitators for each sub-district selected		
Facilitators understand how to measure discharge of weir, water demand unit for cropping, water balance and farming facility availability	Facilitators have yet to understand how to measure discharge of weir, water demand unit for cropping, water balance and farming facility availability.....	2020	Training for facilitators provided and they understand how to measure discharge of weir, water demand unit for cropping, water balance and farming facility availability			
Farmers available to change their traditional cropping calendar to follow cropping calendar set in SK Gubernur	Farmers not yet available to change their traditional cropping calendar to follow cropping calendar set in SK Gubernur	2020	Meeting of farmers with facilitators held but traditional cropping calendar not yet changes	Periodic meeting of farmers and facilitators but traditional cropping calendar not yet changes	Periodic meeting of farmers and facilitators is held but farmers following cropping calendar in SK Gubernur remain insignificant	Periodic meeting of farmers and facilitators is held and number of farmers following cropping calendar in SK Gubernur	Periodic meeting of farmers and facilitators is held and the majority of farmers have followed cropping calendar in SK Gubernur

Results Indicators	Baseline Value	Baseline Year	Target Values of Results Indicators				
			2021	2022	2023	2024	2025
						Gubernur increases	
Database on the availability of farming facilities in Province and District Agriculture Agencies	No database on the availability of farming facilities in Province and District Agriculture Agencies	2020	Meeting of Province Irrigation Commission to discuss the preparation of database on the availability of farming facility at Agriculture Agencies	Fund proposal for the preparation of database on the availability of farming facilities at province and district agriculture agencies	Prepare database on the availability of farming facilities at province and district agriculture agencies.	Database on the availability of farming facilities at province and district agriculture agencies prepared	Database on the availability of farming facilities at province and district agriculture agencies have been used to input cropping alendar
Role sharing of agencies indicated in SK Gubernur concerning cropping pattern and calendar	No role sharing of agencies indicated in SK Gubernur concerning cropping pattern and calendar	2020	Meeting of Province Irrigation Commission to discuss the needs of role sharing between agencies to support cropping pattern and calendar	Province Bappeda holds periodic meeting with BBWS, Prov. PSDA Agency, Prov. and District Agriculture Agencies, District PU Agency to discuss role sharing	Role sharing of agencies included in the agendas of meeting between Province Irrigation Commission and the results contained in SK Gubernur concerning cropping pattern and calendar and implemented in the field	Role sharing of agencies revised in the agendas of meeting between Province Irrigation Commission and the results contained in SK Gubernur concerning cropping pattern and calendar and implemented in the field	Role sharing of agencies revised in the agendas of meeting between Province Irrigation Commission and the results contained in SK Gubernur concerning cropping pattern and calendar and implemented in the field

Results Indicators	Baseline Value	Baseline Year	Target Values of Results Indicators				
			2021	2022	2023	2024	2025
Province and District Bappeda, Province and District PSDA, Province and District Agriculture Agencies, WUAAs and WUAAFs understand irrigation modernization including SIPASI	Province and District Bappeda, Province and District PSDA, Province and District Agriculture Agencies, WUAAs and WUAAFs not yet understand irrigation modernization including SIPASI	2020	Worskhop at province and district for socialization of irrigation modernization including SIPASI	Worskhop at province and district for socialization of irrigation modernization including SIPASI	Province and District Bappeda, Province and District PSDA, Province and District Agriculture Agencies, WUAAs and WUAAFs understand irrigation modernization including SIPASI		
Officials of UPTD PSDA Region II, Mantri, PPA (Gate Keepers) understand their duties relating to SIPASI operation	Officials of UPTD PSDA Region II, Mantri, PPA (Gate Keepers) not yet understand their duties relating to SIPASI operation	2020	SIPASI training for Officials of UPTD PSDA Region II, Mantri, PPA (Gate Keepers) at Punggur Utara and Rumbia Barat Sub-System	Advanced SIPASI training for Officials of UPTD PSDA Region II, Mantri, PPA (Gate Keepers) at Punggur Utara and Rumbia Barat Sub-System	Advanced SIPASI training at pilot locations to Officials of UPTD PSDA Region II, Mantri, PPA (Gate Keepers) at Punggur Utara and Rumbia Barat Sub-System	Start to operate SIPASI at Punggur Utara and Rumbia Barat sub-system	Operate SIPASI at Punggur Utara and Rumbia Barat sub-system
Telemetry equipment installed in WOC connected to climate, rainfall, river discharge	Telemetry equipment not yet installed in WOC connected to climate, rainfall,	2020	-----	-----	Install telemetry equipment in WOC connected to climate, rainfall, river	Install telemetry equipment in WOC connected to climate, rainfall, river	Operate telemetry equipment in WOC connected to climate, rainfall, river discharge

Results Indicators	Baseline Value	Baseline Year	Target Values of Results Indicators				
			2021	2022	2023	2024	2025
station and house/office of Mantri	river discharge station and house/office of Mantri				discharge station and house/office of Mantri	discharge station and house/office of Mantri	station and house/office of Mantri
Tertiary network layout design consistent with KP-05 available	Tertiary network layout design consistent with KP-05 not yet available	2020	Prepare tertiary network design layout consistent with KP-05	Tertiary network layout design consistent with KP-05 available			
Farmers understand the benefits of tertiary network and available to change the existing tertiary network layout	Farmers not yet understand the benefits of tertiary networks not yet plan to change the existing tertiary network layout	2020	-----	Hold famer meeting in the form of PSETK and Public Consultation Meeting (PKM) with advocacy by facilitators to make farmers understand the benefits of tertiary networks and available to change the existing tertiary network layout	Hold farmer meeting with advocacy by facilitators at pilot block locations to make farmers understand the benefits of tertiary networks and available to change the existing tertiary network layout	Farmers understand the benefits of the existing tertiary networks and some of them are available to change tertiary network layout	Farmers understand the benefits of the existing tertiary networks and number of famers who are available to change tertiary network layout increases
Simultaneous cropping calendar in a quarternary block	No simultaneous cropping calendar in a quarternary block	2020	-----	-----	-----	Simultaneous cropping calendar in a quarternary block	Simultaneous cropping calendar in a quarternary block
Regional regulations (Perda)	Regional regulations (Perda)	2020	Province and District Bappeda hold	Province and District Bappeda hold	Discussion with DPRD	Discussion with DPRD	Enact Perda on irrigation that

Results Indicators	Baseline Value	Baseline Year	Target Values of Results Indicators				
			2021	2022	2023	2024	2025
on irrigation at district or province level contain articles of sanctions to illegal off-takes perpetrators	on irrigation at district or province level not yet contain articles of sanctions to illegal off-takes perpetrators		routine meeting with Province and District PSDA Agencies to prepare/revise Perda on Irrigation to include articles concerning sanctions to illegal off-takes	routine meeting with Province and District PSDA Agencies to prepare/revise Perda on Irrigation to include articles concerning sanctions to illegal off-takes	concerning the preparation/ revision of Perda on Irrigation to include articles concerning sanctions to illegal off-takes	concerning the preparation/ revision of Perda on Irrigation to include articles concerning sanctions to illegal off-takes	contains articles of sanctions to illegal off-takes
No issue among villages within one tertiary block and among districts in primary networks	There is issue among villages within one tertiary block and among districts in primary networks	2020	Hold periodic meeting of WUAAs, WUAFs, WUAs and sub-district head at tertiary block covering more than one village	Hold periodic meeting of WUAAs, WUAFs, WUAs and sub-district head at tertiary block covering more than one village	Hold periodic meeting of WUAAs, WUAFs, WUAs and sub-district head at tertiary block covering more than one village	Change the status of operators of division structure at primary canal segment BPU 11 – BPU 22, secondary canal segment KH2 – KR5 and KH2 – KBH16 from officials attached to District UPTD/KPD/UPT into officials of UPTD PSDA Region II (province)	
10 maintenance forms implemented	10 maintenance forms not yet	2020	-----	-----	10 maintenance forms	10 maintenance forms	10 maintenance forms

Results Indicators	Baseline Value	Baseline Year	Target Values of Results Indicators				
			2021	2022	2023	2024	2025
for the maintenance of primary network	implemented for the maintenance of primary network				implemented for the maintenance of primary network	implemented for the maintenance of primary network	implemented for the maintenance of primary network

5 - INSTITUTIONAL AND HUMAN RESOURCES

This chapter describes the findings and analysis on institutional and human resources aspects in the target areas:

1. Assess the institutional and legal frameworks regulating irrigation service provision governance, planning, financing and implementation.
2. Assess the coordination and mechanism of role sharing among the related agencies at primary, secondary, sub-secondary and tertiary level.
3. Evaluate the availability and effectiveness of management and technical and operational staff in the field.
4. Assess the performance of Irrigation Commission.
5. Assess funding mechanism for irrigation management and its performance and budget allocation for the implementation of various activities.
6. Assess and adjust the roles of WUAF/WUAA and Irrigation Commission to assure: (a) effective modernization diagnosis and design and specifications of the agreed irrigation service level, (b) effective participatory construction in irrigation infrastructure modernization at secondary level, and (c) evaluate the availability and need of extension agents/irrigation informants (Irrigation Agents).

5.1 - Findings and Analysis on Institutional and Human Resources

5.1.1 - Pillar 4: Irrigation

There are many institutions engaged in the management, operation and maintenance of irrigation system. VOLUME V, Master Plan Report details all entities involved in the operation of irrigation networks under central authority.

