



REGIONAL PROJECT/PROGRAMME PROPOSAL

PROJECT/PROGRAMME INFORMATION (Summary)

Title of Project/Programme:	<i>Groundwater resources in the Greater Mekong Subregion: Collaborative management to increase climate change resilience.</i>
Countries:	Cambodia, Lao People’s Democratic Republic, Thailand, Vietnam
Thematic Focal Area:	Transboundary water management
Type of Implementing Entity:	MIE
Implementing Entity:	UNESCO
Executing Entities:	National Agencies, CCOP-TS, IWMI, IGRAC
Amount of Financing Requested:	<u>US \$ 4,898,775</u>

Project / Programme Background and Context

Resource status: Groundwater in the Greater Mekong Subregion

The Greater Mekong Subregion (GMS) includes the sovereign nations of Cambodia, Lao People’s Democratic Republic (Lao PDR), Thailand, and Vietnam. With a rapidly increasing population in the range of 250 million people, the region is experiencing more variable surface water flows, a prolonged dry season and intensifying droughts and a growing demand for water resources including groundwater. Despite relatively abundant surface water resources, a considerable number of low-income groups and urban/rural communities rely on low-cost groundwater for their domestic, agrarian and industrial use. Several groundwater reserves are transboundary, and it is recognised that there is limited capacity to manage these shared resources and limited knowledge about the sustainable yields of these transboundary aquifers. This proposal seeks to address this institutional and governance challenge through implementing a transboundary groundwater collaboration. Recent and predicted population dynamics will put more pressure on limited water resources, accelerated by consumption and behavioural patterns, unless serious awareness, education, and science-based information flow will balance this trend. According to UN DESA,¹ the population of the four member states has exceeded 179 million in 2018, versus 44 million in 1950, and it will reach more than 307 million people by 2050, with only Thailand reaching population stability very soon. As a result, the total population increase will be 600 % in only 100 years and still increasing.

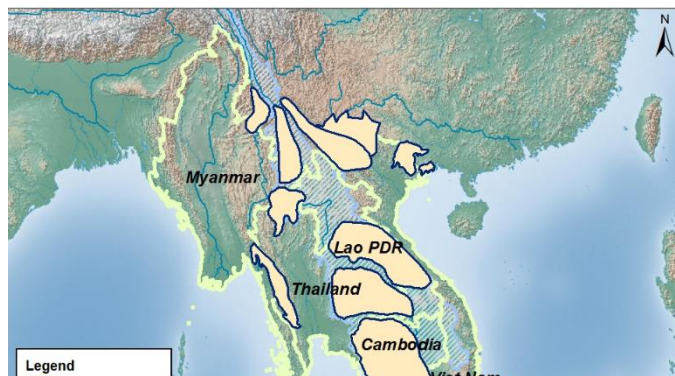


Figure 1: Overview of the main transboundary groundwater aquifers in the Greater Mekong Subregion; source IGRAC.

Throughout the GMS, complex relationships occur between upstream recharge areas and downstream aquifers. The total potential capacity of groundwater resources is estimated to be about 60 million m³/day. Important transboundary aquifers straddle the border areas and highlight the need for multilateral

¹ Sources: UN DESA, World Bank.

cooperation for effective management of shared resources.² Recent studies³ illustrate the intensive use and economic significance of groundwater for both the Vietnamese and Cambodian part of the Mekong Delta. This also applies for the drought sensitive northeast of Thailand (the Isan region) and adjacent parts of Lao PDR.⁴

Groundwater is also an extremely important resource for crop irrigation, food production (notably in Thailand and Vietnam), industries such as food processing and mining, and domestic supply for urban and rural communities. Due to rapid economic and population growth, pressures on groundwater in the region are increasing fast. Climate variability creates a more uncertain dimension of stress, with, for example, the recent El Niño related drought in Thailand leading to emergency measures involving the drilling of 900 wells for irrigating parched rice fields with unknown longer-term consequences.⁵

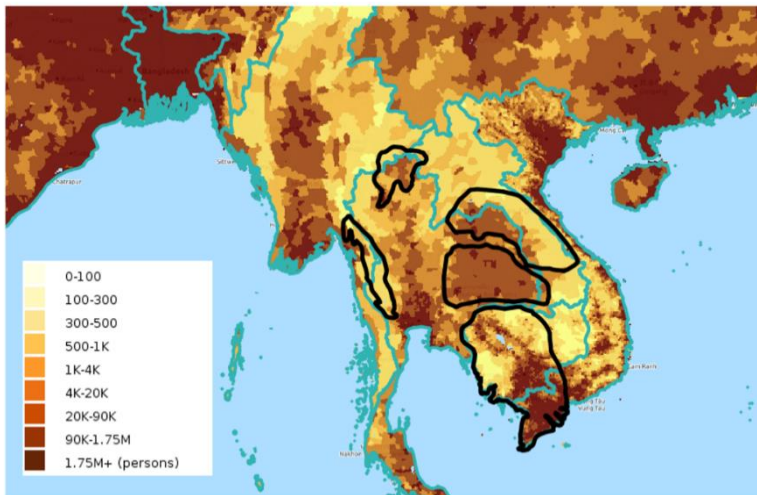


Figure 2: Main transboundary aquifer (TBA) systems in the region and the population density in 2015 in the region (data: SEDAC: Socio-economic Data and Applications Center).

Population densities (persons/km²) vary significantly throughout the region, but it can be said that in more densely populated areas there is a significant dependency on groundwater for agricultural water needs (irrigation) and rural and urban domestic needs, especially in more frequent and prolonged droughts.

Groundwater resources users and increased vulnerabilities

In the recent past over-extraction of groundwater for production of high-value crops, such as coffee, has caused a severe drop in groundwater levels in parts of the Vietnamese highlands. The same is happening in the upstream part of the Mekong Delta (Cambodia) where rice production for export causes unsustainable use of groundwater.⁶ Intensification of irrigation to meet the food demand of growing populations rapidly increases use of groundwater in all countries in the region. In some areas such as southern Cambodia, parts of Lao PDR and the Mekong and Ayeyarwady Deltas, naturally occurring arsenic contamination is already exacerbated by increased groundwater use and higher pumping rates. Climate change adds additional factors of groundwater recharge limitations. Groundwater supports valuable ecosystem services by feeding wetland ecosystems, valuable habitats of fish and aquatic plants contributing to food security.

Intrinsic linkages between surface water and groundwater exist, but they are not always clear. Incidentally, the system connectivity between surface water ecosystems (rivers and wetlands), larger watersheds, land use practices and groundwater is being recognized. In this context, it is critical that climate patterns and climate change realities are considered. These must be studied, with the results taken into account in water allocation planning.

² Landon, M., 2011; Preliminary compilation and review of current information on groundwater monitoring and resources in the Lower Mekong River Basin. USGS report to Mekong River Commission.

³ Erban, L. S.M. Gorelick & H.A. Zebker, 2014; Groundwater extraction, land subsidence and sea-level rise in Mekong Delta, *Environ. Res. Lett.* 9. and Frank Wagner, Vuong Bui Tran and Fabrice G. Renaud; *Groundwater in the Mekong Delta: Availability, Utilization and Risks, in The Mekong Delta System, Interdisciplinary Analyses of a River Delta*, Renaud and Kuenzer (eds.), Springer, 2012.

⁴ Pavelic, P., O. Xayviliya and O. Ongkeo., 2014; *Pathways for effective groundwater governance in the least-developed-country context of Lao*; and Vote et. al. 2015.

⁵ Jikkham, Patsara. "More controls on water use essential, minister warns." *Bangkok Post*, 23 June 2015.

⁶ Erban, L.E., S.M. Gorelick, 2016; Closing the irrigation deficit in Cambodia: Implications for transboundary impacts on groundwater and Mekong River flow. <http://dx.doi.org/10.1016/j.jhydrol.2016.01.072>

Further expansion of irrigation, land use changes (deforestation) in the highland areas, increase of domestic and industrial use in expanding cities (capital and provincial) in the GMS may result in significant depletion of groundwater resources in the future, leading to reduced water availability, higher pumping costs, saltwater intrusion in coastal areas, and loss of ecosystem services. These effects will be exacerbated by the impacts of climate change (increasing demand, potentially reducing recharge) throughout the GMS. The full impacts of climate change on groundwater availability will be complex and require further investigation.

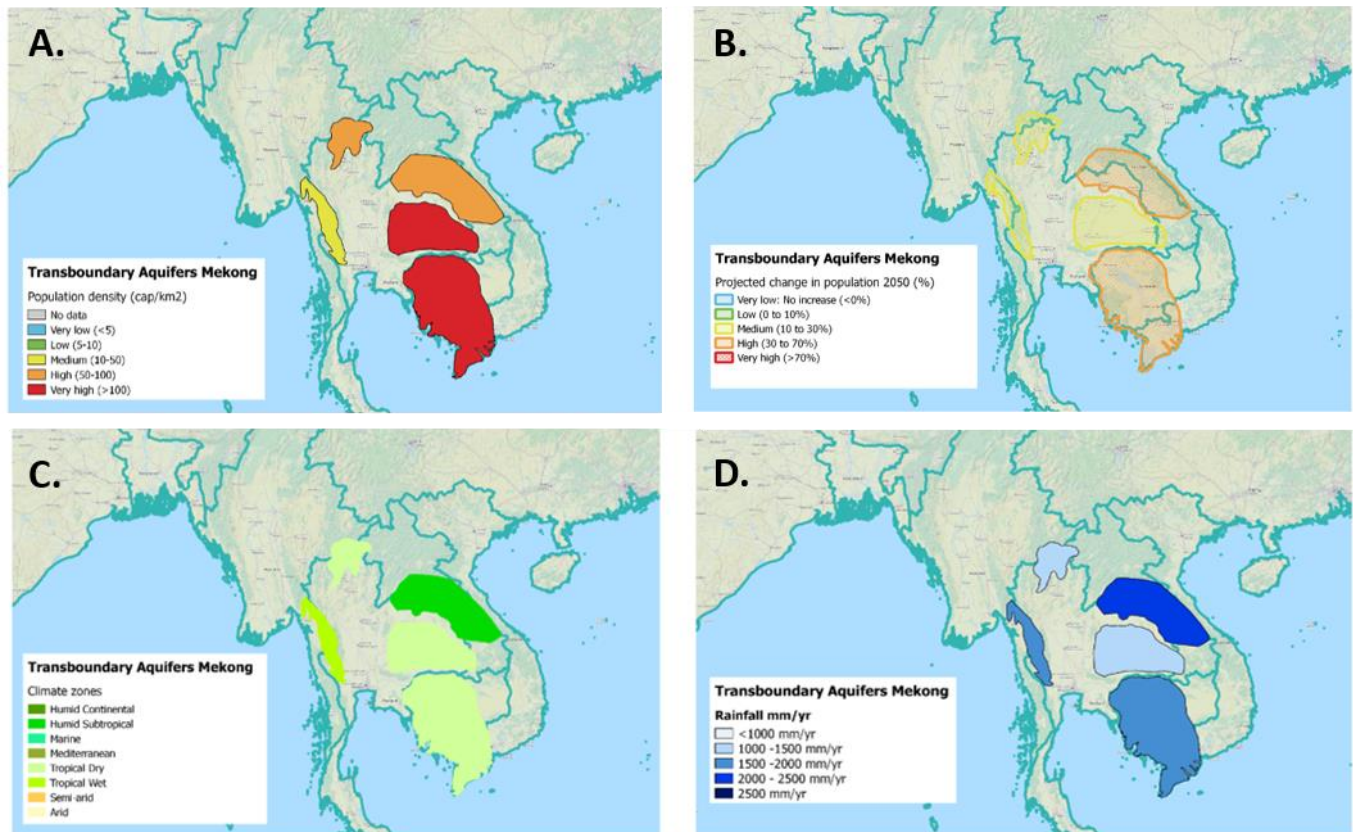


Figure 3: Overview of characteristics of the main transboundary aquifers located in the GMS and shared by Thailand, Lao PDR, Cambodia and Vietnam. A. Population density; B. Projected change in population; C. Climate zones and D. Average annual precipitation. Data derived from the Transboundary Water Assessment Programme (TWAP), <http://twapviewer.un-igrac.org>).

Comprehensive groundwater management and specialized studies (dedicated monitoring, resource assessments) are a relatively new and underdeveloped domain, pertinently so in Lao PDR, and Cambodia. In Thailand the Department of Mineral Resources-Division for Groundwater Management has, over the last decades, made substantial efforts to map groundwater resources (1:250.000 series hydrogeological maps / groundwater maps) throughout the country and conducted various regional and specialized studies. Besides major studies in the Bangkok metropolitan region, important work has also been done in the drier northeast of the country (Isan region) where agriculture relies heavily on groundwater. In a similar mode, systematic groundwater mapping and studies in Vietnam have progressed since early investigations in Red and Mekong River deltas and development of expertise and capacity in central government agencies under the Ministry of Natural Resources and Environment (MONRE). Groundwater is now a recognized component in studies for provincial and municipal water supply and there is growing awareness on long-term supply and water quality issues (arsenic, salinity intrusion, pollution in urban areas). Unfortunately, the situation is very different in Lao PDR and Cambodia where groundwater is a rather neglected resource. It has only gradually been taken into consideration in national water, environmental and natural resources management policies, and capacity has developed slowly.

Climate change scenarios and climate change impacts in the region

All GMS countries are vulnerable to the adverse effects of the existing climate and weather patterns; flooding and heavy monsoon rains are common, but the region can also experience prolonged dry season droughts with pronounced and common water scarcity, with major impacts on the regional and national food security. The monsoon occurs from May to October, with heavy rains, high humidity and strong winds. From November to April is the dry season, with little rain, low humidity and not much wind. Total rainfall varies across the GMS from extremely high (up to 5000 mm annually) to a mere 700 mm per year in the central Dry Zone of Myanmar. Recurrent dry spells constitute a constant threat to the livelihoods of the rural poor. The climate is influenced by the El Niño Southern Oscillation, which causes inter-annual variations, bringing warmer, drier winters in El Niño years and cooler than average summers in La Niña years.

The Greater Mekong Subregion (GMS) is vulnerable to climate change due to high dependence on monsoonal rainfall, extended dry season duration and high exposure to sea level rise and storm surges in coastal areas. Climate change is already impacting the GMS. Temperatures have risen and more frequent and severe droughts and floods are causing severe socioeconomic impacts. The available scientific information indicates that these impacts will worsen over the coming decades. The Mekong River Commission forecasts temperatures to increase by between 0.4°C and 3.3°C by 2060 depending on global greenhouse gas emission pathways. Temperature records show an increase in mean annual temperatures and the number of dry, hot days annually. Future projections suggest that these trends will continue, with the average annual temperature rising by 0.7-2.7°C by the 2060's and 1.4-4.3°C by the 2090's throughout the year (depending on the greenhouse gas emission scenario and the climate model used). Rainfall scenarios over the same timeframe are considerably more uncertain – with potential scenarios ranging from a decrease of 16% through to an increase of 17%. Climate models predict a minor overall increase in annual rainfall in the coming decades but with notable regional and seasonal differentiations. Generally speaking, it is expected that shorter and wetter rainy seasons will occur, with longer and drier dry seasons, and more frequent anomalous seasonal events, such as the occurrence of short droughts during rainy seasons. Together, these impacts mean increased uncertainty in the availability of water for domestic and agricultural users. Given that the climate will be increasingly variable, with more pronounced extremes, the impacts of climate change will be evident primarily through extremes in the water system, which has significant implications for different sectors and water users.⁷

Climate change has direct and indirect impacts on groundwater recharge processes by affecting the magnitude and intensity of precipitation that controls rates of infiltration to groundwater, and on surface water storages in rivers, wetlands and dams that can infiltrate to groundwater. The implications of climate change model forecasts on groundwater resources of the GMS have not yet been established to a significant extent. Changes in recharge processes due to climate change are difficult to deduce with accuracy due to the high uncertainty. Studies carried out in other regions reveal that warmer temperatures and changing rainfall patterns affect both groundwater recharge rates and the demands on groundwater resources.

In general, groundwater resources in the GMS have not been extensively described in scientific literature. As a result, significant knowledge gaps remaining in terms of the extent, distribution, quality, recharge and extraction of groundwater in the GMS. A 2008 CRISO report on the impacts of climate change on GMS water resources called for detailed hydrogeological and geophysical investigations to be undertaken so as to better understand aquifer characteristics of the shallow and confined aquifer systems of the Mekong Basin.

In spite of these persistent knowledge gaps, recent literature has highlighted several likely groundwater-related climate change impacts in the subregion. Changes in precipitation and evapotranspiration directly affect groundwater recharge. In the more arid and drought-prone areas--such as, for example, northeastern Thailand--even small changes in precipitation may have significant impacts on recharge. While these dynamics are not known in detail in the GMS, they add to an overall context of increase water insecurity in the subregion. Increases in air temperature are likely to increase evapotranspiration and decrease recharge, a trend further exacerbated by increased incidence of extreme drought. Conversely, higher seasonal rainfall may lead to increased recharge during the wet season. In the case of GMS, aquifers that are well connected with river systems may see an

⁷ Johnston, R., Lacombe, G., Hoanh, C.T., Noble, A., Smakhtin, V., Suhardiman, D., Kam, S.P. and Choo, P.S., 2010; Climate Change, Water and Agriculture in the Greater Mekong Sub-Region. International Water Management Institute Research Report 136

increased availability of groundwater. In the GMS, this trend towards increased seasonal variability and increased incidence of flood and drought extremes leads to a less predictable and dependable recharge pattern in the GMS. Within an overall context of increasing population pressure and increasing water stress across much of the GMS, groundwater is likely to be an increasingly sought resource with significant potential to support adaptation.

Institutional framework for regional cooperation

Climate change vulnerabilities are not bounded by national borders. Likewise, groundwater resources cross state borders, including in the GMS. Several regional institutions provide an opportunity to address these issues.

The **Mekong River Commission (MRC)** has built up a long track record in contributing to regional water resources management in support of broader socio-economic development and sustainable management of natural resources. The most recent MRC Basin Development Plans⁸ provide a comprehensive, integrated water resources management-based framework. Unfortunately, with respect to groundwater issues the role and mandate of the MRC is less well documented. Logically, it could provide an initial platform for regional transboundary groundwater cooperation by focusing on priority issues, such as:

- Monitoring and data sharing
- Information sharing and a joint approach to deal with high arsenic and chemical element concentrations
- Inclusion of groundwater resource assessments and data monitoring in future Basin Development Plans
- Other associated and emerging challenges, such as those related to groundwater, basin, eco-hydrology, resource management, population, sustainable development goals (SDGs), etc.

⁸ Integrated Water Resources Management-based Basin Development Strategy 2016-2020 For the Lower Mekong Basin, MRC.; <http://www.mrcmekong.org/assets/Publications/strategies-workprog/MRC-BDP-strategy-complete-final-02.16.pdf>

Integrated Water Resources Management-based Basin Development Strategy (BDS) 2016-2020 For the Lower Mekong Basin



Today, the Lower Mekong Basin (LMB) is home for 65 million people, 80% of whom live in rural areas dependent on agricultural livelihoods. Many are still poor; however, all countries are expected to have reached middle-income status by 2030. The Mekong contributes significantly to this growth through the opportunities it provides, including water and waste-water services, energy, agriculture, fisheries, transport and trade, and ecosystems services. However, without coordinated development and effective management, the Mekong can also threaten continued growth through the risks that it brings, including the risks of floods and droughts, the deterioration of water quality, the reduction of sediment loads, and the overall deterioration of ecosystem services and biodiversity. The BDS 2016-2020 recognizes these trends, takes a long-term outlook, and examines longer term water resources development needs. It is assessed that the current national water resources development plans are sub-optimal from a basin-wide perspective. These plans fall short in protecting key environmental assets and protecting millions of increasingly affluent people against major floods (and droughts and other climate change parameters). Finally, the distribution of the benefits, impacts and risks from planned basin development are not equitably distributed.



Figure 4: The Basin Development Strategy (MRC, 2016) focuses on the Mekong River basin surface water resources, while there is increasing awareness that a significant share of water needs for irrigation agriculture, domestic and industrial water supply is met by supplies from groundwater sources. Obviously, surface and groundwater systems are intricately linked, in particular when it comes to addressing the impacts of climate change. This project aims to develop explicit resilience potential on the basis of improved groundwater management, in conjunction with the regional development ambition.

This project is well aligned with the 2021–2030 Basin Development Strategy & MRC Strategic Plan 2021–2025, which was published in April 2021. Specifically, this project makes a direct contribution to the 2021–2030 Basin Development Strategy, which takes note of “opportunities for joint transboundary projects including to support biodiversity corridors and to regulate dry season flows and **groundwater recharge**.” (p. 74). The project also makes a direct contribution towards MRC Strategic Plan 2021–2025 BDS Outcome 3.2, which calls for “regional and international expertise and best practice in the development of guidelines for transboundary groundwater management” (p. 144). Activities under this project will help establish a baseline for 3.2.1.1, which foresees the “development of guidelines on sustainable transboundary groundwater management and support implementation through country-to-country capacity building”. (p. 187).

At the subregional level, the project will draw on both UNESCO’s regional in-country presence in three of the four participating countries, as well as—in particular—coordination and support from the Coordinating Committee for Geoscience Programmes in East and Southeast Asia—Technical Secretariat (CCOP-TS). CCOP-TS has a proven track record in organizing and implementing regional collaboration projects in the field of groundwater that have shown high cost-effectiveness by making use of technical support and contributions from national government agencies. In addition to these internal management arrangements, the project will align closely with the MRC. The MRC and its Basin Development Plans provide a comprehensive, integrated water resources management-based framework. While these Plans are not particularly focused on groundwater, the MRC provides a natural partner through which to advance closer regional transboundary groundwater cooperation in areas such as monitoring and

data sharing – as well as a platform through which to seek greater integration of groundwater resource assessments and data monitoring in future Basin Development Plans.

In each of the four participating countries, the project will engage national institutions in three spheres: policy-regulatory, technical, and educational/capacity-building. Engagement across multiple entities in each country is a necessary to achieve the project objectives, which explicitly seek to establish stronger integration between institutions at the national as well as regional level, as well as between institutional and community stakeholders. This integration is not only desirable between institutions operating in each of the three main spheres, but also among institutions within each sphere. For example, with the possible exception of Thailand, the policy-regulatory sphere includes several government ministries with responsibility for different aspects of groundwater management. These include different constellations of ministries of water resources, environment, agriculture, rural development and energy. Through its engagement of key institutions within each sphere as well as between the three spheres (policy-regulatory, technical, and educational/capacity-building), the project will enhance coordination at multiple levels within each participating country.

Fortunately, the recognition of groundwater as a key natural resource is beginning to reach higher policy levels in government. In Thailand and Vietnam, groundwater work was launched decades ago and became part of natural resources and water agencies' mandates. Subsequently, also professional training and research activities took place. In Thailand, there is a fairly good understanding of the most important national groundwater resource systems; i.e., those underlying the central-north Chao Praya plain and metropolitan Bangkok, and more diverse and problematic aquifer systems in the northeastern Isan region. In this region, irrigated agriculture relies significantly on groundwater and now there is a considerable number of well-trained hydrogeologists and irrigation experts that know how to deal with groundwater. In Vietnam, agricultural development work in Red and Mekong River deltas has resulted in a fair degree of capability in central government agencies in the north and south of the country. In a growing community of experts, there is increasing awareness on the need to develop expertise on a number of challenging issues, like long-term urban water supply and water quality issues (arsenic, salinity intrusion) and, more recently, integrated water resources management (IWRM) to ensure the sustainability of the highly productive agricultural systems in both the Red river and Mekong River delta. In Vietnam, there is ongoing and high-level awareness regarding further developing human resources capacity through higher education and participation in national and international research both in government and academe. There is also a willingness to engage and collaborate with neighboring countries.

Pilot sites

The project proposes to work in three pilot sites that will include the most vulnerable regions in the GMS: 1) the Vientiane Plains (Lao-PDR-Thailand, bordering Mekong River); 2) the border area between northwest Cambodia and Thailand; and 3) the upper Mekong Delta region shared by Cambodia and Vietnam. A comprehensive problem analysis and intervention logic for each of the three pilot regions is provided in Annex I.

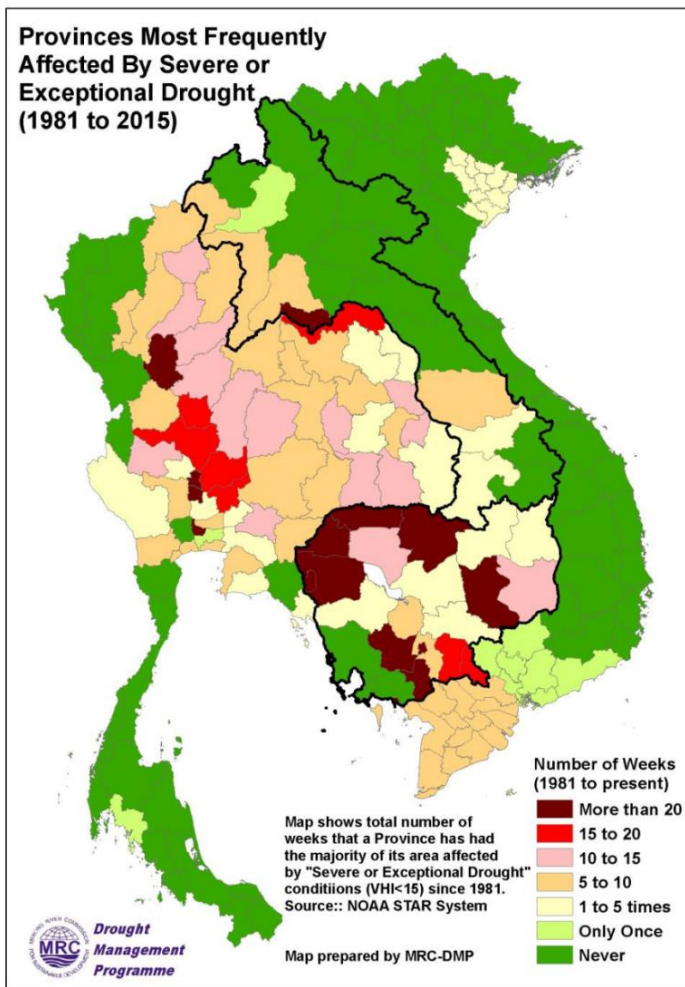


Figure 5: Regional impact of droughts (Source: MRC.org). With changing climate, the frequency of exceptional drought tends to increase; Vietnam's 2016 drought was the worst drought recorded in almost 100 years; (UNICEF, 2016).⁹

Gap Analysis

Institutional gaps: Although the transboundary cooperation in surface water management has progressed, there is no common approach, recognition and cooperation for groundwater resources. The challenges in river management (resource sharing, impacts of river management and hydropower development, climate change, etc.) are equally valid for groundwater resources and their diverse users. The absence of a sizeable community and cooperative network of groundwater experts in the GMS severely hampers addressing these issues, in particular in Lao PDR and in Cambodia, where local capacity in hydrogeology is very limited.

Legal and regulatory gaps: The four participating countries have all established legal frameworks that cover the management of groundwater (see page 30 for details). However, Cambodia and Lao PDR lack a detailed regulatory framework to support this management. In addition, the legal frameworks in all four countries are not conducive to transboundary cooperation, exchange and

sharing of information and data. Differing political, institutional and management-related practices, structures and traditions exist in each country. While ad hoc cooperation takes place on a bilateral basis between countries, it is frequently limited to specific locations and stand-alone activities, rather than forming part of a systematic transboundary exchange over time, which would allow for the accumulation of mutual institutional and technical capacity.

While steps have been taken in recent years to streamline groundwater governance in the participating countries, responsibility for key governance aspects relating to groundwater resources remain divided between different authorities, creating a complicated mosaic of institutional responsibility in both horizontal and vertical terms. Likewise, capacity for the management and monitoring varies significantly between the participating countries. While countries such as Thailand and Vietnam have significant human and financial resources available for groundwater investigation, research, management and monitoring, this is not the case to a comparable degree in other participating countries. Governance capacity also impacts the enforcement of rules and regulations; it is difficult to determine transgressions, because a functional monitoring system has yet to be put in place.

Knowledge and information gaps: Information on groundwater resources of the GMS is limited and contradictory, and there is an absence of analysis needed to support decision-making on pressing issues. Countries in the GMS currently lack information on the following:

⁹ UNICEF, 2016. Vietnam, Humanitarian Situation Report #2, https://www.unicef.org/appeals/files/UNICEF_Vietnam_Humanitarian_SitRep_3_June_2016.pdf

- Extent and/or characteristics of superficial and confined aquifer systems, including useable resource volumes in aquifers systems in the GMS, existing and/or potential water quality threats.
- Current groundwater volumes being extracted by type of use.
- Future demand scenarios for irrigation, urban water supply, and rural water supply.
- Relationships between recharge in highland (upstream) areas and resource potential in lowland (downstream) areas. This includes the groundwater dynamics of several important transboundary systems. Climate change, land use changes, watershed eco-system changes, demand changes, socio-economic changes including, and major interventions in the river systems (dam and reservoir construction, upstream water diversion and flow regulation) will affect these delicate balances in supply and demand. The relationships are not known.
- Sustainability (in view of increasing abstraction) of groundwater resources due to climate change and change factors (natural or anthropogenic).

The community consultations conducted in 2021 also found that knowledge and awareness related to climate change varied widely across the pilot communities that will participate in the project.

Capacity gaps: The regional landscape of GW management capability and expertise is rather diverse. Integrated and comprehensive GW management and specialized studies are rare, especially in Lao PDR and Cambodia, mainly due to a lack of well-trained and experienced experts.

Gaps in gender equality and women’s active participation: The literature review conducted under the gender analysis confirmed that women faced a lack of access to information and barriers to representation that increased their vulnerability to climate-related hazards, such as droughts and flooding, particularly in rural areas.¹⁰ Findings from the 2021 community consultations found that observations regarding gender and climate change varied across communities. In communities where women participated less in public organizations and where employment roles were more divided by gender, the perception that women and men experienced the impacts of climate change differently tended to be stronger. Several communities consulted reported few women participated in local government structures, although low participation was not universal. In summary, gender gaps are complex and are shaped by local context.

Project/Programme Objectives

The project objective is as follows: Establish effective regional capacities, partnerships and network in the Greater Mekong Subregion (Vietnam, Lao PDR, Cambodia, Thailand) for the sustainable management and utilization of groundwater resources as an adaptation response to protect people, livelihoods and ecosystems from climate change impacts.

The main project objective is derived from a sequence of relatively simple and straightforward concepts. In reverse hierarchy, these are:

- There are excellent opportunities for regional cooperation and coordination to address climate resilience and mitigate threats from droughts and water shortages for food security and rural/urban livelihoods
- Groundwater (a “hidden resource”) as an important component and integral part of the water system but is insufficiently considered in general IWRM policies and national CCA strategies
- National groundwater management expertise (from capable to very weak) needs to be developed further. National expert groups in some countries are not yet specifically oriented towards the potential of groundwater to contribute to climate resilience and vulnerability reduction.
- There is a fundamental need to develop closer relationships between groundwater user groups and their urgent water needs for food production (irrigated agriculture), for sustaining rural water supply and other water demands, and the groundwater expert community in order to improve groundwater management and long-term sustainability and address priority needs from different end-user groups.

The main project outcomes are defined in conjunction with the five main components:

¹⁰ See CEDAW/C/Lao/8-9 (2017): 34 and Clingeffer, K. (2020): Gender Learning Report: “Strengthening Climate Information and Early Warning Systems in Cambodia to Support Climate Resilient Development and Adaptation to Climate Change” Project: 5. See Annex IV for additional information.

Component 1: Groundwater Resource Assessment and Monitoring

Outcome 1: Participating countries use a regional GMS approach to address challenges of climate change, sustainable water use and resilience for evidence-based decision-making and management.

Component 2: Priority use and stakeholders

Outcome 2: Groundwater users in different economic sectors have equitable access to requisite information and guidelines and are able to participate actively in groundwater management

Component 3: Resource management, information tools and equipment

Outcome 3: Climate resilience and GW use in pilot areas are increased in an equitable and gender-balanced manner through adaptive technologies and approaches.

Component 4: Regional cooperation, coordination and information exchange

Outcome 4: Regionally consistent management strategies for groundwater resources in support of CCA are adopted through effective stakeholder engagement in the GMS.

Component 5: Capacity building and training:

Outcome 5: GMS stakeholders capably use project tools and knowledge on GW use for CCA and resilience.

These five outcomes will be achieved in the three pilot areas as a cross-cutting, transboundary result that will significantly strengthen the local capacity of primary stakeholders to address climate resilience issues across the region. Implementation of project activities in the three pilot areas will be guided by the project's cross-cutting objectives and will enable the joint generation of resilience deliverables on the ground.

Project/Programme Components and Financing

Table 1: Overview of project components and financing¹¹

Project Components	Expected Outputs	Expected Outcomes	Countries	Amount (USD)
Component 1: Groundwater resource assessment and monitoring	Output 1.1: Shared aquifer inventory for the GMS compiled that assesses groundwater vulnerability and resilience potential. Output 1.2: Harmonized groundwater monitoring network established	Outcome 1: Participating countries use a regional GMS approach to address challenges of climate change, sustainable water use and resilience for evidence-based decision-making and management.	Cambodia Lao PDR Thailand Vietnam	1,180,000

¹¹ A detailed, activity-based budget is provided in Annex VI of this document.

Project Components	Expected Outputs	Expected Outcomes	Countries	Amount (USD)
Component 2: Priority use and stakeholders	<p>Output 2.1: Customized, practical guidelines for community water use introduced in three transboundary pilot regions</p> <p>Output 2.2: Participation of women and other vulnerable groups in groundwater management supported and monitored</p>	Outcome 2: Groundwater users in different economic sectors have equitable access to requisite information and guidelines and are able to participate actively in groundwater management.	Cambodia Lao PDR Thailand Vietnam	495,000
Component 3: Resource management, information, tools, and equipment	<p>Output 3.1: Concrete groundwater management technologies and approaches introduced in three transboundary regions.</p> <p>Output 3.2: Pilot technologies and approaches monitored and adjusted based on project-generated information to align groundwater management with broader climate change resilience measures and surface water management.</p>	Outcome 3: Climate resilience and GW use in pilot areas is increased in an equitable and gender-balanced manner through adaptive technologies and approaches.	Cambodia Lao PDR Thailand Vietnam	980,000
Component 4: Regional cooperation, coordination and information exchange	<p>Output 4.1: Harmonized national strategies established for sustainable GW management in support of CC adaptation.</p> <p>Output 4.2: Regulatory framework for managing resources and expanding new groundwater-based resilience strategies and practical interventions supported.</p>	Outcome 4: Regionally consistent management strategies for groundwater resources in support of CCA are adopted through effective stakeholder engagement in the GMS.	Cambodia, Lao PDR Thailand Vietnam	505,000

Project Components	Expected Outputs	Expected Outcomes	Countries	Amount (USD)
Component 5: Capacity building and training	<p>Output 5.1: A groundwater community of practice created and equipped with the knowledge and skills to ensure technical and policy capabilities.</p> <p>Output 5.2: Project knowledge and international best practice archived, made available, and disseminated to stakeholders at all levels (community, national, regional, global).</p>	Outcome 5: GMS stakeholders capably use project tools and knowledge on GW use for CCA and resilience.	Cambodia Lao PDR Thailand Vietnam	1,001,379
6. Project/Programme Execution cost, 8.3 %				374,524
7. Total Project/Programme Cost				4,535,903
8. Project Management Fee 8 % charged by the Implementing Entity (MIE, UNESCO)				362,872
Amount of Total Funding Requested				4,898,775

Projected Calendar

Table 2: Overview of project milestones in chronological order

Milestones	Expected Dates
Start of Project/Programme Implementation	September 2022
Inception Phase	September 2022 – January 2023
Start-up of three regional pilot programmes	March 2023-July 2023
Mid-term progress workshops of regional pilots	August 2024
Mid-term Review (with Steering Committee)	September-November 2024
Regional project Conference and field visits	June 2025
Project/Programme Closing	August 2026
Terminal Evaluation	September - November 2026

PART II: PROJECT JUSTIFICATION

A. Project/programme components

Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

The project will consist of five interlinked components. For each component, we will define a limited number of specific activities with Results or Outputs. Outcomes (higher level results and/or impacts) as introduced in the previous section are defined at the component level. Under the five project components, each activity has a separate budget line and has inputs that include a number of cost items. Activities will be implemented at project level (generic, or GMS focus) or relate to project implementation in one or more of the three pilots in transboundary areas. The project is a collaborative effort of national groundwater agencies (and other contributing national parties) from the four participating countries with support from independent regional and international groundwater and climate change experts, including the International Water Management Institute (IWMI) and the International Groundwater Resource Assessment Centre (IGRAC).

