



**ASIAN INFRASTRUCTURE
INVESTMENT BANK**

December 13, 2024

Sovereign-Backed Financing

Approval Project Document

P000682 Cambodia: Integrated Water Resources Management Project

Currency Equivalents

(As of July 29, 2024)

Currency Unit – Cambodia Riel (KHR)

KHR1.00 = USD0.00024

USD1.00 = KHR4107

Borrower's Fiscal year

January 1 – December 31

Abbreviations

ADB	Asian Development Bank
ADF	Asian Development Fund
AIDS	Acquired Immunodeficiency Syndrome
AIIB	Asian Infrastructure Investment Bank
AWD	Alternate Wetting-and-Drying
BB1	Alignment with Climate Mitigation Goals
BB2	Alignment with Climate Adaptation and Resilience Goals
BCMs	Billion Cubic Meters
BRP	Basic Resettlement Plan
CAISAR	Climate Adaptive Irrigation and Sustainable Agriculture for Resilience
CAPEX	Capital Expenditure
CCRSIWDFM	Country Climate Resilient Sustainable Irrigation and Water Drought and Flood Mitigation
CPI	Consumer Price Index
CSOs	Civil Society Organizations
CMS	Cubic meters per second
CRVA	Climate Risk Vulnerability Assessment
DEDs	Detailed Engineering Designs
DFWUCs	Department of Farmer Water Users Communities
DPs	Development Partners
EDC	Électricité du Cambodge
EIA	Environment Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
ENPV	Expected Net Present Value
ES	Environmental and Social
ESP	Environmental and Social Policy
FM	Financial Management
FS	Feasibility Study
FWUCs	Farmer Water User Communities
GAP	Gender Action Plan
GCF	Green Climate Fund
GDIA	General Department of Internal Audit
GFPs	Gender Focal Points
GHGs	Greenhouse Gas
GDP	Gross Domestic Product
GDR	General Department of Resettlement
GMAG	Gender Mainstreaming Action Group
GMSP	Gender Mainstreaming Strategic Plan

GRM	Grievance Redress Mechanism
HIV	Human immunodeficiency virus
IAD	Internal Audit Department
IDA	International Development Association
IEE	Initial Environmental Examination
IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
IP	Indigenous Peoples
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resource Management
IS	Irrigation System
JICA	Japan International Cooperation Agency
LARPF	Land Acquisition and Resettlement Planning Framework
MAFF	Ministry of Agriculture, Forestry and Fisheries
MDB	Multilateral Development Bank
MEF	Ministry of Economy and Finance
M&E	Monitoring and Evaluation
MME	Ministry of Mine and Energy
MOE	Ministry of Environment
MRC	Mekong River Commission
MoWRAM	Ministry of Water Resources and Meteorology
MRD	Ministry of Rural Development
NDC	Nationally Determined Contribution
NGOs	Non-government Organizations
NSDP	National Strategic Development Plan
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OPIR	Operational Policy on International Relations
PA	Paris Agreement
PAA	Paris Agreement Alignment
PDS	Project Delivery Strategy
PDWRAM	Provincial Department of Water Resources and Meteorology
PAM	Project Administration Manual
PIU	Project Implementation Unit
PMICs	Project Management and Implementation Consultants
PMU	Project Management Unit
PMO	Project Management Office
PPSF	Project Preparation Special Fund
PPQ	Project Prioritization and Quality
RBCs	River Basin Committees
RBMP	River Basin Management Plan
RFP	Request for Proposal
RGC	Royal Government of Cambodia
R&R	Relief and Resettlement
STIs	Sexually transmitted Infections

SFW	Special Fund Window
SOPs	Standard Operating Procedures
SPS	Safeguards Policy Statement
SPP	Strategic Procurement Plan
SWRF	Shadow Wage Rate Factor
TA	Technical Assistance
TSL	Tonle Sap Lake
tCO2e	Tons Carbon Dioxide Equivalent
TOR	Terms of Reference
UNDP	United Nations Development Program
UXO	Unexploded Ordnance
WAs	Withdrawal Applications
WEO	World Economic Outlook
WRM	Water Resources Management

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1. Summary Sheet

Project No.	P000682
Project Name	Cambodia: Integrated Water Resources Management Project
AIIB Member	Kingdom of Cambodia
Borrower	Kingdom of Cambodia
Sector Subsector	Water Water resources management
Alignment with AIIB's thematic priorities	Green Infrastructure; Technology-enabled Infrastructure
Project Objective	The objective of the Project is to increase irrigation water availability in the dry season and reduce the risk of wet season flooding in Pursat and Sangker River Basins through an integrated water resource management (IWRM) approach.
Project Description	<p>The Project will: (i) strengthen the water resource management capacities of the provincial River Basin Committees (RBCs) in Battambang Province and Pursat Province and develop water basin management plans in Pursat and Sangker River Basins (Component 1); (ii) remodel or upgrade water regulators and irrigation canals to increase irrigation water availability in the dry season (Component 2); and (iii) improve flood-control and drainage facilities to reduce flood risks in the wet season (Component 3).</p> <p>The Project will be co-financed with the Asian Development Bank (ADB), which is the lead co-financier. AIIB and ADB both provided grants to support the Project preparation work with the following amount:</p> <ul style="list-style-type: none"> • AIIB's Project Preparation Special Fund (PPSF) grant: USD 4,939,675 • ADB's Technical Assistance (TA) grant: USD 4,300,000 <p>ADB's TA was used to prepare the Feasibility Study (FS), and AIIB's PPSF is being used for detailed engineering designs (DEDs), procurement package assistance, and additional survey activities required under the FS.</p>
Implementation Period	January 01, 2025 December 31, 2030
Expected Loan Closing Date	June 30, 2031
Proposed Amount of AIIB Financing	USD80 million

Financing Plan	Asian Infrastructure Investment Bank: USD 80.00 million Asian Development Bank: USD 87.99 million Government of Cambodia: USD 30.19 million Total: USD 198.18 million
ES Category (or AIIB equivalent, if using another MDB's ES Policy)	A
ES Category Comments	Significant involuntary land acquisition by the Project
Risk (Low/Medium/High)	Medium
Conditions of Effectiveness	Fulfillment of all conditions to the effectiveness of ADB's loan agreement (except for the effectiveness of AIIB's loan agreement)
Key Covenants	Sustainable water resources operation and maintenance strategies are to be implemented two years before the completion of the Project.
Conditions for Disbursement	Establishment of a Project Steering Committee satisfactory to the Bank
Retroactive Financing (Loan % and dates)	Advanced contracting is proposed for the Project. Proposed items to be covered by the advance contracting include Project Management and Implementation Consultants (PMICs), Environmental Impact Assessment consultants, financial management consultants, and procurement consultants. Eligible expenditures up to 20 percent of the loan amount incurred before the applicable loan effectiveness date but not earlier than 3 months before loan signing.
Policy Waivers Requested	No
Policy Assurance	The Vice President, Policy and Strategy, confirms an overall assurance that the proposed Bank Financing complies with the applicable Bank operational policies.
Economic Capital (ECap) Consumption (USDm)	47.49% USD34.26

President	Liqun Jin
Acting Vice President	Rajat Misra
Director General	Rajat Misra
Manager	Toshiaki Keicho
Team Leader	Ronald Muana, Investment Officer
Team Members	Bo Zhang, Investment Officer (Former Team Leader) Jiaqi Su, Economist Jingrong He, SFD - Procurement Specialist Shodi Nazarov, SFD - Financial Management Specialist Christopher Damandl, Project Counsel Dale Pham, SFD - Environment Specialist Suu Tran Quy, SFD - Social Development Specialist Jinghui Li, Project Assistant

2. Context

2.1. Country and Macroeconomic Overview. Cambodia has experienced rapid economic growth over the past decade, with an average annual growth rate of 7 percent. Consequently, the Gross Domestic Product (GDP) per capita almost doubled from USD950.5 in 2012 to USD1,759.6 in 2022. The economy rebounded from a 3 percent contraction in 2020 to 3 percent growth in 2021 and then increased to 5 percent in 2022 and 2023. Recent growth has been driven by rapid industrialization as well as the financial and trade liberalization reforms. The country's exports, led by labor-intensive manufacturing products, such as garments and footwear, grew from 54 percent of GDP in 2010 to 78 percent in 2022. Net Foreign Direct Investment (FDI) inflows also increased from less than 3 percent of GDP in the early 2000s to over 11 percent in 2022.

The country has made steady progress in diversifying from an agriculture-intensive economy to higher productivity sectors, with employment shifting from agriculture to manufacturing. The share of agriculture in employment declined from 55 percent in 2010 to less than 40 percent in 2022, while the industrial sector's share increased from 16 percent to 25 percent. The rise in national income has also driven an expansion in the non-tradable sector, with the share of construction in GDP growing from 4.9 percent to over 10 percent from 2012 to 2022. This period of sustained growth boom has also led to marked poverty reduction, which declined from 36.7 percent in 2014 to 16.6 percent in 2022.

2.2. Sector Overview.

2.2.1. Water Sector. Water resources are abundant in Cambodia, with an estimated 475 billion cubic meters (BCMs) from the Mekong system and 20 BCMs from groundwater. The Mekong River and Tonle Sap Lake (TSL) are key water resources for Cambodia's agriculture, fish production, biological diversity, water transport, and hydropower. The total quantity of water used each year is around 750 million BCMs, of which 95 percent is used for irrigated agriculture.

2.2.1.1. Limited and inadequate water supply capacity. The available irrigation water in Cambodia has been limited yearly during the dry season due to extreme variation of rainfall, flat topography, lack of water storage, and poor infrastructure accessible to the water. The river basins that drain into the TSL have faced severe water shortages, with monthly rainfall of often less than 100 millimeters during the dry season (November to April). These river basins are likely to face hotter days and more rainless periods in the dry season due to climate change, with consequent impacts of significant increases in evapotranspiration from crops, and longer and more intensive agricultural droughts. The poorly designed water infrastructures, compounded by the absence of consideration of climate change impacts, also hamper efficient water distribution and threaten ecohydrology by limiting the migration of fish and other aquatic animals.¹ Another challenge is inefficient and ineffective water use with limited operation and maintenance (O&M) for end-user facilities. Severe nationwide droughts from 2015 to 2016 resulted in (i) 37 percent of households reporting water shortages, (ii) 62 percent of households reporting income losses, and (iii) a 22 percent decline in household paddy and cassava production. Households residing along

¹ Fish still provide over 80% of protein in the national diet, and most harvested fish are migratory species and from the TSL.

the TSL region were the most affected, with production losses estimated at 29 percent. On average, approximately 20 percent of household income was lost due to the drought.

2.2.1.2. Frequent floods during the wet season. Cambodia is one of the world's most flood-exposed countries, with an estimated affected population of around 4 million people, or 25 percent of the population, and estimated annual losses of USD 250 million.² Although the annual flood pulse of the Mekong River and the TSL is essential for fisheries and ecological systems, extensive flash flooding during the wet season severely impacts the country.³ Rural women, female-headed households, and the poor are most affected. Serious flood damage has been attributed to (i) insufficient physical assets for flood risk management; (ii) insufficient allocation of flood protection capacity within existing reservoir storages; (iii) poor flood forecasting, early warning, and preparedness systems; and (iv) limited investment and O&M funding for physical interventions. During the severe flood event in October 2020, at least 14 provinces and approximately 176,000 households were affected, with 38 people perished and 330,000 hectares (ha) of crops damaged. 80 percent of the affected households were from the TSL region.

2.2.2 Agriculture Sector. The development of the agriculture sector is crucial to mitigate the deteriorating food security and nutrition conditions faced by poor and vulnerable communities. The share of the agriculture sector is still relatively high at around 23.7 percent in 2022 but its contribution to the total GDP declined from 50 percent to 33 percent during the 1990s. This is partly due to the rapid growth of the industrial sector but also to the limited growth in the agriculture sector's contribution to GDP growth, which ranged from 0.8 percent to 1.7 percent during 2016-2022. This limited growth was caused by the persistent low productivity in unprocessed rice production, the decline in global commodity prices since 2014, and adverse weather (rain and drought) conditions. The proportion of the rural population is as high as 75 percent of the national population in 2022. Women represent 39 percent of the agricultural workforce in 2021. However, women only own 12.4 percent of the recorded land area and are estimated to receive only about 10 percent of all agriculture extension services. Given the high share of rural employment, the agriculture sector remains critical for poverty reduction.

2.2.3. Government Sector Strategies.

2.2.3.1. Water Sector Strategies. The National Strategic Development Plan (NSDP) for 2019 to 2023 requested the Ministry of Water Resources and Meteorology (MoWRAM) to implement integrated water resource management (IWRM)⁴. MoWRAM's 15-year program provides a pathway to strengthen sustainable water resources management (WRM) by adapting to climate change impacts⁵. The government developed its National Adaptation Plan in 2017 and updated its Nationally Determined Contribution (NDC) in 2020, which

² Willner, S., Levermann, A., Zhao, F., Frieler, K. 2018. [Adaptation required to preserve future high-end river flood risk at present levels](#). *Science Advances*. 10 January; and ADB and The World Bank Group. 2021. [Climate Risk Country Profile: Cambodia](#)

³ The Mekong River and the TSL are connected by the Tonle Sap River.

⁴ Government of Cambodia. 2019. *National Strategic Development Plan*. Phnom Penh.

⁵ Government of Cambodia, MOWRAM. 2019. *Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019–2033*. Phnom Penh.

proposed 17, 7, and 6 adaptation actions for agriculture, livelihoods, poverty, biodiversity, and water resources, and the mitigation targets⁶.

2.2.3.2. Agriculture Sector Strategies. The NSDP 2019-2023 emphasized the importance of inclusive and sustainable development, focusing on enhancing the resilience and productivity of the agriculture sector. The Agricultural Sector Master Plan 2030 was developed, in alignment with the NSDP 2019-2023, to increase the competitiveness and sustainability of the sector by improving the irrigation system, land management, and connectivity to local and global markets.

2.3. Addressing Key Development Challenges.

A decrease in available water and further flood damage are projected to be exacerbated by climate change. The Project will focus on the Pursat and Sangker river basins located in the Provinces of Pursat and Battambang, respectively, southwest of the TSL. These river basin groups have been assessed as highly vulnerable to climate change impacts⁷. In the target basins, expected changes to precipitation and temperature patterns will result in higher temperature and evapotranspiration and more rainless days in the dry season, impacting water supply and demand in the dry season. Substantial increases in wet season rainfalls are also expected, increasing the risk of both riverine and lowland flash flooding events. The potential for increased peak water levels at the TSL will further exacerbate the risks. Although these risks can be effectively mitigated under the climate adaptive IWRM, due to the limited capacities of provincial agencies, the water resources have not been planned and managed in harmonized and coordinated manners across sectors. Farmer water user communities (FWUCs) are responsible for maintaining the water distribution system in coordination with the Provincial Department of Water Resources and Meteorology (PDWRAM). However, the performance of FWUCs is relatively poor, requiring significant capacity building and support towards irrigation scheme O&M, organizational development, financial management, and stakeholder engagement, among others.

The Project's key interventions are expected to mitigate the shortage of irrigation water in the dry season and flooding in the wet season in the target river basins. Moreover, capacity building will be provided to the provincial River Basin Committees (RBCs) and FWUCs. When the Project is fully implemented, it is expected to have a positive development impact in Cambodia, including enhancing the water availability for irrigation, reducing the vulnerability to flooding, and adopting environmentally sustainable and fish-friendly river management.

⁶ Ministry of Environment and National Council for Sustainable Development. 2017. *Cambodia National Adaptation Plan, Financing Framework, and Implementation Plan*. Phnom Penh.

⁷ ADB. 2021. ADB Briefs No. 171 Surface Water Resources Assessment of the Tonle Sap and Mekong Delta River Basin Groups: Improving Climate Resilience, Productivity, and Sustainability. Manila.

3. Rationale

3.1. Project Objective. The objective of Cambodia: Integrated Water Resources Management Project (“*the Project*”) is to increase irrigation water availability in the dry season and to reduce the risk of wet season flooding in Pursat and Sangker River Basins through an IWRM approach.

3.2. Expected Beneficiaries. The Project is expected to benefit farmers in Pursat and Battambang provinces, and governmental agencies at both national and provincial levels involved in water resources planning, development and management, and Project implementation. Communities involved in the economy of the Project area are secondary beneficiaries. The Project’s direct beneficiaries comprise approximately 72,230 people who are vulnerable to climate-induced drought risks and 54,700 people who are vulnerable to climate-induced flood risks.

3.3. Project Description. The Project supports the government’s goal to make Cambodia’s water resource management climate-adaptive and sustainable to support social and economic growth and ecosystem protection⁸. The Project will focus on the river basin group covering the Pursat and Sangker Rivers located in the Provinces of Pursat Province and Battambang, respectively. These river basins were assessed as highly vulnerable to climate change impacts.⁹ Expected changes to precipitation and temperature patterns will result in less water supply and increased drought risks in the dry season and more concentrated precipitation resulting in more flooding during the wet season. The Project will help address these issues by strengthening irrigation and flood-control systems to be more efficient and resilient and supporting institutional capacity building of the River Basin Committees.

The Project has three components with five main subprojects. Component 1 aims to operationalize River Basin Committees (RBCs) and develop River Basin Management Plans (RBMPs), which include drought forecasting, early warning, and hydrological monitoring systems. Component 2 focuses on modernizing irrigation systems to improve water management across nearly 30,000 ha, which includes the (i) Rehabilitation and modernization of three blocks in the Kanghot Irrigation System Battambang (17,000 ha) (ii) Rehabilitation and modernization of the Kbal Hong Irrigation System Pursat (11650 ha) (iii) Construction or improvement of 12 fish passes. Component 3 focuses on the upgrading of flood management infrastructure, which includes the (iv) Improvement of flood risk management of the Sangker River in Battambang Province and (v) Improvement of flood risk management of the Pursat River in Pursat Province.

The Project has significantly benefited from upstream studies funded by AIIB’s PPSF (USD4.94 million) and the ADB’s TA (USD1.4 million). During the Project preparation, a comprehensive social, gender, and poverty assessment was conducted with a deliverable of the gender action plan (GAP). By following the GAP, the Project is expected to directly benefit women counting for more than 50 percent of the target population. The well-prepared Project’s Climate Risk and Adaptation Assessment report presented a clear

⁸ Government of Cambodia, MOWRAM. 2019. *Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019–2033*. Phnom Penh.

⁹ ADB. 2021. [ADB Briefs No. 171 Surface Water Resources Assessment of the Tonle Sap and Mekong Delta River Basin Groups: Improving Climate Resilience, Productivity, and Sustainability](#). Manila.

climate change rationale for the Project and how climate change could be incorporated into the Project design to ensure the delivery of climate-resilient outcomes in different Project components.

3.4. Expected Results. The Project is expected to generate the following results:

- (i) Component 1: Water resource management capacities of the provincial RBCs strengthened, and river basin management plans developed.
- (ii) Component 2: Irrigation water supply capacity increased during the dry season.
- (iii) Component 3: Flood risks are reduced during the wet season.