Pillar 4, Attachment 4, Circular Letter 01 / SE / D / 2018, identifies the following entities for modernization:

- (i) District Irrigation Committee,
- (ii) WUA, WUAF and WUAA,
- (iii) Modern Irrigation Management Unit (UPIM),
- (iv) Centralized Irrigation Modernization Team

Sustainable modernization in irrigation sector solely under the authority of central government can't be reached without involvement of the Ministry of PUPR and the Ministry of Agriculture, BBWS Mesuji Sekampung, office of the Ministry of PUPR in addition to several technical units of province and district. Irrigation system modernization process must accommodate the interests of the Ministry of PUPR, the Ministry of Agriculture and farmer communities.

In addition, there is also the Ministry of Environment and Forestry and the Ministry of Home Affairs. The latter plays role in synchronizing regional government and central government in performing development policies and programs.

Communication, coordination and cooperation in irrigation modernization can soundly be achieved through joint planning. Modernization program and participation should be accommodated in a coordination forum such as Irrigation Commission at province/district/city. Institutional building is necessary to cover any shortcoming. Meanwhile, institutional development is required to deal with new challenges arising from irrigation management modernization.

1. Below are some major plans for institutional building and development:
 - a) Update decision on the formation of Irrigation Commission
 - b) Strengthen Irrigation Commission with training and workshop activities focusing on the understanding of members on the institution of irrigation commission and other related regulations and policies
 - c) Facilitate program preparation for irrigation commission
 - d) Facilitate irrigation commission secretariat
2. Build the capacity of WUAs/WUAFs/WUAAs that enable them to represent members, perform the duties and responsibilities in irrigation network management in effective way, especially relating to the formation of tertiary blocks. Such capacity building program may consist of training, field training (sekolah lapang) for farmers, PRA activities and study tour.

3. According to irrigation modernization set in Circular Letter of the Director General of Water Resources No 01 / SE / D / 2019, Modern Irrigation Management Unit (UPIM) will be established with autonomous rights in managing irrigation within an irrigation system. This initiative has been applied in Way Sekampung Irrigation System as part of irrigation management modernization process.

5.1.2 - Pillar 5: Human Resources

Irrigation modernization demands personnel who are capable of performing irrigation management duties as usual and their competencies must further enhance to deal with new challenges coming from technology development and environmental changes. Human resources include intellectual capacity, emotional and spiritual intelligence, meanwhile human resources development focuses on human capital and management knowledge.

Pillar 5, Attachment 4, Circular Letter 01 / SE / D / 2018 discusses six components of modernization:

- a) Status and position,
- b) Education, training and certification,
- c) Improved Non-Civil Servant management system,
- d) Career planning,
- e) Incentive/remuneration system
- f) WUA/WUAF/ WUAA empowerment

The involvement of human resources for staff of national government, province and district becomes prerogative right of client. Below are recommendations proposed to client concerning activities that can be accomplished as part of modernization in Way Sekampung Irrigation System.

Based on information reviewed and contained in VOLUME IV, Master Plan Report, some development programs proposed are:

1. Restructure O&M operator placement in Way Sekampung Irrigation System to follow standards work areas concerned with more proportional staff distribution
2. Provide training for O&P operators, especially those with non-civil servant status to provide them with skills that can elevate their employment status
3. Intensify training for O&M operators from training programs by the related agencies
4. Establish career development system for O&M operators
5. Provide training for WUA/WUAF/WUAA management boards.

5.2 - Implementation Arrangement

Implementation arrangement and framework for this chapter have been merged in previous chapters and in chapter 7.

6 - FACILITIES AND INFRASTRUCTURE

This chapter clarifies the findings and analysis on infrastructure and facility at target areas:

1. Evaluate and review the effectiveness of irrigation infrastructure to the specified design criteria
2. Update inventories of infrastructure conditions in irrigation and drainage main systems and include infrastructure available in the existing primary and secondary canals into (GIS-based) information system of asset data in accordance with guidelines provided by DGWR.
3. Review and evaluate flow control system and measurement system in terms of utilities, functionalities, management and conditions, as well as evaluate the conditions of assets.
4. Review and evaluate the current performance of facilities and sediment removal options to improve sediment management at irrigation system, sediment rate modelling in primary canal network.
5. Review and assess the present needs, functionalities, communication conditions, data collection, information system and human resources, financial capacity for sound operation and maintenance activities.

6.1 - Findings and Analysis of Infrastructure and Facilities

6.1.1 - Pillar 2: Irrigation Infrastructure

To enhance irrigation services to farmers with irrigation infrastructure development to support transparency, participation, accountability, efficiency, operability, accuracy and to improve water management, which is more timely, appropriately budgeted and minimizes losses.

Pillar 2, Attachment 4, Circular Letter of DGWR 01 / SE / D / 2018, consists of eight modernization components, to wit:

- Weir, dam, reservoir and long storage,
- Main works,
- Measuring equipment and structure,
- Primary and secondary canals,
- Structure,
- Facilities to support O&M,
- Supporting structure, and
- Tertiary canal system

VOLUME III, Master Plan Report presents complete description of present status of Way Sekampung Irrigation System. Some priority works are inclusive of:

1. Overlooked maintenance activities such as sediment deposit removal and lining to cracked concrete layers. These works can't be economically performed under civil work contract. Thus, Consultants recommend to carry out these works under additional budget arrangement. Infrastructure inspection by Consultants can be used as basis to identify budget allocation and the volume of works.
2. Reach natural streams, which their cross-sections are in damaged conditions and therefore need reform to achieve better water distribution efficiency. Such damage has accelerated water losses due to percolation. It is recommended to cover canals with hard and opaque surface layer like concrete. Lining to canal walls will contribute in reducing water losses from main canal and secondary canals until less than 20 percent.
3. Classification of modernization stage is necessary to select the best system groups ready to undergo modernization program, if not, seven sub-systems in Way Sekampung system must be modernized despite IKMI score at 75 (2017), which means not yet to reach the minimum score set for the preparedness of modernization process (score > 80). There is no other choice than to divide Way Sekampung Irrigation System into several modernization programs.

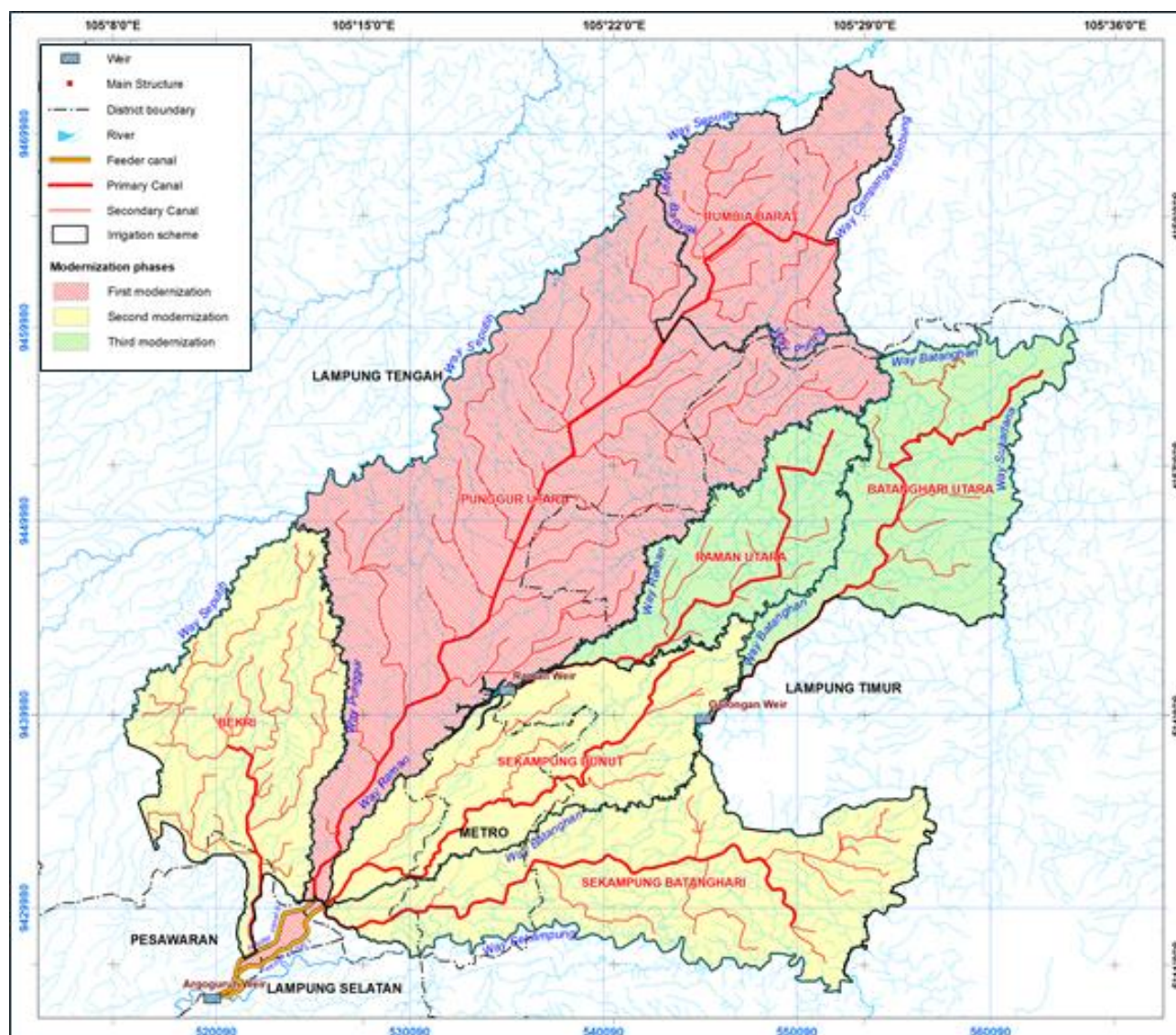
4. Referring to Sub-chapter 4.2 VOLUME III, it can be concluded that modernization should be carried out in three step process while taking sub-system classification into account: To assess the preparedness of a sub-system to undergo modernization program, its conditions and infrastructure functionalities must be identified based on the latest scores, data and information. The scores acquired from infrastructure inspection can be used as a factor of assessment to modernization steps. The following Table 6-1 shows the functionalities of canals and water gates in primary and secondary canals of each sub-system in Way Sekampung system.