Overall project implementation will be supported by CCOP-TS (project executive support), while project management, finance and administration are carried out by the UNESCO Regional Bureau for Natural Sciences in Jakarta, in close support and cooperation from UNESCO Office Bangkok, and further supported by UNESCO Headquarters Science Sector in Paris. Further details of project management are provided in Part III of this document.

The overall **project approach** focuses on community-led sustainable water management in order to adapt to climate change. The approach was informed by preliminary research and pilot projects involving aquifer storage and recovery (ASR) in Southeast Asia spanning several decades. A meta-analysis of case studies involving ASR in Southeast Asia¹² indicated that while cases of managed aquifer recharge (MAR) have been limited to case studies and trials, three conditions would enable wider usage:

1. Pressing groundwater quantity or quality issues;
2. Local technical expertise in groundwater and an appropriate institutional set-up to allow human and other resources to be mobilized; and
3. Links to international networks and institutions.

The project design reflects the need to create these conditions, because without them, concrete measures such as MAR will not achieve community buy-in and will not be sustained over the long term. Therefore, Components 1 and 2 provide the foundation for community-led decision-making and resource management, Component 3 introduces the infrastructure and technology, and Component 4 focuses on scaling up good practice by mainstreaming sustainable groundwater management into policies and programs and by building the regional capacity to implement those policies and programs.

Significantly, the project places substantial emphasis on addressing groundwater knowledge gaps in the GMS by building capacity for groundwater monitoring, analysis, management, research and documentation at all levels – from the groundwater users at the community level to national experts and managers, to subregional basin organizations. By co-designing and co-developing locally appropriate MAR solutions at key transboundary pilot locations across the GMS, the project seems to strengthen adaptation to the resulting overall context of water insecurity by increasing local, national and subregional understanding, management and documentation of groundwater resources. The combination of community-level adaptation through locally appropriate co-developed MAR solutions with knowledge production, consolidation and exchange at all levels will help ensure the sustainability of project outcomes while making a significant contribution to the GMS groundwater and climate change knowledge base.

¹² Pavelic, P. MAR in Southeast Asia. CGIAR.

The following is a summary overview of the five main project components and concrete activities. This project framework will form the basis for detailed work plans that will be developed at subregion level for each of the three pilots during the Inception Phase of the project in close collaboration with the national partners in each of the four countries.

Component 1: Groundwater resource assessment and monitoring

Outcome: A regional GMS approach to address challenges of climate change, sustainable water use and resilience is created for evidence-based decision-making and management.

The creation of a common approach to the groundwater resources inventory across the four participating countries will be critical to capturing the value added of the regional approach. Consistency of data collection and methodologies in transboundary areas will ensure consistency in reporting and results. In a transboundary context, groundwater monitoring also contributes to an improved transboundary governance by allowing the riparian countries to understand the current state of the shared aquifer and how it is changing over time. Online information systems will allow the countries to share and consult updated data and information at any time. This work will also allow the project to identify areas that are most vulnerable to groundwater-related water insecurity.

This component will support community water resource management activities in Component 2 by providing communities (and other stakeholders) with information needed for decision-making: groundwater monitoring and assessment are essential to achieve effective and informed groundwater management, which is the basis of improved groundwater governance. Outputs 1.1 and 1.2 also contribute to the outcome of the pilot concrete adaptation activities in Component 3 by informing the co-design and implementation of pilot managed aquifer recharge (MAR) activities in selected communities. Finally, the assessments and monitoring data will inform regional policies and cooperation under Component 4.

Outputs:

- 1.1 Shared aquifer inventory for the GMS compiled that assesses groundwater vulnerability and resilience potential
- 1.2 Harmonized groundwater monitoring network established

Major Activities

- 1.1.1 Create a shared aquifer inventory with updated and harmonised regional groundwater resources.
- 1.1.2 Carry out an assessment of groundwater vulnerability and resilience potential.
- 1.2.1 Design and launch a common groundwater system monitoring network, with community of experts and on-line information systems.

Under **Major Activity 1.1.1**, the *groundwater resources inventory* will be developed on the basis of published data and maps and will consist of a database and GIS tool modelled after IGRAC's tools or using the CCOP GIS tool. It is not necessary to have all data in the inventory at the early stage; the priority will be to establish a common approach and methodology. The project team will start with countries that have already collected large amounts of data (possibly existing tools, as Cambodia and Lao PDR may not have well developed data inventories).

Under **Major Activity 1.1.2**, the project will develop an assessment framework, tentative resource classification in terms of *resilience potential* initially on basis of groundwater system properties. While groundwater resource studies are fairly common, this assessment will integrate climate resilience concepts and tools. Results will show either resilience potential (use groundwater to help farmers and other users to build resilience) or vulnerability or negative resilience potential; i.e., the resource status is such that existing groundwater use, supporting some form of resilience, could be threatened because of depletion, pollution or other factors. When developing resilience potential, the assessment will take into consideration the fact that (positive) resource value is different for every user group, depending on their capabilities or needs. What might be considered positive resilience potential for large industrial users could be negative or neutral for small farmers.

Geographical coverage: Indicated Pilot areas; selected, preferably transboundary areas with very pertinent, practical and end-user-oriented approach. These areas will also feature in the other components. On the basis of

results from Component 2 (Priority use and stakeholders) define tailored information products, training and awareness activities, coaching and guidance (to farmers, vulnerable groups or intermediaries). Ultimately generate improved resilience for these areas and their inhabitants, whilst working with stakeholders who may take the findings and enable scaling up in other areas.

Groundwater resources inventory, organizing data collection, harmonization: Besides hydrogeological characterizations, groundwater assessment includes environmental, socio-economic and policy/institutional aspects. In the case of the internationally shared groundwater resources in the proposed pilot areas, information management and collaborative international work are two very important aspects to be taken up. Common monitoring and assessment usually face the challenge of data harmonization, including reference systems, formats, definitions, classifications, languages and/or use of different technologies. Therefore, one of the issues to enable collaborative management is to harmonize the hydrogeological information in the selected pilot areas. This will support a common regional view of the groundwater resources in the Mekong, providing a basis for collaborative actions, such as monitoring, pollution prevention and balanced use.

Aquifer status and vulnerability assessment: The transboundary aquifer assessment guidelines developed by IGRAC and the Intergovernmental Hydrological Programme of UNESCO (UNESCO-IHP) can be used for the groundwater inventory and aquifer vulnerability assessment process. The methodology covers hydrological, hydrogeological, socio-economic, environmental, legal and institutional aspects of the groundwater systems and transforms those into resource status and/or resilience indicators. These indicators can be used to facilitate communication between parties with very diverse levels of knowledge and professional backgrounds, one of the components towards collaborative management. The methodology also deals with challenges such as general lack of data, inaccessibility of groundwater information and harmonisation of data across borders. The assessment will pay careful attention to differences in vulnerability and resilience between men and women, including intermediary factors such as employment, skills, monetary and non-monetary resources, and education.

The assessment will provide the scientific and technical basis for actions and agreements, including to development of a specific action plan for the region. The methodology is based on a participatory approach to increase recognition, shared responsibility and transparency of the assessment processes. The collection, harmonization and analysis of the data on the transboundary aquifers should be carried out by a joint team of national experts from the involved countries. The joint assessment and fact-finding of the selected transboundary aquifers lay the first foundation for informed joint management.

Major Activity 1.2.1 will establish minimum monitoring of selected aquifers (high potential, transboundary, vulnerable aquifers). The participating countries will develop and agree on protocol to share monitoring data and will select the number of aquifers for active monitoring. The monitoring network is envisioned as launching by Year 2 of the project in order to collect 3 years of data.

Component 2: Priority use and stakeholders

Outcome: Groundwater users in different economic sectors have equitable access to requisite information and guidelines and participate actively in groundwater management

Component 2 will lay the groundwork for community-based water resource management. Inclusive and transparent community decision-making is a necessary pre-condition for successful pilots of MAR projects, and Output 2.1 will establish the enabling conditions for the pilot adaptation measures in Component 3. However, it will also provide guidelines and participatory practices that will allow communities to maintain the pilot technologies and adopt other adaptive measures as needed in the future. Output 2.2 will ensure that women and other groups are meaningfully involved in decision-making processes and receive an equitable share of the benefits of sustainable water use. It will also provide valuable sex-disaggregated data on water resource use and benefits that can be aggregated at the level of the sub-region.

Experiences with the community dialogues and gender platform will be shared with other climate change adaptation projects in the GMS and with groundwater projects in other regions through the information dissemination mechanisms established in Component 5.

Outputs:

- 2.1 Customized, practical guidelines for community water use introduced in groundwater groups in three transboundary pilot regions
- 2.2 Participation of women and other vulnerable groups in groundwater management supported and monitored

Major Activities

- 2.1.1 Dialogues with GW users and policy-makers to assess GW use scenarios for different sectors
- 2.1.2 Develop and provide custom-made practical guidelines to attain sustainable use of groundwater
- 2.2.1 Establish project gender platform to ensure a fully gender-responsive water assessment
- 2.2.2 Apply the UNESCO WWAP Toolkit on Sex-disaggregated Water Data

Details of the major activities are provided below.

Under **Major Activity 2.1.1**, *Dialogues with GW users and policy-makers* will consist of several steps.

1. Overview of most important GW user groups (user typologies). This step will be undertaken to understand user perspectives. It will allow the project experts to develop outreach and awareness-raising materials that target different users in different ways.
2. Assessment of what GW experts can do to support GW users. The project team will utilize the findings from Component 1 on resilience potential for this step to understand how resilience is understood and potentially valued by different users.
3. Dialogues with national policymakers and experts on the strategic importance of GW resources in the overall CCA discussion
 - Improve general understanding of the transboundary system
 - Clarify roles and responsibilities of local institutions
 - Information, participation and dialogue between stakeholders on both sides of the border
 - Involve local and regional authorities

While the activities under Component 2 will differentiate between users at different GW management levels in small pilots, there will also be a focus on integrating practices into strategies at the national level. The dialogues will focus on pertinent, practical and end-user-oriented outputs, such as information products, training and awareness activities, coaching, and guidance to farmers or extension workers. Provide examples in workshops with different sectors, such as examples of water supply companies on long-term strategy in the Mekong Delta; i.e., how to ensure water supply in view of multiple threats, recharge depletion, salinity intrusion, pollution, etc.

The dialogues will also address the “resilience agenda” for coming years; i.e., what do users need to do and consider? It will use the “Triple A” approach:

- **Agenda:** what are the issues, what has priority, when do we need to act?
- **Atlas/database:** where are our resources, location issues, protection, overlapping claims?
- **interAction:** Who is going to do what, how do we interact--rules of the game, who will decide, who will pay?

Under **Major Activity 2.1.2**, *information dissemination* will cover challenges for users, with special attention to most vulnerable groups. The dialogues and guidelines around groundwater use priorities will aim for gender balance, which may require project staff and consultants to tailor the format, location, scheduling, and leadership of dialogues in order to maximize women’s active participation. All guidelines will be clear to and accessible to women, and they will incorporate women’s view and priorities. Water management and planning bodies at all levels should support women’s active participation regardless of land tenure status. Furthermore, the project should take active steps to ensure that the decisions of water management bodies take lower-income households or households that do not own farmland or other property into account.

Under **Major Activity 2.2.1**, the project will introduce the UNESCO WWAP Toolkit on Sex-Disaggregated Water Data (2019 edition). Sex-disaggregated water data are among the least available across national-level indicators. This lack of data is a major obstacle to the production of scientific evidence on gender inequalities related to water and to the formulation of policies and programs that tackle those inequalities. Sex-disaggregated data are essential to making effective assessments of how women and men experience access to water and sanitation differently. Without this, it will not be possible to capture the project benefits in a gender-sensitive way. The UNESCO WWAP toolkit includes four distinct tools, all of which will be employed in the implementation of the project:

1. 'Gender-responsive indicators for water assessment, monitoring and reporting' features 105 gender-responsive indicators in 10 priority topics aligned with the 2030 Agenda (notably in the categories of human rights-based water resources management, water and education, indigenous knowledge and community water rights, migration, displacement, and climate change);
2. 'Methodology for the collection of sex-disaggregated water data' describes the methodology for data collection;
3. 'Guidelines on the collection of sex-disaggregated water data' gives an overview of common data collection methods for different users and regions;
4. 'Questionnaire for the collection of sex-disaggregated water data' lists 364 questions with suggested methodologies for data collection.

Under **Major Activity 2.2.2**, the project will introduce a *project gender platform* to ensure active engagement on enhancing women's and young people's skills on groundwater issues and related factors, including climate change, ground-water management, eco-hydrology, and rural and domestic water consumption. The gender platform will be established with predominantly female members. Best practices from previous initiatives in the region and beyond will be reviewed and adopted where applicable.

Component 3: Resource management, information tools and equipment

Outcome: Climate resilience and GW use in pilot areas is increased in an equitable and gender-balanced manner through adaptive technologies and approaches.

The 2022 World Water Development Report identifies MAR is an integrated approach that allows replenishment of aquifers to complement storage dams and provides a cost/effective alternative that minimizes evaporation and environmental impacts. MAR can also be used to retain unharvested urban stormwater and recycled water, to be made available for productive use when needed. At the watershed scale, MAR can be used to maintain environmental water flows and their availability, creating lags in water discharges to a stream. The application of MAR has increased by a factor of 10 over the last 60 years, but there is still ample scope for further expansion, from the current 10km³/year to probably around 100km³/year¹³.

Small-scale pilots in the participating countries in previous years has identified technologies and approaches that are most suited to the conditions in the pilot sites of the participating countries. The suite of MAR technologies potentially applicable to the community pilots use one of two methods: surface infiltration through soils to shallow groundwater via basins, ponds, trenches etc.; or subsurface injection or infiltration via wells. They may be installed at different parts of the landscape (on-stream, off-stream, upstream, downstream etc.) and make use of alternative water sources and serve a range of purposes. A broad overview of some of the most commonly used MAR methods that may be applicable to pilot sites in the Greater Mekong Subregion (GMS) are as follows:

- Check dams, percolation ponds - constructed across streams to detain water that infiltrates through the bed and increases the storage in unconfined aquifers
- Spreading basins and farm ponds - water is stored off-stream in depressions and allowed to infiltrate and recharge unconfined aquifers
- Recharge wells – water is infiltrated via gravity or injected into semi-confined or confined aquifers where surface soils are impermeable or land availability is limited
- Bunded paddy fields – can offer effective recharge structures to capture and infiltrate monsoonal rainfall
- Contour trenches - capture rainwater from upstream parts of watersheds and can be tapped in downstream areas using wells

¹³ United Nations, The United Nations World Water Development Report 2022: Groundwater: Making the invisible visible. UNESCO, Paris (p.9)

- Bank infiltration- where groundwater is extracted from a well near a river or lake to induce infiltration from the surface body to improve water quality

Each of these methods require periodic (e.g. annual) maintenance to maintain an uninterrupted flow of water to the recharge structure so that the benefits of MAR are maximized.

MAR has been implemented throughout the world for over 60 years across over 30 countries (covering both developed and developing countries) with a combined installed recharge capacity (in 2015) of around 10 km³ per year¹⁴. MAR experience in the Mekong region has lagged behind that of other more arid areas; however, water security has emerged as a major challenge in more recent years due to intensified water resources development, and compounded by climate change.

Governance frameworks for MAR in Mekong countries need specific attention to varying degrees. Operational performance and sustainability are intrinsic considerations for the development of new MAR pilots. Monitoring of pilots will generate a repository of information, data and reports that will be a key mechanism for providing initial assurance of effective operations and for developing the information to assist developing national and sub-national policies that support future uptake of MAR projects. MAR trials carried out by IWMI and its partners in rural India show that MAR operations can be linked to various governance mechanisms that effectively provide oversight and help incentivize communities to maintain MAR projects effectively¹⁵.

The three fundamental requirements for effective MAR – namely identifying appropriate aquifers for storage; available source water for recharge; and strong demand for recovered water - will be important in informing the selection of MAR locations and approach. Spatial analysis techniques will be used for the identification of potential MAR areas in the pilot communities. Following a multi-criteria decision analysis (MCDA) approach, thematic map layers such as hydrogeological maps, hydrological maps, land use maps, water demand maps, etc. will be consulted. Different MAR potential maps will be produced for different MAR methods. These MAR suitability maps will serve to identify the most suitable locations for the pilot community MAR activities. They will also identify where else MAR could be implemented, which can support regional uptake and diffusion and can be used to raise awareness on the potential of MAR among decision-makers.

The detailed piloting approach outlined in Major Activity 3.1.1 will provide an assessment of the opportunities and constraints of alternative MAR technologies. Guiding that selection will be the case-specific objective(s) that the MAR pilot seeks to address. In broad terms, these objectives may include counteracting groundwater depletion, improving water quality or ecosystem restoration.

Outputs:

- 3.1 Concrete groundwater management technologies and approaches introduced in three transboundary regions.
- 3.2 Pilot technologies and approaches monitored and adjusted based on project-generated information to align groundwater management with broader climate change resilience measures and surface water management.

Major Activities:

- 3.1.1 Identify, screen, select, and design best groundwater management equipment and measures for three pilot areas
- 3.1.2 Implement best groundwater management equipment and measures for three pilot areas for vulnerability reduction and/or groundwater supply improvement.

¹⁴ Dillon P., Stuyfzand P., Grischek T. et al., (2019). Sixty years of global progress in managed aquifer recharge. *Hydrogeology Journal* 27(1): 1–30. <https://doi.org/10.1007/s10040-018-1841-z>

¹⁵ Pavelic P., Sikka A., Alam M.F., Sharma B.R., Muthuwatta L., Eriyagama N., Villholth K.G., Shalsi S., Mishra V.K., Jha S.K., Verma C.L., Sharma N., Reddy V.R., Rout S.K., Kant L., Govindan M., Gangopadhyay P., Brindha K., Chinnasamy P. and Smakhtin V. (2021) Utilizing floodwaters for recharging depleted aquifers and sustaining irrigation: lessons from multi-scale assessments in the Ganges River Basin, India. Colombo, Sri Lanka: International Water Management Institute (IWMI). 20p. (Groundwater Solutions Initiative for Policy and Practice (GRIPP) Case Profile Series 04). doi: <https://doi.org/10.5337/2021.200>

3.2.1 Compile and integrate all data collected into the online information portal for best information sharing and analysis

Activity details:

Major Activity 3.1.1 will lay the groundwork for *resilience-strengthening pilots* for different users in different locations to demonstrate sustainable groundwater use¹⁶ as a resilience-strengthening option. The project will identify best practices in conjunctive management of surface and groundwater based on environmental and socioeconomic aspect of each pilot area

The following approaches will be considered in the design of the pilots:

- Pilot for agriculture/farmers, using small-scale MAR
- Pilot for regional water-supply companies that use specific information in groundwater management tools, making use of tools to manage resources and understand vulnerabilities and information-based resilience options; further develop resilience options

Foremost among these is using the wet season rainfall surpluses to resupply GW buffers to overcome dry season droughts, in other words – enhancing GW recharge. A range of technical options are available for stimulating GW recharge. Direct surface methods are among the most widely used and simplest. Depending on local conditions, water is simply spread over fields to percolate into shallow aquifers. Other methods include digging flooding pits or shafts; or ‘injecting’ water into aquifers through deep boreholes or tube wells from surface water bodies. GW recharge is often best accomplished as a by-product of integrated or ‘conjunctive’ management of reservoir and canal seepage, injection and infiltration of return flow from irrigation, enhanced infiltration of rainfall, or the simple levelling of fields or construction of small check dams. Technology aside, a managed recharge strategy strongly implies a shift to co-management of surface water and GW. These interactions are well understood in the scientific domain, but they remain almost entirely separate domains in the day-to-day worlds of policy and water management authorities.

Groundwater storage and replenishment (through MAR) offers a number of unique benefits, including potentially wider, more equitable access. GW (as long as there is a source of it) is accessible to anyone with the means to dig/ drill a well; an attractive option where surface water management is often highly politicized. As a CCA measure, aquifers respond to droughts and climate fluctuations much more slowly than surface storage structures, and they are more resilient buffers during dry spells. The approach borrows from extensive and successful experiences elsewhere, such as interventions in India (see table below).

¹⁶ Sustainable groundwater use is here understood to be the development and use of groundwater resources to meet current and future beneficial uses without causing unacceptable environmental or socioeconomic consequences.

Table 3: Overview of four possible storage methods and their resilience in relation to climate threats¹⁷

Table 1: Climate change and water storage alternatives.				
	Small surface storage	Large surface reservoirs	Aquifer storage (BAU)	Managed aquifer storage
1. Make water available where needed (space utility)	↑↑↑	↑↑	↑↑↑↑	↑↑↑↑↑
2. Make water available when needed (time utility)	↑	↑↑	↑↑↑↑	↑↑↑↑↑
3. Level of water control offered (from utility)	↑	↑↑	↑↑↑↑	↑↑↑↑↑
4. Non-beneficial evaporation from storage	↓↓↓↓	↓↓	↓	↓
5. Non-beneficial evaporation from transport	↓↓	↓↓↓	↓	↓
6. Protection against mid-monsoon dry spell (2-8 weeks)	↑↑	↑↑↑	↑↑↑↑↑	↑↑↑↑↑
7. Protection against a single annual drought	↑	↑	↑↑↑	↑↑↑↑↑
8. Protection against two successive annual drought	↑	↑	↑↑	↑↑↑↑
9. Ease of storage recovery during a good monsoon	↑↑↑↑↑	↑↑↑↑	↑↑	↑↑↑
10. Social capital cost of water storage and transport and retrieval structure	↓↓	↓↓↓↓↓	↓↓	↓↓↓
11. Operation and maintenance social costs of storage, transport and retrieval structures	↓	↓↓	↓↓↓↓↓	↓↓↓
12. Carbon footprint of agricultural water use	↓	↓↓	↓↓↓↓↓	↓↓↓

Table up to

3 assigns five benefits

or disbenefits to each of 12 resilience considerations. The first two options (small surface water storage facilities and large surface water reservoirs) are quite well known, but they provide little or negative resilience enhancement. The third option, aquifer storage, represents traditional GW use (Business as Usual – BAU), with mostly intensive exploitation (and depletion) of shallow aquifer storage without any demand-side management or systematic strategy for enhancing aquifer recharge. The fourth option, managed aquifer storage, is not widely applied yet, and it will require a radical shift in thinking. It recognizes that GW demand will and can increase, but depending on a region’s hydrology, aquifer storage can sustain this increase with proactive demand-side management and a region-wide program of managed aquifer recharge.

When determining the most appropriate intervention in each pilot area, the costs/benefits of each option will be compared and considered. For the sustainability of interventions, it would be more appropriate to select interventions whose implementation and - in particular – maintenance requires less efforts (in terms of technical requirements, financial resources, human resources). For instance, infiltration wells require significant investments for the drilling work, while infiltration basins might require frequent cleaning to remove the sediments or clogging layer that could form in the bottom. It is likely that the interventions will be designed to provide water for non-drinking purposes, e.g. for irrigation, livestock, or domestic activities like garden watering, toilet flushing, laundry, etc. The reason is that drinking water has higher water quality standards, which might require more demanding technology, e.g. for pre or post-treatment, making the implementation and maintenance of interventions more challenging.

The responsibilities in terms of maintenance will also be determined, as intervention schemes could be managed and maintained by the local community (main beneficiaries), by the water company, the water board, the ministry, research institutions... or a combination of them. Assigning responsibilities will take into consideration the financial and human capacity of these various stakeholders for the maintenance of interventions. If needed, funding schemes could be elaborated, whereby money could be raised to cover (part of) the maintenance budget. Funding schemes, could be for instance a fee to use the water produced by the intervention, or in-kind contributions to the maintenance, like for example to clean infiltration ponds. All these aspects will be duly taken into consideration to make sure that the interventions remain operational beyond the end of the project. A promising approach would be to make village communities autonomous in the maintenance and monitoring of the interventions on which they

¹⁷ Source: Shah, 2009.

rely, like it is being piloted in India¹⁸. In summary, the approach(es) undertaken in the pilot communities will be able to look to previous and current MAR interventions for possible funding arrangements, but ultimately, the arrangements chosen will reflect specific local circumstances and dialogue with local water users and other stakeholders.

In order to ensure tangible impact on the ground, the project's activity plans for the three pilot regions focus on co-development with groundwater users of suitable interventions in support of sustainable use and vulnerability reduction. Resource conservation as well as supply augmentation will both be considered and evaluated on their merits. Pilot trials of demand management that can be built upon have started in pilot area 1. Opportunities to use wet season rainfall surpluses to resupply groundwater buffers to overcome dry season droughts will be identified - in other words, enhancing groundwater recharge through MAR. A range of technical and social options are available for stimulating groundwater recharge. A staged, risk-based approach will be followed. Project team members have extensive experience in MAR in the region and globally. IWMI, working with national and international partners, have commenced a farmer-driven MAR pilot trial in the Central Highlands of Vietnam. This activity could potentially be linked to the pilot areas given that proof of concept has been developed and the government has given firm endorsement of the approach¹⁹. A managed recharge strategy strongly implies a shift to co-management of surface water and groundwater. These interactions are well understood in the scientific domain, but they remain almost entirely separate from the day-to-day worlds of policy and water management authorities in the countries concerned.

Different measures for groundwater vulnerability reduction and water supply improvement will be implemented depending on the environmental and socioeconomic conditions of each pilot area. In the upper Mekong Delta, for instance, the different levels of understanding of the aquifer system between Cambodia and Vietnam have restricted strategic planning of groundwater resource management, thus extra attention will be paid to a systematic sharing of experience, in particular from the Vietnamese Mekong Delta to the neighbouring Cambodian Mekong Delta. Overexploitation of groundwater in the Vietnamese part of the Mekong Delta has caused several issues such as seawater intrusion and land subsidence, thus instrumental measures will be suggested and feasibility of the state-of-art technology. For example, MAR will be tested to increase aquifer resilience. For the Cambodia-Thailand TBAs, intensified development of groundwater resources is recommended to increase availability and ensure its sustainable use, particularly in dry periods. Thus, a joint assessment will be carried out, including the suitability of water recharge/storage methods.

Figure 6 below shows the general design and operational features of the MAR interventions in cross-sectional and plan view. Note that collection areas may also include rooftops, roads and other runoff generating surfaces, which are not shown in the figure.

¹⁸ Managing Aquifer Recharge and Sustaining Groundwater Use through Village-level Intervention
<http://www.marvi.org.in/home>

¹⁹ Pavelic *et al.* (2019) Managed aquifer recharge for sustaining groundwater supplies for smallholder coffee production in the central highlands of Vietnam: report on pilot trial design and results from two hydrological years (May 2017 to April 2019) .
<https://cgspace.cgiar.org/handle/10568/106705>

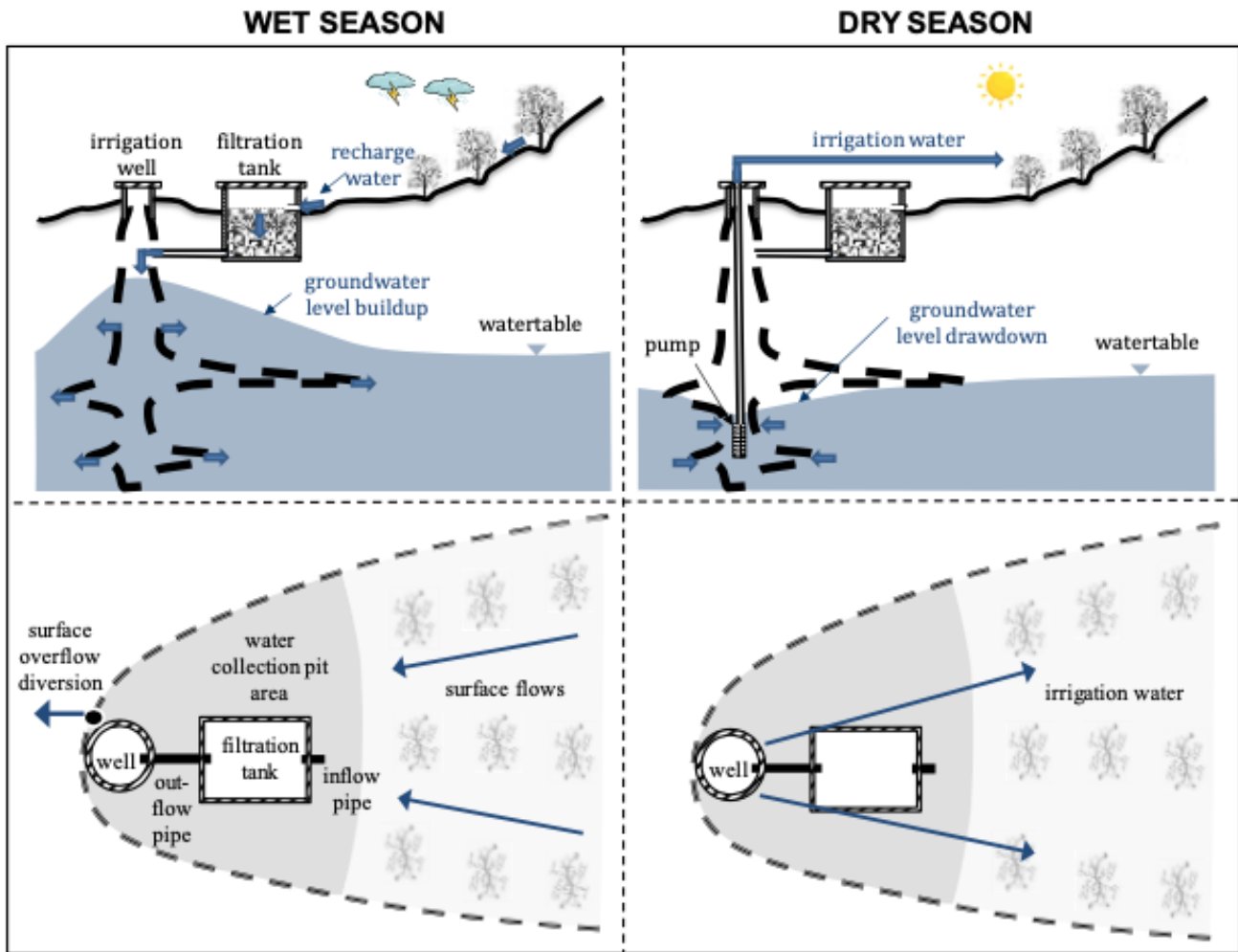


Figure 6: Main features of MAR design and operation during the wet season and the dry season in cross-sectional view (top) and plan view (bottom).

It should be noted that the identification and design of measures may identify complementary or alternative measures to MAR that are related to water storage and use. Solar-powered groundwater irrigation and groundwater desalination are two examples of these types of measures, and they are described in Annex 5. All measures identified in this major activity will undergo screening for compliance with the ESP of the AF.

The project's pilot areas are located in transboundary regions, areas where groundwater users are at risk from unsustainable groundwater supply caused by competitive groundwater use between neighbouring countries. Growing demands on water use and disagreements between neighbouring nations over resource state and development could exacerbate the potential threat of water conflicts, making groundwater users in these areas particularly vulnerable to groundwater shortages. The identification of project beneficiaries - groundwater users of three pilot areas with a special attention paid to marginalized/vulnerable groups, low-income rural communities and women – has been made in response hereto.

Information on *environmental and social safeguards* screening and management is provided in Section III.3 and Annex V. Community health and safety will be paramount in the design of the pilot measures. All measures proposed will comply with local and national environmental and health legislation and regulations. The project will

not pursue any interventions that are designated as high risk (“A”), and infrastructure supported under the pilot projects will receive all necessary permits.

Under **Major Activity 3.1.2**, the project will *implement the pilot interventions* that are identified, designed, screened, and selected under 3.1.1. In order to have a tangible impact on the ground, the project’s activity plans for the three pilot regions will focus on co-development and implementation with GW users of suitable interventions in support of sustainable use and vulnerability reduction.

Based on the implementing partners’ experience in undertaking MAR pilots in other regions, it is expected that MAR pilots may be established in at least two and potentially three of the pilot areas.

The approach to piloting MAR is pragmatic and low-cost, and it will be co-developed with key stakeholders. Detailed costings of the pilot interventions will be made during the assessments in Component 2, and the exact number of pilots with specific locations will be established in consultation with government and community stakeholders.

Other elements surrounding the design and implementation of the resilience-strengthening pilots that are selected will include the following:

- Dialogues with national policymakers and experts on strategic importance of groundwater resources in the overall CCA discussion
- Improved general understanding of the transboundary system
- Clarification of the roles and responsibilities of local institutions
- Information, participation and dialogue between stakeholders on both sides of the border
- Involvement of local and regional authorities
- Development of a post-project financing scheme for each pilot that will consider how operations and maintenance of the pilots will be managed and funded following the closure of the UNESCO-AF project, including mechanisms to ensure continued active participation and inclusion of women and other vulnerable groups. .

The implementation of the pilot interventions will include safeguards monitoring by project staff and partners. Descriptions of monitoring these pilot interventions under the environmental and social management plan and the project grievance mechanism are provided in Part III, Section 3 of this proposal.

Major Activity 3.2.1 will monitor the interventions and capture results in order to inform future decision-making and current knowledge regarding these approaches. The sequence of actions under 3.2.1 is envisioned as follows:

1. Develop groundwater monitoring schemes, including minimum requirements prescribed for general monitoring;
2. Install monitoring systems for selected aquifer locations and collect data;
3. Monitor the pilots for gender-differentiated effects and women’s active participation;
4. Use data and findings from monitoring to inform decision-making in the three regional pilots.

The extent of monitoring and evaluation at each site is expected to be adequate to provide strong evidence of techno-economic viability and sustainability of the pilots. Such a robust Proof of Concept of the MAR pilots will require multiple-year testing to ensure the ‘triple bottom line’ dimensions of sustainability (environmental, economic, and social) are fully accounted for. This is needed to ensure all challenges and risks associated with MAR are addressed effectively whilst working within the available project budget.

The collected and harmonized data and information for the GMS in general and for the three pilot areas will be stored in an online Information Management System (IMS) along with outcomes of assessment and possible management scenarios. IGRAC can provide the IMS that can operate as a data and information sharing platform between the countries and the various water sector and climate resilience actors and stakeholders, covering issues like groundwater resource availability, monitoring of changes and more (pro)active management supporting climate resilience. A dedicated IMS will be set up for each pilot study, and later these will be integrated into one portal regarding groundwater resources in GMS in the form of the Sharepoint facility created under Output 5.2. That facility will contain an overview of the outcomes of the project, a database on groundwater monitoring observations, and other tailor-made tools.

Component 4: Regional cooperation and coordination

Outcomes: Regionally consistent management strategies for groundwater resources in support of CCA are adopted through effective stakeholder engagement in the GMS.

This component will build on the work that has been done in creating enabling conditions for sustainable groundwater management and provide the policy and regulatory framework to scale up the approach. A regional approach, which will produce harmonized strategies, will enable the participating countries to address issues both at the country level, and at a sub-regional level, which will allow dialogue and cooperation on transboundary groundwater resources.

Component 4 will draw upon findings from the groundwater inventory and data collection and monitoring from Component 1. It will also address gaps in primary and secondary legislation, particularly in the participating countries where legislation on groundwater is less comprehensive. Finally, it is expected that the national strategies will provide support for capacity development, groundwater resource management, and information exchange that will sustain the groundwater community of practice that is created in Component 5 over the long term.

Outputs:

- 4.1 Harmonized national strategies established for sustainable GW management in support of CC adaptation.
- 4.2 Regulatory framework for managing resources and expanding new groundwater-based resilience strategies and practical interventions supported.

Major Activities:

- 4.1.1 Establish and operationalise regional working groups of groundwater officials in GMS countries for implementing international consensus and guidelines concerning transboundary groundwater management.
- 4.1.2 Develop a suitable institutional setup and strategy for transboundary aquifer management in GMS.
- 4.2.1 Review existing groundwater primary and secondary legislation to compile a gap analysis.
- 4.2.2 Provide support for the development of secondary legislation in accordance with the findings of the gap analysis and the strategy developed under Output 4.1.