3.5. Strategic fit for the Asian Infrastructure Investment Bank (AIIB). The Project is aligned with AIIB's thematic priorities of Green Infrastructure and Technology-enabled Infrastructure, and the guiding principles of the Water Sector Strategy and the Digital Infrastructure Strategy. In addition, the Project will contribute to achieving the climate financing target set out in the AIIB's Corporate Strategy.

- (i) The Project aligns with Green Infrastructure priority and Water Sector Strategy by investing in climate adaptation and mitigation infrastructure such as water regulators to control floods and irrigation canals with nature-based solutions, flood monitor systems, and fish-friendly passages. The Project also aims to reduce greenhouse gas (GHG) emissions by using new gravity-based irrigation systems, replacing individual diesel pumps with electric pumping stations, and piloting alternative wetting-and-drying (AWD) techniques.
- (ii) The Project aligns with the Technology-enabled Infrastructure priority and Digital Infrastructure Strategy by promoting sustainable infrastructure, integrated water resources management, and adopting innovative technologies. Expected activities include upgrading existing and installing new hydrometeorological stations equipped with remote monitoring and data transmission systems for the irrigation infrastructure and developing drought and flood forecasting and warning systems. By using real-time hydrometeorological data, farmers can make better decisions on the timing to plant, irrigate and harvest crops. Drought and flood warning systems could facilitate timely actions to save lives and reduce losses.

3.6. Paris Agreement Alignment (PAA) and Climate Finance. In line with the AIIB methodology for assessing the alignment with the mitigation and adaptation goals of the Paris Climate Agreement, the Project is assessed as aligned. In line with the joint multilateral development bank (MDB) methodology for tracking climate finance, it is estimated that USD23.1 million of the Project cost contributes to support mitigation and that USD124.82 million of the Project cost contributes to support adaptation. Details on the assessment are provided in Section Climate Change.

3.7. Value addition by AIIB. AIIB's participation will strengthen the Project by contributing to the following aspects:

- AIIB's Project Preparation Special Fund (PPSF) grant enhances the implementation readiness of the Project. The co-financier ADB's technical assistance (TA) grant is limited and only applies to Feasibility Study (FS) preparation. AIIB's PPSF was critical to FS finalization by funding key inputs such as topographic and geotechnical

surveys, fish migration studies, etc. AIIB's PPSF also funds the detailed engineering designs (DEDs) of the civil works components ensuring the project is procurement and construction-ready.

- AIIB is committed to supporting technology-enabled infrastructures. At the Project preparation stage, AIIB requested the FS team to explore as many options as possible for applying new technologies to the Project.
- AIIB's agility, efficiency, and flexibility in responding to the client's needs nurtured a long-term relationship with the Royal Government of Cambodia (RGC). The RGC regarded AIIB as one of the "first-to-go" development partners in the water sector.
- AIIB's Special Fund Window (SFW) to buy down interest rates provides more room for the Cambodian government to meet the concessional requirement of its external borrowings.
- AIIB's flexibility in offering the Chinese Yuan (RMB) as one of the loan currencies gives RGC more options to choose from.

3.8. Value addition to AIIB.

- The Project is a part of the "Country Cooperation Framework" between Cambodia and AIIB¹⁰, which is AIIB's first country programming arrangement in Cambodia. The Project will, therefore, enhance AIIB's engagement with the RGC and solidify the long-term relationship with respective ministries and agencies in the country. It will also expand AIIB's influence among development agencies in Cambodia.
- AIIB does not have much precedence in combining the PPSF with ADB's TA for project preparation. Coordinating with ADB on the usage of grants strengthens AIIB's capacity to implement PPSF on complex projects alongside other donors.
- An important part of the Project is supporting agriculture-related activities such as AWD cropping techniques. AIIB is gradually enlarging its mandate scope to more productive sectors that are in great need by the members, including the agriculture sector. The Project is a valuable opportunity for AIIB to acquire knowledge and experience in this sector through a learning-by-doing approach from the co-financier.
- The Project provides an opportunity to further build AIIB's internal capacity for climate adaptation, irrigation, flood management, and climate-resilient infrastructure through close collaboration with the co-financier. This helps AIIB to be more confident to prepare and invest in more standalone water-sector projects including the two projects that are under preparation: the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project, and the Country Climate Resilient Sustainable Irrigation and Water Drought and Flood Mitigation (CCRSIWDFM) Project. All three projects focus on water resource management, irrigation, and building resilience to climate change in Cambodia. The cumulative benefits and impacts will further position AIIB as a partner of choice in Cambodia.

3.9. Lessons Learnt and Reflected in the Project Design. The Project's design has integrated the lessons drawn from both international best practices, as well as MDB's

¹⁰ The "Country Cooperation Framework" was the first multi-year rolling pipeline between AIIB and Cambodia, which was endorsed by both sides in July 2023. The pipeline included a total amount of USD 1.3billion proposed projects.

experience by taking IWRM practices as a way to address challenges such as inadequate water supply capacity, frequent floods during wet season, weak planning, coordination, and climate change adaptation capacities of WRM at both national and provincial level governments. Key lessons learned from relevant AIIB projects in irrigation, flood management, and water resources management are drawn from ongoing projects such as the Metro Manila Flood Management Project and the West Bengal Major Irrigation and Flood Management Project. These lessons include:

- Applying an integrated approach in addressing irrigation efficiency, flood protection, and water resource management. The Project requires integration of water storage, and distribution, improving farm-level water use efficiency, and increasing the productivity of land and water. Therefore, the Project will invest throughout the system, from the water sources and irrigation intake to the tail-end of the infrastructure network.
- Adopting a long-term perspective towards sustainable planning of O&M. The design process of the Project will include a gap assessment on the planning and operating capacity of MoWRAM, PDWRAMs, and relevant FWUCs in the region to identify suitable interventions and required training programs to be incorporated in the Project.
- Need to support and develop the FWUCs as the basic building block of irrigation systems into independently functioning agriculture organizations entailing continuous training on organizational development and rights and responsibilities, technical support, and budget support, among other areas, until fully independent. Provincial government authorities also need to work closely with FWUCs to provide technical support, in case of serious breakdowns beyond FWUCs' capacity.
- Improvement of agricultural yields is not only dependent on increasing irrigation water supply but also on the application of modern farming approaches including double/triple cropping, AWD water management techniques, shift to high-value crops, and use of modern farming equipment. More extensive and intensive training about modern farming approaches needs to be provided to farmers (through FWUCs) in a sustained manner to ensure long-term adoption.
- Comprehensive analysis and planning at scale are required for optimizing WRM and flood risk reduction. Assessments are needed to address and anticipate the impacts of climate change on irrigated systems to enable informed investment decisions. The Project will carry out computational hydraulic modeling to assess impacts under several climate scenarios with results and considerations to be incorporated into the project design. Through harnessing innovative technologies including monitoring and data transmission systems, the Project will improve operational efficiency and strengthen climate resiliency.

4. Project Description

4.1 **Project Components.** The Project will finance three components as follows:

4.1.1 Component 1: Strengthen the planning, coordination, and climate change adaptation capacities of provincial RBCs¹¹. The Project aims to support RBCs in Pursat province and Battambang province, to (i) develop effective river basin management plans (RBMPs) with performance monitoring and assessment systems for the Pursat river basin of Pursat province and Sangker river basin of Battambang province; (ii) develop climate-adaptive reservoir operation plans to optimize the benefits from water storage and release; (iii) update river flow management plans with water allocation rules; (iv) upgrade existing and install additional hydrometeorological monitoring stations with remote monitoring and data transmission systems; (v) develop and operate drought and flood forecasting and warning systems; (vi) provide capacity building for RBCs and government officials on IWRM; and (vii) help MoWRAM and the two provinces develop sustainable IWRM operation and management strategies for the sustainable O&M of the developed/upgraded infrastructures under Component 2 and Component 3.

4.1.2 Component 2: Increase irrigation water availability during the dry season. To address the challenge of limited and inadequate irrigation water supply capacity, the Project is expected to: (i) redesign and reconstruct the non-functional water diversion structure in the Kbal Hong irrigation system (IS) for stable water intake and better irrigation water diversion; (ii) rehabilitate existing canals (i.e. primary, secondary, and tertiary canals) and, where necessary, construct new canals, with improved regulating structures such control gates, farm turnouts, and flood drainage channels, etc.; (iii) rehabilitate existing and construct new fish passages in 13 locations to protect migratory fish and other aquatic species from being affected by the Project; (iv) form four (4) new FWUCs and strengthen three (3) existing FWUCs for efficient water use and sustainable O&M of the tertiary canals; and (v) demonstrate and pilot alternate wetting and drying (AWD) technique¹² that reduce methane emissions and increase crop yield of rice cultivation. The activities are expected to reduce the climate-induced drought risks for the population of 37,170 in Battambang Province and 35,060 in Pursat Province.

4.1.3 Component 3: Reduce flood risks during the wet season. To address the challenge of frequent floods during the wet season, the Project will: (i) rehabilitate existing river channels in Battambang and Pursat provinces to more efficiently convey flood flow in the Sangker and Pursat Rivers; (ii) develop flood risk maps and operationalize gender-responsive community flood preparedness plans; (iii) integrate the flood mitigation components into the climate-adaptive reservoir operation plans to be developed under Component 1; and (vi) pilot nature-based solutions for river bank protection from erosions caused by heavy rains. The activities are expected to reduce the climate-induced flood risks for the population of 39,400 in Battambang Province and 15,300 in Pursat Province.

¹¹ The river basin management sub-decree was issued by MOWRAM in 2015 to provide the basis for RBCs and to operationalize the Law on Water Resources Management, which sets a framework for IWRM and river basin planning. Under this sub-decree, MOWRAM chairs the national RBC, while provincial Governors lead their respective RBCs. River basin management plans are submitted to MOWRAM by the National RBC through the provincial RBCs.

¹² The AWD method will be implemented under the ADB's Technical Assistance. The total emission of methane from rice field in Cambodia is estimated at approximately 0.376 million ton. The alternate wetting and drying method has been recommended by the International Rice Research Institute.

4.2 Project's linkage to other similar projects in Cambodia. In addition to the Project, two similar projects are under preparation in AIIB's project pipeline in Cambodia: the CAISAR Project, and the CCRSIWDFM Project. All three projects address issues of irrigation water shortage during the dry season and the flooding during wet season. The three projects cover different irrigation schemes across the country. One of the subprojects of CAISAR (Ou Ta Paong irrigation scheme) is also situated in the Pursat River basin, downstream of the Kbal Hong irrigation system under the Project. These subprojects of CAISAR and IWRM are envisioned to be designed and operated synergistically to optimize water usage.

4.3 Cost and Financing Plan

4.3.1 **Project Cost.** The estimated cost of the Project is USD198.18 million, with a USD80 million¹³ loan from AIIB, a USD83.69 million loan from ADB, a USD4.3 million grant from ADB's Asian Development Fund (ADF), and a USD30.20 million contribution from RGC.

4.3.2 To better support the Project preparation, ADB provided a USD1.4 million TA to prepare the FS and AIIB provided a USD 4,939,675 PPSF to support the DEDs of civil works under Component 2 and Component 3, and additional survey activities needed for the FS.

4.3.3 Financing Plan. AIIB and ADB will jointly co-finance the Project. The breakdown of the Project costs and financing plan are presented in Table 1 below. Considering Cambodia's International Development Association (IDA) status and upon the request from Cambodia, AIIB will allocate USD1 million of SFW as the only resource to buy down up to 100 bps interest rate for the Project¹⁴. The funding from Cambodia will be used for land acquisition, resettlement and compensation costs, taxes and duties, Project administration, and supporting consultants to the Project Management Unit (PMU). The remaining costs will be borne by the loans of AIIB, ADB, and ADF grants.

Table 1. Indicative Project Cost and Financing Plan

Item	Project Cost (USD million)	Financing (USD million)		
		AIIB	ADB including the ADF grant	RGC
Component 1	2.66	0.54	2.12	-
Component 2	131.10	59.76	64.47	6.86
Component 3	20.55	8.91	9.42	2.22
Contingencies ¹⁵	24.20	10.79	11.95	1.46
Financial charges during implementation ¹⁶	19.67	-	-	19.67
Grand Total	198.18	80.00	87.98	30.19

4.4 Implementation Arrangements

¹³ RGC has requested to take Chinese Yuan (RMB) as the loan currency for AIIB's financing part.

¹⁴ To convert the USD to CNY, AIIB's Treasury department will calculate the interest buy down rate that this financing equates to, as the Project approaches loan negotiation stage.

¹⁵ Including physical and price contingencies.

¹⁶ Including interest, commitment, and other charges on all financing resources.

4.4.1 The Project implementation will follow RGC's Standard Operating Procedures (SOPs) and the PAM for the Project management, procurement, and financial management (FM). A Project steering committee will be established. The establishment of the Project steering committee is set as the disbursement condition. The committee is to be chaired by the Minister of MoWRAM, with members from the MoWRAM, Ministry of Economy and Finance (MEF), Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Environment (MOE), Ministry of Mine and Energy (MME), Governor's offices of Pursat and Battambang Provinces, and the National River Basin Management Committee. MoWRAM will provide overall management of the Project and implement Components 2 and Component 3. The PMU headed by a Project Director has been set up by MoWRAM, which is responsible for the procurement, FM, monitoring and evaluation activities, and coordination with relevant Project Implementing Units (PIUs). Department of Farmer Water Users Communities (DFWUCs) under the MoWRAM is the key PIU at the central level to implement the Project through the PMU, for the implementation of Components 2 and Component 3. At the provincial level, the PDWRAM of the Battambang and Pursat Provinces are PIUs for most of the activities under Component 1, including the formation of RBCs and the development of RBMPs. The remaining activities under Component 1 such as capacity building for RBCs and government officials on IWRM will be provided by trainers mobilized by MoWRAM.

(i) **Procurement arrangements.**

- a. **Applicable Procurement Policies.** With ADB being the lead co-financier, the Project will follow the ADB Procurement Policy (2017, as amended from time to time) and Procurement Regulations for ADB Borrowers (2017, as amended from time to time) and the Standard Operating Procedures for Procurement for All Externally Financed Projects Programs in Cambodia. ADB Procurement Policy and Regulations are materially consistent with AIIB's Core Procurement Principles and Procurement Standards.
- b. **Institutional Arrangements.** All procurement will be undertaken by the PMU at the central level. The assessment found appropriate and adequate MDB procurement experience with PMU staff, but a concern of insufficient staffing. To mitigate the risk, a team of Project Management and Implementation Consultants (PMICs) will be hired to strengthen the procurement team's capacity under the advanced contracting arrangement.
- c. **Strategic Procurement Plan (SPP).** A comprehensive SPP, equivalent to the AIIB Project Delivery Strategy (PDS), has been prepared with detailed operation context assessment and market analysis. It concluded that advanced procurement and/or retroactive financing is expected, and universal eligibility will apply to all procurement packages to be jointly co-financed by ADB and AIIB. Procurement risks were identified in different stages of the procurement cycle, such as procurement planning, procurement implementation, and contract management. One of the key risks is the potential collusion among bidders due to the limited number of participants. The risk could be mitigated through a wider circulation of procurement notices and enhanced transparency and supervision arrangements.

The overall procurement risk rating was high at the Concept stage and medium with the implementation of mitigation measures.

- d. **Bank's Oversight of the Project Procurement.** ADB, as the lead co-financier, will be primarily responsible for reviewing and providing procurement oversight under the Project following ADB operation policies. AIIB's team will work closely with the ADB team on procurement monitoring through Project progress reports, regular Project support missions, and procurement document reviews as needed.
- (ii) **Financial Management.** The PMU will be responsible for maintaining the FM system of the Project. The cash-based accounting system will be followed for Project accounting. The PMU will maintain Project accounts and have custody of the supporting documents. The FM assessment report has been completed in February 2024. ADB has conducted a comprehensive FM assessment focusing on a review of funds flow, staffing, accounting policies and procedures, financial reporting and monitoring, and audits. The project team is satisfied with ADB's FM assessment capacity and process. AIIB's assessment and its results are mainly based on ADB's findings.

ADB will provide FM and disbursement-related services. Such services will include sharing the results of periodic financial report reviews and annual audits of Project financial statements, reviewing withdrawal applications (WAs), and conducting any other FM-related activities.

4.4.2 Implementation period. The indicative Implementation period is between January 2025 and December 2030.

4.4.3 Implementation Readiness. The FS Report, the PAM, and the SPP were completed in March 2024. The first stage DEDs contract will be awarded in August 2024 and is expected to finish by February 2025. The DEDs contracts include the preparation of bidding documents for the civil works contracts.

4.4.4 The Procurement team with clear procurement roles and responsibilities has been set up in the PMU and PIUs. PMU will lead the procurement work with procurement management, contract signing, and contract management. The PIUs' role in procurement includes the provision of site-specific inputs in the bidding documents during the bidding phase and site supervision support during the contract management phase. The SPP was prepared based on ADB's Guidance Notes on Procurement Risk Framework (2018) and Strategic Procurement Planning (2018). Advanced contracting is proposed for the Project. Proposed items to be covered by the advance contracting include PMICs, Environmental Impact Assessment consultants, financial management consultants, and procurement consultants.

4.4.5 The prepared Land Acquisition and Resettlement Planning Framework (LARPF) by the General Department of Resettlement (GDR) of the MEF has been approved by ADB. The document will guide the principles, requirements, and process of land acquisition and resettlement planning, implementation, and monitoring of the Project. A Resettlement Plan has been prepared for three subprojects (Kbal Hong barrage and intake structures, Kbal Hong Irrigation System, and Kanhhot Irrigation System) as a sample resettlement plan to

follow in preparing other resettlement plans for the Project. The GDR has confirmed that the budget will be allocated sufficiently and on time for planning, implementation, and monitoring of land acquisition and resettlement for the Project.

4.4.6 Monitoring and Evaluation (M&E). The MoWRAM will be responsible for the overall coordination of Project monitoring. The PMICs will be recruited to support the PMU in establishing or confirming baselines, monitoring the implementation process, checking the progress of the Project's results indicators, and assessing the achievements towards the Project objective. The result will be reported in every implementation support mission and will be recorded as a part of the annual implementation report from MoWRAM. AIIB and ADB will jointly monitor the status of the Project implementation and result indicators through biannual implementation support missions.

4.4.7 AIIB's Implementation Support. AIIB will proactively work with ADB to provide support on implementation. AIIB will actively participate in joint missions with ADB and allocate adequate resources to the missions and reviews.

5. Project Assessment

A. Technical

5.1. **Overall Project Design.** The Project will focus on the Pursat and Sangker River Basins in the Provinces of Pursat and Battambang respectively. The two river basins were screened and selected among a “short list” of 10 sites with proposed interventions identified by MoWRAM and the Provincial Governments of Pursat and Battambang. The key selection criteria included dry season water availability, size of command areas, social and environmental impacts during construction and operation, canal layout design prioritized by farmer stakeholders, cost efficiency, and government priorities. The two river basins selected were assessed as highly vulnerable to climate change impacts.