TABLE 6-1 INFRASTRUCTURE FUNCTIONALITY

No	Structure	Function (%)						
		Punggur Utara	Sekampung Bunut	Sekampung Batanghari	Bekri	Batanghari Utara	Rumbia Barat	Raman Utara
1	Primary Canal	96,8%	98,9%	82,9%	81,45%	60,6%	99,50%	39,4%
2	Irrigation Gate at Primary Canal	94,1%	91,5%	80,9%	79,7%	93,2%	98,2%	87,4%
3	Total at primary segment	95,4%	95,2%	81,9%	80,6%	76,9%	98,8%	63,4%
	Good	Satisfactory	Satisfactory	Satisfactory	Good	Reasonable		
4	Secondary Canals	87,3%	87,0%	58,1%	98,59%	62,5%	100,0%	68,6%
5	Irrigation gate at secondary canal	90,4%	95,8%	79,3%	42,6%	91,5%	96,5%	89,6%
6	Total at secondary segment	88,8%	91,4%	68,7%	70,6%	77,0%	98,3%	79,1%
	Good	Satisfactory	Satisfactory	Satisfactory	Good	Satisfactory	Good	Satisfactory

5. First priority of sub-system with "good" category – Rumbia Barat and Punggur Utara. Combining two sub-systems will not bring about any significant implementation hardship. There are 127 semi-automatic gates in 44 division structures and cross regulators put up at Punggur Utara sub-system under project financed by European Community Commission in 1994. Investment with huge capital for this modernization process is a step to improve the infrastructure. Rumbia Barat sub-system as extension of Punggur Utara will install automatic gates as parts of system.
6. Second priority for sub-system with category "satisfactory" – Sekampung Bunut sub-system, Sekampung Batanghari and Bekri. Infrastructure of Sekampung Bunut has better condition than in Sekampung Batanghari and Bekri sub-systems. However, these three sub-systems have similar operation condition, i.e. to take irrigation water from two Feeder Canals.
7. The third priority for sub-system with category "reasonable" – Batanghari Utara and Raman Utara sub-system, which their irrigation water is supplied from weir in Batanghari river and Raman river respectively. These two rivers are not sufficient to serve the two sub-systems which extend respectively 3,957 ha in Baranghari Utara and 4,207 ha in Raman Utara. Additional water supply from Argoguruh through small rivers is necessary. This supplement system is actually not qualified as a technical system in which water to be conveyed must be measured and regulated at water gates.

FIGURE 6-1 IMPLEMENTATION STAGES IN WAY SEKAMPUNG



6.2 - Implementation Arrangement

Implementation arrangement and the associated figures have been combined with two previous chapters.

7 - IMPLEMENTATION ARRANGEMENT AND ROAD MAP

This additional chapter is to combine implementation arrangement and action plan of three preceding chapters into an overall Road Map. This approach is as prescribed in Terms of Reference, page 7, stating that Road Map must be prepared as part of Master Plan.

"Modernization description clarifying the steps to be taken must be prepared in a manner that will depict how to achieve the overall modernization. This modernization description will be harmonized or based on steps indicated in Irrigation Modernization Guidelines. The steps will clarify what actions to be taken subject to the conditions of irrigation scheme."

The first chapter provides overview of implementation arrangement and presents Road Map containing actions proposed.

7.1 - Implementation Arrangement

The implementation of modernization in irrigation water management will be arranged as follows:

- Socialization of irrigation modernization to all stakeholders through workshop, public consultation meeting (PKM), etc.:
- Improve Irrigation Committion meeting process in preparing cropping pattern and calendar while indicating Role Sharing of government agencies in SK Gubernur, activate District Irrigation Commission and hold Farmer Meeting at sub-district level.
- Replace water distribution process in main network from previously using 12-O forms with SIPASI computer software.
- Review the layout of tertiary networks to follow provisions set in KP-05, where the boundaries of quaternary blocks and the serving quartenary canals must be clearly indicated.
- Water distribution into tertiary blocks is made in simultaneous cropping calendar for individual quaternary canals.

Below is implementation framework summary and arrangement as detailed in Annex 5, Master Plan Report.

Way Sekampung Irrigation System modernization is a process beyond the generally understood definition. It has become irrigation sub-sector to support agriculture sector. Apart from direct management to irrigation system, there are other parties that must be involved at central or regional level.

At central, the Ministry of Public Works and Housing through Directorate General of Water Resources, Directorate of Irrigation and Lowlands, Directorate of Roads and Bridges, Directorate of Water Resources Management, and Directorate of Water Resources Network Development will be involved in the implementation of this modernization. Other ministries include the Ministry of Agriculture, the Ministry of Home Affairs and Lampung Province Government, Central Lampung District, Central Lampung District, East Lampung District and Metro City.

BBWS Mesuji Sekampung as technical implementation unit has duties and responsibilities to manage Way Sekampung irrigation system. However, for O&M of the system, this work has been delegated to Lampung Provinve. Local agencies in Lampung Province, such as Human Settlements and Water Resources Agency, UPTD Balai PSDA Region II and Agiculture Agency and Bappeda play coordinating roles in irrigation management among the related parties at province.

Sub-district office, especially UPTD Kabupaten responsible for O&M of Way Sekampung irrigation system and WUAs. WUAFs and WUAAs will be engaged in irrigation modernization process for Way Sekampung irrigation system.

Implementing organizations consisting of Central Project Management Unit (CPMU) covering Central Planning and Control Unit (CPCU), Central Activity Implementation Unit (CAIU) and Activity Implementation Unit (AIU) and other parties will be established. The parties involved in the modernization of Way Sekampung system can be seen in Matrix Table of the Parties engaged in Way Sekampung Modernization as shown in Table 7-1.

TABLE 7-1 OVERALL MATRIX OF WAY SEKAMPUNG IRRIGATION SYSTEM MODERNIZATION

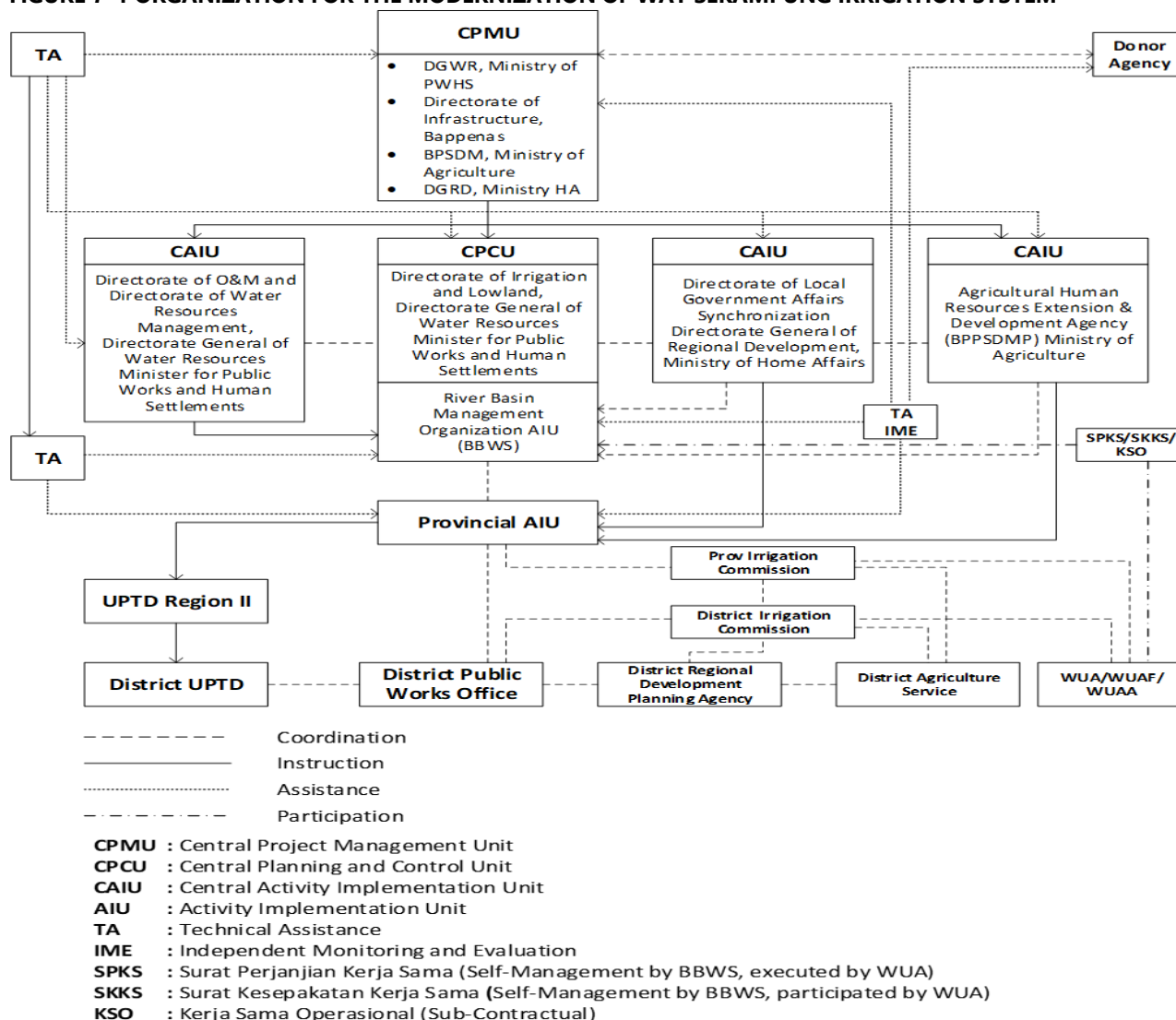
Central	Ministry	Directorate General / Body	Directorate/Central/ Technical Unit	Project Organization
	The Ministry of PUPR	Directorate General of WR		CPMU
			Directorate of Irrigation and Lowlands	CPCU
			Directorate of Operation and Maintenance	CAIU
			Directorate of Water Resources Development	CAIU
			BBWS	AIU
	The Ministry of Agriculture	Resources Development and Empowerment Body (BPPSDM)		CPMU
			Agriculture Extension Service Body	CAIU
	The Ministry of Home Affairs	Directorate General of Regional Development		CPMU
			Directorate of Regional Governance Affairs Synchronization	CAIU
	National Development Planning Agency (Bappenas)	Deputy for Facility and Infrastructure	Directorate of Water and Irrigation	CPMU
Province	Body	Division	Section	
	Province PSDA Agency	Operation and Maintenance	Irrigation and Lowlands Operation and Maintenance	AIU Prov
		UPTD Region II		
	Food Resilience and Horticulture Agency	Agriculture Facility and Infrastructure		
	BAPPEDA	Infrastructure and Regional Planning		
Kab/Kota	Body / Agency	Division/UPTD	Section	
	Public Works and Spatial Planning Agency	Operation and Maintenance	Seksi O&P Irigasi dan Rawa	-
		UPTD Kab.		
	THP Agriculture Agency	Infrastructure and Facility		
	Bappeda	Infrastructure and Regional Planning		
Local	Primary	Secondary	Tertiary	
	WUAA	WUAF	WUA	