Under **Major Activity 4.1.1**, the procedure for establishing and supporting the working groups will be as follows:

1. Document for all four countries the groundwater policies and groundwater management activities; what is there to learn from each other, why is it done the way it is done?
2. Focus on issue of transboundary aquifers: where, what? Are there common interests. Set up a task force to bring transboundary aquifer (water resources) management to a higher level?
3. Conduct at least two follow up workshops by making use of the results produced in the other project components (database, joint monitoring, etc.).
4. Elaborate transboundary regional cooperation for the three selected transboundary groundwater systems as case studies (1. Vietnam-Cambodia: upper Mekong Delta aquifer system; 2. Lao PDR-Thailand: riparian Mekong aquifers; 3. Eastern Thailand – NW Cambodia border region aquifers).
5. Establish two working groups on sharing and co-development of tools and on national/regional policy and strategy.
6. Encourage women's active participation in the working groups and ensure that women are aware of professional opportunities in this area and encouraged to take advantage of them.

Major Activity 4.1.2 will use cooperation between countries as the basis for future transboundary management. Depending on the outcomes of the groundwater inventory, appropriate institutional setups and/or appropriate legal frameworks for their joint and sustainable management need to be developed. Once the interdependence of these countries has been recognized and accepted, the next step consists in establishing contact between them, both technical-regional as well as at the strategic-national-regional (diplomatic) level. This step allows the exchange of viewpoints, the development of confidence and solidarity measures, the sharing of information, and the coherent,

pragmatic and progressive implementation of the various operational tools. The experience of UNESCO especially through established workshop mechanisms such as the *Groundwater for Decision-Makers* training materials produced by the Potential Conflict to Cooperative Potential (PCCP) initiative, will be helpful for assisting in harnessing regional cooperation, by providing their specific advice and assistance, and by encouraging the development and implementation of international consensus building and guidelines concerning transboundary groundwater management.

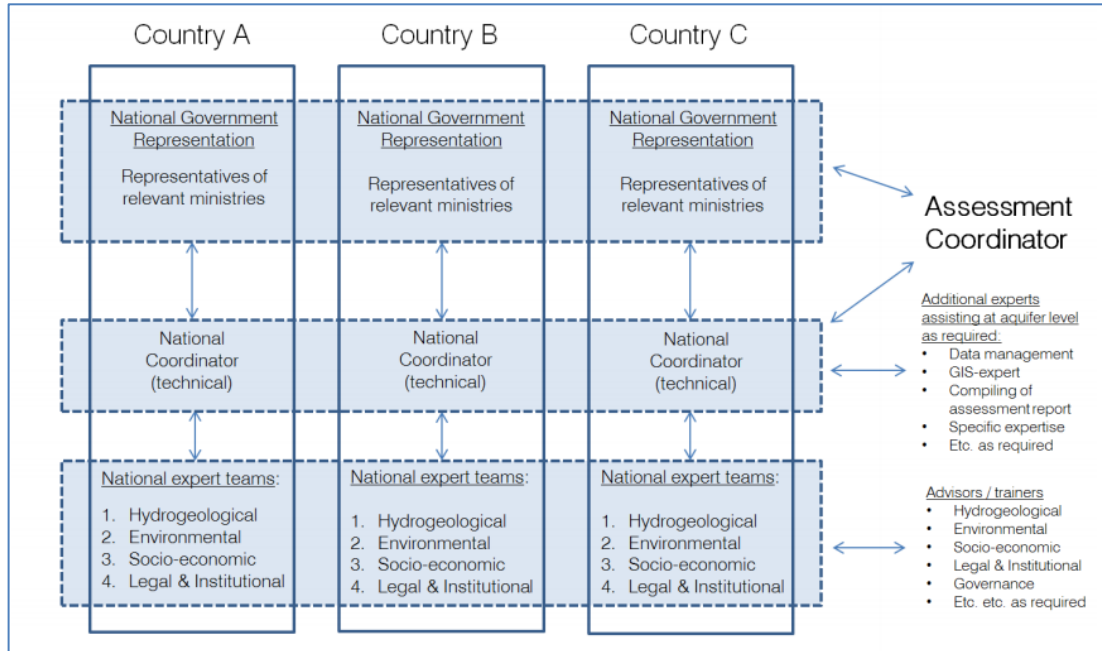


Figure 7: Example from the TBA Collaborative Assessment Methodology²⁰

Executing a joint assessment will bring together experts and government officials from pilot regions as well as national levels to help build consensus mechanisms for standardisation leading to climate change resilience. In this project, in order to improve the understanding of the shared aquifer systems as well as the collaborative management, the involved countries should progressively develop groundwater management network. This network of technical experts and other stakeholders will be established by bringing national as well as local officials together in regional workshops, focusing on the three pilot regions. Official meetings serve to create dialogues between the ministries from various countries to share knowledge, agree on common objectives, discuss stakes and (economic) benefits, ideas on collaborative actions and mechanisms and possibly financing issues. The project will support the development of a resource mobilization strategy as a component of the joint assessment.

Major Activity 4.2.1 is designed to deepen understanding of the legislative and regulatory gaps that were identified during the project formulation period. As outlined in the gap analysis in Part I, the four participating countries have all established legal frameworks that cover the management of groundwater (see page 30 for details). However, Cambodia and Lao PDR lack a detailed regulatory framework to support this management. A review of existing regulatory provisions will be undertaken with particular reference to these countries. **Major Activity 4.2.2** will provide the necessary expert legal support for the development of secondary legislation serving to strengthen implementation of groundwater governance and management.

Component 5: Capacity building and training

Outcomes: GMS stakeholders capably use project tools and knowledge on groundwater use for CCA and resilience.

²⁰ Source: IGRAC & UNESCO-IHP (2015).

Component 5 focuses on building the necessary capacity in different stakeholders in the GMS necessary to implement and sustain the project over the long term. Output 5.1 focuses on providing best practice skills to various stakeholders, ranging from the participating communities (which will need the capacity to co-design, implement, and maintain the pilot measures) to groundwater professionals, who will require skills to monitor and analyse groundwater availability and vulnerability to climate threats, to decision-makers, who will need to understand how groundwater resources are affected by climate change and what types of adaptive measures are available to address these threats.

Output 5.2 focuses on information dissemination based on data and experiences gained from the project activities in Components 1-4. This output also focuses on different stakeholders. The pilot communities will receive information on their pilot projects, but also on pilot projects in other communities. Other communities that could benefit from pilot measures as indicated from the assessments in Component 1 can also receive information on MAR technologies. At the national and sub-regional level, experiences from the project will be shared with the groundwater community of practice created in Output 5.1, but also with decision-makers more broadly. Finally, experiences from the project will be shared with the international research community and climate change adaptation community of practice in order to further knowledge related to MAR and community-driven sustainable groundwater management.

Component 5 will support the sustainability of project activities by the creation in Output 5.1 of the community of practice, which will encourage the formation of professional networks that will continue beyond the project implementation period, and through the creation in Output 5.2 of the Sharepoint facility, which will provide a long-term repository of project data and information that will be able to inform research and evaluation efforts.

Outputs:

- 5.1 A groundwater community of practice created and equipped with the skills to ensure technical and management capabilities.
- 5.2 Project knowledge and international best practice archived, made available, and disseminated to stakeholders at all levels (community, national, regional, global).

Major Activities:

- 5.1.1 Design and conduct training workshops targeting different GW users, communities and stakeholders to strengthen the capacity regarding technical and institutional resources for GW resource management.
- 5.1.2 Develop and introduce groundwater curricular offerings for students and/or professionals in at least one post-secondary institution in each of the participating countries.
- 5.2.1 Collect, share, and archive project-related knowledge and learning at the local, national, and GMS level through a Sharepoint facility.
- 5.2.2 Produce lessons learned notes, guidance notes, training curricula, and case studies on an ad hoc basis in English and other relevant languages.
- 5.2.3 Disseminate the results of the project through a project-specific international conference and other professional conferences and events.

Training activities under **Major Activity 5.1.1** will include the following: 1) Training workshops conducted by the project (see Table 4 below); 2) Support for formal training programs at institutes in participating countries covering aspects of groundwater management for resilience; and 3) Information and resource sharing and cooperation on formal training programmes in institutes, such as mutual recognition of accredited programs and certificates, joint study programs, harmonized curriculum, etc. All training activities will promote gender balance, which may require project staff and consultants to tailor the format, location, scheduling, and staffing profiles in order to maximize women's active participation.

Table 4: Description of Project Trainings/Workshops

Topic of Training/ Workshop	Objective	Content
Transboundary aquifer management	The workshop on transboundary aquifer assessment and management will provide national experts with guidance and tools to execute the assessment in a systematic way. The workshop follows a participative approach in which the regional experts will start the joint fact-finding. Joint fact-finding assists in opening discussion, increased knowledge-sharing, and overall transparency of the assessment processes. These components are all important to reach a common understanding and to enable collaborative management. The training programme will specifically deal with and will be tailored to the selected transboundary aquifer system (one of the three pilot areas).	Content of the training: <ul style="list-style-type: none"> • Transboundary aquifers and their management • Guidance for data collection and harmonization • How to go from data to knowledge? • Training to work with the Information Management System • Transboundary Dialogue on GW issues and Joint Cooperation mechanisms
Advanced groundwater monitoring and analysis	The purpose of the training course is to train a group of GW professionals on GW monitoring networks, setting up monitoring network, and basic information on processing of the information. The second part of the training would provide the local technical consultants/researchers with modern technical skills in the use of Global Groundwater Monitoring Network (GGMN) and GW modelling tools. The GGMN provides an interactive portal for storage, processing and dissemination of GW data. The training participants will have the opportunity to acquire an active role in the GGMN Network and to continue to use the GGMN interactive portal.	Content of the training: <ul style="list-style-type: none"> • Groundwater monitoring objectives and monitoring network types • Procedures and methods of setting-up a groundwater monitoring network • Groundwater monitoring equipment • Open source and freely available groundwater software tools • GGMN Portal (Database and information management) • Time series analysis • Spatial interpolation in QGIS • FREEWAT software (open source GW modelling tool in QGIS)
Conjunctive management of surface and groundwater;	IGRAC will provide content for this training targeted to staff from the Mekong River Commission and National Mekong Commission members with a focus on 'Integration of Groundwater Management into Transboundary Basin Organizations'. The training course will be tailored for the GMS, and partly based on the manual on 'Integration of Groundwater Management into Transboundary Basin Organizations', developed in corporation with IGRAC, Cap-Net, Germany's Bundesanstalt for Geowissenschaften und Rohstoffe (BGR), IWMI, AGW-Net/UNDP and the former GW-MATE team of the World Bank.	The training manual is designed to help develop capacity within the river basin organizations to include and manage (transboundary) GW issues. A community of experts affiliated with the Mekong River Commission and National Commissions in the region provides an initial platform for transboundary GW cooperation.
Community Dialogue (CD) training/workshops	Community Dialogue (CD) training/workshops on participatory groundwater monitoring, developing monitoring with support of user groups and	Building on the outcomes of the community consultations undertaken during the PFG phase, the workshops will respond to and further develop key priority issues at each

	to increase groundwater user engagement in management of resources.	<p>pilot site with the overall objective of enhancing groundwater user engagement with particular focus on key sustainability challenges at each location.</p> <p>Content of the workshops/meetings would likely include:</p> <ul style="list-style-type: none"> • Community dialogue meeting to gain insights into local problems and priorities and to raise awareness on sustainable groundwater use and protection • Community dialogue meeting on building resilience tools on climate change water-related disasters (drought) based on groundwater resource availability and socio-economic status of local communities • Community learning to promote clean water/sanitation access for women and girls in unsafe environments
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Major Activity 5.1.2 will support the development of groundwater curriculum/course offerings in at least one post-secondary academic institution in each of the countries. Details such as the specific curriculum and the selection criteria for candidates will be developed during project implementation. The aim of these courses will be to equip technical specialists and policy-makers with the necessary knowledge to manage groundwater policy and programs

Major Activity 5.2.1 will create an information repository and Sharepoint. The Sharepoint facility will be a publicly accessible database (data repository) where all available data and information is stored and can be accessed. Sharepoint will allow stakeholders to assess current levels of understanding, access research on groundwater management, and view the status of groundwater policies as the knowledge base develops. The repository will be designed and installed by IGRAC (a UNESCO Category 2 Centre), which already manages a global groundwater data sharing system.²¹ This could be done in cooperation with UNESCO drawing on recent advances in water data and information sharing at the regional level. The Sharepoint will store information designed for different sets of stakeholders (policy level, community, general public, scientific, etc.), and it will be open and freely accessible to all users. The Sharepoint will be promoted through project outreach activity and through the information dissemination mechanisms of the project agencies, such as UNESCO-IHP’s Regional Steering Committee Water Science portal. In the final year of the project, the project team will determine a post-project institutional and financing strategy for the Sharepoint in order to ensure access to its data and information following project closure.

As information is collected from all project components and routine monitoring and evaluation for the Sharepoint, project staff and experts will distill lessons learned under **Major Activity 5.2.2** and ensure that they reach a broad spectrum of stakeholders. Finally, the project will hold an International Conference to disseminate the results of the project, and it will also disseminate information on project results through actions under **Major Activity 5.2.3**, including an international project conference and presentations at other regional and international meetings and conferences.

Project Logic

As the figure below illustrates, the four main “technical” components and one cross-cutting component for capacity building form an intervention strategy that will result in climate resilience in the three regional pilots on the basis of a robust balance between groundwater supply and demand. The capacity and knowledge generated from the project can then be scaled up to address threats to groundwater supply across the GMS.

²¹ The Global Groundwater Information System (<https://groundwaterportal.net/global-groundwater-information-system>).

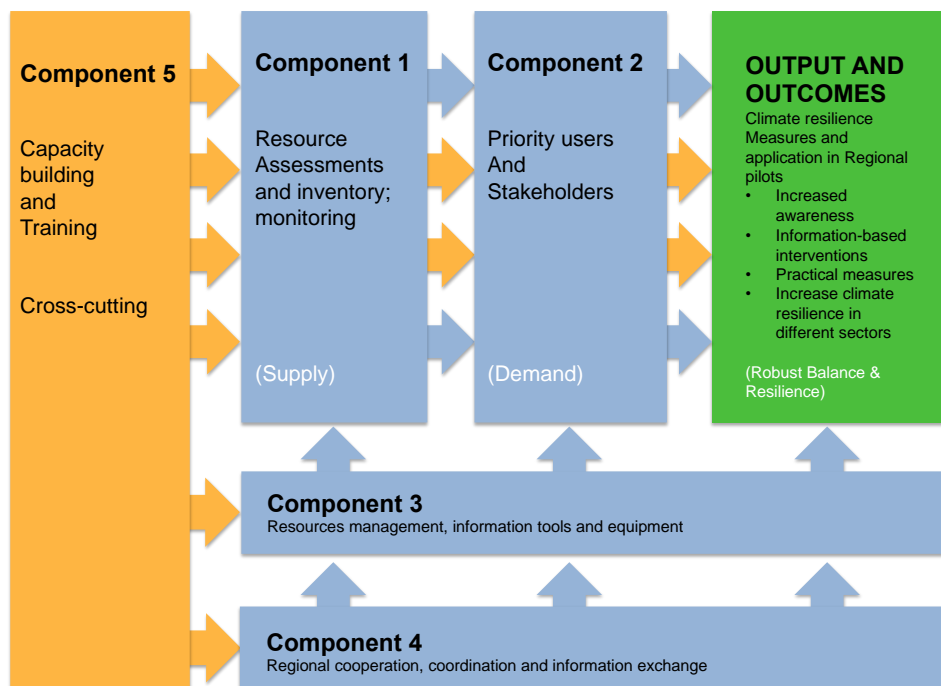


Figure 8: Schematic presentation of the project structure

A Theory of Change for the project is provided as Annex VII of this document.

B. New and innovative solutions

The project includes several new and innovative solutions to climate change adaptation, in particular the following:

1. Climate resilience and added value of regional approach, Greater Mekong Subregion transboundary collaboration

By introducing and stimulating robust methods for resource assessment and collaborative principles for sustainable groundwater use, valuable water resources can be more effectively allocated for strategic and emergency purposes, thereby enhancing resilience in water supply and food production. Climate resilience is based on a broader suite of options, including limited surface water and groundwater, and overall use efficiency is stimulated. The regional approach creates significant efficiency gains in development of resource management concepts, tools and supporting systems and in developing the required regional human resources capacity. By developing regional regulatory guidelines for appropriate groundwater use, unsustainable practices are prevented equally across the region (also creating a level playing field), instead of pushing communities to compete with each other.

2. Sustainability assessment of limited and valuable groundwater resources

To increase resilience and reduce vulnerability it is essential to assess sustainable groundwater extraction rates under various current and future land use conditions, develop with users “low vulnerability” land use and identify solutions to overcome high vulnerability cases, assess impacts of the current and likely future climate change conditions on the groundwater resources; create awareness on the potential depletion of limited groundwater resources; and develop fall-back options and water use efficiency measures that have a direct impact on the ground.

3. Innovative solutions to climate change adaptation; a regional approach and cost-effectiveness

The development of groundwater MIS for the region will provide ample opportunities to introduce innovative ICT supported data collection, information sharing and training. Directly needed groundwater resources monitoring in collaboration with well owners and water users provides excellent opportunities for data collection through crowdsourcing, which also strengthens stakeholder involvement.

The programme connects to national priorities for climate change adaptation, groundwater conservation and sustainable use, as included in respective national policy documents. The programme partners are already working on related studies in the region; this earlier and ongoing work will pave the way for this regional project.

4. An IWRM approach including groundwater and focused on farmers' perspectives and needs.

Unlike many other studies and projects dealing with water resources management, this intervention will apply IWRM from a groundwater system perspective, which is based on the fact that farmers and other water users almost always use (complementary) groundwater to cover seasonal water needs. This applies to farmers producing food and market crops, but more strongly to a large number of rural water users for domestic purposes. Groundwater is nearly always a reliable source for low-cost and relatively good quality water. In applying IWRM principles, specific attention will be paid to user perspectives, matching needs from different user groups and developing insight in ways that groundwater can contribute to increased resilience. This approach not only differs from integrated (surface) water studies, but seeks a bottom-up, user-centered perspective on groundwater resources, versus a more traditional top-down resource-centered perspective.

It is believed that this innovative approach in particular will provide significant, tangible and acceptable climate resilience support to primary stakeholders in the countryside and rural towns.

C. Project economic, social and environmental benefits

Project Benefits

The project will mitigate climate change impacts on food production and water supply, based on the better use of empirical data relating to the groundwater system and environmental parameters, the socio-economic system (groundwater users communities) and the governance context. The project will reduce actual and potential future socio-economic risks for rural communities caused by the impacts of climate change via better access to irrigation water for food production and for domestic use (WASH). This will be done through better analysis of existing data and collect new data on climate, watershed system, ecohydrology, ground-water availability in space and time. The project will also monitor groundwater quality-related parameters, such as multi-element analysis, arsenic content, water-flow-rates and water-consumption carrying capacities.

The project is unique in the sense that it will set up these activities with a groundwater-user based perspective, and in a participatory manner, involving local communities and primary stakeholders. Co-developed with the communities based on local needs and conditions, the activities in the pilot areas will deepen the knowledge base on the groundwater system and vulnerabilities. Increased knowledge and related information will be shared with stakeholders—men and women—and a network of a sub-regional community of experts will be established to advise the end-users on best practices.

Positive social impacts:

- Stimulating sustainable use of groundwater resources, select the best crops for irrigation, and avoid over-utilization, depletion and salinization of aquifers.
- Stimulating nature-based solutions, and the recycling and utilization of waste-water in order to reduce the pressure on ground-water, for specific domestic purposes, such as washing, flushing, irrigation.
- Supporting approaches to ensure equitable access to water for food production and domestic use. It will enable conservation of scarce water resources for low-income groups.
- Enabling regional discussion on shared groundwater resources, climate, eco-hydrology, and responsible consumption and production in support of the targets of several SDGs.

- As one study in Cambodia found, “Women are also generally responsible for family health, hygiene and food security, which suffer from limited access to water....” (ADB and World Bank, 2012: 2). Improved water access will provide benefits to women in their roles in these areas as well as in terms of reduced time spent for water collection (see economic impacts below).

Positive economic impacts:

- Improving availability of water resources may support job creation.
- Adapting farming techniques will support sustainable livelihoods in agriculture and may increase household income in the pilot regions.
- While both men and women will benefit from increased access to water, women and girls may accrue significant benefits in terms of reduced time needed for water collection. This will increase time available for women for income-generating activities and household labor, and—in the case of girls—education, which increases economic opportunities.

Positive environmental impacts:

- Avoiding depletion of aquifers and allow for continuous water-consumption based on aquifer carrying capacity
- Avoiding salinization and increase of chemical particles (cadmium, arsenic, manganese; multi-element analysis and monitoring) via monitoring and respecting carrying capacities.
- Enhancing nature-based solutions, which in turn, have a positive impact on biodiversity conservation.
- Enriching the selection and variety of food crops following best practices in time and space.
- Enhancing wind-breaks, hedges and rows of trees towards agro-forestry and enriched cultural landscapes, generating better long-term man-made ecosystem functioning when compared with mono-specific agricultural schemes.
- Enhancing environmental awareness and community knowledge on eco-system functioning, ground-water recharge capacity, climate patterns and its relation to ground-water flow, nature-based solutions, and waste-water recycling.

Project Beneficiaries

Ultimately, the project – across its five components relating to **enhancing the GMS groundwater knowledge base** (component 1), **strengthening governance** (component 2), **co-development of community adaptation measures** (component 3), **transboundary knowledge exchange and consolidation** (component 4) and **capacity development** (component 5) - benefits the lives and livelihoods of approximately 300 million people residing in the GMS, by enhancing their water-security, food-security, and food-commodity-production capacities in consideration of climate change factors. It also indirectly benefits consumers of agricultural crops produced in the GMS, via generating a more sustainable crop-production capacity in times of increased climate issues.

The five components are closely interlinked so as to ensure the delivery of sustainable long-term impact:

- Component 1 helps build the knowledge base for groundwater management in the GMS, thereby consolidating the basis for project decision-making.
- Component 2 strengthens the application of that knowledge base in the local context through delivery of locally appropriate co-developed adaptation guidelines.
- Component 3 puts these guidelines into practice through the development of cost-effective, locally appropriate adaptation measures owned and operated at the community level.
- Component 4 connects the project’s local-level adaptation measures with the national and subregional transboundary water management context, ensuring uptake of project approaches and creating an enabling environment for replication of results and achievements.
- Component 5 supports all levels of project action with targeted capacity development, training and support.

Expressed in quantifiable benefits at the community level, project activities under component 2 and 3, supported by component 5, will *directly* benefit **1,700 people, 680 of whom are women**.

Furthermore, activities under component 1, 2, 3, 4 and 5 will benefit **1,449,000 people, 579,00 of whom are women** living in the pilot communities through improved GW management,

The project benefits all people living in the three pilot sites via enhanced climate resilience skills related to water availability, water management, agricultural practices, nature-based solutions, and more responsible consumption and production. The project provides support the people living in the pilot areas by contributing to achieve the listed SDGs and their specific targets via scientific research, knowledge enhancement, knowledge sharing, cross-border resource management, demonstration and training.

Through Component 5, pilot communities will also benefit from better information and understanding about the importance of groundwater, eco-hydrology, climate issues, and the SDGs and how it affects their livelihoods, via specific training, based on scientific research, monitoring, and best practices, including in schools. The information generated from the project, communicated via train-the-trainer, train-the-teacher, and community outreach programs, will directly help local farmers, water resource managers, agricultural extension staff, water user organizations, well drillers and potable water suppliers including men and women from vulnerable groups, communities and schools including teachers and young people, to better understand water as a crucial resource and its importance for sustainable human living, and it is connected to climate-surface eco-hydrology, water-shed systems, and human dynamics and interventions.

In addition, actions under Components 1, 2, 3, 4 and 5 will provide benefits to direct and indirect beneficiaries in the pilot communities, project partners from the four countries and the stakeholder groups at national, provincial, district and local levels tasked with managing the groundwater will benefit from capacity strengthening. These beneficiaries include central (national) managers through to field-level technicians from government agencies in relevant sectors, along with staff/students from universities that are engaged in project activities.

Avoidance/Mitigation of Negative Impacts: Environmental Considerations

The project activities, particularly the implementation of concrete adaptation measures, will adhere strictly to local laws and regulations and to agency best practice in safeguards. The Director-General has determined that risk management is a priority to strengthen the overall governance and accountability in UNESCO. In 2008, UNESCO started taking measures towards establishing an integrated risk management framework, following recommendations made at the United Nations level and further reinforced by the Independent Oversight Advisory Committee. To this end, the Organization includes a review of risks, including environmental and social risks, from the very outset of project development. The UNESCO standard template for preparation of project document specifically requires an explanation of how gender equality will be addressed and requires an annex on risk analysis and mitigation, with indication of the risk owner (person accountable for the risk management). The risk categories explicitly mentioned for inclusion are environmental, political, economic and social risks. In project monitoring and reporting, the “conclusions of a risk analysis related to the implementation” are required along with “the measures foreseen to mitigate the negative impact of a threat”, if any. UNESCO’s [Risk Management Training Handbook](#) provides background to increase the competency of programme specialists, while a senior management committee on risk review meets regularly.

This proposal provides additional information on environmental considerations in the following sections:

- Section II.E provides an overview of relevant environmental legislation;
- Section II.K provides an overview of environmental and social risks;
- Section III.C provides an overview of environmental and social risk management in compliance with the AF Environmental and Social Policy (ESP); and
- Annex III documents the community consultations held in the pilot regions in 2021.

Avoidance/Mitigation of Negative Impacts: Social Considerations

Vulnerable groups: In the pilot areas are certain groups of people that are specifically vulnerable to climate change issues. The groups include resident ethnic minority groups as well as those resettled from mountainous areas voluntarily or as a result of government policy. Rural women and children incur much of the burden of fetching domestic water from groundwater wells in villages situated remote from clean and reliable surface waters, particularly in the more remote inland areas. Many of these communities still lack clean and reliable supplies and adequate sanitation. Using gender analysis and vulnerable group experts as well as local authorities, the socio-

economic background and status of marginalized/vulnerable groups in the region will be identified in detail during the Inception Phase and will be monitored through the project implementation period. These groups will receive special attention with a focus on training and interventions that will reduce their burden, for example through and training and application of Green Academy aspects (rain-water; grey-water, black-water management; clean energy; youth groups engagement). By identifying women, young people and ethnic minorities as some of the key users and local champions for groundwater, the project will give particular emphasis to ensuring ongoing and improved rights to access groundwater. Consultations and training will involve women, young people, and marginalized communities engaged in or aspiring to make use of groundwater for domestic supplies and crop or livestock production.

Low income rural population: Traditionally, groundwater is already an important source for water supply for agricultural and domestic purposes for low-income rural population, not connected to piped water systems or irrigation schemes. This project will improve the knowledge for long-term availability, carrying capacity, and sustainability of groundwater supplies to strengthen the better management and avoid over-utilization of groundwater wells.

Gender and youth considerations: As the 2016 Statement on UNESCO's Environmental and Social Policies proclaims, "UNESCO considers gender equality as a fundamental human right, a building block for social justice and an economic necessity. It is a critical factor for the achievement of all internationally agreed development goals, as well as a goal in and of itself. This is why one of UNESCO's two global priorities since 2007 is gender equality and why the organization's Medium-Term Strategy (2014-2021) is accompanied by the Gender Equality Action Plan II, which provides all key definitions, explains UNESCO's adherence to the UN-System Wide Action Plan on gender equality, institutionalizes gender equality in UNESCO's organizational culture, structure and process, and defines expected results for gender equality within all Sectors and services of UNESCO."²²

Among others, IWMI experts have shown that gender-sensitive approaches to groundwater development and management help secure and protect access and use for women and the rural poor.²³ Gendered water rights determine access and control over groundwater resources. Men and women differ in their needs and technological preferences for groundwater extraction and are affected differently when groundwater development interventions are introduced. At the design stage, the project has drawn upon UNESCO and IGRAC support for gender equality in relation to groundwater management and use.²⁴

The project will undertake a proactive gender approach throughout implementation in the three pilot areas using best practices via training, application and demonstration. From rural population groups, female and youth stakeholders will be specifically targeted in accordance with their traditional roles in food production for households and domestic water. The project contains a stand-alone output on gender (Output 2.1), and several major activities focus directly on gender-sensitive resource management involving the active participation of women, particularly the use of the UNESCO WWAP Toolkit on Sex-Disaggregated Water Data and the gender platform, which will be established under Component 2.

A **gender analysis** with specific recommendations and project actions is provided in **Annex IV** of this document.

D. Cost effectiveness

Cost effectiveness through national agency and stakeholder contributions: The project will be implemented in close partnership with national agencies mandated with groundwater management and involved in supportive groundwater studies. Through these, there will be substantial in-kind contributions and spin-off of regional collaboration (better exchange of information, sharing of experience, joint studies, etc.). The resilience pilots will

²² ESD/2016.

²³ IWMI training programme: Gender and Institutional Approaches to Groundwater Development Management, MODULE 6: GENDER MAINSTREAMING IN AGRICULTURAL WATER MANAGEMENT <http://publications.iwmi.org/pdf/H042180.pdf> and <http://siteresources.worldbank.org/INTGENAGRLIVSOUBOOK/Resources/Module6.pdf>

²⁴ See: <https://groundwaterportal.net/focal-area/gender>

be multiplied and extended across the national territories of the four countries. Furthermore, for various proposed pilots and implementation activities there will be contributions from stakeholders, communities and local government. Although this kind of operation is organisationally complex there will be significant cost reductions and, importantly, increased ownership and awareness. For example, stakeholders and groundwater users will be invited to propose case studies and practical cases in which climate resilience measures will be applied and tested-demonstrated.

Cost effectiveness of technical assistance and leverage: The executive model set up for the project emphasizes regional (from the four participating countries) sourcing of many inputs for activities, and regional coordination and support from CCOP-TS. CCOP-TS has been able to organize and implement regional collaboration projects that have shown high cost-effectiveness by making use of technical support and contributions from national government agencies. Additionally, the use of peer-support and local experts from the different expert communities is foreseen.

It is anticipated that the project and its executive proponents CCOP-TS, IWMI and IGRAC will be able to leverage additional support from partners that are active in the region and the subject matter. For instance, there is current support from Australia's Department of Foreign Affairs and Trade (DFAT) for IWMI's groundwater work in Lao PDR, and for climate adaptation and resilience in the Mekong Delta.

1. CCOP-TS has longstanding and active cooperation with BGR. It currently has activities in Vietnam and Lao PDR.
2. CCOP-TS has a long standing and active cooperation with Japan International Cooperation Agency (JICA). Further cooperation in this project is envisaged.
3. There is active cooperation on groundwater management and CCA with KIGAM, Republic of Korea (Korea Institute of Geoscience and Mineral Resources). Recently, and in preparation of this proposal, a workshop was convened with representatives of all partners from the region (CCOP-KIGAM-UNESCO-MME Workshop on "Climate Change and Groundwater Resources in the Mekong River Basin", Sihanoukville, Cambodia, 1-4 June 2016). An earlier workshop also served in preparation and inspiration for this proposal (CCOP-KIGAM-UNESCO-DGR Workshop on Sustainable Groundwater Management in Mekong River Basin 19-20 May 2015, Bangkok, Thailand. Furthermore, CCOP-TS is implementing a project with funding from KIGAM entitled "Vulnerability assessment to climate change of groundwater system in Greater Mekong Subregion and comparative study of the groundwater-dependent ecosystem" in Thailand, Lao PDR, Cambodia, and Vietnam (2020-2022).

Hardware and equipment procured under the project will be designed for long-term use; upon completion of the project ownership of equipment will be transferred to the national agencies.

Cost effectiveness in technology solutions: Implementation of MAR has historically been hampered by the absence of a clear economic case for the investment needed to construct and operate these systems. Research undertaken in developed countries indicates that MAR projects involving high value uses, such as potable supply and in some cases for lower-valued irrigation, tend to be economically feasible provided that local hydrogeological conditions are favourable.²⁵

A 2018 study examining the cost factors in MAR note that "aquifer storage is relatively cheap to operate and there is little evaporative loss."²⁶ Aquifer recharge is relatively inexpensive compared to many other alternative supplies, but this is dependant on the recharge method and source of water selected. In the GMS, pilots in Vietnam have indicated that MAR is a cost-effective technology for smallholder farmers in achieving adaptation through integrated water storage²⁷. Capital costs are less than USD 500 per site and annual operating costs are around USD 15, and is considered more appealing than constructing farm ponds which would require conversion of valuable agricultural

²⁵ Maliva R.G. (2014) Economics of Managed Aquifer Recharge. *Water* 6, 1257-1279; doi:10.3390/w6051257

²⁶ Ross, A. and S. Hasnain (2018). "Factors affecting the cost of Managed Aquifer Recharge (MAR) schemes." In *Sustainable Water Resources Management*: 179-190.

²⁷ Pavelic *et al.* (2019) Managed aquifer recharge for sustaining groundwater supplies for smallholder coffee production in the central highlands of Vietnam: report on pilot trial design and results from two hydrological years (May 2017 to April 2019) . <https://cgspace.cgiar.org/handle/10568/106705>

land. This demonstrates that effectively planned and implemented MAR in developing countries can be economically viable, even though external support is typically required due to limited local financial resources.

Cost effectiveness in project operations: The project *modus operandi* will be ‘implementation by the stakeholders, for the stakeholders.’ This means limited technical assistance support will be mobilized to develop, organize and implement activities (especially in the pilot areas) with and for the primary stakeholder, the actual and potential users. This will be a cost-effective approach, as only overhead costs and limited time inputs will be incurred.

A similar principle will be adopted for activities on higher policy and institutional levels as it is believed that the main objectives of the project will feed directly into the main policy and operational tasks of the involved national partner agencies. It is expected that the strategic support the project can offer will leverage internal resources and create a win-win situation for the project and the national contributors.

Alternatives to the proposed solutions

Costs of MAR relative to other water storage methods that include rainwater tanks, small earthen dams and large gravity and concrete dams have been assessed in the Australian context²⁸. This shows the costs of MAR to be lower at USD 0.001 to 0.008 per cubic meter of water stored, compared with 0.003 to 1.0 per cubic meter for alternative methods. Land costs have been excluded in all cases but note that the land area needed for MAR is generally far less than for surface storage.

In terms of technologies, it is important to note that water storage alternatives to managed aquifer recharge (MAR) in the sub-region would be more costly and would also increase environmental and other risks. Alternatives to large-scale water storage would include concrete tanks and lined earthen impoundments, which would require significant land use and—in the case of impoundments—permits and possible EIAs. The regulatory environment for MAR is conducive in Thailand, emergent in Vietnam and would require development in Cambodia and Lao PDR.

The only less expensive measure for water storage would theoretically be large gravity or concrete dams, which are not considered viable options in the scope of this project due to environmental, wildlife, land use, and many other considerations. Substitution of groundwater sources with small surface storage sites, which are highly affected by inter-annual climate variability and evaporative losses, would also be problematic. For these reasons, the project is proposing MAR as the main focus of the interventions.

The following three features are considered key to the cost-effectiveness of the proposed approach and envisaged solutions. It is argued that possible alternatives, as suggested below are less cost effective.

1. A regional approach and transboundary cooperation: Alternative: a specific country focus, or specific, and different interventions in different countries.
2. Accent on bottom-up, in pilot areas, with local stakeholders and national agencies, setting up of activities and generating results and impact followed by extrapolation to management level and possibly national policy application: Alternative: a top-down approach, starting with policy issues at a multilateral level.
3. Strong role of national cooperating partners and modest support of international technical assistance: Alternative: explicit external and international technical assistance support.

Ad 1. A regional approach generates considerable multiplier effects and synergies. It comes at an appropriate time and connects both to the underlying theme of transboundary groundwater management, as well as to the active CCOP-TS and UNESCO network of groundwater professionals in the region. In the incipient ASEAN Economic Community, despite some traditional controversies and disputes, the region is coming together more and more. Expected efficiency gains are:

- Sharing of information, dissemination of best-practices and project results across four countries
- Identification and elaboration of comparable groundwater management challenges, use of similar tools and application of comparable solutions

²⁸ Dillon P., Toze S., Page D., Vanderzalm J., Bekele E., Sidhu J. and Rinck-Pfeiffer S. (2010) Managed aquifer recharge: rediscovering nature as a leading edge technology. *Water Science & Technology* 62.10.