5.2. ADB and AIIB screened more than 10 candidate subprojects in the Pursat and Battambang river basins, in consultation with MOWRAM and participating provinces during the initial preparation phase. This screening helped identify and prioritize the minimum number of eligible subprojects (two subprojects in each of the outputs 2 and 3). The location of the diversion barrage to be remodeled in the Kbal Hong irrigation system was carefully selected based on the options analysis, considering the impacts to the land acquisition and resettlements, other water users, possible floodings as well as the costs. The Feasibility Studies considered water resource availability with climate change impacts in the next thirty years while respecting environmental flow requirements. Based on a climate change risk simulation, the project was found to be highly at risk from the impacts of climate change. The subproject design incorporated adaptation measures to reduce climate-induced drought and flood risks. ADB and AIIB carried out a climate risk and vulnerability assessment based on climate change scenarios. Following the Joint Multilateral Development Bank Methodological Approach for Assessment of Paris Agreement Alignment, the operation has been assessed as aligned with the goals of the Paris Agreement.

5.3. **Operational Sustainability.** The Project Team identified challenges to the sustainability of the project infrastructure and these include limited provisions and budgets for O&M, weak water resources management (WRM) operation capacity, and limited coordination among the ministries concerned. To address the challenges (i) the government will provide a sufficient O&M budget for the infrastructure modernized under the project and MOWRAM will operate the infrastructure following the sustainable WRM operation plan; (ii) the Project will provide capacity-building programs to the provincial governments to strengthen their planning, coordination, and operation capacities for sustainable and efficient WRM in the target river basins; and (iii) the Project will help farmers strengthen existing FWUCs or form new FWUCs with enhanced O&M capacity at on-farm level and enhanced efficiency in collection of irrigation service fees (ISF). The economic analysis supports that additional farmer revenues resulting from the Project are adequate to cover the maintenance cost of the secondary and tertiary canals. Further, with the support of ADB, MOWRAM, and FWUCs will explore the opportunities to additionally accommodate the O&M budget by introducing (i) a carbon-credit from a methane emission reduction to be piloted under the project; and (ii) a program for leasing surfaces for irrigation

canals and reservoirs for generating solar powers in coordination with the Cambodia's national utility company Électricité du Cambodge¹⁷.

B. Economic and Financial Analysis

5.4. **Economic Analysis.** The economic analysis was conducted for the two subprojects under Components 2 and Component 3 independently by comparing the cost and benefit under with- and without-project scenarios.¹⁸ The irrigation subprojects in Kanghot of Battambang Province and Kbal Hong of Pursat Province aim to protect agricultural communities from drought and enhance income through higher yields, increased cultivated area, and introduction of high-value crops. With a 25-year lifespan, the projects anticipate full benefits by Project Year (PY)7. The costs mainly consist of a capital expenditure (CAPEX) (in economic prices) of USD38 million for Kanghot USD75 million for Kbal Hong, and annual and periodic O&M costs. The benefits include increased cropping intensity and production, leading to a rise in component value and net benefits. Both subprojects surpass the social discount rate of 9 percent, with Kanghot having an economic internal rate of return (EIRR) of 22.4 percent and an expected net present value (ENPV) of USD42.7 million, and Kbal Hong an EIRR of 15.9 percent and an ENPV of USD42.4 million. The sensitivity analysis confirms their economic viability.

5.5. The Pursat and Sangker flood mitigation subprojects, with CAPEX amounting to USD 16.0 million and USD 3.8 million in economic prices, respectively, aim to protect communities from flood risks, reduce flooding area and depth, and lower losses. The subprojects are economically viable with a lifespan of 23 years, including 3 years of investment and 20 years of operations. Benefits, which commence post-construction in the fourth year, include avoided agricultural losses, reduced damages to houses, and decreased emergency costs. Both the Pursat and Sangker subprojects are expected to reduce annual flood damage to assets by USD2.8 million per year. With a 9 percent social discount rate, the Pursat subproject has an EIRR of 16.0 percent and an ENPV of USD8.4 million, while the Sangker subproject has an EIRR of 51.4 percent and an ENPV of USD17.4 million. Both subprojects remain economically viable under sensitivity tests.

5.6. **Financial Analysis.** A conventional financial analysis was not conducted as the Project does not generate a revenue stream from user fees (irrigation water supply to farmers is not billed). The sustainability of the Project depends on the timely allocation of sufficient funds for construction, operations, and maintenance by RGC in its budget. RGC has assured the provision of sufficient O&M budget for the infrastructures to be modernized under the Project. The financial analysis of the two subprojects was carried out at the farm level and the overall scheme level (FWUCs perspective). With the subprojects, the average per ha incremental income is estimated to be USD882.78 per ha for the Kbal Hong subproject area and USD742.74 per ha in the Kanghot subproject area. The O&M costs of

¹⁷ ADB has provided a transaction advisory services mandate with EDC since 2022 to support the development of 2 gigawatts of solar power in Cambodia to help the country achieve its goal of carbon neutrality by 2050. A nationwide study prioritized irrigation canals and reservoirs in the target two provinces for opportunities for generating additional solar power capacity. ADB is assisting EDC in bidding out pilot projects to the private sector.

¹⁸ The fish passages subproject was not analyzed because of its minor cost relative to the total project and the challenges in quantifying its ecological and environmental benefits due to limited data.

the irrigation facilities would comprise 14.1 percent and 8.9 percent of incremental net margin per hectare in the Kbal Hong and Kanghot irrigation subprojects respectively.

C. Fiduciary and Governance

5.7. **Procurement.** The Project SPP details procurement assessment from different perspectives, including operational context, institutions' capacity, market analysis, and procurement arrangements options analysis. Key procurement risks include: (i) high inflation causes bidder's qualification requirements beyond the bidder's past contract value, therefore discouraging participation and resulting in insufficient competition; (ii) ineffective contract management due to the lack of direct communication between supervision consultant and contractors since all correspondence is issued by the PMU; (iii) potential collusion among bidders due to limited participation; (iv) bid evaluation may be carried out with inappropriate interference; (v) insufficient PMU staff working on the Project may cause implementation delay. The following mitigation measures are proposed to mitigate the risks: (i) prepare tailored qualification criteria for experience and annual turnover such that bidders of similar completed contracts can meet the criteria; (ii) authorize supervision consultant to have direct communication with contractors for efficient and effective contract management; (iii) circulate procurement notice widely to attract more bidders and enhance transparency and supervision arrangements to avoid collusion; (iv) members of bid evaluation committee should have no conflict of interest with bidders. Additionally, pre-bid evaluation training should be provided to committee members to enhance impartiality and integrity requirements; (v) hiring additional PMICs to support the PMU.

5.8. **Financial Management.** Based on the FM assessment, the residual FM risk is Medium. The PMU has established FM systems that can meet essential Project fiduciary requirements, identify Project expenditures, and adequately report on the end use of funds. Nevertheless, the following FM risks are identified (i) there is no activity-based capture of expenses because existing ADB-funded projects under MoWRAM only capture and report expenses in a summarized form by ADB Category; (ii) not all projects are included in the scope of the annual internal audit exercise due to limitations of resources; and (iii) delays in processing fund replenishments. These risks are considered manageable. ADB has prepared an FM risk-mitigating action plan, which includes the following measures: (i) the Project's FM information system (based on the chart of accounts within the accounting software) should be focused on the Component/Sub-component/Activity format. This will provide more detailed management information on an ongoing basis. ADB Categories will be a supplementary information capture and reporting; (ii) MoWRAM will include the proposed Project under its internal audit exercise and will provide internal audit service for the proposed Project annually, and (iii) the PMU should regularly follow up with the MEF for timely submission of WAs.

5.9. The government has implemented a budgeting program in all ministries and agencies, and budgets for investment projects are included as part of the budget of the relevant program. Externally financed projects will report to two major stakeholders: the government and the development partners (DPs). Therefore, the Project implementation teams will be instructed to prepare and provide the specific reports required by the government and DPs. The Project plans and budgets are integrated into the budget submissions from the ministries.

5.10. MoWRAM has assigned one of its PMUs to supervise all MDB-funded projects. The said PMU will be responsible for the implementation of the Project. The Project PMU includes three financing officers seconded from MoWRAM and supported by national FM consultants. The national FM consultants carry out most of the detailed FM tasks, while the officers exercise oversight and control functions. The national FM consultants will be engaged with Project funding following terms of reference (TOR) developed for the Project.

5.11. The PMU utilizes Sage 50 Accounting Software, which automates Project Accounting. The data capture and mapping of this system allows customization of financial reports and is found suitable for the Project. The Project Chart of Accounts will reflect expenditure types and sources of financing. MEF's National Accounting Committee issued Guidance on Implementing the Cambodia Public Sector Accounting Standards "Cash Basis of Accounting" for Externally Financed Projects in October 2020. In compliance with this, the Project shall adopt the cash basis of accounting for budgeting, accounting, and reporting. The Projects shall record financial transactions and maintain the main Project accounts and records in US Dollars. All prime financial reports must be in US Dollars. Subsidiary accounts, records, and reports may be maintained in Cambodian Riel.

5.12. The Project will be guided by the policies of the DPs and the SOP for FM developed by RGC that applies to official development assistance-funded projects, including the proposed Project. SOP for FM will apply to any projects funded in the country. The MoWRAM has an Internal Audit Department (IAD). This department is under the oversight of the General Department of Internal Audit (GDIA) of the MEF, which is also responsible for developing and issuing guidelines for the internal audit functions of other government agencies. The IAD shall design its overall annual work program, with the help and guidance of the GDIA. MoWRAM shall select projects or subprojects to be audited based on the IAD's three-year work plan (the latest work plan covers 2022 to 24) and based on their available resources. MoWRAM agreed to include the proposed Project under its internal audit exercise and will provide internal audit service for the proposed Project annually.

5.13. The MEF is responsible for appointing external auditors for all donor-financed projects. The audits are conducted following the Cambodian Standards on Auditing and Assurance, which conforms with the International Standards of Auditing. For Project purposes, an independent auditor will conduct the external audit of the Project Financial Statements under ToR acceptable to ADB and AIIB. The PMU will furnish audited financial statements (and any accompanying Management Letter) to ADB and AIIB no later than six months after the end of each fiscal year.

5.14. **Disbursements.** ADB, as the lead co-financier, will lead Project disbursement management, which will follow ADB's Loan Disbursement Handbook (October 2022 as updated from time to time), providing ADB's disbursement policies and procedures and guiding projects to withdraw loan proceeds from the loan account. The Project will use the direct payment and advance procedures of ADB. Most of the payments are projected to be paid through direct payments. The proposed minimum withdrawal application (WA) value is USD 100,000. The PMU will prepare WAs and supporting documents and submit them to ADB through the MEF. The payments for the ADB portion will be made directly by ADB. The payments for the AIIB portion will be made directly by AIIB after receiving the payment

instructions from ADB, along with a copy of the application and the results of ADB's review of that application.

5.15. There will be one Advance Account per source of financing (as required) held jointly by MEF and MoWRAM, which is delegated to and administered by MoWRAM. There will be one Sub-Account for AIIB financing, which will be called the Designated Account (DA) and will be replenished through WAs. Sub-accounts will be replenished from the respective Advance Account, and Advance Accounts will be replenished through WAs.

5.16. RGC's funding will follow the standard RGC system for cash contributions to development projects. The Project will be included in a separate budget line within the annual MoWRAM budget, and funds will be drawn down as required through payments directly to the beneficiaries. The project team, having conducted financial due diligence, is satisfied that the counterpart funds will be available as and when needed to finance the items described in PD Paragraph 4.3.3 (Financing Plan).

5.17. **Governance and Anti-corruption.** AIIB is committed to preventing fraud and corruption in the projects it finances and will ensure that this Project is implemented in compliance with the Bank's Policy on Prohibited Practices (2016). AIIB reserves the right to investigate, directly or indirectly through its agents, any alleged corrupt, fraudulent, collusive, coercive, or obstructive practices, and misuse of resources and theft relating to the Project and will require the borrower to take necessary measures to mitigate and redress issues promptly. Detailed requirements will be specified in the Loan Agreement and the Project tender documents. AIIB will facilitate and monitor the work related to tender document preparation and tender/proposal evaluation under AIIB financing.

5.18. **Cybersecurity.** The infrastructure financed is not considered as a Critical Infrastructure.

D. Environmental and Social

5.19. **Environmental and Social Policy (ESP).** With ADB as the lead co-financier, the Project's environmental and social (ES) risks and impacts were assessed following the ADB's Safeguards Policy Statement (SPS), 2009. To provide a harmonized approach in addressing the ES risks and the impacts of the Project, and as permitted under AIIB's Environment and Social Policy (ESP), the ADB's SPS applies to the Project in lieu of AIIB's ESP.

5.20. AIIB has reviewed the ADB's SPS and is satisfied that: (i) it is consistent with AIIB's Articles of Agreement and materially consistent with the provisions of AIIB's ESP, including the ES Exclusion List and the relevant ES Standards; and (ii) the monitoring procedures that are in place are appropriate for the Project.

5.21. **Categorization and Instruments.** ADB has categorized the ES risks of the Project as Category B for Environment, A for Involuntary Resettlement, and C for Indigenous Peoples (IP), which are equivalent to Category A if AIIB ESP was applicable.

5.22. An Initial Environmental Examination (IEE), which includes an Environmental Management Plan (EMP), has been prepared (Aug. 2024) and translated into Khmer for

local stakeholder consultation and disclosure. The IEE will be updated, as needed, once the hydraulic designs of the Kbal Hong Regulator, and Main Canal 1 and Main Canal 2 Intakes are completed by the Detailed Engineering Design Consultant (estimated at Feb. 2025). For the regulatory instrument, Cambodia's Ministry of Environment required the Project Management Unit to proceed with an IEE instrument preparation, since no serious impact on the environment, and to complete it within three (3) months (estimated completion by Q1 2025).

5.23. The LARPF has been prepared to govern the land acquisition assessment, land acquisition and resettlement planning, implementation, monitoring, and institutional arrangements for the land acquisition and resettlement process for the Project. The provisions of the LARPF follow the principles and requirements of the relevant government's laws and regulations on land acquisition and resettlement, and the ADB's SPS (2009). A Basic Resettlement Plan (BRP) for core civil work subprojects (Kbal Hong barrage and intake structures, Kbal Hong Irrigation System and Kanghot Irrigation System) has been prepared following the preliminary design of the schemes as a sample BRP to follow in preparing other BRPs for the subprojects under the Project. The LARPF and the BRP have been approved by ADB in September 2024. A BRP will be developed for each subproject that involves land acquisition based on the basic design of the subprojects. Following the DEDs of the subprojects, the Detailed Resettlement Plans (DRPs) are to be prepared and finalized by the GDR of the MEF for implementation. The major involuntary resettlement impacts come from the construction of new secondary and tertiary canals. The estimated total land acquisition cost is around USD8.3 million for acquiring about 474.1 hectares of private lands and mitigation cost, including livelihood restoration measures for about 1,120 severely affected households by the Project. Voluntary land donation is proposed for the minor land acquisition impact of the construction and rehabilitation of tertiary canals. The eligible criteria for voluntary donation, the procedure of implementing donation, the Grievance Redress Mechanism (GRM) and monitoring arrangements (internal and external) for planning and implementation of voluntary donation have been reflected in the approved LARPF of the Project. The proposed procedure ensures that land donation is voluntary, transparent, conducted in meaningful consultations, and no affected household is worse off due to the donation of the affected land area for the Project. A Community Participation Plan (CPP) will be prepared for where voluntary donation happens and will be submitted to ADB-AIIB for review and clearance. Roles and responsibilities of involved agencies in planning, implementation, and monitoring of voluntary land donation have been identified and the budget for all related land donation activities (consultations, preparation of CPPs, monitoring, and others) have been confirmed sufficient by MEF and MOWRAM.

5.24. Due diligence activities indicated that there are no ethnic groups living in the assessed Project areas, nor the ethnic minority community in the Project's command areas. Therefore, ethnic minority policy is not triggered.

5.25. **Environmental Aspects.** The irrigation and drainage subprojects in Kanghot and Kbal Hong irrigation schemes are to have positive impacts in terms of (i) improved operations of existing irrigation areas; (ii) expansion of reliable irrigation into new command areas; and (iii) additional cropping periods in areas previously unavailable for parts of the year due to flooding. Negative impacts mainly come from the construction phase which is short-term and localized with measures to control as specified in the EMP. Some potential impacts are avoided during the IEE by informing the technical design of the FS done in parallel. For example, the IEE identified that many of the existing regulators and weirs do

not have functional fish passes. For the Charek Regulator, based on the variety of migratory fish species found in the area, the vertical slot fishway design was determined as most appropriate. A vertical slot fishway is characterized by a series of pools, each separated by vertical slots that allow fish to pass through.

5.26. Large volume of laterite is required for the Kanghot Irrigation Scheme and Ou Sralau Canal (estimated at 268,203 cubic meters) and Kbal Hong Irrigation Scheme and Svay At Drainage Canal (estimated at 301,802 cubic meters). Laterite to be sourced from borrow pits has associated risks and impacts on flora and fauna and natural resources from poor selection and management, such as degradation or loss of habitat, erosion, and landslides among others. Identification and selection criteria for borrow pits are required to be implemented by the contractor as part of the EMP. Dredging activities and spoil disposal sites have similar risks and impacts if not properly managed, thus a Dredging Management and Spoil Disposal Sub-plan is detailed in the EMP.

5.27. Key sources of noise generation and air emissions during the construction phase are, but not limited to, the hauling of the laterite from borrow sites to the irrigation schemes and canals, operation of concrete batching facilities (if needed), and operation of construction vehicles and machinery. Construction activities will also involve cutting or removal of trees in which a permit is required, together with informing the PDWRAM, local authorities, and authorities that conduct inventory and replantation. There is also potential contamination of surface water and groundwater from construction stockpiles and materials, especially during the rainy season, fuel or oil spills, inappropriate discharge of domestic wastewater (from construction workers or worker camps) or construction wastewater (from the drainage of excavation and drilling, washing aggregates, washing construction equipment and vehicles, pouring and curing concrete, and oil-containing wastewater from machinery repairs), among others. Solid and hazardous waste generation is similarly expected, including the use of hazardous materials such as fuel and oil. These potential risks and impacts are typically localized, short-term, and low in magnitude, and mitigation measures are covered in the EMP.

5.28. During the operation phase, poor and inadequate O&M of the irrigation schemes by the local irrigation agencies responsible for the management of primary and secondary canals and the FWUCs for the tertiary canals are potential risks. Mitigation measures included in the EMP, among others, the provision of sufficient training to FWUCs to manage and operate the tertiary canals sustainably. There are also potential nutrient management issues in canal and irrigation systems, which may lead to water quality degradation and eutrophication, impacts on aquatic ecosystems and human health, and potential conflicts in water utilization between downstream and upstream users. Mitigation measures include coordination and planning by MoWRAM and its local departments, provision of support to FWUCs, provision of training, and implementation of educational programs for farmer households, such as water efficiency practices and equitable share. Further, to address potential issues on pesticide and/or chemical fertilizer use, the integrated pest management and low chemical cultivation training modules applicable to cropping conditions and capacities in the Project sites will be conducted.