Source: Table 5.1 Annex 5.1. Master Plan Report

To assist the implementing bodies in performing modernization, assistance of consultants (technical assistance) is necessary to support the Ministry of PUPR and BBWS Mesuji Sekampung. It is recommended that the monitoring and evaluation of modernization implementation be performed by other independent technical assistance team. Details of main duties to this Technical Assistance team can be seen in Table 5-3, Annex 5.

Figure 7-1 presents flow chart of organization arrangement plan for modernization in Way Sekampung Irrigation System.

FIGURE 7-1 ORGANIZATION FOR THE MODERNIZATION OF WAY SEKAMPUNG IRRIGATION SYSTEM



Source: Figure 5.1. Annex 5, Way Sekampung Master Plan Report

7.2 - Road map

Modernization of an irrigation system covers modernization of irrigation system management in Way Sekampung, which basically will provide description of changes to the implementation, institutional and even infrastructure and facilities towards improvements in all aspects.

To realize modern irrigation management system in Way Sekampung, a road map has been prepared while taking the following matters into account:

- ✦ Three stages are needed to develop overall networks in which every stage has different focus:
 - a) First stage specifically focuses on the preparedness of infrastructure, institutions and farmer communities, interaction format, system management procedure on real-time basis and automatic control of cross regulators at primary canals.
 - b) Second stage is oriented to physical implementation, modern control and water delivery management from primary system, institutional adjustment, interaction format and procedure between users/operators, fully operating data collection system on real-time basis, and automatic gate control procedure.
 - c) Third stage focuses on adjustable and reliable standard operation of the system: (i) infrastructure, (ii) institutional, (iii) communication, (iv) decision making.
- ✦ From substance wise, list of the expected activities that will support the realization of modernization goals in Way Sekampung based on five pillars as prescribed in Irrigation System Modernization Guidelines¹
- ✦ This road map also provides a series of targets or outputs expected from each stage to identify its progress
- ✦ For the proposed activities, the deadlines, targets to achieve, locations of activities and other parties as most relevant to take follow-up actions have been established.

Below is list of modernization activities for Way Sekampung Irrigation System.

¹"Pedoman Umum Modernisasi Irigasi Direktorat Jenderal Sumber Daya Air, Direktorat Irigasi dan Rawa, Kementerian Pekerjaan Umum dan Perumahan Rakyat 2011"

TABLE 7-2 ROAD MAP FOR WAY SEKAMPUNG IRRIGATION NETWORK

No	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
1	WA	Harmonious land use of upstream/downstream	Effective work coordination, planning and implementation by stakeholders. Province Watershed Forum to achieve/maintain 30% land covers at upstream catchment with forests	Prepare action plan to maintain area of cover lands of forests which at present reaches 46% in Batuteги sub-watershed, increase cover forests in Way Sekampung sub-watershed from 15% to 2015 and in Argoguruh sub-watershed from 2% to 10% in 5 years (2021-2025)	Way Sekampung sub-watershed	Water Resources Management Coordinating team of BBWS Mesuji Sekampung	2021	2022
2	WA	Harmonious land use of upstream/downstream	Integrate Spatial Planning into District Local Development Plan (RPJMD)	District Development Plan for Pesawaran, Gunungsugih to include Spatial Plan from 2021 and so forth	Pesawaran, Pringsewu and Tanggamus Regions	Pesawaran Region, Gunungsugih Region	2021	2022
3	WA	Re-arrange the locations of rainfall station at catchments of Batuteги, Sekampung dam, Argoguruh weir and Way Sekampung sub-system with reference to Kagan Method	Carry out activities of Kagan Method and change the locations of rainfall stations	10 rainfall stations at catchment and 7 rainfall sations at sub-systems in the locations determined based on Kagan Method	Batuteги watershed, Sekampung dam, Argoguruh weir and Way Sekampung irrigation network	BBWS and technical assistance consultants	2021	2022
4	WA	The availability of irrigation infrastructure – Phase 1 Punggur Utara and Rumbia Barat	Set AWLR (Automatic Water Level Recorder) and Rating Curve Sungai Lack of inspection in 2019 dealt with. Measuring equipment installed.	AWLR installed at 2 locations	Upstream of Sekampung dam and Argoguruh weir in Punggur Utara	BBWS	2021	2022
5	INFRA			Rehabilitate lining at point 14,861 m of total length of canals reaching 324,742 m (4.6%), repair canal lining with new coating for 40,505 m (12% of total length), masonry works for transtition structure 95 m3, sediment removal for 52,224 m long (16% of total length). Install measuring devices at 337 gates. Irrigation system soundly functional according to KP	Rumbia Barat	DGWR, BBWS MS for goods procurement, canal and structure repair contract. Contract for the delivery, installation of electromechanical works	2021	2022
6	INFRA	Irrigation infrastructure – Phase 1 Punggur Utara dan Rumbia Barat	Test the functionality of irrigation infrastructure that has been improved and performed on periodic basis	Calibration of new measuring devices in 337 gates and 741 existing gates covering a service area 26,736 ha	Punggur Utara Rumbia Barat	BBWS responsible for service contracts of gate calibration, calibration monitoring and evaluation	2021	2022
7	INFRA	Emergency work for secondary canal Bumiarjo	Reconstruct about 500 m secondary canal that collapsed in secondary canal Bumiarjo	Reconstruct supply canal for 500 m long	Bekri sub-system	BBWS and contractor	2021	2022
8	OM1	Re-design of secondary canal system	Topographic survey and Tertiary Canal Redesign	307 ha cropping areas of paddy fields secured for production Tertiary canal system re-design - 560 units	Punggur Utara Rumbia Barat	BBWS MS TA Consultan	2021	2022
9	OM1	Demo Areas	Tertiary construction, infrastructure for demo	Tertiary canal system constructed at demoplot location	3 locations in Punggur Utara and Rumbia Barat	BBWS MS TA Consultants	2021	2022

No	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
10	OM1	Demo areas	Implement demplot at selected tertiary units for ET field, Reff. percolation and water loss observation along the selected canals	Collect data on ET, Reff, percolation and actual water loss along the canals	Demo plots at Punggur Utara and Rumbia Barat	BBWS MS TA Consultants	2021	2022
11	OM1	Water productivity	Measure the outgoing discharge (m3) and take samples of paddy yields (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	Demo plots at Punggur Utara and Rumbia Barat	BBWS MS TA Consultants	2021	2022
12	OM1	Establishment of the MIS/DSS	Implement automatization and the formation of MIS/DSS	Facilitate BBWS and Province Water Resources office in operating SIM/DSS	Bandar Lampung	BBWS MS and APW Provincial	2021	2022
13	INST1	Irrigation Commission	Update Decision of Governor on Irrigation Commission to revise its membership and legal basis	Decisions of Irrigation Commission issued by the Governor of Lampung Province	Lampung Province	Lampung Bappeda HSWRM Lampung Province	2021	2022
14	INST1	Irrigation Commission	Update the decision of district head on the formation of Irrigation commission	Decision of District Head (Regent) of Central Lampung Irrigation Committee issued	Central Lampung	Bappeda APW Central Lampung	2021	2022
15	INST1	Irrigation Commission	Conduct capacity building for the members of Province and District Irrigation Commission referring to Circular Letter of DGWR 01 / SE / D / 2018	Activate Province and District Irrigation Commission to support the government of Indonesia in irrigation modernization	Lampung Province Central Lampung District	Bappeda HSWRM Lampung Province APW Central Lampung	2021	2022