- Closer cooperation in capacity development and formal training across the four countries, whereas otherwise it would be done in four relatively small groundwater Communities of Practice (CoP)
- Region-wide distribution and multiplication of integral project results, if relevant translated into national languages. Alternative, country-focused approaches would be far less ambitious and would have a relatively low impact (larger cost/impact ratio).

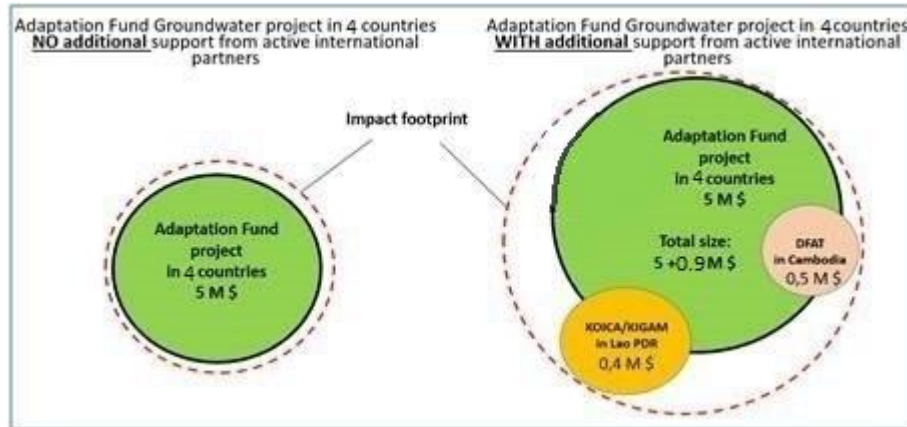


Figure 9: Leverage from AF funds to stimulate further regional and collaborative groundwater management for strengthening climate resilience²⁹

Ad 2. An alternative top-down approach would certainly contribute to improved groundwater management at national levels, meeting new and more appropriate natural resources management targets (in a context of CCA). However, there would be a strong risk of not achieving substantial climate resilience impacts for the primary stakeholders. Our regional experience also confirms the higher effectiveness of local farmer, and/or other actors-based interventions and innovations versus government-introduced measures (top-down). By following the bottom-up approach, the project steers national partners towards generating impact on the ground, in provinces, rather than sticking to traditional but often ineffective work processes aimed at meeting national statistical targets.

Ad 3. With increasing costs of international technical assistance both CCOP-TS and UNESCO are increasingly aware that significant cost savings can be achieved by working with national advisors and experts from within the region. This is challenging and requires strong coordination and some guidance but can still generate impressive impacts. Furthermore, this *modus-operandi* is nowadays far more appreciated in ASEAN. While other projects often involve two to three long-term international experts, this project proposes one Coordinating Technical Advisor supplanted by significant in-country expertise. The substantial involvement of national partners in the four participating countries achieves significant cost savings while aiming for high impacts.

Project partners will explore developing further collaboration with other potential donors with the rationale that this project can act as a core project with affiliated supporting initiatives. If this leverage is successful, the effectiveness of the allocated Adaptation Fund support will be substantially enlarged.

E. Consistency with national or sub-national sustainable development strategies

Economic growth and food security have been important objectives of the governments of Vietnam, Lao PDR, Cambodia, and Thailand. Over the past decade, water resources management policies also have evolved in the countries towards more integrated management and awareness has increased regarding the need to make use of finite resources in support of achieving the SDGs.

²⁹ This project could form the core of an even larger GMS program, with a concerted effort significantly enlarging impact. Note that figures indicated in the right part of the figure are hypothetical. Real spending by these organizations in the past 5 years has probably been higher).

In **Cambodia**, the 2013 Cambodia Climate Change Strategic Plan (CCCSP)³⁰ for 2014-2023 is the foundation for integrating climate change and climate resilience issues into national and sub-national level planning. Climate change strategies, action plans and financing frameworks are among the priority actions undertaken as defined in the National Strategic Development Plan Update (NSDP) 2009-2013. The development of the CCCSP was a significant step towards embedding climate change in the NSDP 2014-2018 and in sector development plans of all relevant ministries. This proposed project will support these initiatives. Furthermore, it will connect directly to most of the eight strategic objectives of the CCCSP, as summarized in Table 5. The implementation schedule of this project will generate results that will directly feed into the medium-term implementation of the CCCSP, and further support its long-term (2021-2050) ambitions, in particular contributing to the following stated response measures:

- Poverty alleviation; as more than 80% of the population depends largely on subsistence agriculture, floods and droughts could push large numbers of people below the poverty line;
- Management of water and fisheries is the lifeline of the Cambodian people. Changes in hydrology as a result of climate change may have adverse effects on water resources and fisheries;
- Expansion of capacity for provision of water and sanitation, particularly to rural areas.

Table 5: Alignment of the proposal with the Cambodia Climate Change Strategic Plan, 2014-2023

Strategic objectives of the CCCSP		Connection with this AF proposal (+ = weak, +++ = strong)	Potential Impact of this proposal to the strategic objective
1	Promote climate resilience through improving food, water and energy security;	++	+++ : food, water security
2	Reduce sectoral, regional, gender vulnerability and health risks to climate change impacts	+	+ : working with low-income groups, water supply for domestic use
3	Ensure climate resilience of critical ecosystems (Tonle Sap Lake, Mekong River, coastal ecosystems, highlands, etc.), biodiversity, protected areas and cultural heritage sites;	++	++: sustainable management of groundwater in the pilot areas
4	Promote low-carbon planning and technologies to support sustainable development;	-	-
5	Improve capacities, knowledge and awareness for climate change responses;	++	+++: strong knowledge and capacity building impact, awareness and climate resilience measures
6	Promote adaptive social protection and participatory approaches in reducing loss and damage due to climate change;	+++	+++: working in 2 pilot areas, participatory approaches and climate resilience measures
7	Strengthen institutions and coordination frameworks for national climate change responses; and	+++	+++: Transfer of pilot area and regional experiences to institutions and coordinated efforts
8	Strengthen collaboration and active participation in regional and global climate change processes.	+++	+++: transboundary collaboration and dissemination of results, international TA support.

In **Lao PDR**, donor support from the Asian Development Bank (ADB) and DFAT/AusAid and international cooperation involving GIZ and IWMI have supported development of IWRM based policies and capacity at policy and operational level (National IWRM Support Programme, ADB, DFAT/AusAid and associated programmes). Although these policies and operational practices are far from mature, there is growing awareness, understanding and political ambition to strengthen natural resources management including groundwater in support of societal needs and in recognition of vulnerabilities of low income groups like small farmers. There is also a firm understanding that the impacts of climate change are not to be underestimated. In Lao PDR, the 2009 National

³⁰ http://www.cambodiaip.gov.kh/DocResources/ab9455cf-9eea-4adc-ae93-95d149c6d78c_007729c5-60a9-47f0-83ac-7f70420b9a34-en.pdf

Adaptation Programme of Action to Climate Change includes two main action points on groundwater. These are well aligned with this proposal.

In **Thailand**, the project will closely align its initiatives with the Ministry of Natural Resources and Environment and the Office of Climate Change Coordination, Office of National Resources and Environmental Policy and Planning (ONEP) as the focal point for the Thailand Strategic Plan on Climate Change. For the specific interventions it will coordinate with the sectoral agencies mandated to address climate change adaptation. The AF project is anticipated to contribute to the strategic objectives shown in Table 6. The project will also support the country's Climate Change Master Plan in its short-term objectives (vulnerability maps), medium-term objectives (forecasting and early warning), and long-term objectives (surface water management and training for farmers).

Table 6: Thailand's Strategic Plan on Climate Change main strategies and anticipated AF project impact

	Plan Strategy	This AF project's impact
1	Build capacity to adapt and reduce vulnerabilities to climate change impacts	Focus on pilot areas to build capacity for stakeholders and institutional partners
2	Promote greenhouse gas mitigation activities based on sustainable development	Developing sustainable use of natural resources
3	Support research and development to better understand climate change, its impacts and adaptation and mitigation options	Resource assessments, study and inventories of transboundary groundwater systems, assessing potential for resilience measures
4	Raise awareness and promote public participation	Focus on pilot areas and preparation of targeted information products
5	Build capacity of relevant personnel and institutions and establish a framework of coordination and integration	Build capacity for institutional partners, stimulate intra-institutional cooperation (interaction MONRE – Agriculture)
6	Support international cooperation to achieve the common goal of climate change mitigation and sustainable development	Regional cooperation, information sharing, intra-regional capacity building

In **Vietnam**, relevant policies on water resources management include the Law on Water Resources (2009); Resolution 120/NQ-CP on sustainably developing the Mekong Delta in adaptation to climate change, which sets up goals for 2050 and a vision to 2100 (issued by the Government of Vietnam in 2017) the national master plan on water resources investigation to 2030; Vision 2050 (Decision 432/QĐ-TTg approved by Prime Minister dated on 24 March 2021); recognition of IWRM principles; and the establishment of River Basin Management approaches for the integrated management of surface and groundwater resources. Its main policy objectives include prioritization of IWRM to meet water needs on river basin level. The project is also aligned with the National Strategy on Climate Change 2011-2020, Resolution 120/NQ-CP on sustainably developing the Mekong Delta in adaptation to climate change, which sets up goals for 2050 and a vision to 2100 (issued by the Government of Vietnam in 2017). Furthermore, the project closely aligns with strategic national development objectives as supported by international development partners such as ADB and the World Bank, including those documented in ADB's 2013 *Environment and Climate Change Assessment for Vietnam*,³¹ the ADB *Asian Water Development Outlook 2020: Advancing water security across Asia and Pacific*; and the World Bank's 2019 Water Report, *Vietnam: Toward a Safe, Clean, and Resilient Water System*.

The project is also aligned with the development planning process in each of the participating countries as reflected in **development cooperation frameworks with the United Nations system**. Table 7 summarizes the alignment of the project with current frameworks in the participating countries.

³¹ <http://www.adb.org/sites/default/files/institutional-document/33916/files/viet-nam-environment-climate-change.pdf>

Table 7: Project Alignment with Development Cooperation

Country	Programming Document	Areas of Alignment
Cambodia	United Nations Development Assistance Framework (UNDAF), 2019-2023	Outcome 3: By 2023, women and men in Cambodia, in particular the marginalized and vulnerable, live in a safer, healthier, more secure and ecologically balanced environment with improved livelihoods, and are resilient to natural and climate change related trends and shocks.
Lao PDR	Lao PDR – United Nations Partnership Framework for Sustainable Development (2017-2021)	Outcome 3: Forests and other ecosystems are protected and enhanced, and people are less vulnerable to climate-related events and disasters.
Thailand	United Nations Partnership Framework for Thailand 2017-2021	Outcome: By 2021, inclusive systems, structures and processes advance sustainable people-centered, equitable development for all people in Thailand Outcome indicator 6: Extent to which implementation of comprehensive measures, plans, strategies, policies, programmes to achieve low greenhouse gas emission and climate-resilient development objectives has improved.
Vietnam	One Strategic Plan: 2017-2021	Focus Area 2: Ensuring Climate Resilience and Environmental Sustainability Outcome 2.1: Low-carbon, climate and disaster resilient development By 2021, Viet Nam has accelerated its transition to sustainable development and green growth towards a low-carbon economy and enhanced its adaptation and resilience to climate change and natural disasters, with a focus on empowering the poor and vulnerable groups. Outcome 2.2 By 2021, Viet Nam has enhanced sustainable management of natural capital, biodiversity and ecosystem services and improved the quality of the environment, while contributing to the implementation of multilateral environmental agreements.

The project makes a distinct and measurable contribution towards the 2030 Agenda and the Sustainable Development Goals. A particular contribution is made towards SDG13 on Climate, SDG6 on Water and Sanitation for all, as well as SDG5 (Gender Equality), SDG11 (Sustainable Communities) and SDG17 (Partnerships and collaboration). However, through the project’s contribution towards improved management, data collection, capacity development, knowledge dissemination and community participation related to groundwater issues, climate change and ecosystem management, contributions are made across a broad spectrum of the Goals. These linkages are summarized in Annex VII.

F. Compliance with relevant standards and with ESP of Adaptation Fund

The first part of this section describes relevant national standards and explains how the project will meet and abide by these standards and regulations. The second part explains how the proposed project will comply with environmental and social principles of the AF Environmental and Social Policy. Screening of the project and proposed interventions leads to a categorization of the project as “B.” It is discussed how this categorization is reached. Further elaboration on project impact and risk management (as part of the ESMP) is provided in Part III, Sections 2 and 3 and Annex V.

F-1. Compliance with technical standards at country and regional level

The implementation of the project at country and regional level relies on approval from and falls under the responsibility of the respective line ministries (and, where relevant, international agreements) related to climate change adaptation, natural resources management (including groundwater) and rural development. Project activities have been assessed by the national partners to ensure compliance with the relevant sectoral policies and national technical standards; this is further elaborated below. The remainder of this subsection (F-1) details the national technical standards in each of the four GMS countries. The compliance assessment presented here is based on extensive consultations with experts, stakeholders and relevant government officials from the region, in combination with the expert judgement of the IE, EE and technical partners (see Section I for further details).

Sectoral (water, groundwater) policies and technical standards

The project deals with natural resources management policy issues specifically relating to groundwater and will comply with all relevant groundwater management guidelines and technical standards established by and applicable in the participating countries. Within each country, the relevant ministries will rely on their line and technical agencies. The institutional and regulatory frameworks in the four participating countries are quite heterogeneous, representing a broad range in terms of regulatory development, complexity and degree of enforcement. In Thailand and Vietnam, groundwater policy and management regulations are quite well developed. In Lao PDR and Cambodia, however, there is no detailed regulatory framework for groundwater. The project makes a contribution towards the further development and improvement of these regulations while at the same time aims to ensure that the associated climate change adaptation regulatory context and resilience development is strengthened. Preparing for this project, the following has been focused on and considered:

- General ownership laws on water and underground resources (where groundwater is sometimes classified as a “mineral resource”)
- Restrictions on groundwater extraction and depletion (such as for construction of drilled wells).
- Guidelines and/or restrictions on groundwater recharge (relating to quality and pollution controls).
- Regulations concerning water quality protection and pollution control (such as the application of pesticides and fertilizers that may pose a serious threat to groundwater quality).
- IWRM guidelines applied in river basins, as well as guidelines concerning the relationship between surface- and groundwater (relating to issues such as natural recharge, base flow, springs, etc.).

For the four countries, the following policy, legal and regulatory documents are of particular relevance to the project³² (See Table 9 for further detail):

- **Thailand:** IWRM Policy and Plan³³, 9th National (Water) Plan; Groundwater Act (1977)³⁴ and amendments, Groundwater Fund; Institutional Adjustments
- **Vietnam:** General Law on Water Resources (2012, Order No. 17/2012/QH13, additional regulations like Decree No. 179/1999/ND-CP (1999) and several supporting decrees and regulations. A more comprehensive overview of relevant legal and regulatory issues is provided in Nguyen (2012).³⁵ The water regulatory framework in Vietnam is quite extensive, including for groundwater (Decree No. 38/2011/ND-CP on water resource exploitation or wastewater discharge into water sources). However, the degree of enforcement is variable.
- **Cambodia:** Law on Water Resources Management, 2007; Law on Environmental protection and Natural Resources Management (1996); Sub-decree #27 on water Pollution Control (1999); Overall and in practice, there are only few regulations concerning groundwater use and management.
- **Lao PDR:** Water and Water Resources Law (1996, 2017) and Environmental Protection Laws (1999, 2015); these recently adopted documents contain only limited references to groundwater (protection). More recently, a National Water Resources Strategy and Action Plan (2015) and a National Groundwater Action Plan have been formulated. Both regulations remain under development and are pending approval; In

³² This is not intended as an exhaustive list; only the most relevant laws/regulations are mentioned here.

³³ Thailand Environment Monitor, Integrated Water Resources Management : A Way Forward (June 2011) <http://documents.worldbank.org/curated/en/367151468303847751/pdf/633680ESW0P1080RM00June020110Final0.pdf>

³⁴ Thailand Groundwater Act (1977):

<http://www.krisdika.go.th/wps/wcm/connect/93a892004e2b8774998bfb798fdc4669/Groundwater+Act%2C+B.E.2520+%281977%29.pdf?MOD=AJPERES&CACHEID=93a892004e2b8774998bfb798fdc4669>

³⁵ Nguyen, T. (2012). Legal framework of the water sector in Vietnam: achievements and challenges. *Journal Of Vietnamese Environment*, 2(1), pp. 27-44. <http://dx.doi.org/10.13141/jve.vol2.no1.pp> 27-44

terms of active application and enforcement of relevant regulations for groundwater, progress in Lao PDR has been limited to date.

Taking note of the particular context in each country, the project aims to further strengthen the practical implementation of groundwater-related regulatory and governance legislation and guidelines by offering training and building capacity among key line ministry officials and staff of agencies.

It must be stressed however, that the application of the label “technical standards” for many of the existing regulations and guidelines is not entirely accurate. Technical guidelines exist in all four participating countries, but these are fairly general in nature, often not quantitatively defined, and their implementation in some cases is weak or non-existent. One indicative example is that of an IWMI project to pilot MAR for sustaining groundwater supplies for smallholder coffee production in the Central Highlands of Vietnam, which was implemented from 2017 to 2019. The most recent Government of Vietnam Decree No. 38/2011/ND-CP on water resource exploitation or wastewater discharge into water sources came into effect in 2011, but it makes no provision for the issuing of licenses or permits in relation to emerging technologies such as MAR. Discussions were held with the Department of Natural Resources and Environment (DONRE) and the Department of Agriculture and Rural Development (DARD) of Dak Lak Province to bring the proposed MAR trial to their notice and to ensure the trial would be conforming with existing laws and rules. This interaction indicated that formal permission to conduct the MAR trial would not be required as the proposal involved the recharge of runoff from an agricultural catchment. The monitoring program prepared for trial was considered sufficient to ensure adequate protection from potential adverse impacts on groundwater resources of the Dak Lak plateau. Monitoring was undertaken in collaboration with the Sub-Division of Water Resources in the Central Highlands, (former name: Hydro-geological Unit 704), based in Buon Ma Thuot of the National Center for Water Resources Planning and Investigation (NAWAPI) of MONRE.

It should be noted that based upon experiences with MAR pilots in the participating countries, the project does *not* anticipate potential delays due to permitting or regulatory processes.

During project implementation, compliance with existing and relevant guidelines and standards will be ensured through the full engagement of national partner agencies. To ensure there will be no conflicts of interest, a verification and review of the compliance assessment will be conducted by the technical implementing partners (IWMI and IGRAC, as well as key international agencies such as MRC). The project will in this way ensure that national partner agency compliance is verified, reviewed and assured through the expertise contributed by the partnering technical institutions. Furthermore, where clear local/national regulations and standards are missing, the project will support their introduction and application. The project will make a targeted contribution towards addressing this gap.

By virtue of its regional approach, and its focus on sustainable and responsible groundwater management, this project will strengthen and widen the availability, awareness and application of such technical standards and guidelines. Based on the initial assessment of the regional institutional context and consultations with the relevant actors and stakeholders (see the overview provided in Section II.H), no compliance issues with currently active laws, standards and regulations issues are anticipated.

Table 8 below gives an overview of the relevant country ministries and technical agencies and departments from which relevant standards and guidelines apply to the project. For groundwater-related capacity building and training, the project will work with the regional hubs for education and training; i.e., the leading national institutions as summarized below. The project’s capacity building, training and knowledge transfer activities will be reviewed and endorsed by these institutions.

Table 8: Overview of the participating country ministries and technical agencies and departments from which relevant standards and guidelines will be used, and with which cooperation will ensure compliance with the relevant laws and regulations.

Countries: Ministries (Policy level)	Country Agencies / Departments (Technical)	Educational / Capacity building
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Cambodia Water Resources and Meteorology; Environment; Mines and Energy; Agriculture, Forestry and Fisheries; Rural Development	Cambodia Department of Geology; Climate Change Department; Department of Environmental Impact Assessment	Cambodia Royal University of Phnom Penh; Institute of Technology of Cambodia
Lao PDR Natural Resources and Environment; Energy and Mines	Lao PDR Division for groundwater Management (DGM); Natural Resources and Environment Institute (NREI)	Lao PDR National University of Laos, Faculty of Water Resources
Thailand Natural Resources and Environment	Thailand Department of groundwater Resources (DGR); Groundwater Research Centre	Thailand Groundwater Research Centre, Khon Kaen University
Vietnam Natural Resources and Environment; Agriculture and Rural Development	Vietnam National Center for Water Resources Planning and Investigation (NAWAPI), DWRPIS (Ho Chi Minh City)	Vietnam Hanoi University Water Resources; Vietnam National University - HCMC

Environment Impact Assessment (EIA) Standards: The four participating countries have established EIA practices and apply national EIA standards (Table 9). The EIA frameworks adopted by the participating countries employ a similar assessment approach involving screening, scoping, impact assessment, approval and post-decision implementation. Implementation of EIAs in the GMS countries is mandated under the relevant ministry (e.g. Ministry of Environment in Cambodia) in coordination with other relevant ministries (e.g. agriculture, natural resources, health, etc.).

Table 9: EIA laws and guidelines in GMS countries

Countries	Environmental legislation & EIA guidelines
Cambodia	Law on Environmental Protection and Natural Resources (1996); Sub-decree on EIA Process (1999); Prokas on EIA General Guideline (2009)
Lao PDR	Environmental Protection Law (No. 29/NA 2012); Environmental Impact Assessment Guidelines (2012, MONRE)
Thailand	Enhancement and Conservation of National Environmental and Quality Act (1992); Environmental Impact Assessment in Thailand (2013)
Vietnam	Law on Environmental Protection (No 55/QH13, 2014); New Law on Environmental Protection (amended) (No.72/2020/QH14, 2020), to be effective from 1/1/2022

It should be noted that the community pilot projects are **not** anticipated to trigger the need for an EIA. This information is indicative. The project will monitor requirements closely and ensure that the pilot projects as designed will be cross-checked against requirements for an EIA. This approach reflects the previous experience of the implementing partners. When co-developing MAR pilots with farmers, for example, water sources for recharge are cross-checking to ensure that sources that would require an EIA (e.g. industrial sources) are not used.

The proposed project will be implemented in close partnership with relevant national authorities; accordingly, vulnerability reduction measures in the proposed project will be designed to be consistent with national EIA standards (principles of precaution and prevention, public participation in preparation and monitoring stages, conservation of biodiversity, effective compliance, etc.). Beyond the EIA, the proposed project will also give strong emphasis to potential social issues such as gender and equality. This will ensure that social and environmental safeguards are fully in place. If—despite this approach—issues arise, measures from the ESMP can be applied, and a grievance mechanism can be activated (see proposal Part III, Section 3).

It is important to note that strengthening compliance, support and general and specific interventions as outlined in this proposal towards enhanced groundwater resilience remain the overall aim of the project; the preparation and introduction of detailed and technically specified groundwater management regulations is not. However, contributions towards the elaboration of such guidelines will be undertaken where sustainable and comprehensive groundwater management has proven its worth as a climate resilience strengthening option. Hence, emphasis is placed on collaborating with national partner agencies, transferring expertise and strengthening capacity, including the development of relevant and applicable technical standards. The project will in particular facilitate the sharing and dissemination of successful examples among the participating countries, organizations and communities.

At the technical level, project activities and outputs will as a minimum meet the technical standards prevailing in water and natural resources management in the participating countries. This is achieved by ensuring that the design, implementation and monitoring of project activities involves technical groundwater agencies from the four participating countries and/or their local/provincial representatives in the three proposed pilot areas. The project will also make full use of guidelines and other documents produced by partners and projects working in the participating countries.

In terms of the project's engagement with legislative frameworks in the participating countries, meeting the prevailing groundwater and natural resources management standards and regulations is not expected to represent a highly significant challenge. As discussed above, in Lao PDR and Cambodia these regulations are fairly general, and in some instances poorly or not at all defined. Rather, the greater challenge will be to develop new and innovative practices and interventions that - once proven useful - may be the subject of new or revised and improved regulatory guidelines and standards (that also meet and include climate change adaptation concepts) formulated and adopted by higher policy levels. This will be done in close collaboration with the project's stakeholders and national participating agencies (see Table 8).

Also in this regard, the regional cooperation aspect of the project will serve as a source of guidance. In Thailand and Vietnam, regulations are more developed, and application has penetrated further. Hence, the project's regional scope adds value by mobilizing and making use of expertise from the more advanced groundwater management and extension centres in the region to ensure that relevant standards and guidelines are shared and applied in a similar way across the region. Both UNESCO and CCOP-TS can make use of a rich and diversified experience in other countries from which best-practices and relevant track record can be obtained.

The project manager will work with all executing agencies and government stakeholders to monitor all relevant legislative and regulatory developments in order to ensure that all project activities comply with legislation that is in force. Additional information on safeguarding activities to comply with relevant legislation and regulations is provided in Sections II.K, III.B, and III.C.

F-2. Compliance with the ESP of the Adaptation Fund

Accreditation: As an accredited organization with the Adaptation Fund, UNESCO has undergone the required assessments to make sure that sound standards are adhered to and that effective social and environmental safeguards are applied to identify any project risks in advance, prevent any harm and improve the effectiveness and sustainability of results. Towards this commitment, UNESCO will, as IE for the project, rely on its environmental, social, ethical and gender principles, standards and policies – principles that are essential not only for the present project, but for UNESCO's entire body of work.

In line with its Constitution, UNESCO works with its member states and civil society to strengthen the foundations for lasting peace, the eradication of poverty, sustainable development and intercultural dialogue. The ESP of UNESCO (see: <https://unesdoc.unesco.org/ark:/48223/pf0000260723>) states that UNESCO is committed "to further universal respect for justice, for the rule of law and for the human rights and fundamental freedoms, which are affirmed for the peoples of the world, without distinction of race, sex, culture, language, religion or sexual orientation." The projects/programmes implemented by UNESCO shall be designed to meet the environmental and social principles, including *Compliance with the Law, Marginalized and Vulnerable Groups, Human Rights, Gender Equality and Women's Empowerment, Core Labour Right and Working Condition, Indigenous People, Protection of Natural Habitats, Conservation of Biological Diversity and Sustainable Management of Living, Natural Resources, Land and Soil Conservation, Land Acquisition and Involuntary Resettlement, Climate Change, Pollution Prevention*

*and Resource Efficiency, Public Health, Safety and Security, Pest Management and Physical and Cultural Heritage*³⁶.

Consequently, UNESCO is firmly committed to abide by the internationally set environmental and social policies and standards of the AF, ensuring that in furthering the Fund's mission of addressing the adverse impacts of climate change projects and programmes supported by the Fund do not result in unnecessary environmental and social harms.

Screening for potential negative impacts and risks: For the proposed project, UNESCO as IE and CCOP-TS as Executive Entity have carefully considered all ESP compliance issues. In collaboration with country partners, the initial project scope and technical activities have been screened for unwanted environmental and social effects. The initial preparatory screening analysis of the proposed project was carried out through a) workshop consultations with regional experts, sectoral officials from the four countries and stakeholders, b) communication with officials and experts on groundwater management, c) gender and water governance experts. Information on the initial screening analysis is available in the summary of March 2019 survey and workshop feedback in Annex II. Environmental and social principles were also discussed during the community consultations conducted in 2021 (see Annex III).

Screening of 15 Environmental and Social Principles: Development and dissemination of climate and groundwater information, sharing of knowledge and capacity building activities that are the core of the project will be carried out in a manner that respects the principles of compliance with the law, human rights³⁷ and gender equity, access and equality. For example, by identifying women who are key users and beneficiaries of groundwater, the project prioritizes understanding of their access to, use and management of groundwater. The design of training activities will include awareness raising among local stakeholders with emphasis on women and marginalized communities engaged in or aspiring to be engaged in groundwater use for domestic supplies, crop production, issues related to groundwater use and protection, and means to access necessary technology, markets, and community-based monitoring and management. The approach and activities will be sensitive to the needs of marginalized and vulnerable groups and will be implemented according to the applicable risk mitigation measures in the pilot areas.

None of the proposed activities in the pilot areas will generate negative impacts or pose risks in Category A of the Adaptation Fund's impact classification. Project activities with potential (limited) adverse impact are small scale, mostly community-based and very localized. They will be co-managed by local communities where possible. Communities will have a stake in avoiding negative environmental and social impacts, which will contribute towards ensuring that the risk of any unintended negative impact is small and localized and can be rapidly mitigated in the context of project implementation. Given this, cascading or cumulative negative impacts are highly unlikely. Proposed activities requiring additional environmental or social screening represent a minor part of the project. Where and when applicable or needed, mitigation measures will be integrated into the project implementation stage, as part of the ESMP and progress monitoring process, as further detailed in Part III, Section 3. It is not expected that activities in the pilot project areas will not involve indigenous communities, however appropriate provisions will be taken in the event that engagement with indigenous peoples should occur (see page 138). Due to the presence of unidentified sub-projects in Component 3 in the pilot regions of the project, the project is classified as "B" in accordance with the Adaptation Fund's impact classification.

G. Duplication of other initiatives or ongoing projects

The project is the result of an intensive regional consultation process, described under Section J (below) with participation of representatives from the four countries and international experts active in the region. The groundwater community is not too large, but the network includes experts with different affiliations (government organisations (different ministries, such as natural resources, agriculture, water, environment and climate change

³⁶ Statement on UNESCO's Environmental and Social Policies (2016), http://en.unesco.org/sites/default/files/statement_on_unesco.pdf.

³⁷ UNESCO's procedure for dealing with alleged violations of human rights (2016), UNESCO, Available at http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ERI/pdf/BrochureProcedure104_2016EN.pdf

policy), R&D institutions, universities, etc.). In this setting there is a good oversight of comparable or related initiatives. There are national or more localized projects, targeting small and specific stakeholder groups, but to our knowledge there is no existing or planned regional and multifaceted programmes as described in this proposal and thus currently no potentially overlapping initiatives.

Earlier initiatives with a somewhat comparable focus included a launch workshop in 2011 by the Asia Pacific Water Forum (APWF) for a regional knowledge hub for groundwater management, with support of the Institute for Global Environmental Strategies (IGES, Japan), ADB, Department of Groundwater Resources (DGR), Thailand Asian Institute of Technology (AIT), and other knowledge hub partners (see: <https://www.iges.or.jp/en/natural-resource/groundwater/index.html>). The meeting had three main objectives:

- Discuss and explore ways to highlight and prioritize groundwater issues on main water agenda and identify feasible actions for sustainable development of resources;
- Clarify importance of groundwater in the time of global change to address food and water security and suggest ways to safeguard its strategic resource value from emerging challenges;
- Facilitate partnership with clients, partners and relevant organisation working in the field of groundwater and dig into opportunities to synergize efforts being taken in different corners of the region.

However, this project lacked concrete interventions on the ground due to poor financial support, and after the launch workshop there was no further follow-up.

A more successful example of a past initiative is TWAP <https://apps.geodan.nl/igrac/ggis-viewer/viewer/twap/public/default>. TWAP is now being set up as an independent project and is financially supported, but it has no explicit Mekong Region focus.

About TWAP

Recognizing the value of transboundary water systems and the fact that many of them continue to be degraded and managed in fragmented ways, the Global Environment Facility Transboundary Water Assessment Programme (GEF TWAP) was developed. The Programme aims to provide a baseline assessment that identifies and evaluates changes in these water systems caused by human activities and natural processes, and the consequences such have on dependent human populations. The project is the first truly global comparative assessment for transboundary aquifers, lakes, rivers and large marine ecosystems, as well as a thematic evaluation of the open ocean, through institutional partnerships that hope to seed future global assessments. The project results are envisioned to assist the GEF and other international organizations in setting priorities for supporting the conservation of transboundary water systems. More information on TWAP including final reports can be found on www.geftwap.org

The portal gives access to the map based results from the groundwater component of the Transboundary Waters



Assessment Programme. The data shown in this portal have been made available by national experts from countries involved in the TWAP groundwater project. It also includes the results from scenario analyses using the global WaterGAP model (University of Frankfurt, Germany) and a study on groundwater systems of small island developing states, also called SIDS (Simon Fraser University, Canada). More information on TWAP groundwater, including reports on methodology and outcomes, can be found on <https://isarm.org/twap/twap-groundwater>

Current projects with which the project will exchange information and maintain communication include the following:

1. The UNEP-AF project “Mekong EbA South: Enhancing Climate Resilience in the Greater Mekong Sub-region through Ecosystem-based Adaptation in the Context of South-South Cooperation.” Communication will focus on identifying and ensuring complementarity between this UNESCO-AF project’s groundwater focus and the UNEP-AF project’s Mekong EbA South ecosystem-based approach.

2. The Global Environment Facility–FAO project “Enhancing sustainability of the Transboundary Cambodia - Mekong River Delta Aquifer.” (GEF ID: 10520; status: concept approved). It will be important to ensure maximum complementarity between this UNESCO-AF project’s groundwater-based adaptation focus and the Enhancing Sustainability project’s focus on groundwater dynamics in the lower Mekong, as this project and the proposed FAO project will be in a position to exchange information on activities in Cambodia.
3. The Worldwide Fund for Nature’s Resilient Asian Deltas Initiative. The initiative focuses on six deltas across South and Southeast Asia. This project focuses on different causes of threats to resiliency: dams that trap sediment and riverbed sand and gravel extraction. This UNESCO-AF project will work to ensure complementarity and sharing of data and information regarding the activities of both projects in the lower Mekong.
4. The UNDP-GCF project “Strengthening the resilience of smallholder agriculture to climate change-induced water insecurity in the Central Highlands and South-Central Coast regions of Vietnam” (FP125). The objective of this project, which was approved in 2020, is to empower vulnerable smallholders in five provinces of the Central Highlands and South-Central Coast regions of Vietnam – particularly women and ethnic minority farmers - to manage increasing climate risks to agricultural production. To achieve its objective, the project will enable smallholder farmers to adapt to climate-driven rainfall variability and drought through implementation of: 1) improved access to water for vulnerable smallholder farmers for climate-resilient agricultural production in the face of climate-induced rainfall variability and droughts, and 2) strengthened capacities of smallholder farmers to apply climate and market information, technologies, and practices for climate-resilient water and agricultural management. While the project focuses on on-farm water efficiency technologies, it will include the training of farmers through farmer field schools that will touch on groundwater recharge. This UNESCO-AF project will communicate with the UNDP-GCF project regarding training curriculum, good practice in groundwater recharge, and exchange of information.

H. Learning and Knowledge Management

Learning and knowledge management is one of the key components of the project (Component 5); capacity building, training and knowledge dissemination are directed first at the community of practice (CoP) of groundwater workers, who need to be better equipped with proper management tools and supported with relevant expertise, and secondly at groundwater end-users and stakeholders who need to be more aware and supported with technologies and information to use groundwater to increase resilience. Hence, the learning and knowledge development and management outcomes for the project have been defined as “Internal capacity in the GMS to develop CCA policy and practical resilience enhancing interventions; use state-of-the-art tools; and work with the CoP, stakeholders, and vulnerable groups.”

The proposed regional approach will ensure involvement and results for four countries and operational and resource efficiency. Activities to capture and disseminate lessons learned include:

- A series of training workshops with participants from the groundwater CoP from the four countries
- Dissemination of relevant expertise and skills to end-users in resilience pilots. In these practical, hands-on demonstrations we will exploit various learning tools, such as: news items in local media, public and school presentations, water management briefings with local community groups, awareness actions for private sector, short training workshops and courses on climate change. Information and supporting guidelines will be consolidated in policy briefs for national decision makers, best practice guidance materials and tools.
- Collaboration with the training institutes in the countries to adapt and improve formal training programmes and promote increased participation by women in the sector.
- International conference

A detailed work plan for the proposed activities will be developed during the Inception Phase of the project.

The first challenge of the learning and knowledge management component of the project is to address a number of knowledge and information gaps; it is of critical importance that knowledge and learning development starts from the correct foundations and proper understanding. The following are important and basic resource management

concepts that need to be addressed: (between brackets the project component/activity in which the issue will be addressed):

- Extent and/or characteristics of superficial and confined aquifer systems, including resource volumes in aquifers systems in the selected pilot areas, existing and/or potential water quality threats (Component 1).
- Current groundwater volumes being abstracted for various uses (Component 2); future demand scenarios for irrigation, urban and rural water supply (Component 1)
- Relationships between recharge in highland areas and resource potential in lowland areas. This includes several important transboundary systems. Climate change and land use changes will affect these delicate balances in supply and demand (Component 1).
- Sustainability (in view of increasing abstraction) and vulnerability of riparian groundwater resources to climate change induced changes in precipitation and changes in river flow regimes, be they natural or anthropogenic (Component 1).
- To understand better the resource and resilience potentials and vulnerabilities of groundwater systems of the region, detailed hydrogeological and geophysical investigations are required. A crucial monitoring network is needed to monitor resource status and critical depletion, and for developing and using regional groundwater information systems and groundwater flow models. These regional (transboundary) groundwater models and information tools will help manage resources. It is therefore also needed to visualize (in maps) regional and transboundary groundwater (recharge and extraction) systems and enable assessment of groundwater recharge rates from flooding and rainfall under the current and future climate conditions (Component 3).
- Determine groundwater resource potential in shallow and deep aquifer systems (for different users) and demonstrate how this potential can be developed to increase resilience. (Components 1, 2 and 3).