5.29. **Social Aspects.** The impact of the Project is socially inclusive economic growth and poverty reduction through improved irrigation and climate-resilient agriculture

(increasing the water supply capacity in the dry season, reducing the flood risk during the wet season – and strengthening the planning and climate change adaptation capabilities of water resources management). The total Project's direct beneficiaries in all the 141 target villages, 20 communes, and 7 districts in 2 provinces are approximately 72,230 people suffering from climate-induced drought risks and 54,700 people suffering from climate-induced flood risks, of which 50.65 percent are females.

5.30. Female-headed households, rural poor, and other vulnerable households heavily rely on farming and fisheries for their subsistence, but they face challenges such as climate change-induced floods and droughts, as well as inadequate irrigation and water resources availability, which negatively impact their livelihoods. The Project is designed to bring benefits to the local farmers in general, while poor and vulnerable farmer households are the most directed beneficiaries of the Project.

5.31. The project implementation, however, would require significant land acquisition from local households. The major involuntary resettlement impacts come from the construction of new secondary and tertiary canals. The screening results of land acquisition by the Project show that a total of 474.1 Ha of private lands would be acquired, and about 1,120 local households would be affected severely by the Project (24 households would be physically displaced, and the remaining households would lose 10% or more of total production landholding of the household). Land acquisition and resettlement will be carried out following the relevant laws and regulations of the Government, the ADB's SPS, and the agreed LARPF for the Project. The GDR of the MEF confirmed during the Appraisal mission that the budget will be allocated sufficiently and promptly for planning, implementation, and monitoring of land acquisition and resettlement for the Project. This has been reflected in the signed Aide Memoire of the Project's Appraisal Mission between the Government, ADB, and AIIB in May 2024.

5.32. The Indigenous Peoples (IP) impact screening was conducted during the Project preparation. There is no ethnic minority recently living in the Project's areas. IP screening activities will be done upon final design completion during the Project implementation stage to reconfirm the presence and the impacts of the Project, if any, on the IP communities.

5.33. **Occupational Health and Safety (OHS), Community Health and Safety, and Labor and Employment Conditions.** There is a risk of injuries or fatalities among workers or members of the public from Unexploded Ordnance (UXO). A Certificate of UXO Clearance is required to be obtained from the Cambodian Mine Action Center before any site mobilization or construction activities, as required in the EMP.

5.34. During the construction phase, potential occupational health and safety (OHS) risks and impacts include but are not limited to, collision with moving machinery and vehicle, prolonged exposure to dust and exceeding levels of noise and vibration, working at heights, risk of fall and drowning, electrical safety, and OHS issues in worker camps (e.g., lack of provision of drinking water, poorly maintained latrines, and non-sanitary living quarters), among others. There are also potential risks and impacts to communities such as traffic safety from construction vehicles especially during hauling of laterite from borrow sites to Project sites, unauthorized access to work areas which may result in injuries and accidents from contact with machinery and heavy equipment or fall from excavations and drowning

in canals, and issues with worker camps from influx of workers such as potential negative interactions between workers and local community and transmission of sexually transmitted diseases, among others. Mitigation measures are included in the EMP.

5.35. During the operation phase, poor and inadequate O&M of the irrigation schemes could cause impacts such as an increased likelihood of exposure to water-borne or water-related vector-borne diseases for community areas near poorly maintained canals. Mitigation measures are outlined in the EMP for the management of primary, secondary, and tertiary canals. Other potential risks and impacts during operation are but are not limited to, falls and drowning into the canals, especially for vulnerable groups such as children, and infrastructure safety such as unauthorized access to pump stations, pump intakes, or diversion barrage. For the workers of the local irrigation agencies responsible for the management of primary and secondary canals and the FWUCs for the tertiary canals, the occupational safety, and health impacts include but are not limited to, physical hazards (such as working at height, falls, and drowning), biological hazards (potential exposure to water-borne or water-related vector-borne diseases and trapped waste from pumping station or sluice gate), and chemical hazards (from exposure to pesticide/chemical fertilizers). The EMP outlines the corresponding mitigation measures.

5.36. **Stakeholder Engagement, Consultation, and Information Disclosure.** The main stakeholders of the Project are categorized into government, beneficiaries, affected persons, civil society organizations (CSOs), non-government organizations (NGOs), private sector, and displaced persons. A detailed Communications Strategy and Plan (with each key stakeholder – the designed outcome for engagement and communications, the information to be provided, the activities and communications to be undertaken, the timing of engagement and communications, responsibilities of involved agencies and resources, etc.) has been prepared and consulted with the stakeholders. The Communication Strategy and Plan will be implemented and monitored to ensure the achievement of the objectives mentioned. For land acquisition and resettlement, the prepared and cleared RF and BRP were disclosed on ADB and MOWRAM's websites - and the summaries of these documents, including the GRM, were placed in the easily accessible places in the project communities in October 2024.

5.37. The prepared and cleared ES instruments in English and summary in the local language (*Khmer*) have been disclosed by the MoWRAM on its website and in hard copies in the Project areas. This documentation has also been disclosed on ADB's website. The links to the disclosed ES documents on the MoWRAM's website and ADB's website will also be included on the AIIB's website. The ES instruments that will be prepared and finalized during the implementation stage of the Project (DRPs, IEE, and others) will be disclosed in the same manner.

5.38. **Project Grievance Redress Mechanism (GRM).** A Project-level GRM has been proposed in consultations with the stakeholders during the Project preparation and included in the RF, BRP, and the Stakeholder Engagement Plan (SEP). The RF, BRP, and SEP (with the GRM as a part of it) were disclosed on the websites of MoWRAM and ADB – and the summaries of the documents in the Khmer language were placed in the easily accessible public places of the project communities in October 2024.

5.39. **Independent Accountability Mechanism.** As noted earlier, ADB's SPS applies to the Project instead of AIIB's ESP. According to AIIB's agreement with ADB, AIIB will rely on ADB's Accountability Mechanism to handle complaints relating to ES issues that may arise under the Project. Consequently, under AIIB's Policy on the Project Affected People's Mechanism (PPM), submissions to the PPM under this Project will not be eligible for consideration by the PPM. Information on ADB's Accountability Mechanism is available at: <https://www.adb.org/who-we-are/accountability-mechanism>.

5.40. **Proposed follow-up.** Bank staff will work together with the ADB's PT and the ES consultants to review and finalize the ES instruments and to ensure that the prepared ES instruments are disclosed, implemented, and monitored properly and complied with. Bank staff will work with MoWRAM to ensure that the established GRM for stakeholders will continue communicating with stakeholders and project communities during the implementation of the SEP - especially during the preparation and implementation of the CPPs. GRM log frame will be prepared and training will be provided to the focal points of different levels of GRM to ensure that complaints or grievances, if any, are recorded, reviewed, responded to, and resolved promptly and monitored following the provisions of the established GRM. Bank staff will also work with MoWRAM, relevant agencies, and the construction contractors – once commissioned, to establish the GRM for the workers for reviewing and addressing the project workplace concerns, including the gender-related concerns of the workers.

E. Climate Change

5.41. **Climate Change.** The Project supports climate change mitigation through the reduction of GHG emissions by using a new gravity-based irrigation system, replacing individual diesel pumps with electric pumping stations, and piloting the AWD technique. The Project will also explore opportunities to lease surfaces of irrigation canals and reservoirs for generating solar power. In terms of climate change adaptation, the Project will enhance the climate resilience of communities and agriculture production in the Project provinces, which is fully consistent with the national and sectoral adaptation strategy and priorities of RGC. Mitigation and adaptation finance from this Project are in line with the joint MDB methodologies. The Project contributes USD124.82 million in adaptation finance and 23.10 million in mitigation finance. Total climate finance of the Project is USD147.92 million, representing 47.1 percent (USD58.84 million) of AIIB finance for the Project. The Project demonstrates a modal shift towards a lower carbon mode achieving net savings of 14,423.09 tCO₂e per year. A climate risk and vulnerability assessment has been prepared for the Project, considering water resource availability and environmental flows with climate change impacts in the next 30 years.

F. Gender Aspects

5.42. **Gender Aspects.** The Project targets the villages in Pursat and Battambang provinces, aiming to increase household incomes by promoting women's economic empowerment through Project construction employment and climate adaptive skills training and address gender inequality for those who face challenges in accessing water resources and limited participation in decision-making in RBCs and FWUCs. Furthermore, the Project will address gender inequality for those who are affected by climate change vulnerability

such as floods and droughts. The GAP has been developed to ensure women's participation and benefits. The GAP includes measures and targets to increase women's representation at higher levels of decision-making, capacity development of national sub-national female staff in gender-responsive irrigation and water resources management, climate change adaptation, and other technical areas.

5.43. Under Component 1, the Project will: (i) engage women in community consultations and planning meetings during the RBCs strengthening process, including the development of gender-responsive and climate-adaptive RBMPs, along with water resource management performance monitoring and assessment systems. Additionally, there will be the implementation of drought and flood forecasting and warning systems, which incorporate gender-responsive flood risk maps. These initiatives aim to increase women's participation in public activities, with a minimum target of 30 percent female involvement; (ii) narrow gender gaps and promote women's involvement in leadership and decision-making positions, with the RBCs membership including a minimum of 10 percent women; (iii) provide capacity buildings, including planning and monitoring activities such as gender-responsive and climate-adaptive river basin management, climate-adaptive multiple reservoirs integrated operation, and gender-responsive river flow management, that will empower women to take on leadership roles in the RBCs and FWUCs. Furthermore, 50 percent of women within the RBCs members will undergo training in O&M to eliminate the gender gap typically associated with these responsibilities and skills being attributed to men; and (iv) support the updating of MoWRAM's Gender Mainstreaming Strategy and Action Plan in Water Resources Sector.

5.44. Under the Component 2, the Project will: (i) improve women's access to and control over water resources (efforts and resources spent to secure irrigated water reduced allowing women and girls have more time to engage in private, public and leisure and income-generating activities); (ii) 25 percent employment of women in unskilled jobs with equal and decent wage, benefits, and enabling environment for protection at work; (iii) ensure the participatory management of irrigation and water resources management from both women and men in the community by establishing a certain number of FWUCs, including the 25 percent of female management committee members and 30 percent of female members, for the 30,520 ha common areas; (iv) enhance capacity for women's leadership, voice and decision within the FWUCs; and (v) improve the economic empowerment of female farmers, who are among the total beneficiaries, through training and site demonstrations on profitable farming systems and climate mitigative agricultural practices such as the alternate wetting and drying method.

5.45. Under Component 3, the Project will: (i) reduce the negative impacts on both women and men, thus, improving mitigation measures such as flood dike strengthening, the construction of ring levees to protect communities, and drainage improvements, and (ii) engage women in participatory flood risk mapping and gender-responsive community flood preparedness planning, implementation, and monitoring. The key GAP indicators are reflected in the Results Monitoring Framework of the Project.

G. Operational Policy on International Relations (OPIR)

5.46. **International Waterways:** The OPIR applies to the Project as it involves the Mekong River, an International Waterway, as defined in paragraph 2.1(b) of the OPIR. The Project includes irrigation and flood control infrastructure in the catchments of Sangker and Pursat Rivers. These rivers discharge to the Tonle Sap/Great Lake of Cambodia. The Tonle Sap basin group is an integral part of the Mekong River Basin.

5.47. The Mekong River runs through southwest China, Myanmar, Lao PDR, Thailand, Cambodia, and southern Viet Nam. In 1995, the Mekong Agreement was signed by the governments of Cambodia, Lao PDR, Thailand, and Viet Nam establishing the Mekong River Commission (MRC). The upper riparians of the Mekong, China, and Myanmar are not signatories of the Mekong Agreement but participate in some activities as observers and share some information via the MRC or other initiatives such as the Lancang-Mekong Cooperation mechanism which includes all six countries of the Mekong Basin. Transboundary rivers flow into Cambodia from all upstream riparians. Transboundary rivers flow out of Cambodia only to Viet Nam.

5.48. Notification to riparian states of the proposed Project's details is required under the OPIR unless one of the exceptions to notification specified in the OPIR applies. A hydrological study has been commissioned through PPSF funding to assess potential project impacts on transboundary flows. The study was conducted from July to September 2024. The study compares actual monitored river flows against the modeled flows of the Sangker and Pursat Rivers incorporating changes in water demand and flows as a result of the Project's irrigation schemes. The study shows that impacts on the quantity, quality, and timing of use of the international waterway resulting from the Project's irrigation schemes are minimal. Transboundary flow would decrease by less than 0.1 percent, and sediment flux would decrease by less than 0.1 percent during dry weather flows. These values are smaller during wet weather flows. The project is aligned with the Mekong agreement and will help improve the target areas' utilization of water especially during dry weather flows. The hydrological study concluded that the Project does not have any material adverse effect on other riparians.

5.49. Considering that the Project is expected to have minimal effect on any of the other riparians, the exception in paragraph 3.3(c)(i) of the OPIR applies and notification of the other riparians is therefore not required.

H. Risks and Mitigation

Table 2: Summary of Risks and Mitigating Measures

Risk Description	Assessment (H/M/L)	Mitigation Measures
<p>Political and Governance</p> <ul style="list-style-type: none"> The country ranks low on the Corruption Perception Index and the agency has inadequate measures to address ethics and anticorruption issues. 	Medium	<ul style="list-style-type: none"> Political risk will be mitigated through a broader set of stakeholder engagement, information dissemination, education, and communication activities on the merits of the Project. Setting high fiduciary standards, separating powers on procurement and contract administration, and necessary checks will help prevent corruption practices.
<p>Institutional Capacity</p> <ul style="list-style-type: none"> Limited experience and skills in implementing agencies. Weak institutional capacity of the PMU and PIU. 	High	<ul style="list-style-type: none"> Provide institutional and capacity-building programs for the PMU, PIU, and FWUCs in carrying out investment activities and long-term operation of the Project. Put in place provisions for the Project Management and PMICs to support the PMU/PIU in managing Project activities and engage individual experts to fill in any identified gaps.
<p>Procurement</p> <ul style="list-style-type: none"> Inflation caused contract qualification requirements beyond the bidder's capacity. Insufficient staff in PMUs. Interference with bid evaluation Ineffective contract management Collusion among bidders 	High	<ul style="list-style-type: none"> Prepare tailored qualification requirements. Hiring qualified consultants to support the PMUs. No conflict of interest between bid evaluation committee members and bidders and pre-bid training to members for impartiality and integrity. Authorize contract supervising engineer direct communication with contractors for effective contract management. Wider circulation of procurement notices and strengthened transparency and supervision arrangements.

Risk Description	Assessment (H/M/L)	Mitigation Measures
<p>Financial Management</p> <ul style="list-style-type: none"> Delays in processing fund replenishments may lead to a shortage of funds. The lack of internal audit from the MoWRAM IAD weakens the implementation of sound internal controls. At the central level, the MoWRAM follows the RGC's established "FMIS" software system, which captures and reports expenses in a summarized form. 	Medium	<ul style="list-style-type: none"> These risks are manageable. Detailed mitigation measures have been proposed in the FM section's paragraph.
<p>Environment and Social</p> <ul style="list-style-type: none"> Negative ES impacts from the Project such as involuntary resettlement. Delay of land acquisition and compensation. 	Medium	<ul style="list-style-type: none"> The draft LARPF, BRP, and IEE have been prepared in consultations with stakeholders and involved agencies - and will be updated during Project preparation would provide necessary technical guidelines to settle the ES impacts of the Project. Subprojects would be subject to proper ES due diligence and follow regulations and best practices. GDR has experience in planning, implementing, and monitoring land acquisition of ADB and AIIB-financed projects. Engage early with the GDR of the MEF at the preparation stage and mobilize the consultancy team to provide the necessary support for land acquisition planning and implementation.
<p>Stakeholders</p> <ul style="list-style-type: none"> Opposition from local communities and other key stakeholders could negatively impact the achievement of the Project's objective. 	Medium	<ul style="list-style-type: none"> Particular attention shall be given to local communities through extensive stakeholder consultations. The Stakeholder Engagement and Communication Plan has been prepared and will be implemented to ensure adequate consultation, monitoring, and transparency.
Overall	Medium	

Annex 1: Results Monitoring Framework

Project Objective: To increase irrigation water availability in the dry season and to reduce the risk of wet season flooding in Pursat and Sangker River Basins through an IWRM approach.												
Indicator Name	Unit of measure	Base-line 2023	Cumulative Target Values						End Target	Frequency	Responsibility	
			2025	2026	2027	2028	2029	2030				
Project Objective Indicators:												
1. Agricultural water productivity increased in the dry season and wet season of target irrigation systems	Percentage	0.08 kg/m ³ in dry season and 0.38 kg/m ³ in wet season	-	-	-	-	-	-	100% increase in dry season and 20% increase in wet season	increased	Annual	MoWRAM
2. Percentage volume increase of the available irrigation water for the target irrigation systems during dry season.	Percentage	0	-	-	-	-	-	-	20%	20%	Annual	MoWRAM
3. Capacity of flood flow diversion increased through the expansion of the old river channels.	m ³ /s	20 m ³ /s ¹⁹ 50 m ³ /s ²⁰	-	-	-	-	-	-	100 m ³ /s ¹⁹ 300 m ³ /s ²⁰	100 m ³ /s ¹⁹ 300 m ³ /s ²⁰	Annual	MoWRAM
Project Intermediate Indicators:												
1. Number of gender-responsive ²¹ and climate-adaptive river basin management plans developed in Pursat	Number	0	-	-	-	-	-	-	2	2	Annual	MoWRAM

¹⁹ Sangker River²⁰ Pursat River²¹The plans will consider different needs, roles, and responsibilities of men and women, as well as women in vulnerable circumstances, such as poor, elderly, or in female-headed households. The approach promotes the participation of women in consultations on how water is managed.