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
16	INST1	Irrigation Commission	Facilitate program formulation	Annual and Five Year Program Plans of Province and District Irrigation Commission established	Lampung Province Kabupaten Central Lampung	Bappeda HSWRM Lampung Province APW Central Lampung	2021	2022
17	INST1	Irrigation Commission	Facilitate secretariat at province or district	Province and district Irrigation Commission have permanent secretariat office with sufficient operational budget from APBD (local budget)	Lampung Province Kabupaten Central Lampung	HSWRM Lampung Province APW Central Lampung	2021	2022
18	INST1	WUA/ WUAF/ WUAA	WUAFs formation at 3 sub-districts	WUAF in three sub-districts of Central Lampung established	Bumi Ratu Nuban Gunung Sugih Seputih Banyak	APW Central Lampung TA Consultants	2021	2022
19	INST1	WUA/ WUAF/ WUAA	Legalize WUA, WUAF, WUAA that enable them to represent their members and participate in all activities relating to the management, operation and maintenance of Way Sekampung	60 WUAs, 7 WUAFs and 1 WUAA officially registered	Central Lampung	APW Central Lampung TA Consultants	2021	2022

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
20	INST1	WUA/ WUAF/ WUAA	Capacity building of WUAs, WUAFs and WUAA in managing organization and running business on behalf of members	40 WUAs have capacity to manage tertiary irrigation areas; 6 WUAFs, and 1 WUAA have capacity to and participate in rehabilitation works for primary and secondary irrigation	Central Lampung	APW Central Lampung TA Consultants	2021	2022
21	INST1	Modern Irrigation Management (UPIM)	Prepare the formation of Modern Irrigation Management Unit (UPIM)	UPIM concept approved, its objectives, goals, functions, fields and services detailed and proposed to the Ministry of PUPR	Lampung Province	BBWS MS TA Consultants	2021	2022
22	INST1	Water Extension Working Unit	Set up working unit for the acceleration of water extension as detailed in Circular Letter of DGWR 01 / SE / D / 2018	Details the duties, functions, fields and service of Water Extension Working Unit. Office, personnel, budget for operation provided	Lampung Province	BBWS MS TA Consultants	2021	2022
23	INST2	WUA/ WUAF/ WUAA	Facilitate the formation of WUAA	1 WUAA in Metro established	Metro	APW Metro	2021	2022
24	HR1	O&M Field Operators	Restructure the placement of O&M field operators by work areas	Field operators distributed proportionally to command area of UPTD (head of UPTD, Mantri, Gate Keeper) in 8 UPTD Central Lampung	UPTDs Punggur, Adipuro, Trimurjo, Kota Gajah, Seputih Raman, Rukti Enndah, Rantau Fajar, Rumbia Barat	TA Consultants HSWRM Lampung Province APW Central Lampung	2021	2022
25	HR1	O&M Field Operators	Provide training for Mantri and Gate Keeper (PPA) to get competency certificate	4 UPTD Heads, Mantri, 75 Gate Keepers trained	Central Lampung	BBWS MS	2021	2022
26	HR1	Training on discharge measurement	Provide training for staff in discharge measurement and water level setting along canal system	16 Mantris and 149 gate keepers trained to operate water distribution	Punggur Utara Rumbia Barat	BBWS MS TA Consultants	2021	2022
27	HR1	Improve skill in hydrology for staff of Batutegi, Sekampung, Argogoruh, BBWS, Province APW, UPTD Region II Seputih Sekampung	Provide training on hydrology modelling, hudrometry and Rainfall-Runoff	Performance of hydrology staff improved	Batutegi, Sekampung, Argogoruh, BBWS, Province APW, UPTD Region II Seputih Sekampung	BBWS Consultant assistance	2021	2022
28	HR1	Employment status of field operators	Test Gate Keeper (PPA) with non-civil servant status to be civil servants or contract-based employees contract-based employees (PPPK) at functional positions	15 PPA recruited as civil servants or PPPK employees after undergoing tests	Central Lampung	APW Central Lampung	2021	2022
29	HR1	Employment status of field operators	Test Gate Keeper (PPA) with non-civil servant status to be civil servants or contract-based employees (PPPK) at functional positions	5 PPA recruited as civil servants or contract-based employees (PPPK) after undergoing tests	Central Lampung	APW Central Lampung	2021	2022

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
30	HR1	WUA/WUAF/WUAA	Train management board of WUA/WUAF/WUAA	40 WUA, 3 WUAF, 1 WUAA managers trained	Central Lampung	APW Central Lampung TA Consultant	2021	2022
31	HR1	Improve skills in hydrology for staff of BBWS and UPTD Region II Seputih Sekampung	Provide training on hydrology, Hydrometry and rainfall data analysis	Performance of hydrology staff improved	Area Sub-Irrigation a Punggur Utara and Rumbia Barat	BBWS and Consultant Assistance	2023	2025

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
32	INFRA	Irrigation infrastructure – Phase 1 Punggur Utara and Rumbia Barat	Gate with service area > 2000 ha and gate of Argoguruh weir completed with electrical actuators for remote control operation	Change 40 structures, install power supply, electric gate actuators and remote control in 65 gates	Punggur Utara and Rumbia Barat	BBWS MS responsible for contracts of control actuator and software delivery, installation and testing	2023	2025
33	INFRA	Irrigation infrastructure – Phase 1 Punggur Utara and Rumbia Barat	Test remote control function of automatic gate	Test on seasonal basis but preferable on annual basis, adjustment and modification according to the needs and final calibration report	Punggur Utara Rumbia Barat	BBWS MS responsible for contracts of control actuator and software delivery, installation and testing	2023	2025
34	OM1	Tertiary canal system development	Conduct PRA at farmer community level to introduce modern irrigation concept and identify needs of tertiary canal system	Tertiary canal system constructed – 30% of 560 units	Punggur Utara Rumbia Barat	TA Consultants	2023	2025
35	OM1	Extend demonstration area	Implement demplot at the selected tertiary units for ET field, Reff. percolation and water loss observation along the selected canals	ET, Reff, percolation and actual water loss along canals collected	Demo plots at Punggur Utara dan	BBWS MS TA Consultants	2023	2025
36	OM1	Water Productivity	Measure the outgoing discharge (m3) and take samples of paddy yields (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	Demo plots at Punggur Utara and Rumbia Barat	BBWS MS TA Consultants	2023	2025
37	OM1	Water Control Center	Water Control Center established	Positions, tasks and functions and responsibilities of central government established; personnel, equipment and budget for operation allocated	Metro City	BBWS MS and APW Lampung Province	2023	2025
38	OM1	Initiation and introduction of automatic water gate operation	Operate computer program/software to compute water balance, water distribution and gate opening setting on real-time basis	Set the opening of gate, 8 cross-regulators, 3 gates serving areas > 2000 ha with remote control	Punggur Utara and Rumbia Barat	BBWS MS and APW Lampung Province	2023	2025
39	OM1	Actual need-based budget allocation for canal system maintenance	Conduct walkthrough along canal system for the preparation of maintenance works based on actual needs	Actual need-based budget allocation for canal system maintenance provided	Punggur Utara and Rumbia Barat	BBWS MS and APW Lampung Province	2023	2025

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
40	OM1	Introduce modern irrigation financing system concept	Hold workshop at province and district and PRA at farmer community level to introduce modern irrigation financing system concept based on water service value as input for farming activities	Modern irrigation financing system concept accepted	Punggur Utara and Rumbia Barat	BBWS MS, Bappeda and APW	2023	2025
41	INFRA	Irrigation Infrastructure – Phase 2	Update inspection records 2019, assess work volume including to update typical design and prepare tender documents	Tender design, technical estimate, BoQ and tender documents for service areas of 21.776 ha available	Bekri Sekampung Bunut Sekampung Batanghari	Lampung Province, Bappeda and APW East Lampung, Bappeda and APW Central Lampung, WUAFs Service Contract between DGWR and BBWS MS responsible for inspection and preparation of tender documents	2023	2025
42	INFRA	Irrigation Infrastructure – Phase 2	Irrigation system to function properly, any shortcoming identified during inspected dealt with, measuring devices installed	Update inspection records in 2019, lining for 57,084 m of total length 295,000 m (19%), new canal lining with inversion length 3,813 m (1% of total length), masonry work for transtition structure 171 m3; sedimen removal 67,670 (23% of total length), install measuring device at 453 gates.	Bekri Sekampung Bunut Sekampung Batanghari	Service Contract between DGWR and BBWS MS responsible for canal construction and repair, also contract for the delivery and installation of electromechanical works Contract for supervision and installation	2023	2025
43	INFRA	Irrigation Infrastructure – Phase 2	Test irrigation infrastructure	Calibrate new measuring devices at 453 units and 301 units in command areas of 21,776 ha on seasonal basis but preferable on annual basis; re-calibration if necessary and evaluation report	Bekri Sekampung Bunut Sekampung Batanghari	BBWS held responsible for Service contract for gate calibration	2023	2025
44	OM1	Re-design tertiary canal system	Topographical survey and tertiary system re-design	Tertiary Canal System Re-design – 496 units Desai Ulang Sistem Saluran Tersier - 496 units	Bekri Sekampung Bunut Sekampung Batanghari	Service contract for calibration monitoring and evaluation BBWS MS TA Consultants	2023	2025
45	OM1	Demonstration area	Tertiary construction, <i>Demo Plot</i>	Tertiary canal system constructed at demo plot locations	3 locations at Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS TA Consultants	2023	2025
46	OM1	Demonstration area	Implement demplot at the selected teriary units for ET field, Reff. percolation and water loss observation along the selected canals	ET, Reff, percolation and actual water loss along canals collected	Demo plots at Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS TA Consultants	2023 2025	