Learning, knowledge development and sharing of expertise are key elements of the program; more advanced practitioners and institutions in Thailand and Vietnam will contribute to this process by helping their less advanced colleagues in Lao PDR and Cambodia. In comparison with isolated single-country interventions, this is much more cost effective. The bulk of the technical support work can be done by regional experts.

Capacity building to form a regional community of experts and address societal needs: Sustainability aspects are highly dependent on the human resources capacity dimensions. With a strong focus on human resources development a new generation of better skilled and equipped groundwater experts will engage with pertinent challenges of the coming decades. They can do this better in a concerted manner, with common tools and data. Sustainability is also enhanced by closely linking groundwater resource studies to societal needs (in various sectors like food production, domestic water supply, industry, ecology/environment). A regional CoP will be fostered, building upon efforts previously undertaken by the project partners. This CoP will meet and share issues annually. The project will also provide an enabling environment and give support to postgraduate studies. The opportunities for regional cooperation are being greatly strengthened in readiness for the establishment of the ASEAN Economic Community later this year.

Finally, the project will benefit from the dedication of its project partners (IWMI and IGRAC) to knowledge development and sharing, such as IWMI's global Groundwater Solutions Initiative for Policy and Practice (GRIPP). GRIPP will provide a useful vehicle for knowledge sharing at the regional and global levels.

GRIPP: Groundwater Solutions Initiative for Policy and Practice

GRIPP is a global level, multi-partner initiative of the IWMI working closely with IGRAC and a host of other partners. Its aims are to '*secure Groundwater resources for livelihoods, food security, climate resilience and economic growth while sustaining the resource for future generations*' by:

- a) creating long-term partnerships
- b) sharing lessons
- c) scaling-up successes
- d) filling knowledge gaps

Thus GRIPP brings in tested success stories, new technology, and innovative policy and institutional approaches for groundwater management in order to achieve the SDGs related to climate resilience, food security, and sustainable water management. As this global mandate conform closely with those



of this regional project, it is anticipated that the inception phase of this project will enable close interactions and linkages to be developed to enable two-way feedback and learnings to better address these contemporary groundwater management challenges. For further information visit: <http://gripp.iwmi.org/>

I. Project consultation process

The consultation process for this project spans six years and a broad variety of stakeholders at all levels (local communities, provincial, national, regional, and global). Initial consultations were carried out in 2015 in order to inform the scope of the project concept and to establish the baseline for activities. In March 2019, the project formulation team conducted consultations specifically related to the environmental and social principles of the Adaptation Fund to ensure conformity. In 2021, the project held additional community consultations for representatives from the pilot regions where the project will operate. It also held a virtual stakeholder workshop for project partners organized by UNESCO in Jakarta on April 22, 2021.

The 2021 community consultations reinforced the importance of the project's community-oriented approach. They confirmed the site-specific nature of community needs and organizational structures, and they also highlighted the urgency of addressing groundwater issues, particularly in the face of droughts. The participants in the consultation expressed their support for the proposed project approach and activities, and there were no concerns voiced related to the project implementation.

Note: The project as originally conceived included the participation of Myanmar, and their participation in the stakeholder consultations is documented in Annex III along with that of the current participating countries.

J. Justification of funding

The project focuses on building climate resilience on the basis of “hidden” and poorly managed groundwater resources in particular for vulnerable rural communities, and other low-income users in cross-border regions of Lao PDR, Cambodia, Thailand, and Vietnam. The overall justification of the project lies in the potential to use groundwater, always a reliable and “safe” resource for low-income groups to provide water for food production, domestic use and production processes. This potential remains undeveloped in large parts of the GMS for a number of reasons. The project will address the following:

- Poor information on and confirmation of resource potential: The project will prepare an updated groundwater inventory of shared aquifers in border regions (three pilot areas), develop resource management concepts and tools, and set up a much needed monitoring network for groundwater systems.
- Regional collaboration will enhance understanding of groundwater recharge processes and formulate recommendations for protection and long-term sustainable management.
- In the general approach and in the pilot areas issues of transboundary groundwater management will be addressed. Taking up transboundary challenges will also form an incentive to develop collaborative solutions.
- In addition to making use of the available national capacities, the project will aim for intensive participation of local stakeholders by implementing principles of groundwater governance through: 1) dialogues with users to assess groundwater use scenarios for different sectors (agriculture, industry, rural and urban domestic water supply); and 2) collection and provision of appropriate information to ensure sustainable use by different user groups (agriculture, industry, domestic water supply).
- On the basis of improved information (supply/demand assessments, climate vulnerability profiles) the project will develop and implement targeted vulnerability reduction measures, groundwater supply quality improvement measures, and identification and protection of strategic groundwater reserves. Implementation of different project activities will be integrated in the three pilot areas and will generate resilience deliverables on the ground.
- On the medium and longer-term the investments in training, capacity building; raising standards for the groundwater CoP across the GMS; and initiating regional water cooperation (diplomacy) will generate long-term benefits.
- Strategic planning for groundwater resources will support high-level policy consensus and regional cooperation

and make significant contributions to climate resilience of low-income and rural water users.

The following summary in Table 1Table 10 provides a justification of the funding for each project component and an overview of adaptation alternatives.

Table 10: Summary overview of justification of funding and adaptation alternatives

Component 1: Groundwater resource assessment and monitoring			
Outcome:	Baseline (without AF project)	Additional (with AF project)	Justification
Participating countries use a regional GMS approach to address challenges of climate change, sustainable water use and resilience for evidence-based decision-making and management	Governments and user groups have incomplete to severely limited knowledge of GW resources and no consistent assessment.	A comprehensive overview of regional GW resources (quality, quantity) is included in a easily accessible inventory (GIS, database).	<p>It is essential to prepare a thorough inventory of available GW resources. However, this inventory should not be an academic or stand-alone investment. Estimates of resource potential should be made in close connection with a comprehensive assessment of water user needs (for different sectors: rural food production/agriculture, domestic water needs and small-town water supply). Without proper understanding of resource availability, GW can still be used as a resilience (as is done in many places), but issues of sustainability and depletion of scarce resources will crop up.</p> <p>By combining expertise from within the region with modest Technical Assistance support in a focused and coordinated intervention valuable and relevant resource availability information will be prepared and made available in formats that improve use by stakeholders and users. It will be possible to level regional differences</p> <p>Adaptation Alternative? Information on GW resources is available in Thailand and Vietnam, but much less so in Lao PDR and Cambodia. This unbalanced information base is not supportive of sustainable resource use and developing fair and equitable resilience measures, and it forms a challenge especially for proper management of transboundary aquifer systems. Existing GW information lacks detail and quality due to a low level or absence of monitoring, especially so with respect to GW management in border regions. It would be difficult to work on the basis of existing information and not possible to achieve the set objectives.</p>
	There is some GW-related info, but hardly used for this purpose.	GW information forms the basis for specific climate resilience measures.	
	Groundwater is seen as a static resource (basic inventories) and no to little data on temporal changes (or depletion)	Monitoring system and information operational and used for periodic updates.	
	Currently, GW information is hardly used.	Clear and consistent reference to GW in support of climate resilience development.	
Component 2: Priority use and Stakeholders			
Outcome 2:	Baseline (without AF project)	Additional (with AF project)	Justification
Groundwater users in different economic sectors have equitable access to requisite information and guidelines and are able to participate actively in	Farmers and other users deplete GW resources regardless of CCA challenges.	Multiple users aware of and supported with resource management information and guidelines; support available in transboundary regions.	Studies of pilot activities in the GMS indicate that governance arrangements are a key enabling factor for effective aquifer storage and recharge. Due to the scientific and academic character of GW studies, also a somewhat neglected chapter not really part of water resources management and neither at the core of natural resources management, the results of GW studies were always a bit out of reach for many GW user

groundwater management	Information on GW potential is not tangible enough to motivate users to adopt and apply.	Supporting national partners dedicated to provide users (in-country and transboundary) with adequate information.	<p>groups. By addressing this, the project will deliver tangible results to different water users so that a) climate change resilience is strengthened, and b) limited but critical GW resources are not depleted. This will be done in close consultation with the stakeholders, in all parts of the proposed pilot areas. From the local pilots, the project will reach for higher institutional and policy levels, to ensure recognition of GW as a resource that can contribute to regional resilience.</p> <p>Adaptation Alternative? Working in the traditional manner will bring the risk of not reaching the target groups and/or maintaining the mismatch and poor coordination between the GW CoP and the user sectors. It also runs a significant risk that “top-down” interventions will not be sustained following the completion of the project. The project workplan allows for flexibility and adaptation (to be used during the Inception Phase) to specific requirements to generate results in the pilot areas.</p>
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Component 3: Resource management, information tools and equipment

Outcome 3:	Baseline (without AF project)	Additional (with AF project)	Justification
Climate resilience and GW use in pilot areas are increased in an equitable and gender-balanced manner through adaptive technologies and approaches	Next to basic resource inventories (GW maps) there is no tailored information to support sustainable resource use of specific measures to support resilience.	Greater resilience and sustainable GW resource use, enabling low income and vulnerable user groups to use GW resources optimally when needed.	On the basis of improved information (supply/demand assessments, climate vulnerability profiles) the project will develop and implement 1) targeted vulnerability reduction measures aimed at meeting the needs of specific (or vulnerable) groups, 2) GW supply quality improvement measures; and 3) identification and protection of strategic GW reserves.
	No transboundary cooperation, incompatible resource inventories, no communication.	Joint and coordinated efforts to use information and tools (monitoring) to develop and apply GW management	Ad 1-2: For each of the pilot areas a critical analysis will be prepared of vulnerabilities for agricultural production, domestic (rural) water supply and possibly other major water users (industry like food processing). Other sectors/stakeholders are not excluded. This will clarify the main climate change related vulnerabilities and stakeholder groups. We will focus on vulnerabilities that have potential to be mitigated on the basis of improved and responsible GW management. Such practices could include: seasonal withdrawals for specific purposes, in combination with recharge measures, adaptation of user needs (different crops or income generating activities), governance and administrative arrangements (allocate limited shallow GW for low-income users), diversification of GW based water supply (deeper aquifers, new well fields), quality treatment of surface- or GW to make it suitable for specific user needs; technical improvements of extraction wells. Increases in extraction should be accompanied by resource conservation (elsewhere) or increase in recharge.
	Only very basic, general information is available	Comprehensive information, tools and methods developed and applied; resilience measures developed and applied (related to the physical GW system, governance of water resources or adaptation of user needs).	Ad 3: Vulnerability mitigation should be accompanied with a careful assessment of water needs versus water sourcing options (surface water or GW). Improved understanding of the GW system

			<p>(Component 1) supports a better assessment and quantification of the available resources and possibly specific constraints in further use. Vulnerable high quality resources (i.e. for drinking water supply) may need to be protected. GW use options could be adapted (i.e. strategically located deep GW extraction could replace vulnerable shallow extraction). Basic monitoring of GW dynamics is needed to be able to match regional extraction volumes/rates to regional recharge rates. All measures rely on support from and awareness in stakeholder/user groups, which is in itself already a vulnerability reduction result.</p> <p>Implementation of different project activities will be integrated in the three pilot areas and this will generate resilience deliverables on the ground. The project will provide farmers and rural communities and village water user groups in the pilot areas with awareness, understanding and skills to managed limited GW resources to overcome CC-induced perennial droughts and water shortages.</p> <p>Adaptation Alternative? One of the fundamental questions is the use of surface vs. GW. In principle, similar resilience levels could be reached with the use of surface water, commonly available in the proposed pilot areas (but not in drought periods). However, the investments needed to ensure availability of surface water and the complexities involved in management give low-income user and rural communities poor leverage and little influence. Surface water, originating outside the area, and destined for other users downstream, is not really an alternative for the “hidden” resource underground. Our approach complements other interventions that deal with surface water management. Other arguments in favor of MAR as a water storage method in the project area are provided in Section II.B.</p> <p>Again, as in Component 2, community-led design as proposed in the project is seen as a pre-condition for sustainability. The alternative, which would be a top-down selection and installation of measures, would be highly unlikely to be maintained following the operational completion of the AF project.</p>
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Component 4: Regional cooperation, coordination and information exchange

Outcome 4: Regionally consistent management strategies for groundwater resources in support of CCA	Baseline (without AF project)	Additional (with AF project)	Justification
	Despite common CCA challenges countries in the region do not optimally share practices, knowledge and resources.	Regionally coordinated GW use contributes to regional, cross-border climate resilience for food	In the provinces, when discussing GW resources for use in agriculture or for domestic purposes, few people realize the resource is not simply available from an underground (limitless) source, but forms part of a complex system with recharge areas, GW flow in complex aquifer systems, interaction with

are adopted through effective stakeholder engagement in the GMS		production, rural water supply, etc.	surface water and sometimes is affected by large scale spatial and long-term temporal dynamics. A similar misunderstanding is encountered among higher policy levels. Our approach for regional and transboundary, joint development is aimed at overcoming these misunderstandings. This justifies a fair amount of bilateral and four-country meetings and workshops, to create a joint understanding, both on advanced technical levels, as well as on policy coordination and complex cross-border cooperation. Adaptation Alternative? From a GW management perspective, there is no real alternative; if there is no real cross-border coordination resource depletion will take place in the medium- to long-term, and communities on both sides of the border will suffer.
	Vulnerable groups in the region and cross-border suffer from detrimental impact of resource depletion and increasing climate change vulnerabilities.	Collaborative transboundary approach to protect limited resources and support vulnerable groups.	

Component 5: Capacity building and training

Outcome 5: GMS stakeholders capably use project tools and knowledge on GW use for CCA and resilience	Baseline (without AF project)	Additional (with AF project)	Justification
	Within the region different national groups work on rather different knowledge levels and there is little bi- or multilateral cooperation.	Community of Practice of GW experts is able to contribute to CCA policy and practical resilience enhancing interventions.	The project investments in training, capacity building and raising standards for GW CoP will use within-the-region training. There is a high (double) return on investment as both the participants as well as the host institutions will benefit. The programme will offer fertile training grounds for a new generation of experts, in a learning-by-doing approach that will cover practical, on-the-ground issues in the pilot areas, but also higher policy levels. New and innovative subject matter and policy context will be injected to give more relevance to the sector. The project will be implemented with limited international TA and build on existing networks. Adaptation Alternative? The direction of development is really set for further ASEAN cooperation for and coordination of important policies in the region. It is an option to implement the project with experts from advanced countries in the GMS region (Thailand, Vietnam). But this will lead to unsustainable results in the priority areas and for priority low income groups in Lao PDR and Cambodia. The underdeveloped GW management capacity in these countries is a challenge and an opportunity to develop greater climate resilience. Bringing in more international TA will substantially raise the interventions costs, as would training in leading institutions outside the region.
	Although there are regional network meetings there is little coordinated effort to improve overall impact level.	Through regional cooperation GW experts have reached a higher and collaborative knowledge and impact level	
		Groundwater CoP is regionally active and able to contribute effectively to different GW system, sustainability or CCA challenges.	

K. Sustainability of outcomes

Project sustainability is highly dependent on human resources capacity dimensions. With a strong focus on human resources development, a new generation of better skilled and equipped female and male groundwater experts will be supported to engage with pertinent challenges of the coming decades. Project outcomes will allow for this process of capacity development to proceed in a concerted manner, with common tools and data. Sustainability of outcomes will also be enhanced by closely linking groundwater resource studies to societal needs (in various sectors like food production, domestic water supply, industry, ecology/environment). A regional community of

practice will be fostered, building upon efforts previously undertaken by the project partners. Working in a more concerted manner, this groundwater community of practice will meet and share issues annually. The project will also provide an enabling environment and give support to postgraduate studies; this will generate long-term benefits to the sector and enhance sustainability. Finally, the project's engagement with community-level organizations in the pilot sites will strengthen the position of communities as resource owners and custodians.

The proposed implementation partnership, with UNESCO, CCOP-TS as executive partner and technical support from IWMI and IGRAC forms a solid foundation for outcome sustainability. All partners have a long presence in the region and are dedicated to continuing their activities in close cooperation with the national partners. The envisaged project cooperation will simulate stronger and more effective intra-regional cooperation in the future, and it provides a collaboration model that makes more effective use of support from partners outside the region, such as JICA, AusAid, KOICA, BGR, global funds, and other development initiatives.

Project outcomes will be shared and made available for uptake by relevant regional organisations such as MRC and climate change coordination focal points under ASEAN. On the national level, national Mekong River Commissions will be engaged.

L. Overview of environmental and social impacts and risks

As further elaborated in Part III, project management, Section 2 and Section 3, the proposed project seeks to fully align with the Adaptation Fund's Environmental and Social Policy (ESP). Table 10 (in Section III.3 below) summarizes the initial analysis that has been carried out to evaluate environmental and social impacts of the project versus the AF policy. Also, it indicates where steps will be taken and where further assessment is needed (in those domains where positive impacts are anticipated). This will be done as part of the project monitoring and evaluation effort.

Activities under Components 1, 2, 4, and 5 are all 'knowledge' activities. Activities taking place at the community level in these components are community focused, and they will take place with explicit stakeholder participation. They are also limited in spatial scale and impact (no or very limited physical construction or disturbance limited to possible measurement instruments), and they can easily be adapted, changed or reversed.

As elaborated throughout the proposal the project specifically aims to deliver positive transboundary impacts. The miscellaneous field activities that will be formulated in detail for the implementation of the designated pilot areas need to be scrutinized more closely. Some of these may be considered 'hard' activities, and as such have the potential, without environmental and social safeguarding and mitigation measures, to have minor negative environmental and social impacts. However, in our assessment, none of the proposed activities is expected to be in Category A of the Adaptation Fund's impact classification. This is because this project proposes potentially 'hard' activities that are small scale and very localized, and co-managed by local communities where possible, who have a stake in avoiding negative environmental and social impacts. This means that the potential for direct impacts is small and localized, that there can be few indirect impacts. Given this, cascading or cumulative negative impacts are also unlikely.

Part III, Section C and Annex V of this document address potential financial risks and environmental and social impacts. The project has not identified explicit or implicit environmental and/or social risks other than those discussed in this document.

Environmental and social impacts and risks relevant to the project were identified through stakeholder consultations, community consultations with potential beneficiaries, and the use of a screening checklist (provided in Annex V). The checklist provided in the Adaptation Fund guidelines for Environmental and Social Policies (provided below in Table 11) has been reviewed, and detailed responses are provided in Table AV.2 in Annex V.

Table 11: Checklist of environmental and social principles

Checklist of environmental and social principles	Risk Mitigation Measures Required	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law		X ³⁸
Access and Equity	X	
Marginalized and Vulnerable Groups	X	
Human Rights	X	
Gender Equity and Women’s Empowerment		X ³⁹
Core Labour Rights	X	
Indigenous Peoples	X	
Involuntary Resettlement	X	
Protection of Natural Habitats	X	
Conservation of Biological Diversity	X	
Climate Change	X	
Pollution Prevention and Resource Efficiency		X
Public Health		X
Physical and Cultural Heritage	x	
Lands and Soil Conservation		X

The project is classified as “B” in

accordance with the Adaptation Fund guidance on impact classification due to the presence of MAR interventions, which will be co-developed and implemented under Component 3 of the project with the pilot communities: these interventions fall under the definition of unidentified sub-projects (USPs). Annex V of this document provides a

³⁸ MAR and complementary adaptation measures will be subject to country-specific legislation.

³⁹ While the screening processes did not identify any ways in which the project design or activities would potentially reproduce discriminations against women, there was a consensus among experts consulted that the project should take pro-active steps to encourage women’s participation in all project activities; hence, this element will be managed for compliance.

description of the nature of the proposed sub-projects, which will be designed, screened, permitted, and implemented on a site-specific basis.

The USP approach for the pilot MAR projects has been selected due to the nature of their design; i.e., they will require a process of community consultation *and* co-creation in order to maximize ownership in the resulting facilities and the governance arrangements for water resources of which they are a part. As such, this approach is understood as a use of USPs as projects that “may include activities that are critically dependent for their formulation on the outcome of other project/programme activities and that can only be fully formulated on the basis of these prior achievements.” (AFB B.32-33.7).

Screening, implementation, and monitoring of the pilot activities in Component 3 are described in the environmental and social management plan (below), which also includes information on how pilot activities that are considered USPs will be screened and monitored for compliance with the Environmental and Social Policy of the AF.

In general, project activities with potential (limited) adverse impact are small-scale, community-based, and localized. They will be co-managed with local communities where possible. Communities will have a stake in avoiding negative environmental and social impacts. Cascading and/or cumulative negative impacts are highly unlikely. Monitoring for unexpected environmental or social impacts is included under project M&E activities (see Section III.C) and will be reported on annually.

PART III: IMPLEMENTATION ARRANGEMENTS

- A. PROJECT MANAGEMENT
- B. PROJECT AND FINANCIAL RISK MANAGEMENT
- C. PROJECT ENVIRONMENTAL AND SOCIAL POLICY
- D. MONITORING AND EVALUATION
- E. PROJECT RESULTS FRAMEWORK (LOGICAL FRAMEWORK): MILESTONES, TARGETS AND INDICATORS
- F. ALIGNMENT WITH ADAPTATION FUND RESULTS FRAMEWORK
- G. PROJECT BUDGET

Sheet 1: Summary project budget

Sheet 2: Breakdown of the project execution costs (CCOP-TS)

Sheet 3: Implementing Entity (MIE) management fee (UNESCO)

Sheet 4: Budget disbursement schedule with time-bound milestones.

Sheet 5: Detailed project budget, Excel format (Annex only)

A. Project Management

Describe the arrangements for project / programme management at the regional and national level, including coordination arrangements within countries and among them. Describe how the potential to partner with national institutions, and when possible, national implementing entities (NIEs), has been considered, and included in the management arrangements.

Introduction

In the following section, arrangements for effective and efficient project implementation and management are introduced. First, project 'ownership' arrangements at overall project level are presented, including coordination arrangements by UNESCO as the Implementing Entity and CCOP-TS as the Executing Entity. Regional and national coordination within countries is also clarified. Actual and prospective partnership arrangements with national institutions are discussed and it is elaborated how national and regional partners will play a role in project implementation and management.

On the basis of this application and following project preparatory consultations and arrangements, the following entities will support project implementation and management.

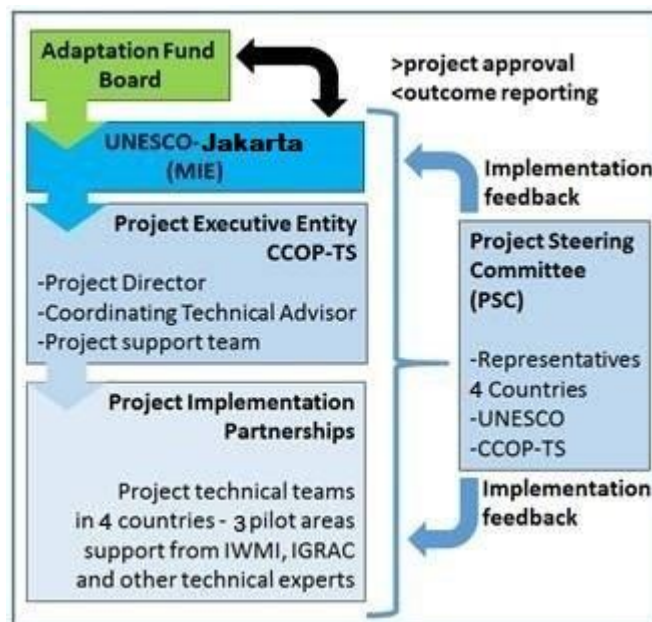


Figure 19: AF project management arrangements.

In-Country Beneficiaries and Stakeholders

1. Government of Cambodia, Ministry of Water Resources and Meteorology and Ministry of Mines and Energy deal with groundwater issues in Cambodia.
2. Government of Lao PDR, Ministry of Natural Resources and Environment (MoNRE), and its subsidiary Department for Water Resources (DWR) including the Groundwater Management Division. Furthermore, the Natural Resources and Environment Institute (NREI) has an executive role in groundwater management.
3. Government of Thailand, Ministry of Natural Resources and Environment; within the Ministry the Department of Groundwater Resources has the responsibilities in planning, assessment, resource conservation, and regulations.

4. Government of Vietnam, MoNRE as the coordinating Ministry for water resources management, is implementing river basin water resources management plans on a national scale that include groundwater. The National Center for Water Resources Planning and Investigation (NAWAPI), has an executive role.
5. Universities, research institutions and local NGOs in the GMS and specifically active in the proposed pilot areas and in a position to contribute to capacity building on groundwater. A specific role is envisaged for the Mekong River Commission and the National Mekong Commissions in the respective riparian countries.

The collaboration will be supported by:

UNESCO: As the Implementing Entity, UNESCO will provide all technical backstopping, facilitation with Member States and processes with the Adaptation Fund.

CCOP-TS: CCOP-TS, as the Executing Entity (EE), will provide technical expertise and coordinate and support implementation along with the national partners.

International Water Management Institute (IWMI): IWMI has been at the forefront of research aimed at exploring opportunities for improved groundwater development and management for poverty alleviation and improving groundwater governance across SE Asia. IWMI will be one of the implementing partners.

International Groundwater Resources Assessment Centre (IGRAC): IGRAC is UNESCO's and WMO's groundwater expertise and resources centre that facilitates and promotes information and knowledge sharing required for sustainable development, management and governance of transboundary groundwater.

Multilateral Implementing Entity (MIE)

As endorsed by the signatories from the four participating countries, UNESCO through its Regional Sciences Bureau for Asia in close coordination with its offices in Bangkok, Hanoi and Phnom Penh will serve as MIE for the project.

UNESCO works to build the scientific knowledge base to help countries manage their water resources in a sustainable way through:

- the activities of its Intergovernmental Hydrological Programme (IHP),
- the Secretariat of the UN-wide World Water Development Programme
- the "UNESCO Water Family," which links over 30 member state-funded and operated centres of expertise in water-related research, education, capacity development and cooperation, as well as a wide network of UNESCO Chairs at universities and research institutions globally.

The IHP is the only intergovernmental programme of the UN system devoted to water research, water resources management, and education and capacity building. Since its inception in 1975, IHP has evolved from an internationally coordinated hydrological research programme into an encompassing, holistic programme to facilitate education and capacity building, and enhance water resources management and governance. IHP facilitates an interdisciplinary and integrated approach to watershed and aquifer management, which incorporates the social dimension of water resources, and promotes and develops international research in hydrological and freshwater sciences. IHP is in its eighth phase, covering 2014-2021. IHP-VIII brings innovative methods, tools and approaches into play by capitalizing on advances in water sciences, as well as building competences to meet the challenges of today's global water challenges.

Under IHP-VIII, groundwater is one of the main areas where IHP is continuing its pioneering work to learn more about the complexity of aquifer systems, the increasing global risk to groundwater depletion, quality deterioration and pollution, and the resilience of communities and populations dependent on groundwater sources.

Objectives include promoting measures addressing the principles of sustainable management of groundwater, addressing methods for the sound development, exploitation and protection of groundwater resources, developing new groundwater resource maps, and strengthening groundwater governance policy and water user rights in emergency situations. These challenges call for comprehensive research, implementation of new science-based

methodologies and the endorsement of principles of integrated management, and environmentally-sound protection of resources.

Focal Areas of IHP-VIII under the theme of “Groundwater in a Changing Environment”

Focal area 2.1 - Enhancing sustainable groundwater resources management

Focal area 2.2 - Addressing strategies for management of aquifers recharge

Focal area 2.3 - Adapting to the impacts of climate change on aquifer systems

Focal area 2.4 - Promoting groundwater quality protection

Focal area 2.5 - Promoting management of transboundary aquifers

UNESCO Regional Sciences Bureau for Asia and the Pacific

Located in Jakarta, Indonesia, the UNESCO Regional Sciences Bureau for Asia and the Pacific was established as a field office for South-East Asian Science Cooperation (SEASCO) in 1951. In 1967 it became the Regional Office for Sciences and for South East Asia (ROSTSEA). Since 2001, UNESCO Jakarta has served as the Regional Science Bureau for Asia and the Pacific. Today, the UNESCO Regional Sciences Bureau for Asia and the Pacific also serves as representative office for Brunei Darussalam, Indonesia, Malaysia, the Philippines and Timor-Leste.

As Regional Bureau for Science, UNESCO Jakarta provides strategic expertise, advisory, monitoring and evaluation functions to Member States, other UNESCO Field Offices and United Nations Country Teams in the area of Science across the entire Asia and the Pacific. In the 48 UNESCO Member States and 2 Associate Members of the Asia-Pacific region, UNESCO is present with a network of 13 Field Offices serving at the regional, sub-regional and country levels.

For the implementation of the project, the UNESCO Regional Sciences Bureau for Asia and the Pacific will serve as MIE, in close coordination with the UNESCO Office in Bangkok – as representative office to Lao PDR and Thailand – as well as the UNESCO National Offices in Hanoi and Phnom Penh.

UNESCO Bangkok Asia and Pacific Regional Bureau for Education

Since 1961, UNESCO Bangkok Office has served the UNESCO Bangkok Asia and Pacific Regional Bureau for Education as well as representative office to the four participating countries. The office covers all UNESCO's fields of competence: education, sciences, culture, communication and information. It is responsible for UNESCO activities directly in Thailand and Lao PDR, and indirectly in support of UNESCO Country Offices in Hanoi and Phnom Penh.

Through its network of field offices at the regional, sub-regional and national level, UNESCO has a strong and permanent presence in the region and in the participating countries. In the field of Science, UNESCO's field offices in the participating units collaborate closely and strategically under the overall coordination of the Regional Bureau for Science.

MIE Management tasks

The following implementation support under the MIE modality will be provided by UNESCO for the project:

- Overall coordination and management of UNESCO's MIE functions and responsibilities, and the facilitation of interactions with the Adaptation Fund Board and other relevant parties;
- Oversight of project implementation through close interaction with the project Executive Entity CCOP-TS and with the Project Steering Committee (PSC) and reporting to AF on progress and on budget performance;
- Quality assurance and accountability for outputs and deliverables during project implementation and upon completion;
- Receipt, management and disbursement of AF funds in accordance with the financial standards of the AF;
- Assurance of national government support, continued participation and uptake of results.
- Assurance of continuous compliance with the project's Social and Environmental Management Plan.

UNESCO as MIE and as part of its project management responsibility will appoint through an open competition a **Project Manager (PM)** who will oversee the implementation of the project along the tasks outlined above. There

will be close cooperation between the PM and the project executive and operational levels (i.e., with Project Director, Coordinating Technical Advisor CTA and CCOP-TS support staff). Through the official network of UNESCO and its field offices in the four participating countries and its Head Office UNESCO as MIE, the PM will be able to actively support project implementation and have regular contact with the Executing Agency (CCOP-TS in Bangkok) over the course of the AF project implementation.

Project Execution

In accordance with its standards and procedures, UNESCO will enter into a contractual agreement with the coordinating executing partner, CCOP-TS, towards the execution of the AF project activities and delivery of the proposed outputs.

The **Project Director (PD)** will be responsible for the overall management of the AF project. The PD (a part-time position taken by CCOP-TS Executive Director) will ensure that the project is run transparently and effectively in accordance with AF and UNESCO's guidelines and approved work plans and budgets. The PD will receive project support from the CCOP-TS project finances manager as well as additional staff members within CCOP-TS. The key functions of the PD will be:

- Facilitating the day-to-day functioning of the project support staff;
- Managing human and financial resources in consultation with UNESCO and the project CTA to achieve results in line with the outputs and activities outlined in the project document;
- Ensure gender analysis and gender monitoring are undertaken by experts;
- Leading the preparation and implementation of annual results-based work plans and logical frameworks as endorsed by the management of UNESCO;
- Monitoring project activities, including financial matters, and preparing monthly and quarterly progress reports, and organising monthly and quarterly progress reviews;
- Together with UNESCO, organizing PSC meetings;
- Regular reporting and providing feedback on project strategies, activities, progress, and barriers to UNESCO, PSC and project partners; and
- Supporting UNESCO to manage relationships with project stakeholders including donors, NGOs and government agencies

A **Chief Technical Advisor (CTA)** will be hired by CCOP-TS to assist the PD and provide technical guidance and support for the implementation of the project. The CTA will:

- Prepare Annual Work plans, TORs for technical consultancies and supervision of consultants' work;
- Assist in monitoring the technical quality of project M&E systems, including annual work plans, indicators and targets;
- provide advice on suitable approaches and methodologies for achieving project targets and objectives;
- provide a technical supervisory function to the work carried out by any other technical consultants hired by the project; and
- assist in knowledge management, communications and awareness raising.

The CTA position will be filled through a transparent and competitive recruitment process that will commence as soon as the Full Project Proposal is approved.

Step-by-step implementation strategy

- Organise an executive project team consisting of national experts from the four partner countries, and experts from the supporting Technical Assistance partners (CCOP-TS, IWMI, IGRAC). As MIE, UNESCO will convene a PSC.
- Develop a common view and understanding of the role that improved groundwater management shall play in strengthening climate resilience in multiple sectors; identify additional opportunities through transboundary collaboration; sharing information, expertise and collaborative policies for climate resilience.
- Resource assessment: common methodology to be adopted and approach to data collection/sharing; agree on protocols for sharing available data on transboundary aquifers.
- Compile various maps / information services and products available from countries/organisations and further demarcate the recharge and extraction zones and consider transboundary issues.

- Identify data gaps and need for new data; collaborative monitoring approach, initiate base-level monitoring.
- Common approach for groundwater resources management information system, basic functions and operations, training expert users, dissemination to end-users in the four countries.
- Raise stakeholder and public awareness on groundwater vulnerability through development of tailored information for sectoral users and multi-media awareness for urban and rural populations.
- Build capacity of local groundwater management professionals, planners and policy makers in the pertinent national government organisations.
- Consult stakeholders and develop a process of ongoing engagement with the specific actors with interest in groundwater from government, donors, NGO's and the private sector.

These activities collectively serve to create the environment needed to achieve positive change on the ground throughout the GMS by reducing vulnerability and increasing adaptive capacity to the impacts of climate change, including climate variability. Clear indicators to track and demonstrate these outcomes will be developed at an early project stage and monitored by the PSC and activities adjusted as needed.

Terms of Reference for Project Steering Committee (PSC)

The PSC will be formed to keep abreast of the project progress and to facilitate the implementation of the project, while direct implementation of the project and decisions regarding the allocation of resources and assistance under the project will be taken by UNESCO as the MIE and CCOP-TS as EE. The PSC will:

- Facilitate the implementation of the project to achieve progress on time, on scope and on budget
- Review progress reports submitted by the Project Team
- Support the broader dissemination of the project's results, especially towards government entities and policy-makers.

PSC Members: One PSC member from each participating country will be invited through the appropriate governance channels. Hence, the PSC will have five (country) members. Chair will rotate every year. UNESCO as MIE and CCOP-TS will attend, as well as CTA.

PSC Meetings: The PSC will meet quarterly throughout the lifetime of the project and may meet more often as required. A calendar of meetings will be developed at the project inception workshop. Whether virtual meetings can serve after at least two successful in-person meetings have been held will be assessed.

Secretariat function: CCOP-TS as EE will provide secretariat services for the PSC by coordinating meetings, producing documentation and meeting minutes, managing correspondence, information management/ dissemination and related tasks.

Documents will be made available to PSC members at least one month prior to the meetings. Minutes of the meetings will be prepared by UNESCO & CCOP-TS. Members of the PSC will share information with non-member stakeholders.

CCOP-TS for project execution

For this project CCOP-TS is the designated project Executing Entity (EE).⁴⁰

CCOP, established in 1966, is one of the oldest intergovernmental organisations in East and Southeast Asia. Its mission is to contribute significantly to the economic development and sustainable management of the environment of the quality of life of its Member countries by the application of Earth sciences knowledge. Its focus is on:

- **Outreach:** to enhance influence with decision-makers, investors and the general public through the provision of relevant earth system science information and to develop appropriate skills to communicate effectively with stakeholders in the CCOP member countries.
- **Cooperation and partnerships:** to enhance the internal and external partnerships to improve the quality, reach, application and impact of earth sciences information and knowledge
- **Knowledge enhancement and sharing:** to manage, promote, share and exploit the region's earth sciences information and skills

⁴⁰ Additional information is also available at www.ccop.or.th.