Project Objective:		To increase irrigation water availability in the dry season and to reduce the risk of wet season flooding in Pursat and Sangker River Basins through an IWRM approach.										
Indicator Name	Unit of measure	Base-line 2023	Cumulative Target Values						End Target	Frequency	Responsibility	
			2025	2026	2027	2028	2029	2030				
Province and Battambang Province.												
2. Number of people at risk under flood hazards with 20 years return period	Number	39,400 people in Battambang and 15,300 people in Pursat	-	-	-	-	-	-	28,000 people in Battambang and 10,000 people in Pursat	28,000 people in Battambang and 10,000 people in Pursat	Annual	MoWRAM
3. Number of drought and flood forecasting and warning systems developed and fully functional.	Number	0	-	-	-	-	-	-	2	2	Annual	MoWRAM
4. Percentage of women among the unskilled labor in upgrading and construction of irrigation and flood protection infrastructure	Percentage	N/A	-	-	-	-	-	-	25%	25%	Annual	MoWRAM
5. Number of flood risk maps and gender-responsive community flood preparedness plans developed and operated in target river basin groups.	Number	0	-	-	-	-	-	-	At least 2 for flood risk maps and 2 for preparedness plans.	At least 2 for flood risk maps and 2 for preparedness plans.	Annual	MoWRAM

Annex 2: Detailed Project Description

A. Project Development

1. **Need for integrated water resource management.** Water resources in Cambodia are abundant. The country has more water resources than any other country in the world that has agriculture as the mainstay of people's livelihoods. About 90 percent of the land area lies in the catchment area of a perennial river, the Mekong, with an estimated average annual surface water volume of 473,000 MCM of which 134,000 MCM (about 30 percent) is from rainfall within the country and the balance is inflows from upstream countries, namely Lao PDR, Thailand, and China. The average annual outflow volume in the Mekong River to Viet Nam is estimated to be 437,000 MCM which represents 92 percent of the annual surface water volume. The annual water use in the country is estimated at 10,000 MCM which is only 2 percent of the annual surface water volume. However, about 90 percent of the annual rainfall occurs during the wet season, from May to November, and the dry season surface water use is 6,000 MCM which represents only 7 percent of the dry season water volume, and about 95 percent of this is used for agriculture²².
2. Water resource infrastructure for agriculture, domestic, and industrial uses, remains degraded and underdeveloped due to limited capital investment to upgrade the systems and inadequate funding for effective O&M. Most of the irrigation systems, which were constructed over 50 years ago, were poorly designed and rice-centric with no consideration for the rapid diversification of irrigated agriculture and the need for water control, or future climate change impact. While many of these schemes have been rehabilitated by different stakeholders during the last 10 to 20 years, there remain schemes that operate inefficiently in terms of water distribution, particularly during the dry season, and the ability to manage water delivery in terms of timing and amounts.
3. With droughts occurring with increasing frequency and intensity, together with the inadequacy of water resource management it is foreseen that this situation will not only impact irrigation for agriculture but increasingly domestic water availability. This will result from increased difficulty in extracting water from rivers for water supply, water shortages in ponds and wells for rural water supplies, and constraints on the migration of fish and other aquatic life. In contrast, the increasing intensity of storms during the wet season is resulting in flash flooding that is compounded by the lack of sufficient physical assets for flood risk management and limited flood protection capacity within reservoir systems, as well as the absence of effective early warning and preparedness systems.
4. Over the last decade, significant flood events have occurred in most years affecting an estimated 0.5 million households and during the floods in 2020, an area of 330,000 ha of crops were damaged. Further impacts are being felt on the inland capture of fish and aquatic animals that for some households contribute up to 80 percent of their protein intake, whilst the Tonle Sap fisheries provide for 60 percent of the protein intake of the entire population. An essential component of fisheries production in Cambodia is related to the annual flood pulse of the Tonle Sap and any reduction in the volumes of water or measures that restrict access by aquatic life to flooded areas of tributaries could have a devastating impact on their life cycles of fish and their levels of productivity.
5. This situation is likely to deteriorate further in the coming years as the climate

²² ADB (2019). *TA Consultants Report. Kingdom of Cambodia: Preparing the Irrigated Agriculture Improvement Project.*

change impacts become more insidious, resulting in further loss of water resources available during the dry season and increased risk and extent of flood damage. The adoption of a more holistic approach to the management of water resources can provide an effective strategy for coping with these impacts. The introduction of an IWRM approach under this project is timely and very appropriate by providing support to strengthen the capacities for better coordination, planning, and technical support at the sub-national level and ensuring that the water resources in the major river basins can be better managed.

6. **Formulation of the Project.** The Project was developed to achieve the goals for water resources management identified in MoWRAM's Strategic Plan and Road Map 2019-2033. The draft final FS prepared under joint AIIB and ADB financing was completed in May 2024. The Project FS is informed by several previous studies, which include the following:

- ADB Strengthening Integrated Flood Risk Management completed in 2022.
- Irrigation Rehabilitation Study in Cambodia, Mekong Secretariat, Halcrow, June 1994.
- Cambodia Water Resources Profile produced under ADB TA7610 (2014).
- Rapid Assessment of Water Resources and Hydro-ecology also produced under ADB (2019).
- Flood and Drought Risk Management and Mitigation Project, funded by ADB.
- CNMC/Hatfield 2013 Study Water Demand Analysis within the Pursat River Catchment Fostering Evidence-based IWRM in Pursat River Catchment.
- JICA 2016 Survey on Basic Information in Pursat River Basin Survey on Actual Condition of Facilities and Utilization of River Basin Water Resources.
- JICA Preparatory survey for expansion of water supply systems in Pursat 2019.
- ADB Integrated Urban Environmental Management in the Tonle Sap Basin – Drainage and Wastewater Treatment in Pursat and Battambang 2021.
- Hydropower: Pursat 1 FS Sino Hydro for Ministry of Energy and Mines 2017.
- Water Accounting in Selected Asian River Basins: Pilot study in Cambodia–IHE/ADB 2017.

B. Description of the Project

7. **Project Objectives.** The Project aims to increase irrigation water availability in the dry season and to reduce the risk of wet season flooding in Pursat and Sangker River Basins through an IWRM approach.

8. To achieve the objective, the Project will: (i) strengthen the water resource management capacities of the river basin committees (RBCs) in the Provinces of Battambang and Pursat and develop water basin management plans in Pursat and Sangker River Basins²³; (ii) remodel or upgrade water regulators and irrigation canals to increase irrigation water availability in the dry season; and (iii) improve flood-control and drainage facilities to reduce flood risks in the wet season.

9. **Scope Development:** Much of the Tonle Sap River basin group is lowland with an elevation less than 100 meters above mean sea level and with only gently undulating topography and a total area of almost 83,000 km². The elevations increase in the southwest in the Cardamom mountains to over 1,700 m and in the northeast escarpment of the chain of the Dangrek mountains that reach an average altitude of about 500 m. The Tonle Sap

²³ The sub-decree of river basin management was issued by MOWRAM in 2015 to provide the basis for RBCs and operationalize the Law on Water Resources Management which set a framework of IWRM and river basin planning.

River basin group covers 15 major catchments, excluding the lake itself, which can be subdivided into 42 sub-catchments.

10. The Project originally identified as priority four major catchment groups namely: Sangker River (6,052 km²), Moung Russei River (1,468 km²), Svay Don Keo River (2,228 km²), and Pursat River (5,964 km²) located in Pursat and Battambang provinces to the southwest of the TSL catchment (see Figure 1). These river basin groups were assessed as one of the groups most vulnerable to water shortages during the dry season and flooding in the rainy season due to climate change impacts.

11. During the preparation of the Project FS, the Provinces of Pursat and Battambang were assessed to be the two most highly impacted provinces in the country for recent flooding incidents. At the same time, in the first months of 2024, the two provinces experienced over 80 consecutive dry days since December 2023, above that expected by climate models and impacting water availability and raising water demands. Farmers in Pursat are facing a severe impact on crops planted after the flood to be harvested in 2024. Such events risk driving more people into poverty when crops fail, and farmers cannot pay back loans on the crop inputs used. The ADB study of rural resilience in the Greater Mekong Area found that even a 1-in-3-year event of the combined occurrence of flood and drought within 1 year could elevate the probability of households falling into extreme poverty in all zones by up to 55 percent. Agriculture is central to the lives of rural people in the provinces and water is a key requirement for successful agriculture. Given these, the Project's geographical scope was focused on the Provinces of Pursat and Battambang, particularly the Pursat River and Kanhhot River.

12. **Component 1.** Integral to the IWRM concept is the operationalization and sustainability of RBCs. An RBC has recently been established in Pursat Province with JICA funding and an RBC for the Sangker River Basin was established with Agence Française de Développement (AFD) funding. However, assessment indicate that the RBCs are not operating effectively and need support to strengthen the capacity of its members and its mode of operation. As part of the FS, a strategy for establishing effective river basin management committees, keeping in mind women's representation, and a mechanism that will enable them to develop and implement effective and climate adaptive RBMPs that take account of identified climate change impacts, vulnerabilities, and risks was formulated. The strategy included the formulation of an "RBC Implementation Plan" which will be executed through the PMICs under Component 1. To enable data-driven decision-making, Component 1 also includes upgrading hydrometeorological equipment and flood and drought forecasting systems as identified and prioritized by Project stakeholders.

13. **Component 2.** The component focuses on the improvement of irrigation infrastructure and irrigation management practices in the targeted areas. For the development of irrigation investment packages, a "long list" of Project sites with proposed interventions were identified by MoWRAM and the Provincial Governments of Battambang and Pursat provinces. The list was reviewed against eligibility and prioritization criteria agreed upon among the Project stakeholders. Based on available studies and data, a short list of two sites in Battambang and three sites in Pursat was finalized.

14. The sites were further narrowed down to two subprojects based on overall feasibility and PDWRAM priorities. These are Kanhhot in Battambang and Kbal Hong in Pursat, two of the larger schemes.

15. **Subprojects in Battambang Province** focused on three blocks totaling 19,775 ha gross area and 17,020 ha irrigated area out of the full design area of the Kanhhot irrigation scheme (IS) of 47,000 ha. The subproject will serve 45 Villages with 8465 Households with

a total beneficiaries of around 37,170. The upgrading will involve: Strengthening and capacity building of 3 FWUCs, minor upgrading, and repair of 5 existing lined main canals and associated structures totaling 60.1km; Upgrading of 27 existing Secondary Canals totaling 118km and 9 new secondary canals totaling 50.4km; Upgrading of 83 Sub Secondary or Tertiary Canals totaling 98.4km and an estimated 342 new tertiary canals of approximate length 398km.

16. **Subprojects in Pursat Province** focused on two irrigation areas, one area on each side of the Pursat River serving a gross area of 13,565 ha and irrigation service for 11,646ha. The Project is expected to serve 76 Villages with 8030 Households and a total beneficiaries of around 39,400. The upgrading will include the Construction of a new regulator in the Pursat River that will span the full width of the river (110m) and raise the water level with 5 gates each 4.5m high with provision for 2 fish ladders; the Construction of 3 new FWUC Buildings; Strengthening and capacity building of 4 FWUC is critical for the long-term sustainability; Minor Upgrading and repair of 2 existing unlined main canals and associated structures totaling 26km; Upgrading of 21 existing Secondary Canals totaling 71km and 8 New Secondary canals totaling 52km; Upgrading of 189 Sub Secondary or Tertiary Canals totaling 67.7km and an estimated 251 new tertiary canals of approximate length 255km.

17. **Fish Passages.** Component 2 will also include the Construction of the fish pass structures at 14 locations in the Moug Russey, Svay Donkeo, Pursat, and Sangker River Basins. Working with the Inland Fisheries Administration new fish passes or remedial works at existing poorly performing structures will target a free passage from the TSL up and down the four tributary rivers of the Project area.

18. **Component 3: Improved Flood Risk Management:** Subprojects for the Sangker River Basin and the Pursat River have been formulated, both of which followed a similar methodology, properly utilizing the flood storage capabilities of the major upstream dam and making minor works to manage the flood plain flows to lower damages. The work for Sangker is to improve the spill capacity at the intake of the Ou Sralau channel, which is just upstream of the urban part of Battambang. For Pursat, the work will enhance the flood spill from the Pursat River to the Svay Ath and surrounding floodplain. The total beneficiaries will be around 39,400 in Battambang province and 15,300 in Pursat province.

19. **Project Management Plan:** The PMU will be supported by a PIC team and a separate DEDs consultancy team for the advanced works. MoWRAM will manage the consultancy firm that will prepare DEDs and bidding documents for the key civil works, based on the FS and other deliverables produced by the Consultant in Component 2 and Component 3. The costs for the DEDs consultancy firm will be financed through the PPSF and its engagement period is expected to overlap with the engagement period of the PIC team, to maximize the benefit and synergy between the two consultant teams.

20. **Project Implementation.** The overall Project implementation plan is provided in the PAM. Early activities include hydrometeorological equipment upgrading and creation of flood forecast systems, creating Farmer Water User Groups, and support to the RBCs. The expected start of construction of the Kbal Hong regulator is in the dry season of 2026 and completion at the end of 2028, at which time some parts of the distribution system should be operational.

21. The overall Project structure proposed is given below in figure 2-1. Details of the members of the Project Steering Committee are given in the PAM.

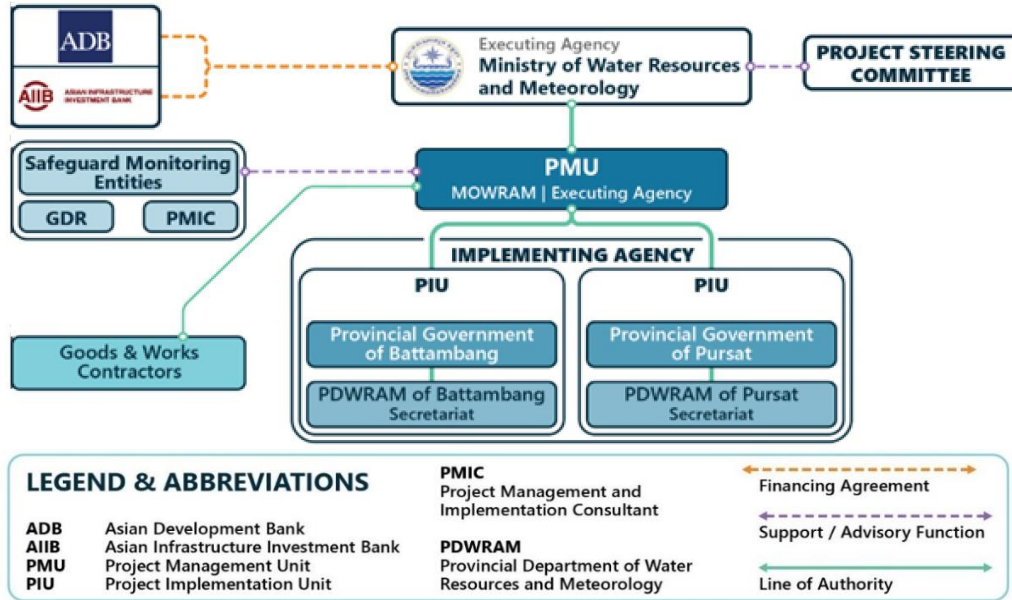


Figure 2-1 Project Organization Structure

22. As presented in Figure 2-2 below, the Project management unit in MoWRAM will have 18 members and will be supported by PIUs in each province and PMICs. At each of the provinces, there will be a local PIU headed by the PDWRAM. It will be detailed administrative and technical staff to carry out their role.

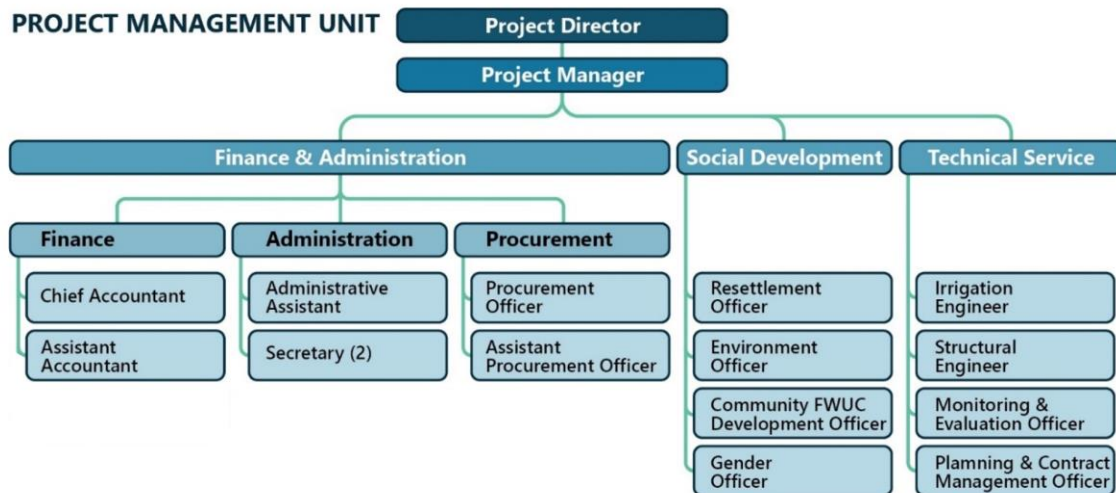


Figure 2-2 Organizational Structure of the Project Management Unit

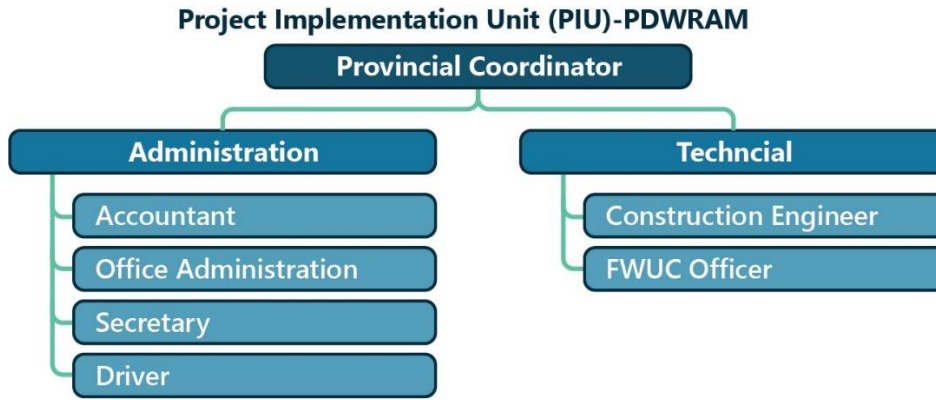


Figure 2-3 Provincial Project Implementation Units (1 in Battambang and 1 in Pursat)

23. **Project Cost Estimation.** Capital costs have been calculated for each subproject by completing an outline of the expected canal/channel sizes and necessary structures, and estimating quantities of excavation/fill, concrete, land acquisition, gates, etc. to derive a Bill of Quantities. Unit rates from similar projects in Pursat and Battambang (2022 prices) are then used to derive the cost of the civil works. A contingency of 5 percent is applied reflecting uncertainties of the design as further consultation and survey are needed. Design and Supervision cost is included in the estimate of PMICs and the separate advance works DEDs for Kbal Hong regulator and intakes, all based on time estimates and unit rates. PMICs work on support to RBMC, hydrometeorological, and flood forecasting systems are based on direct estimates of time required and cost of goods. Agricultural support is based on unit rates per hectare.

24. O&M costs are estimated based on an annual estimation approach. For the Irrigation systems, unlined canals are to be used and annual routine O&M of earthworks is assumed as 5 percent of construction cost, structures 1 percent, and a periodic O&M every 10 years of 30 percent of construction cost of earthworks and 10 percent of structures. For the flood schemes an operating cost of the hydromet and forecasting systems is estimated and similar operating costs for channels and structures.

Annex 3: Economic and Financial Analysis

The Project seeks to strengthen the water resources management capacities of the RBCs in Battambang Province and Pursat Province (Output 1); remodel or upgrade water regulators and irrigation canals to increase irrigation water availability in the dry season (Output 2); and improve flood-control and drainage facilities to reduce flood risks in the wet season (Output 3). Economic analysis was conducted for the Kbal Hong and Kanghot irrigation system subprojects and the Pursat and Sangker flood risk mitigation subprojects. The economic viability of the whole project was assessed based on the economic viability of these subprojects, as they represent the bulk of project expenditure and benefits. All four subprojects were found to be economically viable.²⁴ The – cost-benefit analysis is conducted by comparing the with - and without-project scenarios for each subproject. “Do nothing” is assumed for the “without project” scenario, while the proposed project is assumed in the “with” scenario.