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
47	OM1	Water Productivity	Measure the outgoing discharge (m3) and take samples of paddy yields (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	Demo plots di Bekri	BBWS MS	2023	2025
48	INST1	Irrigation Commission	Conduct capacity building for the members of Province and District Irrigation Commission referring to Circular Letter of DGWR 01 / SE / D / 2018	Activate Province and District Irrigation Commission to support the government of Indonesia in irrigation modernization	Sekampung Bunut Sekampung Batanghari Lampung Province Kabupaten Central Lampung	TA Consultant Bappeda HSWRM Lampung Province APW Central Lampung	2023	2025
49	INST1	WUA/ WUAF/ WUAA	Capacity building of WUAs, WUAFs and WUAA in managing organization and running business on behalf of members	40 WUAs have capacity to manage tertiary irrigation areas; 6 WUAFs, and 1 WUAA have capacity and participate in rehabilitation works for primary and secondary irrigation	Central Lampung	APW Central Lampung TA Consultants	2023	2025
50	INST1	WUA/ WUAF/ WUAA	Capacity building for WUA, WUAF and WUAA	98 WUA/13 WUAF/1 WUAAs perform their duties without any significant constraint	Central Lampung	APW Central Lampung TA Consultants	2023	2025
51	INST1	Modern Irrigation Management Unit (UPIM)	The Ministry of PUPR to review the proposals and consider the formation of UPIM	The Ministry of PUPR to issue regulation concerning the formation of UPIM including the personnel and budget for its operation	Lampung Province	BBWS MS TA Loan Consultant	2023	2025
52	INST1	Water Extension Acceleration Working Unit	Establish Water Extension Working Unit as prescribed in Circular Letter DGWR 01 / SE / D / 2018	Details of responsibilities, functions, fields and services of Water Extension Working Unit, personnel, budger for operation available	Lampung Province	BBWS MS TA Consultants	2023	2025
53	INST1	Special Mobile Maintenance Task Force (SPKM)	The formation of Special Maintenance Working Unit (SPKM) as established in Circular Letter DGWR 01 / SE / D / 2018.	Responsibilities, functions of Special Maintenance Working Unit established Field and service areas detailed. Office, personnel, equipment, budget for operation provided	Lampung Province	BBWS MS TA Consultants	2023	2025
54	INST1	Irrigation Security Working Unit (SPI)	The formation of Irrigation Security Working Unit (SPI) as established in Circular Letter DGWR 01 / SE / D / 2018.	The objectives of Irrigation Security Working Unit (SPI) including its responsibilities, functions, fields and areas established. Office, personnel, equipment, budget for operation available. 10 Mantri and 110 gate keepers trained to operate water distribution measurement	Lampung Province	BBWS MS TA Consultants	2023	2025
55	HR1	Training on Discharge Measurement	Staff training in discharge measurement and water level regulation along canal system		Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS TA Consultants	2023	2025
56	HR1	Field Operators for O&M	Training for Mantri and Gate Keeper (PPA) to acquire competency certificate	4 UPTD heads, 8 mantris and 74 gate keeper trained	Central Lampung	BBWS MS	2023	2025
57	HR1	Field Operator Status	Test Gate Keepers with Non-Civil Servant status to become civil servant or contract-based employees (PPPK) at functionsl positions	20 PPA recruited as civil servants or contract-based employees (PPPK) after tests	Central Lampung	APW Central Lampung	2023	2025

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
58	HR1	Field Operator Status	Test Gate Keepers with Non-Civil Servant status to become civil servant or contract-based employees (PPPK) at functionsl positions	15 PPA recruited as civil servants or contract-based employees (PPPK) after tests	Central Lampung	APW Central Lampung	2023	2025
59	HR1	Career Development	Apply career development system for field operators of O&M	O&M field operators of civil servant have functional status and non-civil servants have PPPK employee status	Central Lampung	APW Central Lampung	2023	2025
60	HR1	WUA/WUAF/WUAA	Training for WUA/WUAF/WUAA Management board	58 WUA, 11 WUAF managers trained	Central Lampung	APW Central Lampung	2023	2025
61	HR1					TA Consultants		
62		Hydrology skill improvement for staff	Provide training on hydrology, hydrometry and rainfall data analysis	Performance of hydrology staff improved	Area Sub-Irrigatioan	BBWS and TA Consulants	2026	2030
				Tertiary canal system construction – 70% of 560 units	Bekri, Sekampung	BBWS MS	2026	2030
	OM1	Tertiary canal construction	Provide training on hydrology, hydrometry and rainfall data analysis		Batanghari, Bunut, Raman	TA Consultants		
					Utara, Batanghari Utara			
					Punggur Utara			
					Rumbia Barat			
63	OM1	Additional Demonstration Area	Implement demplot at the selected teriary units for ET field, Reff. percolation and water loss observation along the selected canals	ET, Reff, percolation and actual water loss along canals collected	Demo plots at Punggur Utara and Rumbia Barat	BBWS MS TA Consultants	2026	2030
64	OM1	Water Productivity	Measure the outgoing discharge (m3) and take samples of paddy yiels (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	Demo plots at Punggur Utara and Rumbia Barat	BBWS MS TA Consultants	2026	2030
65	OM1	Increase the number of Automatic Gates	Operate computer program/software to compute water balance, water distribution and gate opening setting on real-time basis	Set gate opening in 68 division structure from 63 gates and in 670 turnout structures from 577 automatically controlled gates	Punggur Utara and Rumbia Barat	BBWS MS and APW Central Lampung	2026	2030
66	OM1	Actual need-based budget allocation for canal system maintenance	Maintenance work to assure water flows along canal system based on actual needs	Actual need-based budget allocation for canal system maintenance allocated	Punggur Utara and Rumbia Barat	BBWS MS and APW Central Lampung	2026	2030

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
67 68	OM1	Introduction of modern irrigation financing system at certain areas	Conduct workshops at province and district and PRA at farmer community to introduce the application of modern irrigation financing system based on water service value as input for farming activities	Initial introduction of modern irrigation financing system accepted in certain areas	Selected areas Punggur Utara and Rumbia Barat	BBWS MS, Bappeda and APW Lampung,	2026	2030
		Irrigation Infrastructure – Phase 2		Modify 27 structure, install power supply, automatic gate control and remote control unit at 61 gates	Bekri, Sekampung	Bappeda and APW East Lampung, Bappeda and	2026	2030
	INFRA		Water gate with service area > 2.000 ha completed with electrical actuators for remote control		Batanghari, Sekampung	APW Central Lampung, WUAFs		
					Bunut	BBWS MS		

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
						TA Consultants		
69	INFRA	Irrigation Infrastructure – Phase 2	Modify canals and gates for remote monitoring and gate opening setting	Install actuator at 61 electromechanical gates to monitor and control the opening og gates from remote	Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS held responsible for service contract of actuator and software control delivery, installation and testing	2026	2030
70	INFRA	Irrigation Infrastructure – Phase 2	Functional test of remote flow control and automatic gates	Test on seasonal basis but preferable on annual basis, adjustment and modification as necessary and final calibration report	Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS held responsible for service contract of actuator and software control delivery, installation and testin	2026	2030
71	OM1	Tertiary Canal System Construction	Conduct PRA at farmer community to introduce modern irrigation concept and identify needs of tertiary canal system	Tertiary canal construction - 30% of 496 units	Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS TA Consultants	2026	2030
72	OM1	Additional demonstration area	Implement demplot at the selected teryary units for ET field, Reff. percolation and water loss observation along the selected canals	ET, Reff, percolation and actual water loss along canals collected	3 locations at Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS TA Consultants	2026	2030
73	OM1	Water productivity	Measure the outgoing discharge (m3) and take samples of paddy yiels (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	3 locations at Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS TA Consultants	2026	2030
74	OM1	Initiation and introduction of water gates with remote control system	Operate computer program/software to compute water balance, water distribution and gate opening setting on real-time basis	Set the opening of gate, non-division structures, non-gates serving areas > 2,000 ha with remote control	Bekri Sekampung Bunut Sekampung Batanghari	BBWS Ms and APW Central Lampugn	2026	2030
75	OM1	Actual need-based budget allocation for canal system maintenance	Maintenance work to assure water flows along canal system based on actual needs	Actual need-based budget allocation for canal system maintenance allocated	Bekri Sekampung Bunut Sekampung Batanghari	BBWS Ms and APW Central Lampung	2026	2030
76	OM1	Introduce modernization concept	Conduct workshops at province and district and PRA at farmer community to introduce the application of modern irrigation financing system based on water service value as input for farming activities	Modern irrigation financing system concept accepted	Bekri Sekampung Bunut Sekampung Batanghari Lampung Province	BBWS MS, Bappeda and APW Lampung Province, Bappeda and APW East Lampung, Bappeda and APW Central Lampung, WUAFs	2026	2030
77	INST1	Irrigation financing system for Irrigation Commission	Capacity building for members of Province and District Irrigation Commissions referring to Circular Letter DGWR 01 / SE / D / 2018	Activate Province and District Irrigation Commission to support the government of Indonesia in irrigation modernization	Central Lampung District	Bappeda HSWRM Lampung Province APW Central Lampung	2026	2030