- **Data and information:** to advance sharing of data and information and integrate earth sciences data across national boundaries
- CCOP's primary network consists of the 15 member countries: Cambodia, China, Indonesia, Japan, Republic of Korea, Lao PDR, Malaysia, Mongolia, Myanmar, Papua New Guinea, Philippines, Singapore, Thailand, Timor-Leste and Vietnam. Additionally, it maintains close ties with a considerable number of Cooperating Countries and Cooperating Organisations. The management and organization structure of CCOP and CCOP-TS is presented below. At the beginning of 2016 CCOP-TS had 10 permanent staff, including four earth science experts and six support staff.

Collaboration with groundwater user organizations

In the proposed pilot areas groundwater user organizations (if existing) or other stakeholder groups will be engaged in the project. They may be regarded the primary beneficiaries of the project and will be involved in the development, application, evaluation and wider dissemination of groundwater-based resilience strengthening measures. Groundwater user organizations will be supported (stimulated when they are embryonic or not yet set up), and subsequently will be:

- Actively supporting collection of groundwater data
- Participating in development of groundwater management information products
- Supporting validation of resilience strengthening measures
- Strengthened to be able continue contributing to sustainable groundwater management as part of CCA resilience
- Evaluating and providing feedback on project interventions and impact

For the project management groundwater user organizations are the most important group of project stakeholders that will validate the impact of the project.

It should be noted that groundwater user organizations are not directly involved in project management *sensu stricto*.

B. Project and Financial Risk Management

A number of potential project and financial risks have been considered and analysed in the process leading up to this Adaptation Fund proposal. These are summarized in Table 12 below. The risk management strategy of this AF project will be further fine-tuned during the project Inception Phase.

Table 12: Project risks and mitigation measures

#	Risk	Classification	Impact/ Probability 1=Low 5=High	Mitigation Measure
1	National policy and institutional practices undermine the development of concrete resilience measures in the pilot areas	Institutional	Impact: 4 Probability: 1 Rating: Low	The project will work on different intervention levels, from national natural resources management and CCA policy in the four countries (national ministerial level), as well as on regional (responsible agencies and sub-ministerial) level and stakeholder group organisations, to local level through direct interaction with primary stakeholder groups.

#	Risk	Classification	Impact/ Probability 1=Low 5=High	Mitigation Measure
2	Data availability and consistency is inadequate to design trusted and acceptable resilience measures.	Environmental	Impact: 3 Probability: 3 Rating: Medium	The project will follow a step-by-step approach, with simple and low-threshold initiatives first, and then gradually develop more complex and higher impact practices.
3	Resilience measures increase inequity in communities	Environmental and Social	Impact: 3 Probability: 2 Rating: Medium	Local level implementation through farmer and other groundwater user groups will ensure that resilience measures are demonstrated on the basis of participative processes which are gender-sensitive and enable participation of vulnerable and marginalized groups.
4	Political and safety situation is not supportive of field visits and working with stakeholders in pilot areas	Social, Political	Impact: 4 Probability: 2 Rating: Medium	For Cambodia, Lao PDR, Thailand, and Vietnam, pilot areas have been selected with stable and safe conditions in mind. Different pilot areas can be selected at project inception if needed.
5	Technical support capabilities and budgets from the project are inadequate.	Institutional	Impact: 3 Probability: 2 Rating: Medium	The project is relying on a participative approach through its engagement with national partners and local stakeholders in the pilot areas. This will stimulate ownership and allow for collaboration with local initiatives and will muster support from national and international partners.
6	The COVID-19 global pandemic results in travel restrictions and economic difficulties in participating countries	Operational	Impact: 3 Probability: 3 Rating: Medium	Project planning will take short-term constraints on gathering and travel restrictions into account and will use on-line and other remote consultation and learning methods where needed. Remote community consultations were piloted during implementation of the project formulation activities in 2021. The focus on community-based capacity development will provide the most effective mitigation of risks over the long term, as the oversight of resource governance and adaptation-related infrastructure measures will be led by stakeholders who will not need to travel to the project sites.

C. Measures for Environmental and Social Risk Management

Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

Introduction

During the preparation stage of this proposal, UNESCO, as lead applicant and designated IE, in collaboration with partner and representatives from the GMS countries, has conducted a screening and self-assessment in order to determine if the project construct and scope will comply with the ESP principles of the Adaptation Fund. This process and its outcomes are summarized below (Figure 10). The following section summarizes measures for environmental and social risk management in line with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

The project acknowledges, and has been designed in accordance with, the Adaptation Fund's Environmental and Social Policy (AF ESP document; March 2016 documentation). Full adherence to the ESP will ensure that the project promotes positive environmental and social benefits, and that maximum effort is made to mitigate and/or avoid adverse environmental and social risks and impacts.

Environmental and Social Management Plan - ESMP

In line with the guidelines of the AF the project applicants have developed an Environmental and Social impacts and risks Management Plan (ESMP). The risks recognized have been assessed for impact and mitigation and proper management measures are identified at project level and at pilot level. The ESMP includes the relevant components, i.e. mitigation plans, institutional arrangements, stakeholder consultation, capacity building, monitoring and evaluation and reporting. The ESMP, tailored for each pilot area will comply with the ESP of the AF and the national technical standards of the relevant country. Once formulated and approved, the status of ESP issues will be reported in the applicable progress and evaluation reports prepared for the AF and national stakeholders.

The project's categorization and compliance with the ESP has been outlined in Part II, Section L. Table 13 below provides an overview of the managing and monitoring of residual risks identified in relation to the ESP. Supporting information related to risk screening is provided in Table AV.I of Annex V.

Table 13: ESMP Overview

Principle	Residual Risk	Mitigation Measure	Responsibility	Monitoring Indicator	Budget
Compliance with the Law	Pilot interventions could theoretically be designed that were not in accordance with national environmental and water legislation.	An environmental and social screening at each pilot area will be carried out for each pilot intervention in compliance with national environmental laws and AF principles. Specific procedures are in place for each pilot intervention for screening and monitoring – they are described in the ESMP steps below. The USPs that are identified in project Components 2 and 3 will be screened and will bear in mind all necessary procedures where applicable. Activities with a high risk rating ("A") will not be considered for inclusion in the project. Screening and monitoring will continue as the	UNESCO Staff, Implementing Partners, Project Staff and Consultants	Communities in at least 3 pilot regions will have adaptive interventions that conform with all applicable regulations.	No additional budget

Principle	Residual Risk	Mitigation Measure	Responsibility	Monitoring Indicator	Budget
		adaptation measures are implemented under Component 3.			
Access and Equity	Water resource governance decisions or pilot measures might disadvantage women or vulnerable groups by reproducing discriminatory patterns of resource allocation	<p>Local-level implementation involving different water users and farmers' and women's groups will ensure that resilience measures are demonstrated on the basis of participative processes that are gender-sensitive and enable participation of vulnerable and marginalized groups.</p> <p>The project will take specific steps in Component 2 and Component 5 to support outreach to women and empower them through training and meaningful participation in decision-making. Access to a low-cost and stable water supply for primary livelihood and WASH purposes will be supported for women and men.</p> <p>Project activities in Component 2 will specifically monitor and support women's equitable participation in project activity. Women's participation will be scrutinized in reporting, analysed, and closely monitored.</p>	UNESCO Staff, Implementing Partners, Project Staff and Consultants	Community dialogues on water use in Component 2 and decision-making feature meaningful participation by women and vulnerable groups.	No additional budget; funded under Output 2.1 and Output 2.2
Marginalized and Vulnerable groups	Water resource governance decisions might disadvantage low-income households	<p>A needs assessment will be carried out to identify the most vulnerable communities within the pilot areas.</p> <p>Vulnerable groups will be supported in their access to low-cost and stable water supply. Project documentation will be provided and community awareness meetings will be held to ensure consultation and compliance.</p>	Implementing Partners, Project Staff and Consultants, Community Partners	Community dialogues on water use in Component 2 and decision-making feature meaningful participation by vulnerable groups.	No additional budget; funded under Output 2.1
Gender Equity and Women's Empowerment	Project activities could potentially limit women's access to water resources due to women's differing roles in accessing natural resources.	<p>Men and women will participate fully and equitably. Women will be consulted in on-site, in-depth community assessments at the project preparation stage. A gender assessment has been completed, and specific project activities are included to ensure that women are meaningfully engaged in project activities and realize an equitable share of project benefits (see Annex IV).</p> <p>Specific project indicators will ensure that results-based management will cover meaningful participation of both women and men.</p>	UNESCO Staff, Implementing Partners, Project Staff and Consultants, and Community Partners	Indicators are provided under the Project Results Framework	No additional budget; funded under activities in Output 2.2

Principle	Residual Risk	Mitigation Measure	Responsibility	Monitoring Indicator	Budget
Pollution Prevention and Resource Efficiency	Improvement in groundwater management could lead to increased resource extraction	<p>Component 2 of the project will focus explicitly on sustainable groundwater management, and the governance arrangements put into place will allocate groundwater resources and prevent over-extraction.</p> <p>Training and capacity building in Component 5 will increase understanding in the pilot regions that groundwater is a limited resource.</p>	Implementing Partners, Project Staff, Consultants and Community Partners	Indicators are provided under the Project Results Framework	No additional budget; funded under activities in C1 and C5.
Public Health	Drinking water quality could be affected run-off sources or storage	<p>Although adverse impacts are highly unlikely and not expected, this aspect will be monitored during project implementation in compliance with national environmental laws and other relevant guidelines (e.g. drinking water standards, groundwater quality).</p> <p>Detailed sampling will be carried out during both the wet and dry seasons for a comprehensive suite of physical-chemical and microbiological parameters, including water quality parameters of serious concern from the perspective of human health, irrigation or environmental quality to ensure compliance with national water quality standards and best practice.</p>	Implementing Partners, Project Staff and Consultants, Community Partners	Pilot projects in communities will comply with all laws and guidelines on drinking water quality.	No additional budget; funded under activities in C1 and C3.
Lands and Soil Conservation	Project risks could be incurred by the storage of groundwater and the project could result in change in groundwater quality and quantity in pilot communities.	Interventions and proposals for future action developed in the context of project implementation will be reviewed and designed to ensure that soil and land degradation is avoided. Although adverse impacts are highly unlikely and not expected, this aspect will be monitored during project implementation in compliance with national environmental laws and other relevant guidelines.	Implementing Partners, Project Staff and Consultants, Community Partners	Pilot projects in communities will comply with all laws and guidelines on drinking water quality.	No additional budget; funded under activities in C1 and C3.

In line with AF guidelines, the project has followed a stepwise approach (depicted in Figure 10 below) towards setting up and applying an ESMP. The proposed Environmental and Social Management Plan is introduced below.

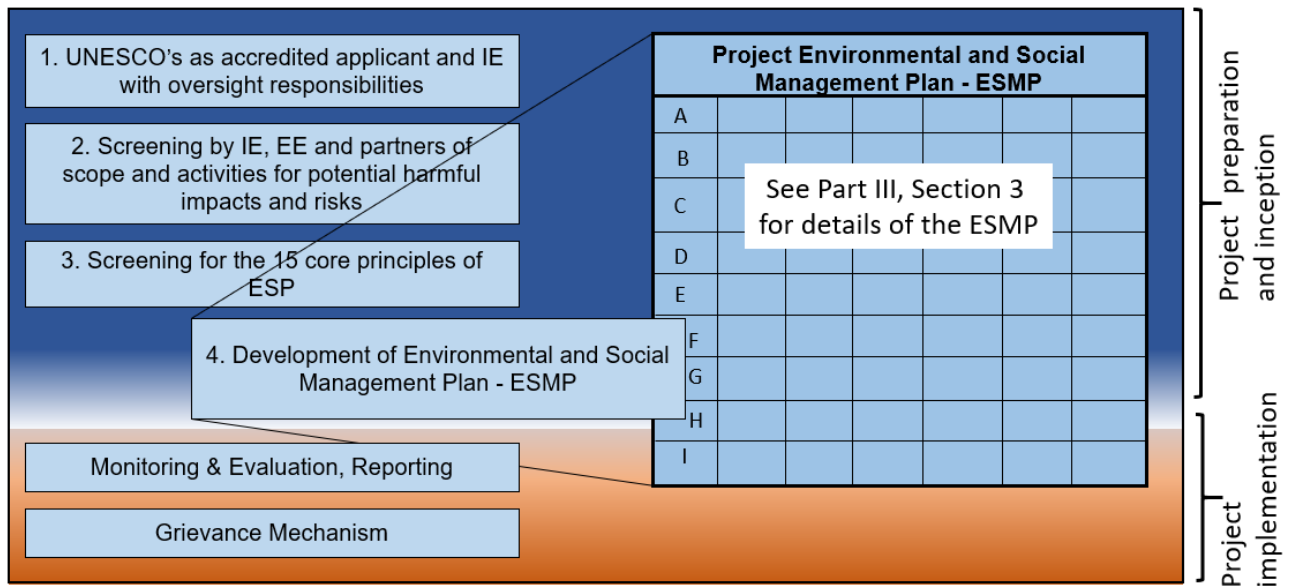


Figure 10: Schematic overview of the project ESP compliance approach. The upper part 1-4 components were developed and applied during project preparation and will be further improved in the project's Inception Phase. The ESMP will be applied during project implementation, as well as monitoring and evaluation, reporting and—if required—the activation of the grievance mechanism.

As lead applicant UNESCO strives to apply four key mechanisms to comply with the ESP:

1. Programme-Level Quality Assurance; As elaborated in Part II, Section F. UNESCO's as accredited applicant and IE with oversight responsibilities and core policy to lead in application of environmental, gender and social principles.
2. Project-Level Quality Assurance; As elaborated in Part II, Section F. Screening, by IE, EE and partners in the four countries, of proposed project scope and activities for potential harmful impacts and risks.
3. Project-Level Social and Environmental Screening Procedure; As elaborated in Part II, Section F. Screening of impacts and possible risks of proposed project in relation to the 15 core principles of ESP; Categorization of the project as "B".
4. Development and application of ESMP; As per guidelines of the Adaptation Fund. The ESMP is further elaborated below.

Finally, in accordance with the project Monitoring and Evaluation approach, progress reporting will pay specific attention to the compliance issues. And following from the project concept and set-up, there is already a high level of stakeholder involvement and this also ensures a low risk of non-compliance for several key principles. Whenever potential non-compliance issues arise, the Grievance mechanism can be activated (see dedicated sub-section below on the grievance mechanism).

The proposed ESMP consists of a number of fixed core elements, but it can also be improved and adapted in the course of the project (especially after the Inception Phase).

The core elements of the Environmental and Social impacts and risks Management Plan (ESMP) are provided in Table 14.

Table 14: Core elements of the Environmental and Social impacts and risks Management Plan (ESMP)

ESMP elements	Who	When
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A	Project team awareness and training on compliance with ESP and gender guidelines, monitoring process and related issues.	Core project team and executive partners, pilot coordinators	During project Inception Phase
B	Awareness and training for key project stakeholders, in particular: a) government partners, and b) pilot area teams, with particular reference to vulnerable groups, indigenous peoples.	Core project team and executive partners, pilot coordinators	In the first year of project implementation.
C	Re-assessment of impacts and risks on two levels: 1) integral project and 2) for the three pilots. Pilot project impact and risk assessment will screen for compliance with all existing local and national regulations and legislation. ⁴¹	1) IE and EE 2) Pilot area teams coordinated by EE	Inception Phase, PPR reporting, ⁴² and on an ad hoc basis prior to the initiation of each USP.
D	Updated reporting on compliance with ESP and gender guidelines and update of monitoring system	Supervision IE and EE	Part of Inception Phase reporting
E	Validation of the monitoring and evaluation approach, and reporting with clear and verifiable indicators and Means of Verification	Supervision IE and EE	Towards the first M & E reporting instant
F	Periodical progress reporting as prescribed in the project management plan	1) IE and EE 2) Pilot area teams coordinated by EE	According to M & E and progress reporting schedule (Section 3, M & E)
G	Gender issues assessment and ensuring positive impacts and compliance	Dedicated gender expert engaged from/through IE	After project Inception, Year 1 and towards completion, Year 4
H	M & E; Systematic progress monitoring, collection of stakeholder feedback and reviews	Supervision IE and EE	At least twice during the project with one survey at the end of the project.
I	Project Steering Committee assessment of compliance	Invited by IE to assess and give feedback	At least twice during the project
J	Awareness and activation of Grievance Mechanism	IE and pilot area coordinator	In the first year of project implementation

Elaboration of ESMP elements

A: UNESCO, as the IE, will provide an introduction and training to the EE and coordinators at the onset of project implementation in order to ensure that all principal project partners have the required knowledge and awareness level regarding their responsibilities with regards to the provisions of the Environmental and Social Policy of the AF as well as the promotion of human rights, including specifically the complaint handling mechanism of the Fund. The ESP of the AF will be used as the main guidance to ensure compliance. The introduction and training on the relevant concept and tools for compliance will be used for the project team, and also for the wider community of participants and key stakeholders.

B: In order to prevent the exacerbation of existing inequities, the project will identify vulnerabilities in pilot areas during the Inception Phase and will monitor the impact during the whole project implementation period. As part of the participative processes, community dialogues, training and close collaboration with national and local

⁴¹ Standard steps will include conducting an environmental risk screening (in addition to the risk screening prepared for the project as a whole) for each site, which will include public participation. If an environmental impact assessment (EIA) is deemed necessary, the project will carry out an EIA [none of the pilots is anticipated to require an EIA]. If the risk screening at the MAR pilot sites identifies the need to apply for a permit, the project staff will oversee that process, and work will not proceed in the absence of all applicable permits.

⁴² For PPR reporting, the project will list each USP that has been identified, confirm that the ESMP has been applied, list all ESP risks that have been identified, document whether an impact assessment has been carried out, state whether adequate consultation has been held during the risks and impacts identification, and clarify whether the grievance mechanism has been made widely known to identified and potentially affected parties.

authorities will enable participation of vulnerable and marginalized groups and successful signaling, management and mitigation of risks.

C: For each pilot area, the comprehensive risk screening and mitigation plan will be re-visited, following further detailing of the work plans (i.e. project locations, target groups, groundwater management activities and project interventions to be defined in greater detail during the project Inception Phase). Where deemed necessary, project scope and interventions will be adjusted to ensure risks are mitigated and potential negative impacts avoided. As much as possible the risk screening will be done in a participatory manner, with the involved groundwater user and community groups.

In conformity with the ESP of the AF, the community pilot projects (USPs) will undertake the following procedures during the formulation phase:

1. In the selection phase, the scope of the USPs that are included in the will be limited by the following eligibility restrictions:

The following projects will be ineligible for funding under the programme:

- those located inside areas protected for biodiversity or within or close to critical habitats;
- those that could result in physical or economic resettlement;
- those in areas where there is uncertainty or dispute over land tenure or land rights or other conflict;
- those that could adversely affect indigenous people;
- those that could results in transboundary impacts;
- those that involve wide scale spraying of pesticides;
- those that involve vegetation clearance close to watercourse or within floodplains;
- those that involve critical infrastructure such as dams or water impoundments that would require specific technical assessments and safety studies;
- those that could impact cultural heritage; and
- those that could result in significant in migration and/or induced development.

Priority will be given to projects that:

- do not require an EIA process current regulations in participating countries; and
- are not subject to substantial controls or demanding permit conditions to achieve national compliance with technical regulations regarding environment, health, and safety in the pilot community country.

Projects will be cross-checked against the proposed technologies and approaches identified and screened in the Funding Proposal. Projects that are outside the current range of stated technologies will be considered only under extraordinary circumstances and with prior consent of the AF Secretariat.

2. Social and environmental risks of each pilot will be identified. Each pilot project will include a detailed description of the process that will be applied during project implementation to ensure ESP compliance for the USPs. During the review of the funding application for a project/programme with USPs, such process will be reviewed for its potential and likelihood to deliver the same ESP compliance outcome as is required for fully formulated applications. Each project will include its own ESMP.
3. These ESMPs will include the review process that will ensure that for a USP, as and when it is being formulated to the point where effective ESP risks identification is possible, such risks are identified and subsequent measures are taken according to the risk findings. The risk assessment will include the inherent risks of the given activity and risks related to the specific environmental and social setting in which it will take place. The review process of USPs during project/programme implementation will follow the same steps as are specified in the ESP for activities that are formulated prior to submission. As stated in Table 14, project review will include checking for compliance with all existing, applicable local and national regulations and legislation prior to any activity.

D: As part of the compliance approach, ESMP and progress monitoring, the status and issues arisen will be reported at the end of the Inception Phase. The Inception Phase (IP), as a go/no-go moment can be used to improve on any inadequate environmental and social risk monitoring or mitigation.

1. The USPs will be assigned a risk that corresponds to AF ESP risk categories (A, B, and C). Category C USPs will not be approved. In order to be approved, USP projects must be compliant with both the AF ESP and national EIA requirements, whichever are more stringent.
2. The results of the screening will be submitted to the AF Board Secretariat for review and approval prior to proceeding to the next stage.
3. The project/programme-wide ESMP will be updated with the outcome of the safeguard activities for the USPs.

E: Validation of the monitoring and evaluation set-up and reporting with clear and verifiable indicators and means of verification. The implementers will build on the proposed M&E approach and, when required, can update the M&E approach in accordance with the latest AF guidelines. In conformity with the ESP of the AF, the community pilot projects (USPs) will undertake the following procedures during the compliance and monitoring phase to update AF on the IE's progress in applying the sequential requirements of the ESP process and to enable approvals. This process will include the following steps:

- Descriptions of each of the fully formulated USPs, including their environmental and social setting (see Step C above), once they are fully developed;
- Provision of completed screening checklists and EIAs commensurate with the identified E&S risks for each USP as they become available;
- Updated versions of the overall project ESMPs that incorporates any USP specific measures that may be required;
- Notifications of any modification proposed on the roles and responsibilities of those responsible for ESP compliance, needed to address such changes in the ESMP;
- Information regarding consultation and feedback relating to each USP;
- details of how the information used in the environmental and social risk identification and subsequent development of mitigation measures for each USP took account of gender issues; and
- Information on how the grievance mechanism was applied to each USP, including a summary of grievances received where applicable and their status (open/addressed).

F: Periodical progress reporting as prescribed in the project management plan, and as per AF guidelines. UNESCO and CCOP-TS as IE and EE will prepare the final environmental and social assessment reporting for AF and in a suitable format for people, communities and other stakeholders involved in the project. A special section of the progress reports will be dedicated to stakeholders and vulnerable groups in each pilot area.

G: Gender issues assessment and ensuring positive impacts and compliance. The Terms of Reference for a gender specialist engaged for the project by the IE will be prepared during the IP and the involvement ensured.

H: M&E; Systematic progress monitoring, collection of stakeholder feedback and reviews, including monitoring and feedback information related to the USPs in pilot communities (see Step E above). The updated ESMP will be attached to the annual PPR as additional information and refinements are included based on the USPs.

I: Project Steering Committee assessment of compliance; following on the partner country consultations on the ESP compliance issues, the project Steering Committee (again composed of representatives from the four countries) will be asked to pay specific attention to this subject.

J: Awareness and activation of Grievance Mechanism (see the section on the grievance mechanism below).

ESMP Monitoring

Overall project M&E is described in Section 4 below. As IE, UNESCO will establish a project M&E and reporting mechanism through which to monitor and report, with at least, 1) project progress and results on the basis of verifiable indicators and means of verification; and 2) assessment of outcomes and compliance with ESP Principles. ESMP monitoring will be done throughout project implementation. As the project will focus on the implementation of activities in three pilot areas, ESMP monitoring and reporting processes will place particular emphasis on (sub)national and community level in the following manner:

For the project as a whole, and for each of the three pilot areas, the project team will produce the following:

1. Semi-annual workplan preparation and approval assessed by means of checklist on potential negative impact and risks and for each of the fifteen Environmental and Social Core Principles. Activities (Tables 10 & 11); Apply screening measures as introduced in Tables 10 and 11.
2. Upon completion of semi-annual workplans, implementing units will be specifically requested to report any issues pertaining to adverse environmental and social impacts, and/or mitigation actions implemented or considered.
3. An annual summary statement / communique will be prepared on the basis of which further public consultations and associated activities can take place.
4. In each pilot area, a small representative committee of local and national stakeholders will be involved. This committee will approve/endorse:
 - a. the summary findings of the environmental and social impact assessments, and
 - b. possible mitigation actions for unforeseen adverse impacts.Since the project will focus on implementation in the pilot areas, consultation and mobilization of project support and understanding by local stakeholders and their representatives is essential. If necessary, a grievance mechanism can be applied (see Section 3.5).
5. National partners, in their supporting roles for the implementation of the project, will be involved in and support steps 1-4. This process will be overseen by UNESCO as IE and reported on at semi-annual project meetings. The ultimate responsibility for implementation of the M&E mechanism rests with the IE.

UNESCO and the project partners have in the project formulation and initial screening process (Concept Note and Proposal stage) carefully considered any potential direct, indirect, transboundary, and cumulative impacts in the project's area of influence. This assessment is supported and substantiated by considerable earlier and ongoing groundwater work by the project partners in the countries and regions involved.

On this basis, it is concluded that project interventions are unlikely to have any serious adverse environmental or social impacts. Hence the project has been classified in Category B. The monitoring approach outlined in the section above will ensure - in case of doubt or due to unforeseen developments - that any potential risks can be mitigated and any associated negative impacts prevented.

If, against expectations, project implementation generates negative environmental or social impacts, this will be addressed through the ESMP monitoring mechanism and reflected in periodic project reporting. The annual project performance report will include a section detailing the status of ongoing environmental, social impacts and risks, as well as consideration of gender issues. Reports will include, where necessary, a description of any corrective actions taken during the reporting period. The mid-term and terminal evaluation reports will also include a detailed evaluation of the project's performance with respect to gender and environmental and social risks.

Grievance mechanism

All direct beneficiaries of the project and other related stakeholders will be informed about the grievance mechanism and the complaint-handling mechanism of the project. The IE with project partners will produce public information materials (leaflets and brochures) that explain the project, complete with detailed contact information of persons in charge (name, position, address, phone, email), and including access to information regarding the mechanism for handling complaints of the AF (<https://www.adaptation-fund.org/page/mechanisms-handling-complaints>). These public information materials will be distributed during community consultations and general awareness activities.

As part of the project's ESMP as well as progress and results monitoring, stakeholder feedback and reviews will be collected systematically. Focus will be placed on the results evaluation of tangible measures and activities in

the three pilot areas (where the closest connections occur between stakeholder interests and needs and the intended effects and impacts of the project).

As part of the monitoring and evaluation process, a grievances modality will be set up - both for the project as a whole (as part of the project's website and information portal), and as part of the specific evaluation and progress data collection (M&E) in the pilot areas. This approach will allow concerned stakeholders to raise issues (anonymously if they wish), to the project management implementers at all levels of implementation.

During the project inception workshops and initial community workshops and meetings, stakeholders including project staff, project beneficiaries in the community, and implementing partners will be advised of the grievance mechanism, which they can use in the event that they have concerns relating to the design or management of the project, including social and environmental risks. The principles of Grievance Mechanism will include:

- involvement of the beneficiaries in the design of the mechanism;
- ensure that people understand and agree to how the complaint and/or feedback will be processed.
- ensure that the mechanism is accessible, including for illiterate beneficiaries and for beneficiaries who do not have access to a telephone;
- ensure confidentiality and professionalism;
- allow for anonymous complaints;
- ensure a referral system for protection-related complaints; and
- design procedures for high priority cases (fraud, corruption, sexual exploitation and abuse).

This grievance mechanism will be applied to all project target areas. The mechanism considers the particular needs of different groups in the target communities. As part of the grievance redressal mechanism, the contact details of the project partners and Project Manager would be made available to stakeholders including project beneficiaries and the community, contact numbers will also be displayed on all project documents and at strategic places such as the relevant offices of community and district officials in the participating countries as well as community centers and on-site MAR facilities in the pilot communities. The aggrieved persons can lodge their complaints in their local languages. Stakeholders can raise their complaints at any project organized event in public or in private.

A Complaints Management Committee will be set up in the PSC. It will include representatives of different stakeholders: implementing partners, government representatives, and representatives of the target communities. All committee members will be trained in receiving messages and on reporting any grievances. This committee will review all complaints and feedback and will forward them as follows:

- complaints and feedback about the project setup, beneficiary selection, targeting, and implementation are forwarded to the PSC;
- complaints about fraud or sexual abuse or exploitation are directly forwarded to the UNESCO; if they involve UNESCO staff, the UNESCO forwards them to the AF Office of Inspections and Investigations.
- protection concerns (clinical, legal, psychosocial, security) are referred to external protection-mandated partners.

All grievances will be treated with equal and urgent importance, regardless of who raised them, or the mode used. Stakeholders will be reminded of the grievance mechanism periodically throughout the project. The contact details of the AF will also be made public for anyone wishing to raise concerns regarding the project:

Adaptation Fund Board Secretariat
1818 H Street. NW
Washington, DC
afcomplaints@adaptation-fund.org

Figure 11 depicts the grievance mechanism process to be implemented in the project. The grievance mechanism process will support receiving, evaluating, and addressing project-related grievances from local communities and other stakeholders.

It will be possible to express grievances via submission on the website or by phone. Receipt of the grievance will always be acknowledged, recorded and subsequently investigated in a timely manner. Where relevant, resolved grievances will be included among the Frequently Asked Questions on the project website in order to prevent any future misunderstandings.

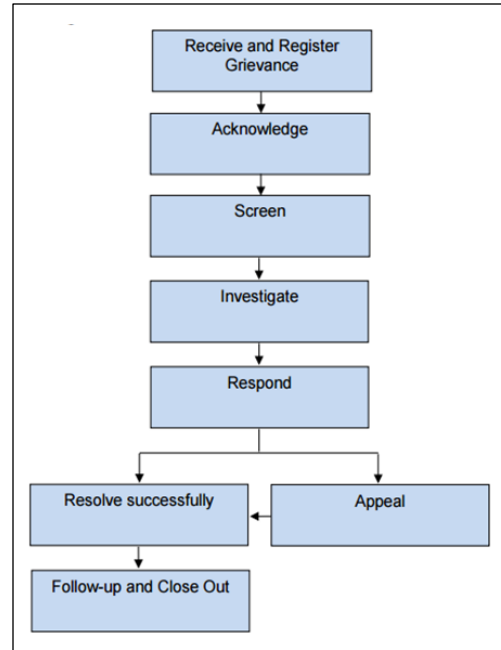


Figure 11: Grievance mechanism activation process

D. Monitoring and Evaluation

Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan, in compliance with the ESP and the Gender Policy of the Adaptation Fund.

The monitoring and evaluation (M&E) scheme of the project will be applied in accordance with established UNESCO procedures throughout the project lifetime. The M&E plan will be implemented as summarized in Table 16. Integral management and oversight will be provided by the UNESCO project holder and the CCOP-TS project team. The following are a number of essential ingredients for project M&E.

Project Inception: A Project Inception Workshop will be held within the first three months of the project and with participation of all persons and organizations that have been assigned roles and responsibilities in the project organization. Representatives from the national agencies, technical advisors and stakeholders from the region will contribute to the Inception Workshop. The Inception Workshop is crucial to generate momentum for project implementation and to develop the work plan for the first year of the project.

The Inception Workshop will address a number of key issues including:

- a. Assist all national partners to fully understand and take ownership of the project;
- b. Specify the roles, support services and complementary responsibilities of the project team and the national partners in the four countries;
- c. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms;
- d. Confirm the procedures and arrangement to engage project staff;
- e. Based on the proposed project results framework, review and finalize the first annual work plan;
- f. Verify and agree on project indicators, targets and their means of verification, and recheck assumptions and risks;
- g. Provide a detailed overview of reporting, as well as M&E requirements. The M&E work plan and budget should be agreed and scheduled;
- h. Discuss financial reporting procedures and obligations, and arrangements for audits;
- i. Plan and schedule PSC meetings.

The first PSC meeting will be scheduled directly following the Inception Workshop.

Following the Inception Workshop, an Inception Report will be prepared as a key reference document. The Inception Report will serve as an Annex to the signed project document and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly reporting: Quarterly project progress will be monitored by UNESCO on the basis of concise project progress reports.

Comprehensive annual reports: Annual project progress reports are comprehensive key reports which are prepared to monitor progress made since project start and in particular for the previous reporting period. The annual progress reports will include at least the following: (a) Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of- project targets (cumulative); (b) Project outputs delivered per project outcome (annual); (c) Lesson learned/good practice; (d) Annual work plan and other activity and expenditure reports; (e) Risk and adaptive management. UNESCO will assess the quality of annual progress reports for completeness, comprehensiveness, analytical rigor and lessons learned.

Periodic monitoring through site visits: UNESCO and CCOP-TS will participate in project work visit and activities on location (activities as in the agreed schedule in the project's Inception Report and Annual Work Plan) to assess project progress first-hand. Members of the PSC and Technical Advisory Group may join these visits incidentally. A Field/Activity Visit Report will be prepared by CCOP-TS for circulation no less than one month after the visit to the project team and PSC members.

Mid-term of project cycle: The project will undergo an independent Mid-Term Evaluation which will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for the Mid-term evaluation will be prepared by UNESCO based on guidelines from the AF and in line with UNESCO's evaluation policy as updated in 2016 which calls for a minimum of 3% of project costs to be allocated to the evaluation function.

External final project evaluation: An external final project evaluation will take place during the final three months of the project and prior to the final PSC meeting. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the achieved contributions to capacity development in the country and pilot areas, and the SDGs, as well as the project's relevance, effectiveness and efficiency. The Terms of Reference for this evaluation will be prepared by UNESCO and the project management based on AF programme guidelines and in line with UNESCO's evaluation policy as updated in 2016.

Financial audit: Project audits will follow UNESCO's financial regulations, rules and applicable audit policies. A final certified and audited financial statement will be sent to the AF Board once the project is completed. The external financial audit will be conducted in line with the financial regulations, rules and directives of UNESCO.

Project final reports: During the last three months of the project, CCOP-TS and the implementation team will prepare the Project Final Report. This comprehensive report will summarize the results achieved (Objectives, Outcomes, Outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Table 15: Overview of M&E Activities and Budget⁴³

Description	Responsible party	Budget (tentative) excluding staff time	Time frame
Project Inception Workshop	Project management team	15,000	Project start
Inception Report	Project management team		Two weeks after the Inception workshop
Periodic status/ progress reports	Project management team		Quarterly
Safeguards / Monitoring for Compliance with the AF ESP, including the gender equity principle	Project management team, MIE, implementing partners, community partners, external evaluator(s)		Ongoing for all activities; additional safeguards and monitoring for USPs.
Meetings of PSC	Project management team, MIE	35,000	Two times in every year of the project (including virtual/Skype meetings)
Annual Progress Reports	Project management team, MIE		End of each year
Mid-Term Evaluation	External evaluation team	40,000	End of year two
External Audit	External auditor	52,500	At project closing

⁴³ The indicative budget allocations are part of the Executive and Implementing Entity allocations. These will be reviewed during the Inception Phase.