Part 1: Irrigation Subprojects in Kbal Hong and Kanghot

Two irrigation projects in Kanghot, Battambang, and Kbal Hong, Pursat aim to protect agricultural communities from drought and boost income. Both subprojects expect higher rice yields, more cultivated areas, and the introduction of high-value crops. The Kanghot subproject will install secondary and tertiary irrigation canals and related structures in the existing irrigation scheme. The Kbal Hong subproject will install a new barrage to divert water into two main canals, rehabilitate these two canals, and install or rehabilitate secondary and tertiary irrigation canals and related structures.

The project spans 25 years with 5 years of construction period and no salvage value at termination. Benefits start the year after construction ends. Physical contingencies are estimated at 5 percent for civil works and 10 percent for other costs. O&M costs are budgeted at 5 percent for routine and 30 percent for periodic maintenance of civil works, with routine costs beginning in the first operational year and periodic costs every decade. Costs and benefits are expressed in constant fourth quarter 2023 USD, valued using the domestic price numéraire, excluding taxes, duties, interest, and price contingencies. Tradable goods and services are adjusted by a shadow exchange rate factor of 1.01 without taxes, and unskilled labor is valued using a shadow wage rate factor (SWRF) of 0.9. A social discount rate of 9 percent reflects the opportunity cost of capital in Cambodia. For irrigation subprojects, 50 percent of the benefits are realized in the year following construction, with full benefits in subsequent years.

1. Irrigation Subprojects Cost

Kanghot’s CAPEX is USD 37.7 million in economic prices,²⁵ with land valued at USD 12,000/ha.²⁶ Kbal Hong’s capex is USD76.7 million, with land valued at USD10,000/ha. See CAPEX details in Table A.1. Both have annual O&M costs of 5 percent and 1 percent for earthworks and structures, and periodic O&M costs of 30 percent and 10 percent. This totals USD0.95 million routine and USD6.3 million periodic O&M for Kanghot, and USD2.0 million routine and USD13.5 million periodic O&M for Kbal Hong.

²⁴ The economic assessment is conducted by the ADB team based on the FS report. The following analysis is a summary of the ADB assessment.

²⁵ The economic investment costs were estimated by subtracting the value of taxes (value added tax of 10 percent), splitting the financial costs into different cost categories (tradable goods, non-tradable goods, skilled labor and unskilled labor) and multiplying them by relevant conversion factors.

²⁶ This price was obtained via FS consultations in project areas in June 2023.

Table A.1. Investment cost in economic prices by components (unit: USD million)

Item	Kanghot	Kbal Hong
Civil works	31.64	67.33
LAR	3.18	4.58
FWUC establishment & CB	0.31	0.31
Agriculture support services	0.58	0.58
Base costs	35.71	72.80
Physical contingency	1.99	3.91
Total costs	37.70	76.71

2. Irrigation Subprojects Benefit

2.1. Cropping yields

Kanghot's net command area is 17,020 ha. Its cropping intensity will rise from 209 percent to 227 percent with better water management, more dry-season paddy, and new high-value crops.²⁷ Kbal Hong's net command area is 11,646 ha. Its cropping intensity will increase from 111 percent to 224 percent, with more paddy, new crops, and legumes.²⁸ See details in Table A.2.

Table A.2. Cropping patterns and yields under the without (WOP) and with (WP) scenarios

Items	Kanghot				Kbal Hong			
	Cropping pattern		Yield		Cropping pattern		Yield	
	W/O (ha)	W/P (ha)	W/O (ton/ ha)	W/P (ton/ ha)	W/O (ha)	W/P (ha)	W/O (ton/ ha)	W/P (ton/ ha)
Command Area	17,020	17,020			11,646	11,646		
Wet season cultivation area								
Paddy rice EWS	15,318	15,318	4.0	5.0	1,230	10,481	3.0	4.5
Paddy rice LWS	15,318	15,318	3.5	4.5	4,100	10,481	2.5	4.3
Paddy rice MS	1,702	1,702	2.3	3.5	2,870	1,165	2.0	3.5
Paddy rice rainfed					3,446	-	1.5	-
Subtotal	32,338	32,338			11,646	22,128		
Dry season cultivation area								
Paddy rice DS	3,157	3,788	4.5	5.5	1,250	2,500	4.5	5.5
Legumes (mungbean)	-	1,702	-	1.0	-	582	-	1.3
Sweet corn	-	851	-	15.0	-	582	-	15.0
Cover crop (sun hemp)	-	851	-	-	-	233	-	-
Subtotal	3,157	7,192			1,250	3,898		
Total	35,495	39,530			12,896	26,025		

Note: ha = hectare, W/O = without project, W/P = with project. Source: Consultants estimates.

2.2. Per-ha crop costs, total production, and net economic benefit

Table A.3 outlines the subproject's impact on components, cost, and revenue. Incremental agricultural costs consist of labor costs in land preparation, planting, and harvesting, and various input costs, such as seeds, fertilizers, herbicides pesticides, and fuel. Year 2031 was selected for demonstration purposes, as 100 percent of Project benefits are expected to be accrued from that year onwards. In the with-project scenario, the cost of rice cultivation is likely to rise due to improved seeds and more fertilizer.

Table A.3. Planted area, total production, and net economic benefit in 2031

Items	Unit	Kanghot			Kbal Hong		
Price (C)							
White rice	USD/ton		328.3			328.3	
Aromatic rice	USD/ton		332.9			332.9	
Legumes (mungbean)	USD/ton		978.4			1,222.9	
Sweet corn	USD/ton		318.0			220.1	
Cover crop (sun hemp)	USD/ton		0.0			0.0	
Items	Unit	W/O	W/P	Increment	W/O	W/P	Increment
Planted area (A)							

²⁷ Crop budgets for mung bean and sweet corn were used in the analysis to represent legumes and vegetables, respectively.

²⁸ Crop budgets for mung bean and sweet corn were used in the analysis to represent legumes and vegetables, respectively.

Paddy rice EWS	ha	15318	15318	0	1230	10481	9251
Paddy rice LWS	ha	15318	15318	0	4100	10481	6381
Paddy rice MWS	ha	1702	1702	0	2870	1165	(1705)
Paddy rice rainfed	ha	-	-	-	3446	-	(3446)
Paddy rice DS	ha	3157	3788	631	1250	2500	1250
Legumes (mungbean)	ha	0	1702	1702	-	582	582
Sweet corn	ha	0	851	851	-	582	582
Cover crop (sun hemp)	ha	0	851	851	-	233	233
Total Planted Area	ha	35495	39530	4035	12896	26025	13129
Total production (B)							
Paddy rice EWS	ton	61272	76590	15318	3690	47,166	43,476
Paddy rice LWS	ton	53613	68931	15318	10250	45,070	34,820
Paddy rice MWS	ton	3915	5957	2042	5740	4,078	(1,663)
Paddy rice rainfed	ton	-	-	-	5169	0	(5,169)
Paddy rice DS	ton	14207	20834	6628	5625	13,750	8,125
Legumes (mungbean)	ton	0	1702	1702	-	757	757
Sweet corn	ton	0	12765	12765	-	8,735	8,735
Cover crop (sun hemp)	ton	0	0	0	-	0	0
Total production	ton	133006	186779	53773	30474	119,555	89,081
Revenue (B*C)							
Paddy rice EWS	USD m	20.4	25.5	5.1	1.2	15.7	14.5
Paddy rice LWS	USD m	17.8	22.9	5.1	3.4	15.0	11.6
Paddy rice MWS	USD m	1.3	2.0	0.7	2.7	3.3	0.7
Paddy rice rainfed	USD m	-	-	-	1.7	0.0	(1.7)
Paddy rice DS	USD m	4.7	6.8	2.2	1.8	4.5	2.7
Legumes (mungbean)	USD m	0.0	1.7	1.7	0.0	0.9	0.9
Sweet corn	USD m	0.0	4.1	4.1	0.0	1.9	1.9
Cover crop (sun hemp)	USD m	0.0	0.0	0.0	0.0	0.0	0.0
Total revenue	USD m	44.2	63.0	18.8	10.9	41.4	30.5
Input costs per ha (D)							
Paddy rice EWS	USD	490.0	618.8	-	414.0	591.6	-
Paddy rice LWS	USD	464.6	564.7	-	414.0	535.0	-
Paddy rice MWS	USD	443.0	529.5	-	820.7	1,411.5	-
Paddy rice rainfed	USD	-	-	-	411.4	534.5	-
Paddy rice DS	USD	457.6	557.9	-	445.3	538.0	-
Legumes (mungbean)	USD	0.0	359.8	-	0.0	524.4	-
Sweet corn	USD	0.0	487.6	-	0.0	951.6	-
Cover crop (sun hemp)	USD	0.0	69.1	-	0.0	69.1	-
Total input costs (A*D)	USD m	16.8	22.2	5.4	5.4	14.8	9.4
Net revenue	USD m	27.4	40.8	13.4	5.5	26.7	21.1

Through an increase in cropping area, productivity, and crop diversification, the production of paddy rice, legumes (mung bean), and sweet corn are expected to increase annually.²⁹ For Kanghot, the annual revenue will increase by USD19.0 million, while the annual cost for agricultural inputs will increase by USD5.4 million, resulting in an increase of USD13.5 million in the annual economic net margin. For Kbal Hong, the annual gross revenue is USD 30.5 million, and agricultural input cost is USD 9.4 million annually, thus the annual net revenue is USD 21.1 million.³⁰

2.3. Unquantified benefits

In addition to crop benefits, the subprojects are expected to provide non-crop and non-quantifiable benefits such as improved mobility from new roads, potential for increased fish and livestock production due to better water availability, and social welfare improvements. The Kbal Hong regulator's reconstruction will include a bridge over the Pursat and the main canal could potentially supply water to other areas in the future.

3. Estimated Economic Returns and Sensitivity Analysis

The subprojects are economically viable with a 9 percent social discount rate. Kanghot has an EIRR of 22.5 percent and an ENPV of USD 43.1 million. Kbal Hong has an EIRR of 15.7 percent and an ENPV of USD 41.3 million. Both surpass the social discount rate. Sensitivity analysis confirms their viability, assuming a 10 percent reduction in costs, crop prices, yields, and a 1-year delay. More details are in Tables A.4 and A.5.

²⁹ The revenue for medium-wet-season rice in the Kbal Hong area is also affected by the reduced cultivation area, but in 2031, half of the land is used to grow the aromatic rice, which has a higher unit price, instead of white rice. Thus, the gross revenue for this item has a positive value in 2031.

³⁰ The revenue for medium-wet-season rice in the Kbal Hong area is also affected by the reduced cultivation area, but in 2031, half of the land is used to grow the aromatic rice, which has a higher unit price, instead of white rice. Thus, the gross revenue for this item has a positive value in 2031.

Table A.4. Estimated economic analysis for the irrigation subprojects (USD million)

Year	Benefits	Costs		Balance		
	Incremental revenue	Incremental input costs	Investment costs	Prorated PM costs	O&M costs	Incremental net revenue
Kanghot subproject						
2024	0.0	0.0	0.0	0.0	0.0	(0.0)
2025	0.0	0.0	3.3	0.4	0.0	(3.7)
2026	0.0	0.0	2.7	0.3	0.0	(3.0)
2027	0.0	0.0	16.5	0.3	0.0	(16.8)
2028	0.0	0.0	15.2	0.3	0.0	(15.4)
2029	9.4	2.7	0.0	0.3	0.9	5.5
2030-2037	18.8	5.4	0.0	0.3	0.9	12.1
2038	18.8	5.4	0.0	0.0	7.3	6.1
2039-2047	18.8	5.4	0.0	0.0	0.9	12.4
2048	18.8	5.4	0.0	0.0	7.3	6.1
ENPV	115.3	33.2	28.8	1.4	8.8	43.1
EIRR						22.54%
Kbal Hong subproject						
2024	0.0	0.0	0.0	0.0	0.0	(0.0)
2025	0.0	0.0	4.7	0.8	0.0	(5.6)
2026	0.0	0.0	6.9	0.5	0.0	(7.4)
2027	0.0	0.0	24.6	0.6	0.0	(25.2)
2028	0.0	0.0	30.7	0.5	0.0	(31.2)
2029	0.0	0.0	9.6	0.5	0.0	(10.2)
2030	15.3	4.7	0.0	0.7	2.0	7.9
2031-2038	30.5	9.4	0.0	0.0	2.0	19.1
2039	30.5	9.4	0.0	0.0	15.5	5.7
2040-2048	30.5	9.4	0.0	0.0	2.0	19.1
ENPV	168.5	51.8	57.1	2.8	15.4	41.3
EIRR						15.69%

Table A.5. Sensitivity analysis for the irrigation subprojects

Sensitivity Test	Kanghot		Kbal Hong	
	ENPV (USD m)	EIRR (percent)	ENPV (USD m)	EIRR (percent)
Base Case	43.08	22.54	41.35	15.69
+10 percent investment cost	40.06	20.78	35.36	14.36
+10 percent O&M costs	42.20	22.34	39.81	15.47
+10 percent input costs	39.21	21.54	36.06	14.94
-10 percent crop prices	31.55	19.47	24.50	13.21
+1-year delay	38.82	22.50	35.72	15.52
-10 percent crop yields	32.12	22.54	32.18	15.69

Part 2: Flood Mitigation Subprojects in Pursat and Sangker

Two flood mitigation subprojects in Pursat and Sangker aim to protect communities from flood risks, reduce flooding area and depth, and lower losses and costs. Significant flooding would continue without these projects, causing large losses and damages. Benefits and routine O&M will commence in PY6, and periodic O&M will occur every 10 years respectively. Agricultural inputs are obtained via surveys, with prices aligning with the irrigation subprojects.³¹

The Pursat subproject involves transforming the Svay At channel into a flood diversion canal and enhancing the management of the under-construction Stung Pursat hydropower dam. The Sangker subproject will enhance the flood control of the Sek Sork Reservoir and increase the Ou Sralau stream's water diversion capacity.

³¹ The assumptions for social discount rate, exchange rate, standard conversion factor, SWRF, physical contingencies and management costs is the same as the irrigation subprojects and will not be repeated here.

4. Flood Control Subproject Cost

Investment costs for Pursat and Sangker are USD 15.9 million and USD 3.1 million each, with most costs for civil works. See cost details in Table A.6. Land costs are USD10,000/ha for Pursat and USD12,000/ha for Sangker. The annual and period O&M is USD0.4 million and USD2.7 million for Pursat; and USD0.1 million and USD0.5 million for Sangker. The prorated PM cost is USD 0.76 million for Pursat and USD 0.2 million for Sangker.

Table A.6. Investment cost in economic prices by components (unit: USD million)

Item	Pursat	Sangker
Civil work	13.33	2.53
LAR	1.72	0.35
Support to Sangker RBMC	-	0.65
Base costs	15.05	2.88
Physical contingency	0.84	0.23
Total costs	15.89	3.11

5. Flood Control Subprojects Benefit

The quantified project benefits were (i) avoided losses and damages from future flooding and (ii) reduced cost of emergency response to flooding, including evacuation and clean-up costs. This analysis attempts to quantify only the direct and tangible damages: physical damage to residential buildings, contents, livestock, and agricultural production losses.

5.1. Parameter calculation - Flooded area and number of affected households

Software simulated flood events for Pursat and Sangker, focusing on floods of 0.5m or higher with 5, 20, 50, and 100-year return periods.³² Damages were quantified based on flood depth and duration, using established damage curves. Annual probable losses were calculated as the integral of avoided losses and exceedance probabilities. The difference between losses with and without the project represented the flood protection benefit. Table A.7 shows the flood damage factors used in the estimation of the flood damages to residential buildings and agricultural production. In both Pursat and Sangker, the average residential building value is set at USD 8,948.³³ The estimated maximum damage for building contents is USD 3,799,³⁴ while for livestock, it's USD 860 in Pursat and USD 1,253 in Sangker.^{35 36}

Table A.7: Flood Damage Factors

Flood depth (m)	0.1 - 1	1 - 2	2 - 3	3 - 4	4 - 5	> 5
Damage factor - residential	0.41	0.67	0.87	0.93	0.98	1.00
Flood depth (m)	0.1 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2		
Damage factor - Agricultural	0.00	0.27	0.67	0.70		

Sources: Huizinga, J., et.al. 2017. [JRC Publications Repository - Global flood depth-damage functions: Methodology and the database with guidelines \(Europa.eu\)](#), Badri Bhakta Shrestha B., et.al., 2021, *Development of flood damage functions for agricultural crops and their applicability in regions of Asia*, Journal of Hydrology: Regional Studies 36, 100872.

Flood damage to agricultural production is approximated by flood damage to wet-season crops (paddy rice) in the Project area.³⁷ Flood damage to rice crops is defined as a function of flood depth, flood duration, and growth stage of rice plants and is estimated as the cost

³² SWAT, HEC Ressim, and HEC RAS 2D software were used for basin runoff, reservoir operations, and hydrodynamic flood modelling respectively.

³³ ADB. 2023. Project Land acquisition and resettlement survey. December 2023.

³⁴ JICA. 2014. Resettlement Action Plan for the NR No.5 Improvement Project (Middle and End Section). Adjusted by the 2023 price index to reflect the current prices.

³⁵ ADB. 2023. IWRMP Socio-economic survey - Final report. October 2023.

³⁶ ADB. 2023. Integrated Water Resources Management (IWRMP) Socio-economic survey - Final report. October 2023.

³⁷ Floods occur mainly during the wet season. Wet farmlands produce paddy as primary staple food crop in Cambodia, making it one of the largest producers of the rice in the world (Statista, 2024. [Top rice exporting countries worldwide 2023/2024 | Statista](#)).

of inputs lost when flooding occurs at early stages of growth (from seedling to vegetative stages), and as full output lost valued at farm gate prices when flooding occurs during reproductive and maturity stages of growth. Due to data limitations and complexities involved in the estimation of flood loss to rice crops, only one rice crop is assumed to be lost (valued at the farm gate price). Annual average maximum damage to agricultural production is estimated at USD978 per hectare in Pursat and USD1,152 per hectare in Sangker.³⁸

The detailed summary of residential buildings and agricultural land at risk and protected for various return periods of flooding is shown in the supplementary document. On a per-annum basis, the avoided flood damage is estimated at USD 2.88 for residential buildings in Pursat and USD 2.78 for Sangker. For agricultural production, the avoided damage is about USD 0.64 million in Pursat and USD 0.16 million in Sangker. Summing up the benefits, the annual avoided assets damage is estimated at USD 3.52 million for Pursat and USD 2.94 million for Sangker.

5.2. Avoided emergency costs

Floods require emergency services like evacuation, relief, and cleanup. The annual avoided emergency service cost is estimated by adding 10.7 percent to the annual avoided direct asset damage.³⁹ The estimated annual emergency cost is around USD 0.38 million for Pursat and USD 0.32 million for Sangker.^{40 41}

5.3. Unquantified benefits

Floods can harm urban infrastructure and halt economic activity and cause human and livestock casualties. However, these impacts weren't quantified due to lack of data.