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
78	INST1	WUA/ WUAF/ WUAA	Capacity building for WUA, WUAF and WUAA	98 WUA/13 WUAF/1 WUAAs perform the given tasks in effective way	Central Lampung	APW Central Lampung TA Consultants	2026	2030
79	INST1	Modern Irrigation Service Unit (UPIM)	Develop UPIM	UPIM established, office, personnel, equipment, budget for operation provided	Lampung Province	BBWS MS TA Consultants	2026	2030
80	INST1	Water Distribution Working Unit	Establish Water Distribution Working Unit as prescribed in Circular Letter DGWR 01 / SE / D / 2018	Responsibilities, functions, fields and services of Water Extension Working Group detailed. Office, personnel, budget for operation provided	Lampung Province	BBWS MS TA Consultants	2026	2030
81	INST1	Irrigation Security Working Unit (SPI)	The formation of Irrigation Security Working Unit (SPI) as established in Circular Letter DGWR 01 / SE / D / 2018.	Responsibilities, functions, fields and services of Irrigation Security Working Group (SPI) detailed. Office, personnel, budget for operation provided	Lampung Province	BBWS MS TA Consultants	2026	2030
82	INST2	Irrigation Commission	Update Decision of Governor on the formation of Irrigation Commission	Composition of Irrigation Commission (members) issued under SK Gubernur of Lampung Province	Lampung Province	Bappeda, HSWRM Lampung Province. TA Consultants	2026	2030
83	INST2	Irrigation Commission	Update Decision of District Head (Regent) on the formation of Irrigation Commission	New Decision of East Lampung District Head of Irrigation Commission for Metro issued	East Lampung, Metro	Bappeda, APW East Lampung, Metro, TA Consultants	2026	2030

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
84	INST2	Irrigation Commission	Capacity building for the members of province and district Commission Irrigation referring to Circular Letter DGWR 01 / SE / D / 2018	Activate Province and District Irrigation Commission to support the government of Indonesia in irrigation modernization	Lampung Province East Lampung Metro	Bappeda, HSWRM Lampung Province, Bappeda, APW EEast Lampung I, Metro, TA Consultants	2026	2030
85	INST2	Irrigation Commission	Capacity building for the members of province and district Commission Irrigation referring to Circular Letter DGWR 01 / SE / D / 2018	Activate Province and District Irrigation Commission to support the government of Indonesia in irrigation modernization	Lampung Province East Lampung Metro	Bappeda, HSWRM Lampung Province, Bappeda, APW EEast Lampung I, Metro, TA Consultants	2026	2030
86	INST2	Irrigation Commission	Facilitate program formulation	Annual and Five Year Program Plans of Province and District Irrigation Commission established	Lampung Province East Lampung Metro	Bappeda, HSWRM Lampung Province, Bappeda, APW EEast Lampung I, Metro, TA Consultants	2026	2030
87	INST2	Irrigation Commission	Facilitate secretariat at province or district	Province and district Irrigation Commission have permanent secretariat office with sufficient operational budget from APBD (local budget)	East Lampung Metro	APW East Lampung dan Metro	2026	2030
88	INST2	WUA/ WUAF/ WUAA	WUAFs formation at 2 sub-districts	WUAF in two sub-districts of East Lampung established	Batanghari Nuban Bumi Agung	APW East Lampung TA Consultants	2026	2030

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
89	INST2	WUA/ WUAF/ WUAA	Legalization to WUA, WUAF, WUAA	30 WUA in East Lampung and 12 WUA in Metro, 2 WUAF in East Lampung and 2 WUAA in East Lampung and 1 WUAA in Metro have legal body status	East Lampung, Metro	APW East Lampung dan Metro TA Consultants	2026	2030
90	INST2	WUA/ WUAF/ WUAA	Capacity building for WUA, WUAF and WUAA.	104 WUA have capacity to manage tertiary irrigation system; 13 WUAF, 3 WUAA have capacity and participate in rehabilitation works of secondary and primary irrigation networks	East Lampung, Metro	APW East Lampung dan Metro TA Consultants	2026	2030
91	INST2	WUA/ WUAF/ WUAA	Capacity building for WUA, WUAF and WUAA.	104 WUA/13 WUAF/3 WUAAs perform the given tasks without any significant constraint	East Lampung, Metro	APW East Lampung dan Metro TA Consultants	2026	2030
92	INST3	WUA/ WUAF/ WUAA	WUAA formation	2 WUAA in Raman Utara and Batanghari Utara formed	East Lampung	APW East Lampung TA Consultants	2026	2030
93	INST3	WUA/ WUAF/ WUAA	Legalization for WUA, WUAF, WUAA that enable them to represent the members and participate in all activities/entities relating to Way Sekampung management, operation and maintenance	10 WUAs, 3 WUAFs dan 2 WUAAs in East Lampung established and legalized	East Lampung	APW East Lampung TA Consultants	2026	2030
94	INST3	WUA/ WUAF/ WUAA	Capacity building of WUAs, WUAFs and WUAA to manage the organization and perform the tasks together with the members	28 WUAs have capacity to manage tertiary irrigation system; 4 WUAF, 2 WUAA have capacity and participate in rehabilitation works of secondary and primary irrigation networks	East Lampung	APW East Lampung TA Consultants	2026	2030
95	INST3	WUA/ WUAF/ WUAA	Capacity building for WUA, WUAF and WUAA.	28 WUA/4 WUAF/2 WUAAs perform the given tasks without any significant constraints	East Lampung	APW East Lampung TA Consultants	2026	2030
96	HR2	O&M field operators	Rearrange the placement of O&M operators in Way Sekampung irrigation system to meet standard work areas with more proportional distribution	O&M operators (UPT heads, Mantri and Gate Keeper) in 5 UPTD Central Lampung, East Lampung and Metro in adequate number available	UPTDs Bekri, Metro, KPDs Pekalongan, Sekampung, Purbolinggo	HSWRM Lampung Province, APW East Lampung dan Metro	2026	2030
97	HR2	O&M field operators	Training for Mantri and PPA to acquire competency certificates	5 UPTD heads, 8 mantri and 78 PPA trained	Central Lampung, East Lampung, Metro	BBWS MS	2026	2030

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
98	HR2	Field operator status	Test Gate Keeper (PPA) with non-civil servant status to be civil servants or contract-based employees (PPPK) at functional positions	40 PPA with non-civil servant status recruited as civil servants or contract-based employees (PPPK)	Central Lampung	APW Central Lampung	2026	2030
99	HR2	Field operator status	Apply career development system for O&P operators	O&P operators of civil servant have functional status and non-civil servant have PPPK based employment status	Central Lampung, East Lampung, Metro	APW Central Lampung	2026	2030
100	HR2	Manager capacity, to have 1 manager for WUAA/Empowerment	Training for WUA/WUAF/WUAA managers	Training 40 WUA, 3 WUAF, 1 WUAA managers	Central Lampung, East Lampung, Metro	APW Central Lampung TA Consultants	2026	2030
101	HR2	WUA/WUAF/WUAA	Training for WUA/WUAF managers.	Training for 36 WUA, 7 WUAF managers	Central Lampung, East Lampung, Metro	APW Central Lampung, East Lampung, Metro TA Consultants	2026	2030
102	HR3	The availability of O&M field operators	Rearrange the placement of O&P operators in Way Sekampung irrigation system to meet standard work areas with more proportional distribution	O&M operators (UPT heads, Mantri and Gate Keeper) in 5 KPD East Lampung in adequate number available	KPD Batanghari and KPD Raman Utara	HSWRM Lampung Province, APW East Lampung	2026	2030

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
103	HR3	O&M Field Operators	Training for Mantri and PPA to acquire competency certificates	2 KPD Heads, 4 mantri and 41 PPA trained	East Lampung	BBWS MS	2026	2030
104	HR3	Field operator status	Test Gate Keeper (PPA) with non-civil servant status to be civil servants or PPPK employees at functional positions.	12 PPA of non-civil servant recruited as PPPK / PNS	East Lampung	APW East Lampung	2026	2030
105	HR3	Field operator status	Test Gate Keeper (PPA) with non-civil servant status to be civil servants or contract-based employees (PPPK) at functional positions	O&P operators of civil servant have functional status and non-civil servant have PPPK based employment status	East Lampung	APW East Lampung	2026	2030
106	HR3	WUA/ WUAF/ WUAA	Training for WUA/WUAF managers.	Training for 20 WUA, 2 WUAF, 2 WUAA managers	Central Lampung, East Lampung, Metro	APW Central Lampung TA Consultants	2026	2030
107	OM1	Tertiary canal system construction	Conduct PRA at farmer community to introduce modern irrigation concept and identify needs of tertiary canal system	Tertiary canal system construction- 70% of 496 units	Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS TA Consultants	2031	2035
108	OM1	Additional demonstration area	Implement demplot at the selected tertiary units for ET field, Reff. percolation and water loss observation along the selected canals	ET, Reff, percolation and actual water loss along canals collected	Demo plots in Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS TA Consultants	2031	2035
109	OM1	Water productivity	Measure the outgoing discharge (m3) and take samples of paddy yields (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	Demo plots in Bekri	BBWS MS	2031	2035