External Final Evaluation	External evaluation team	96,300	In the final three months of the project
Project final reports	Project management team and MIE		Final draft one month before the end of the project

E. Project Results Framework (Logical Framework)

Table 16: Project Logical Framework

Program Strategy	Indicator	Baseline	Target	Objectively verifiable indicators				
				Sources of verification	Means of Collection	Frequency	Responsible parties	Assumptions
Objective: Establish effective regional capacities, partnerships and network in the Greater Mekong Subregion for the sustainable management and utilization of groundwater resources as an adaptation response to protect people, livelihoods and ecosystems from climate change impacts.	Number of Direct and Indirect Beneficiaries (AF Core Indicator)	0	By the end of the project, 1700 people will directly benefit from project activities (of that 680 women and 170 youth) By the end of the project, 1,449,000 people will benefit indirectly from project activities (of that 579,000 women and 290,000 youth)	Community records, project documentation, independent MTR and TE	Documentation review (direct beneficiaries); estimates (indirect beneficiaries)	Continuous collection at project-related activities	UNESCO, implementing partners, project staff	The political situation within and between participating countries will not change in a way that would jeopardize project activities and regional cooperation.
	Natural assets protected or rehabilitated (AF Core Indicator)	0	By the end of the project, 15 natural areas and ecosystem elements will be protected and 18 will be rehabilitated.	Site surveys, pilot project documentation, independent MTR and TE	Documentation review	Annual	UNESCO, implementing partners, project staff	Water retention and aquifer recharge areas will continue to be maintained by the pilot communities

									throughout the project.
Component 1: Groundwater resource assessment and monitoring									
<i>Outcome: Participating countries use a regional GMS approach to address challenges of climate change, sustainable water use and resilience for evidence-based decision-making and management.</i>									
Output 1.1: Shared aquifer inventory for the GMS compiled that assesses groundwater vulnerability and resilience potential.	Indicator	Baseline	Target	Sources of verification	Means of Collection	Frequency	Responsible parties	Assumptions	
	Presence of a shared aquifer inventory that includes all participating countries.	Governments and user groups have incomplete to severely limited knowledge of groundwater resources; no consistent assessment exists.	By Q6 of the project, there will be a comprehensive 4-country inventory of regional groundwater resources (with data on water quality and quantity) in an easily-accessible format (GIS tool and database).	Regional inventory database and GIS tool.	Database and GIS tool review	Annually as needed	UNESCO, project staff	Inventories will inform decision-making on water resource management	
Output 1.2: Harmonized groundwater monitoring network established	Presence of an operational system for the four participating countries in the GMS sub-region	Monitoring approaches are not harmonized, and regular monitoring does not take place at the sub-regional level.	By Q8 of the project, the monitoring system is operational, and information on key hydrogeological data is collected on a quarterly basis for periodic updates.	System data files, technical documentation from the monitoring system	Review of data files and documentation	Annually as needed	UNESCO, project staff	National partners are willing to provide data to be included in database.	
Component 2: Priority use and Stakeholders:									
<i>Outcome: Groundwater users in different economic sectors in the GMS have equitable access to requisite information and guidelines and are able to participate actively in groundwater management</i>									
Output 2.1: Customized,	Indicator	Baseline	Target	Sources of verification	Means of Collection	Frequency	Responsible parties	Assumptions and Risks	

practical guidelines for community water use introduced in the pilot areas	Development services improved (AF core indicator 2.2.1)	Farmers and other users are currently depleting groundwater resources.	By the end of the project, communities in the three transboundary pilot regions and local and regional decision-makers will have access to 8 development services that support adaptation. ⁴⁴	Guidelines for different water use sectors, GW user association records, structured interviews.	Site visits, review of guidelines	Annually	UNESCO, Project Staff	GW users sufficiently aware of CCA challenges.
	Number of GW users accessing improved development services	0	At least two different local GW users' groups in each of the three pilot areas, (in total 7500 users, at least 50% of whom are women) receive the development services necessary to use groundwater sustainably for adaptation and climate risk reduction measures.	Attendance of users in resource management meetings/training (gender-disaggregated)	Attendance records	Ongoing at all events	Project staff, community partners	National partners sufficiently enabled to achieve the objectives and targets for the transboundary aquifer systems.
	% of GW users aware	Limited availability of guidelines;	By Q12 of the project, at least 60% of GW	Survey data	Community surveys (gender-	At MTR and TE.	Project staff and	Guidelines informed by Community

⁴⁴ These services include support for technical and managerial skills and regulatory framework for GW management, improved capacity of regional and local monitoring and oversight, increased capacity of GW use-related extension services.

	of the guidelines	guidelines may not incorporate needs of all stakeholders and lack integration of climate risk.	users (and equal proportions of women and men) are aware of the guidelines and satisfied with the guidelines (satisfied/very satisfied, or 4/5 on a 5-point scale).		disaggregated)		implementing partners	Dialogues will have an overall high rate of satisfaction due to stakeholder ownership.
Output 2.2: Participation of women and other vulnerable groups in groundwater management supported and monitored	Gender-differentiated participation rates in GW user groups. Women's relative level of awareness and satisfaction with community GW use practices.	Women have lower participation rates in resource user groups than men.	At least 40% of the participants in GW users' groups are women. By the end of the project, awareness levels and satisfaction levels among GW users do not vary significantly between women and men.	GW user group documentation and project documentation. Survey data	Documentation review Community surveys (gender-disaggregated) at MTR and TE.	At MTR and TE.	Project staff and implementing partners	The gender platform and gender-sensitive trainings will ensure that capacity strengthening is equitable.

Component 3: Resource management, information tools and equipment
Outcome: Climate resilience and GW use in pilot areas is increased in an equitable manner through adaptive technologies and approaches.

Output 3.1	Indicator	Baseline	Target	Sources of verification	Means of Collection	Frequency	Responsible parties	Assumptions and Risks
Concrete groundwater management technologies and approaches introduced in	Physical assets produced (AF Core Indicator 2.2.2)	Communities using GW lack significant adaptive technologies	By the end of the project, at least fifteen (15) concrete adaptation measures will be	Visual confirmation, reporting independent MTR and TE	Site visits, project documentation	At MTR and TE	UNESCO, partners, staff, evaluator(s)	Community dialogues and inclusive GW user groups will lead to GW user

three transboundary regions.		and infrastructure.	operational in transboundary regions of the GMS (five per pilot region)					support for the projects.
	Percentage of population applying appropriate adaptation practices.	Next to basic resource inventories (GW maps) there is no tailored information to support sustainable resource use or specific measures to support resilience; awareness of appropriate measures is low.	By the end of the project, 30-50 % of the targeted population in pilot regions is applying appropriate adaptation practices; i.e., MAR, strengthened management of agricultural practices and wastewater.	Site visits, community surveys, extension documentation of practices of farmers and other user groups that apply resilience measures				Increased awareness of climate risk through increased participation in GW management in Component 2 and training and information in Component 5 will allow GW users to identify and apply appropriate CCA practices.
	Women's meaningful participation in co-design of adaptation interventions	Women's participation in water resource decision-making varies across the pilot regions.	By the end of the approval process for the pilot adaptation interventions, at least one women's focus group on the design will be held in each of the three pilot regions.	Project documentation, community records.	Document-ation review	Annually as needed	Project staff	Women, as water users, will be motivated to participate in the focus groups.
Output 3.2: Pilot technologies and approaches	Uptake of data on groundwater management	N/A	By the end of the project, all three pilot areas employ	Visual confirmation, project documentation,	Site visits, Document review, interviews	MTE and TE	UNESCO, partners, staff, evaluator	GW user groups and other higher-level decision-

monitored and adjusted based on project-generated information to align groundwater management with broader climate change resilience measures and surface water management.	in pilot projects and water management and CC adaptation more broadly.		enhanced groundwater management strategies linked to broader climate change resilience measures and surface water management.	independent MTR and TE				makers will be motivated to use information generated by the project to inform policies and user guidelines.
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Component 4: Regional cooperation, coordination and information exchange
Outcome: Regionally consistent management strategies for groundwater resources in support of CCA are adopted through effective stakeholder engagement in the GMS.

Output 4.1:	Indicator	Baseline	Target	Sources of verification	Means of Collection	Frequency	Responsible parties	Assumptions and Risks
Regional cooperative network and harmonized national strategies established for sustainable GW management in support of CCA.	Presence of national strategies for sustainable GW management in support of CC adaptation	GW management is not generally integrated into CC adaptation policies and strategies, and in some countries it is absent in water resource strategies.	By the end of the project, at least one key climate or sectoral national policy, strategy, or report in each country <i>and</i> a regional resource mobilization strategy will draw upon common GW data, approaches, and activities supported by the project.	Government registers, project documentation, structured interviews in the MTR and TE.	Site visits, document review, interviews	Annually	Implementing partners, project staff	Policy-makers will be receptive to new information generated by the project.
Output 4.2:								

Regulatory framework to manage resources and expand new groundwater-based resilience strategies and practical interventions supported.	Level of regulatory framework to manage resources.	The regulatory framework for GW resource management is incomplete for the GMS.	By Q14, specific secondary legislation (by-laws/regulations) is proposed for Thailand and Vietnam in areas identified as result of the gap analysis. By Q14, primary legislation on groundwater has been drafted for Cambodia and Lao PDR.	Draft secondary legislation; gap analysis; project documentation; structured interviews during the independent MTR and TE.	Document review	Annually	Implementing partners, project staff	Participating country governments will be receptive to proposed secondary legislation that addresses current gaps.
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Component 5: Capacity building and training

Outcome: GMS stakeholders capably use project tools and knowledge on GW use for CCA and resilience.

Output 5.1:	Indicator	Baseline	Target	Sources of verification	Means of Collection	Frequency	Responsible parties	Assumptions and Risks
A groundwater community of practice (CoP) created and equipped with the skills to ensure technical and management capabilities.	Presence of an active CoP on user-oriented groundwater management	Skills and access to knowledge and information vary widely across the GMS, and there is little bilateral / multilateral cooperation.	By Q6, a CoP of 20 experts from the region (at least 40% of those women) has adopted a terms of reference for its work and is meeting on a semi-annual basis.	Proceedings of meetings and collaborative products, joint statements.	Document review	Annually	Implementing partners	Experts will be motivated to participate because of increased access to current data and best practice.
Output 5.2: Project knowledge and international best practice archived, made available, and disseminated to	Number of participants in project events with increased awareness and skills on climate-		By the end of the project over 600 participants in project events have increased awareness and skills on climate related impacts	Event registration and attendance records and ex post self-assessed knowledge change via	Record review Structured interviews during the independent	Annually	Implementing partners, staff, evaluator	The project management team will identify and support the attendance of participants best suited to

<p>stakeholders at all levels (community, national, regional, global).</p>	<p>related impacts.</p>		<p>(male/female = 60/40%).</p> <p>By the end of the project, at least 100 of those participants will have taken part in professional or academic training related to groundwater and/or aquifer storage and recharge at a post-secondary research or academic institution in one of the participating countries (male/female = 60/40%)..</p>	<p>written evaluations.</p>	<p>MTR and TE.</p>			<p>the material offered at each event in order to support uptake of concepts and information.</p>
	<p>Availability of key project knowledge outputs to stakeholders</p>	<p>At present, there is no common repository of information and training materials on groundwater in the GMS.</p>	<p>By the midpoint of the project, key knowledge products, including lessons learned notes, training curricula, workshop reports from training and awareness-raising events to date are archived in the</p>	<p>Review of the Sharepoint.</p>	<p>Record review in Sharepoint cross-checked with documentation from trainings and other project activities.</p>	<p>MTE and TE</p>	<p>Implementing partners, evaluator</p>	<p>The inclusion of archiving in project activities will support the collection of documents for Sharepoint, and stakeholders will be motivated to access documents on Sharepoint to</p>

			<p>project's Sharepoint.</p> <p>By the end of the project, key knowledge products including lessons learned notes, training curricula, workshop reports from training and awareness-raising events to date are archived in the project's Sharepoint.</p>					<p>support their work.</p>
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F. Alignment with Adaptation Fund Result Framework

Table 17 below provides an overview of the project objective and outcome indicators with AF outcomes and outcome indicators.

Table 17: Alignment of Project Objectives/Outcomes with AF Results Framework

Project Objective(s) ⁴⁵	Project Objective Indicator(s)	AF Outcome	AF Outcome Indicator	Grant Amount (USD-indicative)
Establish effective regional capacities, partnerships and network in the Greater Mekong Subregion (Vietnam, Lao PDR, Cambodia, Thailand) for the sustainable management and utilization of groundwater resources as an adaptation response to protect people, livelihoods and ecosystems from climate change impacts.	Over 25 partnerships and active collaboration set up to support groundwater management capabilities that strengthen resilience and reduce detrimental climate change impacts. Over 50 regional experts support institutional capacity in 5 countries (male/female = 60/40%). Over 250 participants have increased awareness and skills on climate related impacts (male/female = 60/40%).	Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses.	2.1.1. Number of staff trained to respond to, and mitigate impacts of, climate-related events (by gender). 2.1.2 Number of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector and scale).	2,500,000
Groundwater users including women from different economic sectors in the GMS have access to requisite information and guidelines and thus participate in groundwater management.	In three pilot areas at least two different local groundwater users' groups are capacitated to use groundwater sustainably for adaptation and climate risk reduction measures. Higher management is also aware and involved.	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level.	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses. 3.2. Percentage of targeted population applying appropriate adaptation responses.	2,400,000

⁴⁵ The AF uses OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply

Project Objective(s) ⁴⁵	Project Objective Indicator(s)	AF Outcome	AF Outcome Indicator	Grant Amount (USD-indicative)
A regional GMS approach to address challenges of climate change and resilience is created based on an information-based policy.	Greater groundwater management services made more responsive through improved resource assessments, management capability and information tools and human resources capacity in the sector. Greater water and specifically groundwater management services and supporting hard and soft infrastructure (policy and guidelines, database, monitoring systems, MAR systems) have been improved towards higher adaptive capacity.	Outcome 4: Increased adaptive capacity within relevant development sector services and infrastructure assets.	4.1. Responsiveness of development sector services to evolving needs from changing and variable climate.	1,000,000
			4.1.1. Number and type of development sector services modified to respond to new conditions resulting from climate variability and change (by sector and scale).	
Climate resilience and groundwater use in pilot areas is increased, and low income and other vulnerable groups' needs are prioritized.	Vulnerable people in three pilot areas and four countries will be able to rely on improved water management in support of livelihoods and other water needs.	Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	6.1 Percentage of households and communities having more secure access to livelihood assets.	1,000,000
			6.2. Percentage of targeted population with sustained climate-resilient alternative livelihoods.	800,000
A regionally coherent policy for sustainable groundwater management in support of CCA is adopted based on a level playing field of all users in the GMS.	Local interventions and guidelines (at least 3 in each pilot area) support resilience measures that are upscaled to national policies and guidelines. Regional (5 countries) and transboundary cooperation in pilots will generate at least 15 risk policies/guidelines.	Outcome 7: Improved policies and regulations that promote and enforce resilience measures.	7.1. Number of policies introduced or adjusted to address climate change risks (by sector).	500,000

Project Objective(s) ⁴⁵	Project Objective Indicator(s)	AF Outcome	AF Outcome Indicator	Grant Amount (USD-indicative)
<p>GMS stakeholders and communities capably use project tools on groundwater use for CCA and resilience.</p>	<p>Number of partnerships and active collaboration set up to support groundwater management capabilities that strengthen resilience and reduce detrimental climate change impacts.</p>	<p>Outcome 1: Reduced exposure to climate-related hazards and threats.</p>	<p>1.1 Number of projects/ programmes that conduct and update risk and vulnerability assessments by sector and scale.</p>	<p>800,000</p>
	<p>Over 50 regional experts support institutional capacity in 5 countries (male/female = 60/40%). Over 250 participants have increased awareness and skills on climate related impacts (male/female = 60/40%).</p>	<p>Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses.</p>	<p>2.1.1. Number of staff trained to respond to, and mitigate impacts of, climate-related events (by gender). 2.1.2 Number of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector and scale).</p>	

The result framework has been complemented with an overview of core impact indicators (SMART), using the core indicators tables prescribed by AF.

ADAPTATION FUND CORE IMPACT INDICATOR 1: NUMBER OF BENEFICIARIES

Project Title		Groundwater resources in the Greater Mekong Sub-region: Collaborative management to increase resilience				
Country		Cambodia, Lao PDR, Thailand, Vietnam				
Implementing Agency		UNESCO Office Jakarta with UNESCO Office Bangkok, CCOP-TS Bangkok and supporting technical organizations				
Project Duration		4 years; 2021-2025				
AF Core Impact Indicator 1: “Number of Beneficiaries”						
	Baseline	Total for whole project	Target at project approval (absolute number), per pilot area			1 = Lao PDR; 2=Cambodia-Vietnam Mekong Delta; 3=Cambodia NW-Thailand
			1	2	3	
1. Direct beneficiaries supported by the project	0	1700	500	800	400	i.e. people trained or directly involved
1a. GW user groups		90	20	50	20	Average size of GW user group is 20 people
1b. GW management provincial – regional level	0	325	50	150	125	Participants from selected provinces/districts
1c. GW management & policy national level		190	30	100	60	Participants from national and subnational level
Clarification; 500 = No. of people participating in training and/or other awareness raising activities or otherwise directly involved in project activities. It is also reflecting the larger populations in for instance the upper Mekong Delta pilot areas. This is a very conservative estimate; the numbers will be adjusted on the basis of data collected during project inception and more specific workplans.						
Female direct beneficiaries	0	680	200	320	160	Set at 40 % for the GW / water/ natural resources management sector
Youth direct beneficiaries (aged 15-24)	0	170	50	80	40	Set at 10 %, for instance through doing a school-oriented awareness/training programme
2. Indirect beneficiaries supported by the project (in thousands)	0	1449	175	878	396	The communities of the above group (i.e. 5 trainees from 1 village or district of 5000 people, so here the No. of indirect beneficiaries is 5000. Estimated as a reasonable % of the total population in the pilot area = 8-10 %. The total is about two million.
Female indirect beneficiaries	0	579	70	351	158	Set at 40 % of the total
Youth indirect beneficiaries (aged 15-24)	0	290	35	176	79	Set at 20 %, for instance through doing a school-oriented awareness/training programme. At 20 % this means 1/100 = 1% of the total population

AF Core Impact Indicator 2: “Assets Produced, Developed, Improved, or Strengthened”

Project Title	Groundwater resources in the Greater Mekong Sub-region: Collaborative management to increase resilience						
Country	Cambodia, Lao PDR, Thailand, Vietnam						
Implementing Agency	UNESCO Office Jakarta with UNESCO Office Bangkok, CCOP-TS Bangkok and supporting technical organizations						
Project Duration	4 years; 2021-2025						
AF Core Impact Indicator 2: “Assets Produced, Developed, Improved, or Strengthened”							
	Baseline	Total for whole project	Target at project approval (<i>absolute number</i>), per pilot area 1 to 3			1 = Lao PDR; 2=Cambodia-Vietnam Mekong Delta; 3=Cambodia NW-Thailand	
Sector: Cross-sectoral: Water Management, Food Security, Rural Development, Agriculture, Health			Water supply based on GW resources touches upon all these sectors and it is the explicit aim to develop and apply GW-based resilience measures for different sectoral stakeholders.				
Targeted Services / Assets							
1) Development Services (developed/improved)	0	24	8	8	8	Development services; support for technical and managerial skills and regulatory framework for GW management, improved capacity of regional and local monitoring and oversight, increased capacity of GW use-related extension services.	
2) Physical assets/infrastructure (produced/improved/strengthened)	0	15	5	5	5	Physical assets/infrastructure: Physical infrastructure to increase resilience and adapt to climate change including: GW exploitation and recharge systems, resource use monitoring networks and necessary data management and processing systems, water harvesting and conservation systems. The number of individual (small) wells could be significantly higher.	
- Well systems	0	1750	150	1200	400		
- GW recharge systems	0	70	10	30	30		
- Monitoring systems	0	14	2	6	6		
Changes in asset status							
- Development Services; (<i>Qualit.</i>)	0	3-5	3-5	3-5	3-5	3-5	Services and Assets change of status 5: Fully improved, 4: Mostly Improved or 3: Moderately improved
- Training, information and awareness services (Quant.)	0	24	3	8	8	5	

AF Core Impact Indicator 3: “Natural Assets Protected or Rehabilitated”

Date of Report							
Project Title	Groundwater resources in the Greater Mekong Sub-region: Collaborative management to increase resilience						
Country	Cambodia, Lao PDR, Thailand, Vietnam						
Implementing Agency	UNESCO Office Jakarta with UNESCO Office Bangkok, CCOP-TS Bangkok and supporting technical organizations						
Project Duration	4 years; 2021-2025						
AF Core Impact Indicator 3: “Natural Assets Protected or Rehabilitated”							
	Baseline	Total for whole project	Target at project approval (<i>absolute number</i>), per pilot area 1 to 4				1 = Lao PDR; 2=Cambodia-Vietnam Mekong Delta; 3=Cambodia NW-Thailand
			1	2	3	4	
Natural Asset or Ecosystem - Improved water retention areas - Aquifer recharge areas	0 0	-	-	-	-	-	The number of designated water retention and aquifer recharge areas is indicated below; size in ha cannot yet be specified, the given number is indicative
Change in state <i>Effectiveness of protection/ rehabilitation - Scale (1-5)</i>	0	3-5	3-5	3-5	3-5	3-5	5: Fully improved, 4: Mostly Improved or 3: Moderately improved
Total number of natural assets or ecosystems protected/ rehabilitated	0 0	15 18	3 4	4 6	8 8	8 8	Natural areas and ecosystems elements designated as recharge areas

TABLE 19: ADAPTATION FUND CORE IMPACT INDICATORS

G. Project budget

This technical project proposal is accompanied by a comprehensive budget proposal, following Adaptation Fund guidelines. The budget is available in **Annex VI** (Excel format).

Project budgets

Summary project budget (Annex VI, Sheet 1)

Breakdown of the project execution costs (CCOP-TS; Annex VI, Sheet 2)

Budget disbursement schedule with time-bound milestones (Annex VI, Sheet 4)

Detailed project budget, Excel format (Annex VI)

A breakdown of the IE fee is also included below.

In this main document we present summaries of the different budget sheets

Sheet 1: Summary project budget

No.	Description	Budget (US \$)
1.	Programmatic costs, Component 1 - 5	4,161,379
2.	Execution Costs @ 8.3 %	374,524
3.	Subtotal	4,535,903
4.	Management fee MIE @ 8 % of Subtotal	362,872
5.	Total Project budget	4,898,775

Sheet 2: Breakdown of the Project Execution Costs

No.	Description	Budget (US \$)
1.	Project coordination cost	155,000
2.	Support staff cost	96,024
3.	Operational costs	40,000
4.	Project related travel (mission cost)	31,000
5.	Audit	52,500
	Total	374,524

Sheet 3: Budget disbursement schedule with time-bound milestones.

Payment	Upon Agreement signature		Year 1		Year 2		Year 3		Year 4		Total %	Total Amount
	30/09/2022		30/03/2023		30/09/2023		30/09/2024		30/09/2025			
Scheduled Date	30/09/2022		30/03/2023		30/09/2023		30/09/2024		30/09/2025			
Project Funds, incl. Exec. costs	11,02%	500 000	11,21%	508 359	29,85%	1 353 922	30,44%	1 380 670	17,48%	792 952	100,00%	4 535 903
Implementing Entity Fee	9,65%	35 000	12,59%	45 669	29,85%	108 314	30,44%	110 453	17,48%	63 436	100,00%	362 872
Total	\$ 535 000		\$ 554 028		\$ 1 462 236		\$ 1 491 123		\$ 856 388			\$ 4 898 775

Budget Breakdown of the Implementing Entity Management Fee

Description	Percentage	Total (USD)
Direction	29%	105 233
Strategic Planning	14%	50 802
Human resources management	23%	83 461
Financial management	23%	83 461
ICT infrastructure and operation	10%	36 287
Administration & Management	1%	3 628
Total		362 872


Note: the information in this table is provided for information purpose only and will not lead to any reporting. Management Costs (UNESCO terminology), or Implementing Entity Fee (Adaptation Fund terminology) are incurred by UNESCO in support to extrabudgetary projects, but which cannot easily be traced unequivocally to the project. These costs are, therefore, estimated as a percentage of direct project costs.

PART IV: ENDORSEMENT LETTER BY NATIONAL GOVERNMENTS, ACCREDITED SIGNATORIES CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government:

Cambodia: Mr. Tin Ponlok , Secretary-General, National Council for Sustainable Development (NCSD) / Ministry of Environment	Endorsement letter is attached
Lao PDR: Mr. Syamphone Sengchandala , Director-General, Department of Climate Change (DCC), Ministry of Natural Resources and Environment	Endorsement letter is attached
Thailand: Mr. Jatuporn Buruspat , Permanent Secretary, Ministry of Natural Resources and Environment	Endorsement letter is attached
Viet Nam: Dr. Tran Hong Ha , Minister, Ministry of Natural Resources and Environment	Endorsement letter is attached

B. Implementing Entity certification

<p>I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (Lao PDR and Vietnam) and subject to the approval by the Adaptation Fund Board, <u>commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund</u> and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.</p>	
<p>Implementing Entity Coordinator: MOHAMED DJELID, Director and Representative, UNESCO Office in Jakarta</p> 	
<p>Date: 04/27/2022</p>	<p>Tel. and email: +62 (21) 7399 818 (ext 801) m.djelid@unesco.org</p>
<p>Project Contact Person: Hans Dencker Thulstrup</p>	
<p>Tel. And Email: +62 (21) 7399 818 (ext 810); h.thulstrup@unesco.org</p>	

KINGDOM OF CAMBODIA
Nation Religion King



National Council for Sustainable Development

No: 003..... NCS D

Phnom Penh.....^{9th}.....May 2022

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

**Subject: Endorsement for Groundwater resources in the Greater Mekong
Subregion: Collaborative management to increase climate change resilience**

In my capacity as designated authority for the Adaptation Fund in Cambodia, I confirm that the above regional project/programme proposal is in accordance with the Royal Government of Cambodia national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Cambodia.

Accordingly, I am pleased to endorse the above project/programme proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented by UNESCO and executed by Department of Green Economy of the General Directorate of Policy and Strategy in collaboration with other relevant Ministries with technical support and coordination from Coordinating Committee for Geosciences Programme (in East and Southeast Asia)-CCOP, International Water Management Institute (IWMI), and International Groundwater Resources Assessment Centre (IGRAC). *easy for IWR*

Yours Sincerely,



Tin Ponlok
Secretary of State



Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Ministry of Natural Resources and Environment
Department of Climate Change

Vientiane Capital, Date: 23 April 2021

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

**Subject: Endorsement for Groundwater resources in the Greater Mekong Subregion:
Collaborative management to increase climate change resilience.**

Dear Secretariat,

In my capacity as designated authority for the Adaptation Fund in Lao PDR, I confirm that the above regional project proposal is in accordance with Lao PDR national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Lao PDR.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented by UNESCO and executed by relevant country agencies in Lao PDR with technical support and coordination from Coordinating Committee for Geosciences Programme (in East and Southeast Asia) CCOP, International Water Management Institute (IWMI), and International Groundwater Resources Assessment Centre (IGRAC).

Details of the executing country agencies in Lao PDR will be communicated in due course, pending the completion of ongoing organization of work among the relevant agencies.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Syamphone SENGCHANDALA'.

Syamphone SENGCHANDALA

Director General,
Department of Climate Change,
Ministry of Natural Resources and Environment.

Designated Authority for the Adaptation Fund of Lao PDR

No 1007.4/ 1076



Ministry of Natural Resources
and Environment
92 Soi Phohol Yothin 7,
Phohol Yothin Road, Phaya Thai,
Bangkok 10400 Thailand
Tel./Fax +66 2 265 6692

28 April B.E. 2564 (2021)

Sir/Madam,

**Subject: Endorsement for Groundwater Resources in the Greater Mekong Subregion:
Collaborative Management to Increase Climate Change Resilience**

In my capacity, as designated authority for the Adaptation Fund in the Kingdom of Thailand, I confirm that the above regional proposal is in accordance with the government's national and sub-regional priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the Mekong Region, and support Thailand's National Adaptation Plan implementation on water management sector.

Accordingly, I am pleased to endorse the above proposal for your consideration. If approved, the project will be implemented by United Nations Educational, Scientific and Cultural Organization and executed by Department of Groundwater Resources of Thailand with technical support and coordination from Coordinating Committee for Geosciences Programme (in East and Southeast Asia) – CCOP, International Water Management Institute (IWMI), and International Groundwater Resources Assessment Centre (IGRAC).

Yours sincerely,

(Mr. Jatuporn Buruspat)

Permanent Secretary

Ministry Natural Resources and Environment

Adaptation Fund Board Secretariat
c/o Global Environment Facility
1818 H Street NW, Washington DC 20433, USA
Email: secretariat@adaptation-fund.org



SOCIALIST REPUBLIC OF VIET NAM
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT

Hanoi, 20 April 2021
Ref.No: 20 MONRE-2021

The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org

Subject: Endorsement for the Project Proposal “Groundwater resources in the Greater Mekong Sub-region: Collaborative management to increase climate change resilience”

In my capacity as Designated Authority for the Adaptation Fund in the Socialist Republic of Viet Nam, I confirm that the above regional project proposal is in accordance with government’s national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the Socialist Republic of Viet Nam, which is part of the Greater Mekong Sub-region.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by UNESCO and executed by the National Centre for Water Resources Planning and Investigation - Ministry of Natural Resources and Environment of Viet Nam.

Yours sincerely,



Dr. Trần Hồng Hà
Minister of Natural Resources and Environment
Socialist Republic of Viet Nam

Annexes

Annex I: Comprehensive characterization of the proposed three pilot areas

Annex II: Detailed information on stakeholder involvement in project preparation

Annex III: Summaries of 2021 Community Consultations

Annex IV: Gender Analysis

Annex V: Environmental and Social Screening Information

Annex VI: Detailed budget and budget Excel sheets

Annex VII: Project Alignment with Agenda 2030

Annex VIII: Abbreviations

Annex IX: Table of Contents

Annex I: Comprehensive characterization of the proposed three pilot areas

This annex provides a general overview of the characteristics and salient properties of the proposed pilot areas. The project will focus on the stakeholder groups in these areas; farmers, groundwater users in villages and small towns, small industries or other activities that rely on groundwater. Project activities will be designed in such a way that vulnerabilities will be addressed and climate resilience strengthened in each pilot area and for specific stakeholder groups, as follows:

- Local⁴⁶ authorities (village, municipal, district and provincial level);
- Local, regional and national groundwater specialists and professionals in government agencies and academia;
- Local, regional and national groundwater specialists and professionals in the private sector and agriculture
- Farmers' groups;
- Representatives from small or larger industries that operate in the area; and
- Community groups, with representatives of ethnic minorities (if any), women and youth.

The project activities will be implemented in three regional pilots. In each pilot, the same activity format will be applied, considering local circumstances. The aim of the project is to enhance climate resilience in all pilot areas. The results can be multiplied across the region and used as case studies, by the national Governments and/or the MRC. This is expected to generate a multiplier effect and long-term multilateral cooperation. The proposed pilot areas are:

1. Lao PDR – Thailand (Mekong river riparian aquifer systems (Lao PDR, Thailand, and possibly Cambodia); The Vientiane Plains, Lao PDR and adjacent aquifers in Thailand will be the priority area. Other areas like the Southern Lao PDR Pakse region (Lao PDR – Thailand – Cambodia TBA) can also be included.

2. Vietnam – Cambodia (Upper Mekong Delta Transboundary Aquifers. Mekong Delta aquifers in Vietnam are intensively used and contribute to the high productivity agri- and aquaculture systems in the entire Delta. It is assumed that major recharge takes place in the upper delta region in Cambodia, but this TBA system is poorly understood and there is little qualitative data.

3. Cambodia – Thailand (North-West Cambodia – Eastern Thailand border area). Transboundary aquifers in drought prone area with vulnerable rural population. Groundwater potential is essential to support food security / rural water supply and demand from tourism sector.

Scope of Activities in the Pilot Areas

The activities proposed in the pilot areas are intended to deal with priority climate resilience issues in each area, and they have a high degree of relevance to other areas with comparable physical and socio-economic characteristics in the region. Collectively, the interventions in the three pilot areas have been designed and will be further detailed to contribute to the five main outcomes of the project (1. resource assessments and information survey; 2. engagement with groundwater users, 3. IMS, inventories and tools; 4. regional cooperation, and 5. training & capacity building).

Pilot area 1 focuses on the Mekong River riparian and transboundary aquifers-Vientiane Plains, Lao PDR. In the first activity, a groundwater management plan would be elaborated. This would be the first for Lao PDR, capitalizing on the increasing interest in GW resources in the country. It will be one of the major tools to support planning and decision making for the pilot area and serve as a model for other parts of Lao PDR and possibly also adjacent parts of transboundary aquifers in Thailand. This activity is divided into various tasks: (i) carrying out an inventory of the existing wells and GW use across the various districts of the Plains; (ii) consultations with a broad range of stakeholders including government officials across relevant sectors, the private sector, NGOs, and the community;

⁴⁶ "Local" refer to people from within the pilot area; regional: from within the pilot area and relevant adjacent locations

(iii) tailoring regulations in consultation with local authorities and other stakeholders and (iv) awareness raising through dissemination of project findings through communication material tailored to specific stakeholders. To better serve the planning, a numerical GW flow model would also be developed and validated with field measurements and used for scenario analysis. The model would explore a range of possible development scenarios including those identified by stakeholder consultations to ensure sustainable GW management can be achieved. The opportunities for so-called bottom-up approaches to GW management processes would be explored by assessing community perceptions and interest in participatory GW management and identifying relevant entry points to compliment traditional top-down approaches.

Pilot area 2 focuses on the Upper Mekong Delta Transboundary Aquifers (Vietnam + Cambodia). The first activity would involve setting up a joint GW monitoring system between Vietnam and Cambodia. Through this collaborative exercise, the GW monitoring capabilities of the Cambodian counterparts in particular would be improved. An inventory of GW infrastructure would be prepared and GW use estimated for the various aquifer units and sectorial uses. The undertaking of these activities will form the basis for dialogue and awareness raising amongst the main stakeholders on key issues related to transboundary aquifer management and interactions between the surface water and GW systems. The information and discussion generated also serve to identify potential resilience enhancing measures in the context of transboundary integrated surface-GW management. Specifically, they will seek to answer the following questions:

- 1) Who are the most important stakeholder groups that stand to benefit, in terms of climate resilience, from improved and more active GW management?
- 2) To what extent is serious GW depletion occurring and can this be reversed?
- 3) Which GW vulnerability reduction measures (e.g. MAR) contribute to increase GW resilience effectively?

Pilot area 3 focuses on the Northwest Cambodia – Eastern Thailand border area. The first activity to be carried out would be a joint GW resource assessment, recognizing that greater efforts are needed on the Cambodian side where very little is currently known. From the Thailand side of the border, useful lessons-learned and existent GW management practices can be adopted. A basic monitoring system would be established and necessary training to relevant agencies provided to support improved GW management capabilities in Cambodia. Through dialogue with the main stakeholders, the potential to increase GW use in support of food production and rural water supply would be explored and the best possible evidence-based case for sustainable development determined. A joint task force would be setup to develop resilience enhancing measures in the framework of integrated surface-GW management.

Project activities will be implemented in each of the three regional pilots, applying the same activity format, adjusted to suit local circumstances.

Joint, cooperative activities covering all pilot areas include the following:

- Organize a sub-regional project validation workshop and annual interim workshops (for example within the Tonle Sap UNESCO Biosphere Reserve or other suitable locations in one of the pilot areas);
- Organize a sub-regional policy development meeting with four participating countries and possible participation by stakeholders as observers;
- Establish an Information Management System (IMS) for groundwater resources and groundwater use and an associated Sharepoint;
- Carry out data collection, analysis, reporting and entry into the IMS and ensure there is a plan to sustain its use after the project;
- Carry out groundwater skills and knowledge capacity inventories, needs assessments, and corresponding training;
- Hand over the project from UNESCO to the national partners and possibly MRC after project completion.

Activities that will take place in each of the pilot areas:

- Carry out groundwater surveys/assessments (and produce associated reports and maps);

- Carry out information surveys on (ground)water demand and use in different sectors (agriculture, domestic, urban, industry), and produce reports and maps;
- Provide training on groundwater monitoring, management and sustainable use, also covering concepts of recharge (MAR), including training-of-trainers and information dissemination to communities (all in close collaboration with relevant governmental agencies, local authorities and groups);
- Establish a simple groundwater monitoring system, in each of the three pilot areas, following a participatory approach and ownership by users.

Integration of all project activities in each pilot area will stimulate a balanced and output-oriented way of working, without undue focus on specific studies or research. In each of the pilot areas the project will generate specific and stakeholder-oriented, practical climate resilience measures, such as increased public awareness, information on groundwater resource potential, and groundwater system data and monitoring information results, in order to propose tailored and information-based interventions. Three of the three areas will include working in challenging transboundary aquifer systems and developing bilateral or multilateral cooperation. The available information from the different regions indicates the anticipated climate resilience measures can be targeted to different sectors. In all pilot regions, stakeholders include a significant number of high-vulnerability groups.