6. Estimated Economic Returns and Sensitivity Analysis

With a 9 percent social discount rate, the Pursat subproject has an EIRR of 11.3 percent and an ENPV of USD 8.4 million. The Sangker subproject has an EIRR of 51.4 percent and an ENPV of USD 17.4 million. Sensitivity tests were done with a 10 percent change in investment cost, O&M cost, and rice yields, a year delay in the construction period, and a 20 percent deduction of the avoided losses from agriculture and household property. Both subprojects are economically viable based on the base case analysis and sensitivity test. More details are in Tables A.13 and A.14.

Table A.13. Economic Analysis of the flood mitigation subprojects

Year	Benefits		Costs		Balance	
	Avoided asset damages	Avoided emergency costs	Investment costs	Prorated PM costs	O&M costs	Project net benefits
Pursat Subproject Economic Analysis (USD million)						
2024	0	0.00	0.00	0.00	0.00	0.00
2025	0	0.00	1.78	0.17	0.00	-1.95
2026	0	0.00	3.43	0.11	0.00	-3.54
2027	0	0.00	6.77	0.12	0.00	-6.89
2028	0	0.00	3.91	0.11	0.00	-4.02
2029	3.52	0.38	0.00	0.11	0.40	3.39
2030	3.52	0.38	0.00	0.14	0.40	3.36
2031-2037	3.52	0.38	0.00	0.00	0.40	3.50
2038	3.52	0.38	0.00	0.00	3.07	0.83

³⁸ Economic price of rice (\$329/ton) x average rice yield (3 tons/ha) (IWRMP Kbal Hong Irrigation SP).

³⁹ This multiplier is stipulated in ADB's guideline for economic analysis of flood mitigation projects. Source: ADB (2022), Strengthening Integrated Flood Risk Management - A Guide to Integrated Flood Risk Management Economics.

⁴⁰ ADB. 2022. [Strengthening Integrated Flood Risk Management: A Guide to Integrated Flood Risk Management Economics Consultants' Report.](#)

⁴¹ USD0.38 million per year = 0.107 x (avoided damage to residential buildings and their contents of USD2.88 million per year + avoided damage of agricultural output USD0.64 million per year).

Year	Benefits		Costs		Balance	
	Avoided asset damages	Avoided emergency costs	Investment costs	Prorated PM costs	O&M costs	Project net benefits
2039-2047	3.52	0.38	0.00	0.00	0.40	3.50
2048	3.52	0.38	0.00	0.00	3.07	0.83
ENPV	22.78	2.44	12.52	0.57	3.72	8.40
EIRR	11.3%					
Sangker Subproject Economic Analysis (USD million)						
2024	0	0.00	0.00	0.00	0.00	0.00
2025	0	0.00	0.20	0.04	0.00	-0.24
2026	0	0.00	0.69	0.03	0.00	-0.72
2027	0	0.00	1.47	0.03	0.00	-1.50
2028	0	0.00	1.40	0.03	0.00	-1.42
2029	2.94	0.32	0.00	0.03	0.08	3.16
2030	2.94	0.32	0.00	0.03	0.08	3.15
2031-2037	2.94	0.32	0.00	0.00	0.08	3.18
2038	2.94	0.32	0.00	0.00	0.58	2.68
2039-2047	2.94	0.32	0.00	0.00	0.08	3.18
2048	2.94	0.32	0.00	0.00	0.58	2.68
ENPV	19.04	2.04	2.89	0.13	0.70	17.35
EIRR	51.37%					

Table A.14. Sensitivity test on the base case for the flood mitigation subprojects

Sensitivity tests	Pursat		Sangker	
	ENPV (USD m)	EIRR (percent)	ENPV (USD m)	EIRR (percent)
Base Case	8.40	11.30	17.35	51.37
+10 percent in investment cost	7.09	10.85	17.05	48.03
+10 percent in O&M costs	8.03	11.22	17.28	51.28
7.9511.2017.2351.17-10 percent in rice yields	6.37	10.83	15.39	47.88
-10 percent reduction of avoided houses & possession losses	7.61	11.27	15.61	51.37
+ 1 year delay in construction	8.40	11.30	17.35	51.37

Annex 4: Paris Agreement Alignment Assessment and Climate Finance Estimation

1. PAA assessment for the Project has been completed in line with the [Methodology](#) for assessing PAA of AIIB operations, covering BB1 (mitigation goals) and BB2 (adaptation and climate resilience goals).

2. **Alignment with Climate Mitigation Goals (BB1):** The Project, being an irrigation project, is categorized under the ‘universally aligned’ list. Hence, no further assessment is needed. The climate change mitigation measures of the Project include using a new gravity-based irrigation system with high efficiency, replacing individual diesel pumps with electric pumping stations, and piloting the AWD technique.

3. **Alignment with Climate Adaptation and Resilience Goals (BB2):** The Project aims to improve the resilience of the population and agricultural production in Cambodia through investment in (i) climate-resilient irrigation infrastructure and digital asset management against flood and drought; and (ii) awareness and institutional capacity strengthening for WRM. Activities supported by the Project are fully in line with Cambodia’s Climate Change Strategic Plan and its updated NDCs. The Project can, therefore, be considered as aligned with the adaptation and climate resilience goals of the PA.

4. The table below provides a summary of the assessment of the Project’s alignment with the mitigation and adaptation goals of the PA.

Assessment against Mitigation Goals of the Paris Agreement (BB1)

3. BB1 Assessment	
Questions/assessment steps	Answer and justification
UNIFORM ASSESSMENT CRITERIA	
#U1: Is the project/ economic activity included in the “universally aligned list” with activities that have a positive or negligible impact on the climate?	Yes. The Project activities “water supply (water efficiency, drought management, new gravity-based irrigation system, and high-efficiency electric pump station)” and “Fisheries (conservation of natural habitats and ecosystems)” are included in the “universally aligned list” with activities that have a negligible net impact on the climate. Overall, the Project reduces GHG emissions by 14,423.09 tCO ₂ e per year through gravity-based irrigation, replacing diesel pumps with electric pumping stations, and introducing the AWD technique.
#U2: Does the project/ economic activity contradict the mitigation goals of the PA directly or indirectly (e.g., is it on the “universally non-aligned list”)?	No. The Project and its activities are <u>not</u> on the MDB Universally Not Aligned list.

SPECIFIC ASSESSMENT CRITERIA	
Questions/assessment steps	Answer and justification
#SC1: Is the operation/economic activity inconsistent with the NDC of the country in which it takes place?	No. Under Cambodia’s updated NDC (2020), a 42% emission reduction has been planned for 2030, with 10% from the agricultural sector. The Long-Term Strategy for Carbon Neutrality (2021) of Cambodia suggests the introduction of AWD practices as one of the means for carbon emission reduction. In addition, the Project activities are consistent with the goals of Cambodia’s

SPECIFIC ASSESSMENT CRITERIA	
Questions/assessment steps	Answer and justification
	updated NDC ⁴² which mentions “the improvement of support services and capacity building to crop production resilient to climate change by promoting research, trials and up-scaling climate-smart farming systems that increase resilience to climate change and extreme weather events” as one of the adaptation actions. The development of irrigation facilities is indicated as one of the available technologies to support the implementation of the action. Another related goal of the NDC is to “Establish nationally standardized best practice systems for irrigation.”
#SC2: Is the operation/economic activity, over its lifetime, inconsistent with the country’s LTS or other similar long-term national economy-wide, sectoral, or regional low-GHG strategies compatible with the mitigation goals of the Paris Agreement?	No. The Project activities are not inconsistent with the country’s LTS ⁴³ or other similar long-term national economy-wide, sectoral, or regional low-GHG strategies. Cambodia’s LTS reiterates “Maintaining surface water quality and quantity; reducing and delaying flood flows”, as well as the importance of alternate wetting and drying practices and energy efficiency measures as key sectoral mitigation actions. The proposed modernization of the irrigation systems under Component 2, which will reduce the water withdrawal from the rivers for dry season cropping and avoid the use of diesel pumps and the methane emission of the rice cropping process, is aligned with this. The proposed revitalization of old river channels to divert flood flows from main rivers and updating reservoir operation rules to increase climate-induced flood protection capacity in existing reservoirs during the wet season is also aligned with this.
#SC3: Is the operation/economic activity inconsistent with global sector-specific decarbonization pathways in line with the Paris Agreement mitigation goals, considering countries’ common but differentiated responsibilities and respective capabilities?	No. The Project activities are not inconsistent with global agriculture sector-specific decarbonization pathways in line with the Paris Agreement mitigation goals, considering countries’ common but differentiated responsibilities and respective capabilities. Improving irrigation efficiency is highlighted as a key priority in the Intergovernmental Panel on Climate Change (IPCC)’s Special Report on Food ⁴⁴ to facilitate sustainable intensification of agriculture. “Efficient irrigation systems have been also analyzed and proposed...” A similar IPCC Report notes that “Physical and technical strategies for irrigation efficiency include building large-scale reservoirs or dams, renovating or deepening irrigation channels, building on-farm rainwater harvesting structures, lining ponds, channels, and tanks to reduce losses through percolation and evaporation, and investing in small infrastructure such as sprinkler or drip irrigation sets.” Consistent with this objective, structural interventions for the Project include the extension of irrigation canals and the remodeling of an existing irrigation barrage. In addition, AWD technology has been evidenced as an effective measure to substantially reduce methane emissions during the crop cycle of rice. (Link: https://www.fao.org/agroecology/database/detail/en/c/1679283/).

⁴² Government of Cambodia. 2020. [Cambodia’s Updated Nationally Determined Contribution](#). Phnom Penh.

⁴³ [Cambodia’s Long-Term Strategy for Carbon Neutrality](#)

⁴⁴ [IPCC Special Report: Food Security - Special Report on Climate Change and Land](#)

SPECIFIC ASSESSMENT CRITERIA	
Questions/assessment steps	Answer and justification
#SC4: Does the operation/economic activity prevent opportunities to transition to Paris-aligned activities OR primarily support or directly depend on non-aligned activities in a specific country/sectoral context?	No. The Project promotes Integrated Water Resources Management which is aimed at improving dry season irrigation water availability and coping with wet season flooding. The updated irrigation systems (largely gravity-based, and installation of an electric pumping station) as well as the AWD technology for rice cultivation to be modernized under Component 2 will substantially reduce the water withdrawal volume, and it is considered the lowest-carbon design principle and the energy efficiency measure as the volume of the water to be pumped up will be substantially reduced. In addition, the AWD technology will substantially reduce methane emissions during the crop cycle of rice as justified above. The Project will not support or directly depend on not-aligned upstream and downstream activities. Therefore, the Project operation will not prevent the transition to Paris-aligned activities.
#SC5: Is the operation/economic activity economically unviable, when taking into account the risks of stranded assets and transition risks in the national/sectoral context?	No. Irrigation systems are not at risk of becoming stranded assets from a climate mitigation perspective. This updated irrigation system will continue to provide a necessary role in food production and will reduce the carbon footprint of the irrigation system, further, the supply of water does not rely heavily on fossil fuels as an energy source, and there are negligible transition risks.
Result	The operation meets the BB1 criteria and therefore is aligned with the mitigation goals of the Paris Agreement.
<i>Assessment against Adaptation Goals of the Paris Agreement (BB2)</i>	
4. BB2 Assessment	
Questions/assessment steps	Answer and justification
CRITERION 1: Establishment of Climate Risk and Vulnerability Context	
Step 1: Identifying and assessing physical climate risk Is the operation (including assets, stakeholders, and the system within which it takes place) at risk?	Yes. The Climate Risk Screening determined that the climate risk is categorized as ' Medium ' for the proposed operation. The identified climate risks are detailed in Table 2 of the Project Document.
CRITERION 2: Definition of the Climate Adaptation and Resilience Measures	
Step 2: Addressing physical climate risks and building climate resilience Have climate adaptation and resilience measures been identified to reduce material physical climate risks and contribute to building climate resilience?	Yes. Based on the Climate Risk Vulnerability Assessment (CRVA) key adaptation and resilience measures to be implemented by the Project include: <ul style="list-style-type: none"> • Enhance river basin management capacity including updating RBMPs. • Enhance storage capacity for water supply and flood protection by updating reservoir operation plans and rules. • Revitalize old river channels to divert floods from the main rivers. • Modernize irrigation systems. • Strengthen capacity for water management. • Develop flood risk maps, and flood preparedness plans.
CRITERION 3: Assessment of Inconsistency with a National/Broad Context for Climate Resilience	

SPECIFIC ASSESSMENT CRITERIA	
Questions/assessment steps	Answer and justification
<p>Step 3: Assessing the broader climate resilience context Is the operation not inconsistent with relevant national policies/strategies, private sector, or community-driven priorities for climate adaptation and resilience?</p>	<p>Yes. All project activities are not inconsistent with Cambodia’s national policies and strategies, private sector, or community-driven priorities for climate adaptation and resilience. The proposed activities are fully consistent with Cambodia’s Climate Change Strategic Plan, which includes the following strategic objectives:</p> <ul style="list-style-type: none"> • “Promote climate resilience through improving food, water and energy security. • “Reduce the vulnerability of sectors, regions, gender and health to climate change impacts.” • Similarly, the country’s NDC has the following in their prioritized adaptation actions: • “Establish a centralized and standardized approach to climate-resilient water management.” • “Establish a national climate and flood warning system, including a service center and flood emergency plans.” <p>The operation specifically addresses these issues through the development of the country’s water and flood management. Therefore, the operation is not inconsistent with Cambodia’s national policy on adaptation.</p>
Result	The operation meets the BB2 criteria and therefore is aligned with the adaptation goals of the Paris Agreement.
Climate finance estimate, USD	The total climate finance of the Project is accounted for USD147.92 million. Climate adaptation is estimated to cost USD124.82 million and climate mitigation is estimated to cost 23.10 million. AIIB will finance 47.1% (USD58.84 million) of the adaptation cost and 48.3% (USD11.26 million) of the mitigation cost.
5. Paris Agreement Alignment Assessment Result: Aligned	

Annex 5: Gender Action Plan

Gender Objective	Actions/Targets	Process Orientation Suggestions	Performance Indicators	Cost Estimation	Responsible Agencies
Component 1: Planning, coordination, and climate change adaptation capacities of water resources management strengthened					
1. Strengthen river basin planning in the Provinces of Pursat and Battambang.	<ol style="list-style-type: none"> 1. Capacity development of female staff at national, sub-national, and FWUCs, as well as women in vulnerable groups, be undertaken in gender mainstreaming in IWRM, and in climate change adaptation, river basin resilience; (2022 baseline: 0) (O) 2. Promotion of female staff in MoWRAM and PDWRAM to decision-making roles, increased number of women participation, in at least 30% in training in technical knowhow related to IWRM, RBMPs, irrigation service operations, water allocation rules development and implementation, and FWUCs development (2022 baseline:0) 3. Drought and flood forecasting and warning system with women at least 30% in flood risk maps, including vulnerable groups mapping development and function (2022 baseline:0) 	<ul style="list-style-type: none"> • Training programs of MoWRAM, DFWUCs, and PDWRAM female staff in gender-responsive climate change adaptation and improved climate resilience • Target participants: Women/gender focal point, related technical staffs at DFWUCs, PDWRAM, and FWUCs, and women in the vulnerable group – poor, elderly, female-headed household, and related stakeholders from national and sub-national level • MoWRAM GFP and Gender Mainstreaming Action Group (GMAG) mobility to provinces 	<ul style="list-style-type: none"> • Numbers of staff trained at national, and sub-national levels, FWUCs in gender-sensitive IWRM, climate change adaptation, and river basin resilience, • Female staff promoted to decision-making levels in MoWRAM, PDWRAM, • at least 30% of women staff MoWRAM, and PDWRAMs trained in technical knowhow related to IWRM, RBMPs, irrigation service operations, water allocation rules development and implementation, and FWUCs development • Women form at least 30% of all trainees in drought and flood forecasting and early warning systems, including poor, vulnerable women, the elderly, and other socially excluded groups • GMAG mobility to provinces improved 	USD30,000	<ul style="list-style-type: none"> • MoWRAM, DFWUCs, PDWRAM, • PMU at national, and sub-national levels, gender training consultants, gender focal points (GFPs) at MoWRAM, PDWRAM, GMAG
2. Strengthen women's voice in the Project design.	1. Consultations/Focus Group Discussions (FGDs) with women in at least 30% of villages in each command area/ watershed area	<ul style="list-style-type: none"> • Village-level consultation with women from households that own and/or rent land in command areas 	<ul style="list-style-type: none"> • Women's exclusive FGDs in at least 30% of villages in each watershed area, • At least two consultative meetings in each command 	USD5,000	<ul style="list-style-type: none"> • PDWRAM, PMU at national and sub-national levels, DFWUCs, GFPs

Gender Objective	Actions/Targets	Process Orientation Suggestions	Performance Indicators	Cost Estimation	Responsible Agencies
	<p>2. At least two community consultations were conducted in each command area with at least 40% women participants, including women holding positions at commune and village level and women FWUC management committee members.</p>	<ul style="list-style-type: none"> Location, timing, and information dissemination about consultations/ FGDs need to take into account women's household/female-headed households and women are informed of availability to participate. 	<p>area with at least 40% women participants including women holding positions at commune and village level and FWUC management committee members</p>		<p>at national and sub-national levels, GMAG, gender consultants under PMU</p>
<p>3. Strengthen women's membership, participation, leadership in FWUCs, development, planning, management, and good coordination.</p>	<ol style="list-style-type: none"> At least 30% of FWUC members are women including women who hold sole or joint titles to rent land in command areas. At least 25% of FWUC management committee members are women Women increasingly registering land in joint or single names; Ensure women in the Project areas aware of the relevant laws, land registration procedures, and their land rights. Ensure that weekly/monthly updates on the status of water resources and climate change are regularly shared with women in the command areas. Skills training for FWUC members in command areas on accounting, communication, facilitation/coordination, planning development, and climate-resilient water management, with at least 40% women participation. (Sessions will include decision-making, members' rights and responsibilities, conflict 	<ul style="list-style-type: none"> FWUCs are encouraged to adopt membership policies that conform with Sub-Decree No.31(membership is open to people of either sex who own or rent land in the scheme) Women will be particularly encouraged to become members of FWUCs Women can be made aware of land registration procedures and weekly updates on the status of water resources through radio, information at health centers and schools, posters, brochures, and information sessions. Through the skills-building sessions, women from households with land on tertiary canals, in particular, are encouraged to stand for election to FWUC management committees. Awareness for local leaders, as well as men and women in the communities will cover gender equality, why women's voice is important, why both women's 	<ul style="list-style-type: none"> Women increasingly registering land in joint or single names; Women form 30% at least of members of FWUC in the sub-projects singly or jointly as landowners with registered titles Information on climate change and, the status of water resources is regularly shared with women through FWUC meetings at commune/village levels, notices put up in commune/village offices regularly; information shared with district offices of women's affairs for sharing in women group meetings, information collected by gender consultants and gender focal groups and reported to PMU; FWUC women members exhibit their skills in accounting, water resources planning, conflict resolution, undertaking 	<p>USD10,000</p>	<ul style="list-style-type: none"> PDWRAM, PMU at national and sub-national levels, DFWUCs, GFPs at national and sub-national levels, GMAG, gender consultants under PMU