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
					Sekampung Bunut Sekampung Batanghari	TA Consultants		
110	OM1	Additional gates with remote control	Operate computer program/software to compute water balance, water distribution and gate opening setting on real-time basis	Gate opening setting of 62 division structure from 48 gates and 487 turnout structures from 58 gates with remote control	Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS and APW Central Lampung	2031	2035
111	OM1	Budget based on actual needs for canal system maintenance	Maintenance work to assure water flows along canal system based on actual needs	Actual need based budget for canal system maintenance available	Bekri Sekampung Bunut Sekampung Batanghari	BBWS MS and APW Central Lampung	2031	2035
112 113	OM1 INFRA	Initiate the introduction of modern irrigation financing system in certain areas Irrigation Infrastructure – Phase 3	Conduct workshops at province and district and PRA at farmer community to introduce the application of modern irrigation financing system based on water service value as input for farming activities Update inspection records 2019, assess work volume including to update typical design and prepare tender documents	Initial introduction of modern irrigation financing system accepted in certain areal Tender design, technical estimate, BoQ and tender documents for service areas of 8,164 ha available and investigation of additional supply system to weir location	Selected areas in Bekri Sekampung Bunut Sekampung Batanghari Raman Utara Batanghari Utara	BBWS MS, Bappeda dan APW Lampung Province, Bappeda dan APW East Lampung, Bappeda dan APW Central Lampung, WUAFs DGWR and BBWS MS responsible for service contract of inspection and tender document preparation	2031 2031	2035 2035
114	INFRA	Irrigation Infrastructure – Phase 3	Deal with all shortcomings identified during inspection and install measuring devices to canal and outlet structures	Update inspection records 2019 for canal repair 37.547 m of total length reaching 109.900 m (34%), <i>lining canal invert</i> 13.864 m (13% of the total, masonry works to division structure 117 m3; Sedimen removal 13.800 (13% of the total), Install measuring devices at 196 gates	Raman Utara Batanghari Utara	DGWR and BBWS MS responsible for contract of canal construction and rehabilitation and contract for the procurement and installation of electromechanical works	2031	2035
115	INFRA	Irrigation Infrastructure – Phase 3	Improves functional test to Irrigation Infrastructure	Calibration to new measuring devices at 196 gates and the existing 84 measuring devices covering service area 8,164 ha, on seasonal basis but more preferable on annual basis, recalibration as necessary and evaluation report	Raman Utara Batanghari Utara	BBWS responsible for service contract of gate calibration Service contract for calibration monitoring and evaluation	2031	2035
116	INFRA	Irrigation Infrastructure – Phase 3	Modify gate for remote monitoring and gate opening setting	Install actuator at 28 electromechanical gates for remote monitoring and gate opening control	Raman Utara Batanghari Utara	BBWS MS responsible for service contract of procurement, installation and testing of actuator and software controls	2031	2035
117	INFRA	Irrigation Infrastructure – Phase 3	Functional test of automatic gates with remote control	Test on seasonal basis but preferable on annual basis, adjustment and modification according to the needs and final calibration report	Raman Utara Batanghari Utara	BBWS MS responsible for service contract of procurement, installation and testing of actuator and software controls	2031	2035

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
118	OM1	Tertiary Canal Redesign	Redesign tertiary canal system	Redesign tertiary canals - 281 units	Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2031	2035
119	OM1	Demonstration area	Tertiary canal construction, Demo Plot	Tertiary canal system constructed for demo plot locations	3 locations in Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2031	2035
120	OM1	Demonstration area	Implement demplot at the selected tertiary units for ET field, Reff. percolation and water loss observation along the selected canals	ET, Reff, percolation and actual water loss along canals collected	Demo plots in Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2031	2035
121	OM1	Water Productivity	Measure the outgoing discharge (m3) and take samples of paddy yields (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	Demo plots in Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2031	2035
122	INFRA	Irrigation Infrastructure – Phase 3	Modify gates with service area > 2.000 ha and intake of Garongan and Raman weir for automatic control and remote control	Modify 12 structures, install power supply, actuators of automatic and electromechanical gates in 28 gates			2031	2035
123	INFRA		Functional test of automatic gates and automated flow control	The test continues for several times but more preferable on annual basis, adjustment and modification as necessary and final calibration report	Raman Utara Batanghari Utara	BBWS MS responsible for service contract of actuator and control software operation and adjustment	2031	2035
124	INST2	Irrigation Commission	Capacity building for members of Province and District KPU referring to Circular Letter o DGWR 01 / SE / D / 2018	Activate province and district Irrigation Commission to support the government of Indonesia in irrigation modernization	Lampung Province East Lampung Metro	Bappeda, HSWRM Lampung Province, Bappeda, APW East Lampung I, Metro, TA Consultants	2031	2035
125	INST2	WUA/ WUAF/ WUAA	Capacity building for WUA, WUAF and WUAA.	104 WUA/13 WUAF/3 WUAAs performs the given tasks in effective way	East Lampung, Metro	APW East Lampung and Metro TA Consultants	2031	2035
126	INST3	WUA/ WUAF/ WUAA	Capacity building for WUA, WUAF and WUAA.	28 WUA/4 WUAF/2 WUAAs performs the given tasks in effective way	East Lampung	APW East Lampung TA Consultants	2031	2035
127	HR1	Training on Discharge Measurement	Staff training in discharge and water level measurement along canal system	4 Mantri and 40 gate keeper trained in operating measurable water distribution	Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2031	2035
128	HR2	Field operator status	Test Gate Keeper (PPA) with non-civil servant status to be civil servants or PPPK employees at functional positions.	38 PPA of non-civil servants recruited as PPPK employees or civil servant	Central Lampung	APW Central Lampung	2031	2035

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
129	HR2	Field operator status	Apply career development for O&M operators	O&M operators with civil servant status have functional position and non-civil servant have PPPK-employment status	Central Lampung, East Lampung, Metro	APW Central Lampung	2031	2035
130	HR3	Field operator status	Test Gate Keeper (PPA) with non-civil servant status to be civil servants or PPPK employees at functional positions.	11 PPA recruited as PPPK / Civil Servant	East Lampung	APW East Lampung	2031	2035
131	HR3	Field operator status	Test Gate Keeper (PPA) with non-civil servant status to be civil servants or PPPK employees at functional positions.	O&M operators with civil servant status have functional position and non-civil servant have PPPK-employment status	East Lampung	APW East Lampung	2031	2035
132	OM1	Tertiary canal system construction	Conduct PRA at farmer community to introduce modern irrigation concept and identify needs of tertiary canal system	Tertiary canal system constructed - 30% of 281 units	Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2036	2040
133	OM1	Additional demonstration area	Implement demplot at the selected tertiary units for ET field, Reff. percolation and water loss observation along the selected canals	ET, Reff, percolation and actual water loss along canals collected	Demo plots in Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2036	2040
134	OM1	Water productivity	Measure the outgoing discharge (m3) and take samples of paddy yields (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	Demo plots in Raman Utara and Batanghari Utara	BBWS MS TA Loan Consultant	2036	2040
135	OM1	Initiation and introduction of automatic gate operation	Operate computer program/software to compute water balance, water distribution and gate opening setting on real-time basis	Set gate opening in division structure serving areas >2000 ha with remote control	Raman Utara and Batanghari Utara	BBWS MS and APW Central Lampung	2036	2040
136	OM1	Actual need-based budget for canal system maintenance	Maintenance work to assure water flows along canal system based on actual needs	Actual need-based budget for canal system maintenance available	Raman Utara and Batanghari Utara	BBWS MS and APW Central Lampung	2036	2040

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
137	OM1	Introduce modern irrigation financing system	Conduct workshops at province and district and PRA at farmer community to introduce the application of modern irrigation financing system based on water service value as input for farming activities	Modern irrigation financing system accepted	Raman Utara and Batanghari Utara	BBWS MS, Bappeda and APW Lampung Province, Bappeda and APW East Lampung, Bappeda and APW Central Lampung, WUAF	2036	2040
138	OM1	Tertiary Canal System Construction	Conduct PRA at farmer community to introduce modern irrigation concept and identify needs of tertiary canal system	Tertiary canal system construction - 70% of 281 units	Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2036	2040
139	OM1	Additional demonstration area	Implement demplot at the selected tertiary units for ET field, Reff. percolation and water loss observation along the selected canals	ET, Reff, percolation and actual water loss along canals collected	Demo plots at Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2036	2040

No.	Pillar	Aspect	Activities	Objectives	Location	Implemented by	Start	Finish
140	OM1	Water productivity	Measure the outgoing discharge (m3) and take samples of paddy yields (ton GKP/ha)	Evaluate water productivity (M3 / Kg GKG) based on paddy yields expressed in ton GKP/ha	Demo plots at Raman Utara and Batanghari Utara	BBWS MS TA Consultants	2036	2040
141	OM1	Increase the number of automatic gates	Operate computer program/software to compute water balance, water distribution and gate opening setting on real-time basis	Set gate opening in 20 division structure from 16 gates and in 193 cross regulators from 196 gates with remote control	Raman Utara and Batanghari Utara	BBWS MS and APW Central Lampung	2036	2040
142	OM1	Actual need-based budget for canal system maintenance	Maintenance work to assure water flows along canal system based on actual needs	Actual need-based budget for canal system maintenance available	Raman Utara and Batanghari Utara	BBWS MS and APW Central Lampung	2036	2040
143	OM1	Introduce modern irrigation financing system in certain areas	Conduct workshops at province and district and PRA at farmer community to introduce the application of modern irrigation financing system based on water service value as input for farming activities	Initial introduction of modern irrigation financing system accepted in certain areas	Area terpilih at Raman Utara and Batanghari Utara	BBWS MS, Bappeda and APW Lampung Province, Bappeda and APW East Lampung, Bappeda and APW Central Lampung, WUAF	2036	2040

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