Gender Objective	Actions/Targets	Process Orientation Suggestions	Performance Indicators	Cost Estimation	Responsible Agencies
	resolution strategies, and information on gender issues and the existing and potential role of women in irrigation, water management, and FWUCs.)	and men's views, perspectives, and participation in decision-making is important, and why and how to share household and caring responsibilities so that both women and men can participate equally in trainings and decision-making.	canal maintenance, as well as gender issues, the importance of raising women's voices, their concerns on land and water management, and gender-based violence awareness among others		
4. Update Gender Mainstreaming Strategic Plan (GMSP) in Water Resources Sector 2024-2028	<ol style="list-style-type: none"> 1. National and sub-national level meetings, consultation, key informant interviews and focus group discussions 2. Improved mobility for MoWRAM GFPs and GMAG members to provinces for leading and monitoring of progress made in gender mainstreaming and updating the GMSP (2024-28) 3. Consultative workshop with related stakeholders at national and sub-national levels to discuss the draft of the updated GMSP, and finalize it 4. Launching MoWRAM's GMSP 2024-2028 with PDOWRAM, FWUC, GFPs, DPs, and other stakeholders from national and sub-national levels. 	<ul style="list-style-type: none"> • Target participants: Women/gender focal point, related technical staff at MoWRAM, DFWUCs, PDWRAM, and FWUC, and related stakeholders at the national and sub-national level • MoWRAM GFP and GMAG mobility to provinces 	<ul style="list-style-type: none"> • Reports of consultative meetings and key interviews at national sub-national levels submitted to PMU and Steering Committee • Submission of vehicle purchase plan to GMAG, PMU, and Steering Committee • National/subnational Consultative workshops report • Updated GMSP Plan 2024-2028 submission to PMU, MoWRAM, Steering Committee for approval 	USD10,000	<ul style="list-style-type: none"> • DFWUCs, GMAG, GFPs, PMU, Steering Committee • GMAG, GFPs, PMICs
Component 2: Water supply capacity during the dry season increased					
5. Ensure women's active participation in irrigation scheme membership, leadership, decision-making, in particular, water distribution/allocation plan, and mentoring to	1. Training needs assessment conducted with women and men in command area communities, and training/mentoring program designed to explicitly address priorities/needs of women and men.	<ul style="list-style-type: none"> • Target topics for training/mentoring program: Accounting/finance; communications and outreach techniques; conflict resolution; leadership and management skills. • The design and delivery of the training/mentoring program 	<ul style="list-style-type: none"> • Training needs assessment of gender-based priority needs submission of report to PMU • % of women in IWRM training reported 	USD10,000	<ul style="list-style-type: none"> • PDWRAM, PMU at national and sub-national levels, DFWUCs, GFPs at national and sub-national levels, GMAG, gender

Gender Objective	Actions/Targets	Process Orientation Suggestions	Performance Indicators	Cost Estimation	Responsible Agencies
support effective management of FWUCs.	2. At least 40% of women participants in IWRM training and mentoring activities.	will: i) provide practical knowledge and skills, ii) use methods and tools to promote participatory adult learning, and iii) take into consideration women's time, mobility, and literacy limitations.			consultants under PMU
6. Promote women's economic empowerment and safety.	<ol style="list-style-type: none"> 1. Ensure women's economic participation and safety during the construction of the Project. 2. All contracts for civil works will guarantee: i) equal pay for women and men in similar positions; ii) enforcement of zero-tolerance work site policies regarding sexual harassment; iii) separate sanitation facilities for women and men; iv) provision of worker safety training, equipment, and clothing for women and men. 	<ul style="list-style-type: none"> • Priority will be given to women who read and write for paid work related to record bookkeeping, accounting, and equipment suppliers. • PMICs and PMU will collaborate to provide gender sensitivity training for all construction site supervision staff encompassing information on policies and procedures to prevent sexual harassment, child labor exploitation, gender-based violence, human trafficking, and transmission of Human immunodeficiency virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS) and Sexually Transmitted Infections (STIs). 	<ul style="list-style-type: none"> • At least 25% of local unskilled labor in upgrading and construction of irrigation and flood protection infrastructure, as stipulated in contract specifications and tender documents. (2022 baseline: NA) (OP 2.3) 		<ul style="list-style-type: none"> • PMU, PMICs, GFPs, gender consultants, monitoring reports to PMU/Steering Committee
7. Ensure women's active participation in village-based training and field demonstration programs on climate-resilient agricultural strategies, water management, and FWUC	<ol style="list-style-type: none"> 1. At least 35% of participants in all IWRM training on climate-resilient agricultural strategies are women 2. At least 35% of participants in in-field demonstrations are women. 3. 50% of FWUCs in the Project areas, (with at least 25% of women in FWUC management committee members and 40% of FWUC members are women) 	<ul style="list-style-type: none"> • Targets for training/field demonstration program: paddy water management, different rice varieties, crop diversity and calendars, climate resilient and higher-value crops, water management, etc. • The design and delivery of the training/mentoring program will: i) provide practical knowledge and skills, ii) use 	<ul style="list-style-type: none"> • Participation of at least 40% women in training 	USD5,000	PMICs, PMU, gender consultants, PDWRAM

Gender Objective	Actions/Targets	Process Orientation Suggestions	Performance Indicators	Cost Estimation	Responsible Agencies
	<p>established and fully functional for 10,000ha command areas (2022 baseline: XX)</p> <p>4. 20% of farmers in the command areas (10% of which are female farmers) trained on the profitable farming system and climate-mitigated agriculture practices (e.g. AWD) (2022 baseline: 0)</p>	<p>methods and tools to promote participatory adult learning, and iii) take into consideration women's time, mobility, and literacy limitations.</p>			
Component 3: Flood risks during wet season reduced					
<p>8. Strengthen gender mainstreaming capacity on flood risk mitigation in IWRM provinces, to promote women's opportunities related to FWUC and water resources management.</p>	<p>1. Conduct subproject commune level sex-disaggregated flood impacts information, gathering through FGDs, key individual interviews, and community suggestions regarding steps that can be taken towards better preparedness for protection of life, livelihoods, and assets, particularly of poor and vulnerable groups,</p> <p>2. Training FWUCs in early warning systems using community and local media, messaging services, flood protection structures, and campaigns to provide information to communities, and vulnerable sections. At least 30% of participants are women.</p> <p>3. Prepare flood mapping including quantification and location of vulnerable groups and essential infrastructure for women (2022 baseline:0).</p>	<ul style="list-style-type: none"> • Target participants: Irrigation engineers and other technical staff at PDWRAM; DFWUCs staff at national and provincial levels • Target topics: roles and responsibilities of FWUCs at all levels; opportunities/constraints for women's participation in irrigated agriculture and FWUCs; conflict resolution techniques • Training methods/tools prioritize participatory approaches and linking knowledge/skills to the work responsibilities of participants and gender-responsive 	<ul style="list-style-type: none"> • Reports on gender-specific flood impacts need priorities; • Sex disaggregated reports on training, flood risk maps, and risk assessment for vulnerable sections including the children, single women households, elderly, and disabled. 	<p>USD8,000</p>	<ul style="list-style-type: none"> • PMICs, PMU, GFPs, gender consultants, PMU

Annex 6: Member and Sector Context

A. Member Context

Cambodia has experienced rapid economic growth over the past decade, with an average annual growth rate of 7 percent. Consequently, the per capita GDP has nearly doubled from USD950.5 in 2012 to USD1,759.6 in 2022. The economy rebounded from a 3 percent contraction in 2020 to 3 percent growth in 2021 and then increased to 5 percent in 2022 and 2023. Recent growth has been mainly driven by rapid industrialization as well as the financial and trade liberalization reforms. The country's exports, led by labor-intensive manufacturing products, such as garments and footwear, grew from 54 percent of GDP in 2010 to 78 percent in 2022. Net Foreign Direct Investment (FDI) inflows also increased from less than 3 percent of GDP in the early 2000s to over 11 percent in 2022.

The country has successfully transitioned from an agriculture-intensive economy to higher productivity sectors, with employment shifting from agriculture to manufacturing.⁴⁵ The share of agriculture in employment declined from 55 percent in 2010 to less than 40 percent in 2022, while the industrial sector's share increased from 16 percent to 25 percent. The rise in national income has also driven an expansion in the non-tradable sector - the share of construction in GDP grew from 4.9 to over 10 percent from 2012 to 2022. This period of sustained growth boom has also led to marked poverty reduction, which declined from 36.7 percent in 2014 to 16.6 percent in 2022.⁴⁶

However, the COVID-19 pandemic caused delays in human capital formation and infrastructure investment, which may affect long-term growth potential. As national income continues to grow, labor cost advantages will diminish, particularly in the era of advanced automation and AI. To maintain growth, the economy needs to upgrade its global value chain positioning, which depends on improved infrastructure, institutions, and a skilled labor force.

The Cambodian government recognizes infrastructure's role in economic diversification and has prioritized improving logistics, transport, energy, and digital connectivity in its 2019-2023 NSDP. Emphasis is also placed on inclusive and sustainable development, with a focus on enhancing the resilience and productivity of the agriculture sector. The Agricultural Sector Master Plan 2030 was developed, in alignment with the NSDP 2019-2022, to increase the competitiveness and sustainability of the sector by improving the irrigation system, land management, and connectivity to local and global markets.

The climate transition offers significant development opportunities for Cambodia. Around USD2 billion per year is estimated to be required to meet the infrastructure investment gap and the sustainable development goals.⁴⁷ Continued investments in new energy sources

⁴⁵ The unemployment rate has been below 1 percent of total labor force since 1990, except 2007 when it rose to 1.3 percent. Source: [Unemployment, total \(% of total labor force\) \(modeled ILO estimate\) - Cambodia | Data \(worldbank.org\)](https://data.worldbank.org/SH.UV.TS)

⁴⁶ Estimates according to 2023 Global Multidimensional Poverty Index, by the United Nations Development Program (UNDP) and the University of Oxford.

⁴⁷ Source: <https://outlook.github.org/countries/Cambodia>

not only enhance the country's climate change preparedness but also promise higher productivity and efficiency in the future. The government's commitment to invest an additional USD 6.5 billion in renewable energy infrastructure from 2026 is commendable. The global decarbonization trend also provides opportunities for foreign investment and the development of new industries and products, improving the current account. The recent growth in solar panel and electrical parts manufacturing and exports is a positive step.

B. Sector Context

Cambodia is endowed with water, of which 96 percent is used for agriculture, 1 percent for domestic rural use, and less than 1 percent for industrial and domestic urban, and aquaculture.⁴⁸ Cambodia is one of the world's most flood-exposed countries, with an estimated affected population of around 4 million people, or 25 percent of the population, and with estimated annual losses of USD 250 million.⁴⁹ Due to extreme variations of rainfall within a year, the country's flat topography, lack of water storage, and poor infrastructure accessible to the water, available water has been limited yearly during the dry season. Among others, the river basins that drain into the TSL have faced severe water shortages with annual rainfall of 800 millimeters and monthly rainfall of often less than 100 millimeters during the dry season, from November to April. In contrast, the annual flood pulse of the Mekong River and Tonle Sap brought positive impacts on the fisheries and ecological responses. Both fresh and marine fisheries account for almost 5 percent of the overall GDP and 61 percent of households' animal protein intake. Cambodia's capture fisheries produced an estimated 601,100 tons in 2019.⁵⁰ However, national fish catches are estimated to now be at the extreme upper end of sustainability. Impact studies of the Mekong mainstream dams suggest that up to 70 percent of capture fisheries in Cambodia are threatened, with millions of livelihoods potentially being affected in the future.⁵¹

Agriculture is critical in recovery efforts, especially in response to deteriorating food security and nutrition faced by poor and vulnerable communities. Though the share of the agriculture value-added in total GDP declined from 50 percent to 33 percent during the 1990s, the share in 2022 is still substantial at an estimated 23.7%. The sector contribution to GDP growth has been limited—over 1 percent throughout the decade to 2013, barely positive in 2014 and 2015, and a range of 1.7 percent and 0.8 percent during 2016 – 2022. This was caused by the persistent low labor productivity in unprocessed rice production, declining global commodity prices since 2014, as well as adverse weather (rain and drought) conditions. The proportion of the rural population is still high with 75 percent of the national population in 2022 and it was estimated that 34.5 percent of the total labor force is engaged in the agriculture sector in 2019. Women represent 39 percent of the agricultural workforce in 2021.⁵² However, women only own 12.4 percent of the recorded land area and are

⁴⁸ Government of Cambodia, MoWRAM. 2019. *National Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019–2033*. Phnom Penh.

⁴⁹ Willner, S., Levermann, A., Zhao, F., Frieler, K. 2018. [Adaptation required to preserve future high-end river flood risk at present levels](#). *Science Advances*. 10 January; and ADB and The World Bank Group. 2021. [Climate Risk Country Profile: Cambodia](#)

⁵⁰ Government of Cambodia, MAFF. 2020. *Annual Fisheries Statistics*. Phnom Penh. Actual catch is most likely three times higher due to underreporting.

⁵¹ Mekong River Commission. 2011. *Assessment of Basin-Wide Development Scenarios: Main Report (Basin Development Plan Programme [Phase 2])*. Phnom Penh and Vientiane; and Supreme National Economic Council. 2007. *The Report of Land and Human Development in Cambodia*. Phnom Penh.

⁵² World Bank. [Employment in agriculture, female \(% of female employment\) \(modeled ILO estimate\) | Data \(worldbank.org\)](#) (derived 10 February 2024).

estimated to receive only about 10 percent of all agriculture extension services. Given the high shares of rural employment and women, the agriculture sector remains critical for poverty reduction.

Cambodia ranked 14th in the Global Climate Risk Index, which is highly vulnerable to climate change. The country is projected to experience a 3.1°C temperature increase by the 2090s, posing a significant threat to outdoor workers. Without intervention, the population exposed to extreme river floods could increase by approximately 4 million by the 2040s. Climate change and human activities threaten the productivity of the TSL and Cambodia's fisheries, crucial for many impoverished rural communities. By 2050, more severe floods and droughts could affect the country's GDP by nearly 10 percent.

The updated NDC of Cambodia highlights agriculture and water resources as the sectors most vulnerable to climate change impacts. Most of Cambodia's agricultural areas will face higher risks of drought under future climate conditions, with production losses mainly due to flooding and drought in the past two decades. This could lead to the breakdown of food systems, putting vulnerable groups at risk of food and nutrition crises. The NDC estimates that overall GHG emissions in 2030, including forestry and other land use, are expected to increase to 155 million tCO₂e/year. Despite past data limitations, the situation is improving with the development of Information Systems and the upcoming completion of the National Water Resources Data Centre in 2024

Annex 7: Sovereign Credit Fact Sheet

Recent Economic Development

1. Cambodia, a lower-middle-income country with a population of 16.8 million, has an income per capita of approximately USD 1,760.⁵³ The economy was resilient during the pandemic as the growth rebounded from a contraction of 3.6 percent in 2020 to 3.1 percent in 2021 and peaked further to 5 percent in the subsequent two years. While agriculture faced challenges due to weather and rising costs, the service sector made a strong comeback. Electronics exports, especially solar panels, offset a decline in garment exports.
2. Inflation remained below 3 percent during the pandemic but rose to 5.3 percent in 2022 due to higher fuel and food prices. It stabilized at 2.1 percent in 2023. The central bank has been gradually unwinding pandemic-era support measures, including increasing reserve requirements for foreign currencies.
3. The government implemented countercyclical measures to mitigate the pandemic's impact, resulting in a 5.2 percent GDP budget deficit in 2021. With economic recovery and improved tax revenue, the fiscal deficit reduced to 0.2 percent in 2022. However, it expanded to 2.2 percent in 2023 due to a combination of factors: extended social support; spending on the 2023 South-East Asia Games and General Election; and completion of pending infrastructure projects from 2022.
4. The current account deficits were above 7 percent of GDP pre-pandemic but narrowed to 2.5 percent of GDP in 2020, due to non-monetary gold exports and import compression. However, the deficit expanded to 31 percent of GDP, attributed to subdued tourism and increased imports.⁵⁴ Improved trade performance in 2022 reduced the deficit to 19.2 percent of GDP. In 2023, the current account balance shifted to 1.3 percent of GDP surplus, largely due to gold import restrictions. From 2020 to 2023, public and external debt stayed below 36 percent of GDP. The exchange rate remained stable, and foreign reserves were sufficient, covering over seven months of imports.

Economic Indicators	2020	2021	2022	2023*	2024*	2025*
Real GDP growth (% change)	-3.6	3.1	5.1	5.0	6.0	6.1
CPI Inflation (average, % change)	2.9	2.9	5.3	2.1	2.3	3.0
General government fiscal balance	-2.5	-5.2	0.2	-2.2	-1.7	-1.7
General government gross debt	25.5	26.3	25.7	25.9	26.4	26.2
Current account balance	-2.5	-31.0	-19.2	1.3	-3.5	-4.1
External debt	34.4	35.9	34.8	35.6	35.8	35.8
Gross international reserves (months of imports)	7.8	7.3	7.1	7.4	7.7	7.8
Exchange rate (KHR/USD, EOP) /2	4,035	4,064	4,108	4,071	4,065	

Note: * denotes projections; in percent of GDP, unless indicated otherwise. Data Source: IMF WEO April 2024; IMF Article IV report No.24/36; FX rates from Refinitiv as of May 8th, 2024.

Economic Outlook and Risks

5. Looking ahead, the International Monetary Fund (IMF) projects 6.0 percent growth for

⁵³ Source: <https://data.worldbank.org/country/cambodia>

⁵⁴ Gold imports in Cambodia have often been large - as much as 5 percent of imports - but those for 2021 were exceptional. Source: IMF Country Report 22/371.

the short term and 5.5 percent growth in the medium term, driven by tourism revival and robust non-garment exports. However, risks are skewed to the downside, including a protracted slowdown in import demand from advanced economies trading partners, a weakening of the Chinese economy, larger-than-expected impacts of US monetary tightening, high private debt, geo-economic fragmentation risks, and climate events.

6. Starting from 2024, the fiscal deficit is projected to narrow in line with the authorities' commitment to scaling back temporary support measures (including cash transfers), while retaining targeted fiscal support to the poor through social protection system reform. Public debt to GDP is projected to increase moderately during the next decade but stay within the official threshold of 55 percent, and, the risk of debt distress remains low, although there are vulnerabilities from shocks to exports and growth.
7. The current account deficit is projected to converge back to an average of 4 percent of GDP in the medium term. Public external debt should remain within the official threshold (40 percent of GDP for public external debt) but is sensitive to shocks in the current account balance.
8. In November 2022, Moody's affirmed Cambodia's B2 credit rating but revised the outlook from stable to negative. The negative outlook reflects the widening of the current account deficit and transparency concerns. (Neither Fitch nor Standard & Poor have ratings for Cambodia).