Table AI.1: Overview of pilot area characterization

	PILOT AREA 1 Lao PDR-Thailand	PILOT AREA 2 Vietnam-Cambodia	PILOT AREA 3 Cambodia-Thailand
Location	Vientiane Plains with the Mekong River riparian aquifer systems, including Lao PDR, Thailand, and Cambodia	Upper Mekong Delta transboundary aquifers in Vietnam and Cambodia	North-West Cambodia – Eastern Thailand border area
Precipitation /Climate zone	2,000 mm/yr Tropical Dry	1,700 mm/yr Humid Subtropical	1,400-2,000 mm/yr Tropical Dry
Population density and projected growth	Average to high	Very high	Average
Major land use	Paddy, vegetable crops, forest, urban	Paddy, vegetable crops, cities and villages	Paddy, vegetable crops, forest,
Aquifer type	Alluvium bounded by sandstone on margins and at depth	Alluvium, at depth older, semi-consolidated river deposits (sand and clay)	Thin alluvium, sandstones
Recharge rates	200-400 mm/yr (approx.)	Vietnam: 300 mm/yr Cambodia: not known	Thailand: 200 mm/yr Cambodia: not known
Interactions with surface water	Groundwater drains to rivers which are affected by hydropower schemes; infiltration from small reservoirs and ponds	Groundwater recharge from river channels with high/low seasonal flow; infiltration from small reservoirs and ponds	Recharge from small rivers, ponds, small reservoirs; Groundwater drains to rivers and Tonle Sap lake (UNESCO Biosphere Reserve)
Current abstraction	Relatively low (based on the available data)	High to extremely high, deep tube wells and shallow wells	Low (Cambodia) and modest to high in Thailand
Major purposes for abstraction	Domestic, emerging agriculture, small industry (packaged water, salt production)	Irrigation, village supply, city water supply, minor industry	Small scale irrigation, village supply
Water quality	Good; salinity (natural), some organic contamination	Good, some concern about arsenic levels, pesticide etc. pollution from surface water	Good, some concern about arsenic levels, microbial pollution at groundwater points
Transboundary issues	Recharge from Mekong River and connectivity with adjacent Thai aquifers	Integrated resource management by Cambodia – Vietnam authorities; recharge	Contrast between Thailand and Cambodia regions in utilization of resource; very

		from Mekong River (floods); pollution threats	limited management in Cambodia
Major issues/threats groundwater for climate resilience	Expansion of groundwater use, for irrigation and domestic use, rapid urbanization, poor oversight of (possibly) large extractions	Overall volume of extractions, decreasing recharge; implications of extraction and lesser recharge for shallow domestic wells and downstream replenishment of aquifer	Non-sustainable use in Thailand; undervalued resource in Cambodia; management capabilities and better alignment with user needs

Each of the three pilot areas is located in a transboundary region. Relevant statistics of these areas are provided in the table below. Based on these data, project beneficiaries number a minimum of 5 % and maximum of 10 % of the total population, adding up to a total of around 2 million people. This number of direct beneficiaries may vary across the regions. Clarification of column headers is provided on the next page, below Table 2.

Table A1.2: Relevant statistics for the pilot areas

1. Pilot area	2. Provinces-districts	3. Population	4. No. of project beneficiaries	5. Vulnerable groups	6. Issues and threats	7. Economic benefits	8. Additional comments
1. Lao PDR - Thailand							
Lao PDR	Vientiane province	419,000	Around 8-10 % 175,000	Mixed peri-urban and rural population; low & middle income households, farmers	Expansion of groundwater use, for irrigation and domestic use, rapid urbanization, poor oversight of (possibly) large extractions	Improved access to water for domestic use → lower cost of living; increased irrigated agriculture; → food supply ensured → higher incomes	Social benefits include reduced time spent by women & children in collecting water; environmental benefits for streams and wetlands supporting habitat and livelihoods
	Vientiane Cap. Region	821,000					
Thailand	Nhong Khai	517,000					
2. Cambodia - Vietnam							
Cambodia	Takeo	845,000	Up to 10 %, mostly rural 878,000	Predominantly rural population; low & middle income households, farmers; water users in provincial towns	Overall volume of extractions, decreasing recharge; implications of extraction and lesser recharge for shallow domestic wells and downstream replenishment of aquifers	More resilient water supply for agriculture: → higher incomes; resilient water supply for domestic use: → lower costs; preparedness for prolonged drought: → food supply ensured. Long-term resilience	In Cambodia % of villages with access to water through tube/pipe water wells is 80 %; % of villages exposed to drought and/or food shortage in the five years prior to census was 38 %.
	Kandal	1,265,000					
	Prey Veng	947,000					
	Svay Rieng	483,000					
Vietnam	An Giang	2,143,000					
	Dong Thap	1,667,000					
	Long An	1,436,000					
3. Cambodia - Thailand							
Cambodia	Banteay Meanchey	678,000	Up to 8 %, mostly rural 396,000	Predominantly rural population; low & middle income households, farmers	Non-sustainable use in Thailand; undervalued resource in Cambodia; management capabilities and better alignment with user needs.	More resilient water supply for agriculture: → higher incomes; resilient water supply for domestic use: → lower costs; preparedness for prolonged drought: → food supply ensured. Long-term resilience	The area is prone to severe and prolonged drought and has relatively little surface water resources. Increasing groundwater demand for tourism in vulnerable areas.
	Oddar Meanchey	186,000					
	Siem Reap	896,000					
Thailand	Sakeo	552,000					
	Buriram	1,579,000					
	Surin	1,392,000					
Totals			1,449,000				

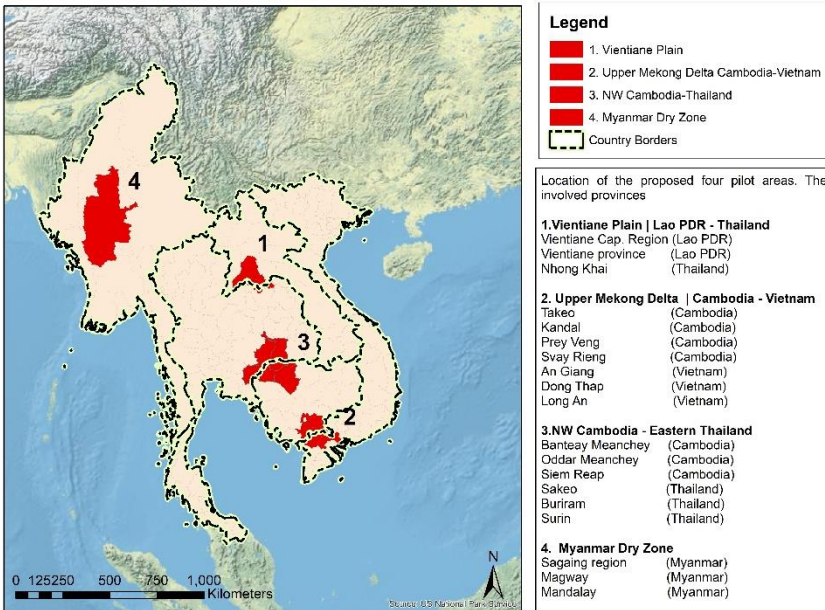
Clarification of column headers

1. No clarification needed.
2. No clarification needed.
3. **Population numbers:** Approximate total population numbers are given based on various documents and internet sources; Lao PDR: https://en.wikipedia.org/wiki/Provinces_of_Laos (2015 Census); Cambodia; Census of Agriculture report, 2015; Thailand: https://en.wikipedia.org/wiki/Provinces_of_Thailand & Thailand Human Development Report, UNDP (2014) Vietnam: https://en.wikipedia.org/wiki/Provinces_of_Vietnam; General Statics Office of Vietnam
4. **No. of project beneficiaries;** between 5 and 10 % of the total population.

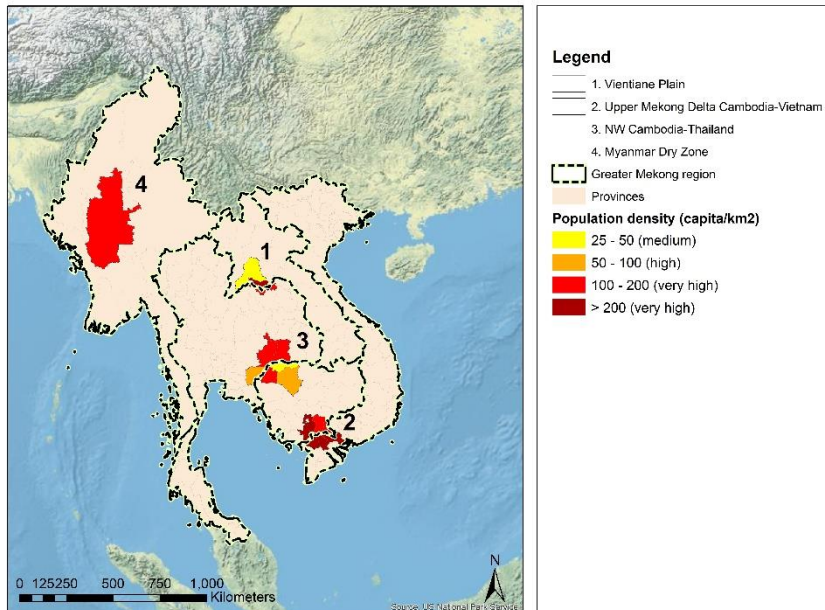
5. **Vulnerable groups;** where possible, listing of specific vulnerable groups is provided (as determined by the socio-economic and physical characteristics of the area); the project will always focus on the women, children and young adults segment of the general population (over 60 %). The proposed Cambodia provinces are among the poorest and most densely populated in the country (2015 Census).
6. **Issues and threats:** as summarized in the profiles of the pilot areas (Annex 1)
7. **Economic benefits;** not very different across the pilot areas, but since a majority of the population is rural, improved groundwater management will contribute to lower cost for domestic water, improved access to water for irrigated agriculture and hence higher incomes, improved capacity to absorb shocks in water supply in times of prolonged drought. For non-agricultural, (urban) stakeholders the project contributes to lower cost for water supply and savings for water purchase.
8. **Remarks**

In addition to the characterization of the proposed pilot areas, maps of the proposed projects sites are provided on the following pages.

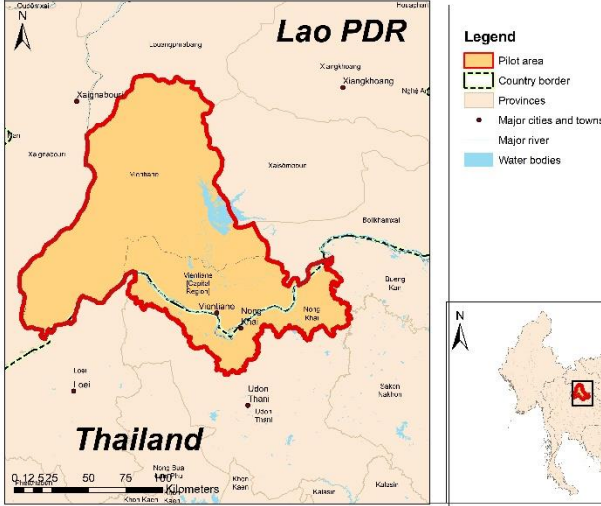
Pilot areas - Groundwater resources in the Greater Mekong Subregion



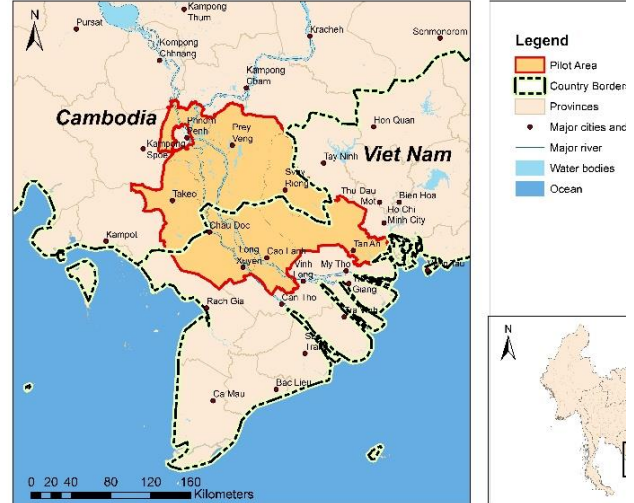
Groundwater vulnerability: Population density in pilot areas



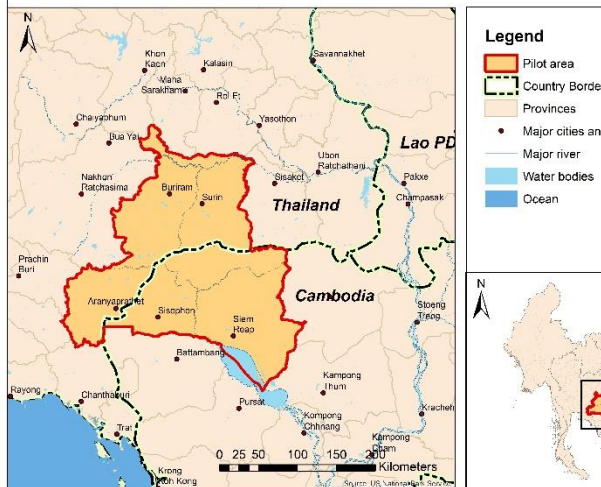
Pilot area: Vientiane Plain | Lao PDR - Thailand



Pilot area: Upper Mekong Delta | Cambodia - Vietnam



Pilot area: NW Cambodia - Eastern Thailand



Annex II: Detailed information on stakeholder involvement in project preparation

Note: The project as originally conceived included the participation of Myanmar, and their participation in the stakeholder consultations is documented here along with the current participating countries.

The consultation process for the preparation of the AF project proposal has been guided by UNESCO and CCOP-TS with external support of IWMI and IGRAC, in close contact with national partners in the four countries. Crucial element in this process has been the possibility to obtain first-hand information, experience and input from local stakeholders through earlier and ongoing work in the four countries. This proposal is largely the result of this ongoing presence in the region and the approach underwrites the long-term engagement with the subject and, increasingly, also the awareness on significant vulnerabilities. Although the engagement of CCOP-TS and UNESCO with the groundwater CoP has been successful in its own right, the need was felt to raise the stakes and bring the challenge of CCA and supporting resilience to the forefront. Hence, this is one of the objectives of this AF project. In these project preparation workshops (listed below) also discussions were dedicated to the challenge of how to interact with stakeholders in such a way that vulnerable groups and women are prioritized. Consensus was made by all participants that girls and women in unsafe/polluted environment of GMS suffer from lack of freshwater access, sanitation problems and increasing vulnerability to water-related disasters. Special emphasis should be placed on sustainable groundwater supply to the rural poor, women in the vulnerable working environment and girls in unsafe conditions through continuous consultation and close collaboration with local community/NGOs/governmental bodies. In the characterization of the three proposed pilot areas (Annex I), further supporting information is provided as to the role of potential beneficiaries, vulnerable groups and groundwater users.

A summary of relevant activities of the international consultation process is provided in the table below.

Table 12: Overview of consultations and technical workshops with stakeholder groups, groundwater community experts and government agencies on issues relevant for the scope of the project, regional embedding and alignment. Directly and indirectly, the results of these consultations have fed into this proposal.

Consultation	Date/Place	Participants	Objective
Vietnam, Mekong Delta Participation in research workshop of Rise & Fall research on groundwater and land subsidence in Mekong Delta (https://www.uu.nl/en/futuredeltas/project-rise-and-fall)	March 2015, Can Tho, Vietnam	National and regional experts, international researchers, representatives from regional government agencies Mekong Delta	Dissemination of approach for and results of groundwater studies and climate adaptation approach, data collection, discussion on groundwater management in the delta provinces.
Consultations with village authority and households on community managed water supply for domestic use and agriculture.	April-September 2015; Ekkang village, Phonhong District, Lao PDR	Households comprised of ethnic minority groups, household heads, village authorities	Discussions to establish how communities self-manage groundwater supplies to reduce vulnerability to extreme seasonal water scarcity.
CCOP-KIGAM-UNESCO-DGR workshop on Sustainable groundwater Management in Mekong River Basin	May 2015, Bangkok, Thailand.	KIGAM, CCOP-TS, DGR (Groundwater Agency) staff, international and national experts, representatives of regional stakeholder groups	Discussions on regional cooperation for groundwater management, effects of climate change; Status reports on groundwater management practices in the countries; Discussions on the project concept.
Multiple meetings and workshops on development of Lao PDR groundwater policy, management and capacity development	April-September 2015, Vientiane, Lao PDR	MONRE officials Lao PDR, national groundwater experts, provincial officials and community representatives	Discussions on development of Lao PDR National groundwater Action Plan, Climate Adaptation & resilience measures; Discussions on the project concept.
Meetings on regional cooperation groundwater management	September 2015, Bangkok and Khon Kaen, Thailand	CCOP-TS, DGR (groundwater Agency) staff, experts of AIT, Chulalongkorn University, groundwater Research Centre Khon Kaen University	Discussion on technical issues (groundwater monitoring, data collection capacity development and regional cooperation).
Regional workshop on groundwater management BGR-NAWAPI	January 2016, Can Tho, Mekong Delta, Vietnam	National groundwater experts, provincial officials and community representatives; farmers groups and village people	Sharing experiences and practices on groundwater management, climate adaptation and resilience, discussions on the project concept
UNESCO-IGRAC workshop groundwater Monitoring Workshop for South-East Asia;	March 2016, Bangkok Thailand.	National groundwater and hydro met experts, provincial officials and community representatives;	Discussion on the technical project activities (monitoring, data collection and management), Capacity development and regional cooperation

CCOP-KIGAM training workshop on sustainable groundwater resource management with partner agencies from the Mekong region.	May 2016, Daejeon, Korea	National groundwater experts from Mekong region countries, provincial officials and national groundwater researchers in Mekong region	Discussions on groundwater status in each country and training on prediction and management of groundwater security.
CCOP-KIGAM-UNESCO-MME Workshop on “Climate Change and groundwater Resources in the Mekong River Basin”.	June 2016, Sihanoukville, Cambodia	National groundwater experts, provincial officials and community representatives; community representatives	Proposal preparation of this proposal, with representatives of all partners from the region
Farmer Consultation on Community scale groundwater irrigation	August 2016 Phousan village, Phonhong District, Lao PDR	Women and men farmers, agricultural extension officers, district officials	Consultation with farmers and other stakeholder on the viability of community scale groundwater irrigation based in initial results of a pilot trial
ACIAR-MAF Policy Dialogue	October 2016 Vientiane, Lao PDR	Vice Minister, Department Heads, government officials, researchers	Policy-science discussions on the potential role of groundwater-for-irrigation for small for agriculture in Lao PDR
UNESCO-IGRAC workshop on Monitoring for Regional and Transboundary groundwater Management for Vietnam	October 2016 Hanoi, Vietnam	National groundwater experts, provincial officials and international groundwater specialists	Discussion on the technical project activities (monitoring, data collection and management), Capacity development and regional cooperation
Participation in workshop of SALINPROVE project on Mitigating groundwater SALINity impacts for imPROVED water and food security in coastal areas under socio-economic and climate change	28 November – 2 December, 2016 Tra Vinh , Viet Nam	National and regional experts, international researchers representatives from provincial government agencies Tra Vinh, Mekong Delta, Vietnam.	Discuss the overall outcomes of the project, the activities and work plan for 2016/2017, the involvement of the stakeholders, and the data requirements and acquisition strategy.
Participation in workshop of Project on Adaptation to groundwater vulnerability of Asian cities to climate change: developing capacity to bridge the science and policy interface.	Asian Institute of Technology (AIT), Thailand 13-14 December, 2016	National experts from Thailand, Vietnam, Pakistan, and Indonesia; international researchers from Asian Institute of Technology (AIT), Institute for Global Environmental Strategies (IGES)	Shared a draft of methodology of groundwater vulnerability assessment and adaptation options and its application; Presented the overall status of groundwater resources in their respective cities and then prioritize major issues; Prioritized the groundwater vulnerability issues and indicators using multi-criteria decision-making and identify suitable set of indicators for vulnerability assessment, and finally prioritized potential adaptation measures.
Consultations and meetings on the use of groundwater for water supply in Lao provinces	Late 2016 and ongoing, Lao PDR	ADB, Lao PDR national groundwater experts, officials Ministry Public Works, Dept. Water Supply, provincial officials and community representatives (water supply sector);	Sustainable and responsible use of groundwater, resilience measures, capacity development, monitoring and data collection
Consultations on the AF reviewer’s comments and improvements to the project scope, risk assessment and environmental and social compliance issues.	Hanoi, March 20-21-22, 2019, Vietnam	Representatives of Myanmar, Thailand, Lao PDR, Cambodia and Vietnam (from the groundwater and climate change adaptation sector), technical partners and external experts	Collect information on the issues and discuss ESMP and other measures to ensure compliance with the Principles; review the general scope of the project and its activities and assess it meets national standards and objectives.
Community consultations in proposed pilot regions	All four participating countries, Feb-Apr 2021	Community members, CSO members (e.g. Women’s Union, Farmer’s Union), local leaders and water managers, other decision-makers.	Present project approach and activities to communities; assess climate change knowledge and attitudes; collect information on gender related to water and climate change.
Stakeholder validation workshop with project and country partners	Jakarta (on-line) April 23, 2021	Country and regional office representatives of the MIE, all executing partners, and government representatives of Cambodia, Lao PDR, Thailand, and Vietnam.	Present project approach and activities, discuss project safeguards strategy, and review project institutional arrangements.

UNESCO coordination and consensus building role builds on established experience in diverse programmes on environment and natural resources management, both in and beyond the region. UNESCO, through its diplomatic and official network, has access to, and is able to mobilise high-level political and institutional offices and support in the region. In this way, UNESCO was able to muster support for this proposal and this will be the way UNESCO will support during implementation. On the one hand disseminating

information on the project status, objectives and progress, and on the other hand seeking for confirmed political support, assistance (if needed) and promoting acceptance and embedding of verified project results.

CCOP-TS executive support: The CCOP-TS approach is such that progressively regional collaboration takes place without much external technical assistance; CCOP-TS has nearly 60 years of experience with keeping regional cooperative networks alive in this way.

In preparation of the proposal, important support was also gathered in the following consultative meetings:

1. CCOP-KIGAM-UNESCO-DGR Workshop on Sustainable Groundwater Management in Mekong River Basin 19-20 May 2015, Bangkok, Thailand.

CCOP Technical Secretariat, in collaboration with the Korea Institute of Geoscience and Mineral Resources (KIGAM), the UNESCO Bangkok Office and the Department of Groundwater Resources (DGR) of Thailand, co-organized this workshop on 19-20 May 2015 in Bangkok, Thailand. This meeting is within the framework of the five-year CCOP-KIGAM Project “Solutions for Groundwater problems in the CCOP region” funded by KIGAM since 2013.

The meeting was attended by 26 participants (45 % female) from CCOP Member Countries, Cambodia, Republic of Korea, Lao PDR, Myanmar, Thailand, Vietnam, international resource persons and CCOP-TS staff.

It was recognized from the presentation of country reports that Cambodia, Lao PDR and Myanmar have limited information available on groundwater resources and lack any mechanisms to regularly monitor groundwater for quality or quantity. On the other hand, Thailand and Viet Nam have adequate monitoring data at the national level. To address this dearth of information on groundwater and encourage collaboration in its management, a proposal was made during the workshop for the creation of a groundwater monitoring network and to provide technical support to countries in need of developing sustainable management plans for this resource.

Figure 18: Participants of the May 2015 workshop (not all shown in the picture)



2. UNESCO-IGRAC workshop, Bangkok, March 2016

UNESCO-IGRAC workshop Groundwater Monitoring Workshop for South-East Asia; On 15-16 March 2016, the workshop was held in Bangkok Thailand. The workshop was organised by UNESCO Bangkok Office, DGR and the IGRAC under the framework of the Global Groundwater Monitoring Network (GGMN) programme. In total 45 groundwater specialists from six countries (Cambodia, Iran, Malaysia, Myanmar, Thailand and Vietnam) attended the workshop.

Workshop objectives

The purpose of the workshop was to bring together national and international groundwater experts to review the state of groundwater monitoring in the region, to introduce the GGMN programme and its possible role in Southeast Asia. The workshop was also intended to build synergies and strengthen international water cooperation.

Results and Contributions

Presentations were given by country representatives to share experiences on the current state of groundwater

monitoring, information management and future challenges. The GGMN was introduced followed by a live demonstration of the [GGMN Portal](#). Participants explored the functionalities of the GGMN Portal to become familiar with the GGMN Programme and the GGMN Portal functionalities. There was an interactive session to identify the bottlenecks for proper groundwater monitoring and translate some of those into additional developments for the GGMN Programme.

Professor Yangxiao Zhou ([IHE Delft Institute for Water Education](#)) provided a presentation on groundwater monitoring in the Netherlands and the use and application of time series analysis for groundwater monitoring data. Afterwards, participants learned how to work with the time series analysis tool available in the GGMN Portal and how to create spatially interpolated groundwater maps using the GGMN Portal. Sangam Shrestha (Asian Institute of Technology) presented the recently published book: 'Groundwater Environment in Asian Cities: Concepts, Methods and Case Studies'. Dutch experts affiliated with IGRAC introduced the use of remotely sensed data for monitoring and the role of information technology and big data in groundwater research and management.

3. CCOP-KIGAM-UNESCO workshop Sihanoukville, Cambodia, June 2016

A workshop on "*Climate Change and Groundwater Resources in the Mekong River Basin*" was convened in preparation of this proposal, with representatives of all partners from the region (Sihanoukville, Cambodia, 1-4 June 2016).

CCOP-KIGAM-UNESCO-MME Workshop
"Climate Change and Groundwater Resources in the Mekong River Basin"

Date: 1-4 June 2016
Venue: Sihanoukville, Cambodia
Host: CCOP, KIGAM, UNESCO, and MME
Participants: Vietnam, Lao PDR, Cambodia, Thailand, Myanmar, China, Republic of Korea and international experts

Background
Groundwater is a valuable natural resource and one of the primary sources of water in Mekong River countries. Global climate change is expected to affect availability and sustainability of groundwater resources by altering hydrological cycles and groundwater recharge in the face of human activities (higher demand). Despite its importance, the impact of climate change on groundwater resources has received inadequate attention in Mekong River countries. The communication and collaboration between countries are required (1) to more urgently assess climate change effects on groundwater, and (2) to mitigate the impact of climate changes to the water resource supply in the Mekong River Basin.

Aims of the workshop
The objectives of this workshop were to promote sharing information and best practices among Mekong countries for assessing availability of groundwater resources under climate change and to support member countries to prepare for sustainable groundwater management. The key players of each country in the Mekong River Basin addressed major issues and status of groundwater management with changing environment. Strategies to enhance collaboration between neighbouring countries and to adapt to future climate change were discussed. The workshop provided opportunities to further understand the dynamic relationships between climate change and groundwater and to provide strategies for sustainable groundwater resource management in the lower Mekong River Basin.

In all, the sequence of regional meetings and workshops laid the foundation for the project concept and consensus on priorities and opportunities. The meetings were well attended by a regionally representative assemblage of groundwater experts, policy-makers and government officials responsible for natural resources management and CCA policies. The network has multiple important functions:

1. Share ideas and information on the status of groundwater resources management and alignment with national and regional government policies
2. Provide an opportunity to assess the status of national capabilities and mandates
3. Support regional cooperation, capacity building and knowledge exchange. The regional network is complemented and supported by international experts.
4. Identify opportunities and priorities for regional cooperation and increasing the impact of the sector.

It is believed that the series of workshop and bilateral meetings has resulted in a shared vision and ambition to use groundwater expertise and potential not just as an additional natural resource, but as a strategic asset, that, when used sustainably and responsibly, can make a significant contribution to climate resilience and livelihood improvement.

Until this stage, vulnerable groups and groundwater users in the four countries and proposed pilot areas have been involved indirectly in the proposal consultation process. The process of consultation will continue during the Inception of the project, and during project implementation, with direct consultations between the project team and national implementers and stakeholders in the pilot areas.

Because of the open and participatory nature of the mentioned consultation workshops (and characteristic for the approach of CCOP-TS and UNESCO in their programmes) the consultation and technical discussions are fruitful in bringing to the fore specific and/or new concerns from country representatives. As a result, this proposal incorporates and prioritizes some of those concerns, in particular **the engagement of groundwater experts and the groundwater CoP directly with stakeholders and groundwater users**. This approach is now much more at the core of the project. (Traditionally and very often discussions in groundwater expert group workshops, conferences, etc. deal with very specific technical and details and the workings of the physical groundwater system, and not so much with the interests of vulnerable groups). Primarily, in the consultation process, participants from the region, with firm connections to the “local” issues and groundwater users in the provinces, were able to specifically present their views and experiences. So, with participating international experts who work in the region, and groundwater workers from the four countries attending there was a strong link from groundwater users and vulnerable groups and their concerns to project conceptualization.

- (Inter)national experts and groundwater workers from the region involved in proposal preparation are actively working on the ground and have a strong link with groundwater users and stakeholder groups in the countries and in the proposed pilot areas
- Issues discussed and inserted into the project concept primarily reflect concerns of user groups and stakeholders, although these groups and their interests will be more specifically framed during project implementation, when we will bring on board experts in gender analysis and on regional indigenous communities

4. ESP Workshop for AF Designated Authorities, March 2019

Summary of March 2019 survey and workshop feedback Assessment of and compliance with national standards, guidelines and ESP Principles

In March 2019, representatives of the Adaptation Fund Designated Authority in each participating country took part in a consultative workshop to review and respond to the comments made as a result of the Adaptation Fund review of the proposal document. In addition to the workshop itself, representatives of the four countries were requested to provide feedback through a questionnaire circulated in advance. The questionnaire introduced and requested input relating to the following issues:

1. A further assessment on the risk of causing detrimental effects, for instance in relation to any of the 15 environmental and social principles.
2. How to ensure a gender balanced or gender positive approach and outcomes; possible additional measures.
3. Will proposed activities in the indicated pilot area require an Environmental Impact Assessment (according to government’s regulations)?
4. Consultations with stakeholders in the pilot regions, additional stakeholder groups (e.g. farmer groups, local water managers) that should be consulted?
5. The most urgent adaptation challenges and vulnerabilities
6. Project management and implementation set-up and capabilities; (is it adequate to monitor for, identify and mitigate possible negative effects of this project)?

Below, a concise summary of the questionnaire responses is presented, with particular emphasis on new and complementary information.

Questionnaire responses (a selection)

1. **Myanmar:** our assessment is that this project will not cause detrimental effects
Cambodia: The proposed activities do not cause detrimental effects to any of the Adaptation Fund environmental and social principles.
Vietnam: The proposal does not violate any of the proposed principles, but mainly brings practical benefits to participating countries. The first is for the lives of people living and directly affected around the Mekong River basin. Then, it is necessary for the countries to participate in improving the capacity of managing groundwater issues, ensuring the security of groundwater sources which are increasingly polluted and exhausted.
2. **Myanmar:** Institutional strengthening on the issue of gender balance
Cambodia: we suggest mainstreaming the importance of groundwater resources and its conservation and protection

in women and community educational programmes.

Vietnam: The proposal addresses the enhancement of interactions and allows women to benefit from the proposal that is entirely consistent with the social policies in Vietnam on gender equality.

3. **Cambodia:** for this project's activities no EIA is required in Cambodia.

Myanmar: In Myanmar, groundwater laws and regulations are not designated yet, but project activities will require an environmental impact assessment in accordance with government's regulations.

Vietnam: In the indicated pilot area of the project Environmental Impact Assessment is required in accordance with our government's regulations base on Law on Environmental Protection (No 55/QH13, 2014).

4. **Cambodia:** Consultation may be conducted with the line ministries related to the consumption and protection and conservation of water resources that include the Ministry of Environment, Ministry of Water Resources and Meteorology, Ministry of Agriculture, Forestry and Fisheries, Ministry of Rural Development, Ministry of Mines and Energy, and the Ministry of industry and Handicrafts. Consultation can also involved the local authorities such as provincial departments and communities in the pilot areas in each province.

Myanmar: stakeholder groups have little knowledge of groundwater management, while they see it is a valuable resource; hold meetings with villagers and water user groups sharing awareness of groundwater in the pilot regions.

Vietnam: several methods are proposed for stakeholder consultation: 1. Question - Answer; 2. Obtain consultations through the internet (website - consult; Social media, 3. By documents and official letters are sent to grassroots levels for consultation.

5. **Vietnam:** The most urgent challenges and vulnerabilities in our country's pilot area are: 1. Uneven population distribution, low awareness of water resources protection, indiscriminate exploitation of underground water. mainly depends on demand, not interested in potential; 2. The network of water resources monitoring and supervision is not fully synchronized to fully assess the quality and quantity; The current situation of exploitation and use is still inadequate.

Cambodia: A regular monitoring program should be established and groundwater information should be available to local groups; Important issues are: Access to and uncontrolled use of groundwater and tube well installation, over-pumping; resources assessment: Quantity and quality of groundwater: How much groundwater is available?; location of suitable recharge zones, protection and conservation of recharge zones.

Myanmar: Groundwater laws and regulations; in Myanmar groundwater laws and regulations are not designated yet; need a strong groundwater data exchange programme among institutions.

6. **Vietnam:** The project management and implementation set-up can deliver the expertise and capability to monitor for, identify and mitigate possible negative effects of this project.

Cambodia: The management and implementation setup is very appropriate for this project; All expertise and capability are included.

Myanmar: There is no missing expertise

Consultation workshop on the AF reviewer's comments and improvements to the project scope, risk assessment and environmental and social compliance issues. Hanoi, March 20-21-22, 2019, Vietnam; With representatives of Myanmar, Thailand, Lao PDR, Cambodia and Vietnam (from the groundwater and climate change adaptation sector), technical partners and external experts.

5. Stakeholder Validation Workshop, April 23, 2021

The stakeholder validation workshop was led from Jakarta and conducted on-line on Zoom. It involved 22 participants representing all participating countries, the MIE, and all project partners. The list of participants is provided below.

Stakeholders confirmed the timeliness and importance of the project, and no concerns were raised regarding the project approach and/or activities. Feedback on the current version of the proposal included the following:

- Agreement with the proposal to proceed with a four-country project in light of the political situation in Myanmar.
- Support for the capacity strengthening activities under the project, particularly activities and training that build the capacity of officials at the communal level. Community-level training and capacity strengthening is noted in Components 2 and 4 of the project.
- The importance of water quality to users. This is highlighted in information to be collected and monitored, and training and information dissemination will include information on water quality.
- The need to provide tangible investments in infrastructure in the participating communities. The major activities and outputs under Component 3 now emphasize this work and specify the tasks necessary to support it. Corresponding safeguards are described in Part III and Annex V of this document.
- Updates on in-country activities and policy developments. Updated information has been provided by partners and is now included in the text of the FP).

Project partners also summarized the community consultations briefly. While COVID-19-related restrictions on travel and meetings complicated the scheduling and logistical process, consultations were possible in all countries due to the use of hybrid in-person/remote events in some countries and the use of off-line consultations via telephone where needed. These consultations are described in Annex III.

List of participants:

ID	Name	Country	Institution / organization	Gender	Position
1	Nguyen Vu Minh	Vietnam	NAWAPI, MONRE	Man	Staff
2	Marivic Pulvera Uzarraga	Thailand	Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP)	Woman	Manager, Project Information and Operation
3	Dr. Alin Chintraruck	Thailand	Department of Groundwater Resources	Woman	Head of International Relations Unit
4	Mr. Thatree Intharasut	Thailand	Department of Groundwater Resources	Man	Plan and Policy Analyst
5	Mun DoungNimol	Cambodia	Department of Green Economy, General Secretariat of Sustainable Development/Ministry of Environment	Woman	Vice-Chief Office
6	Khampasong Khamvene	Lao PDR	Department of Climate Change, MONRE	Man	Technical officer
7	Meng Eang Taing	Cambodia	National Council for Sustainable Development	Man	Director of Green Economy Department
8	Lan Huong Tran	Vietnam	UNESCO	Woman	National Professional Officer
9	Nissay Sam	Cambodia	UNESCO Phnom Penh	Man	National Project Officer
10	Viet Anh Le	Vietnam	UNESCO Vietnam	Woman	Project Officer
11	Paul Pavelic	Lao PDR	IWMI	Man	Senior Researcher
12	Hans Dencker Thulstrup	Indonesia	UNESCO	Man	OIC
13	Adhe Wulandari	Indonesia	UNESCO	Woman	Project Assistant
15	Sovichea LEANG	Cambodia	Department of Green Economy-National Council for Sustainable Development/MoE	Man	Deputy Director
16	Neno Kukuric	The Netherlands	IGRAC	Man	Director
17	Susan Legro	Czech Republic	E Co	Woman	Key Associate
18	Kongkea Phan	Cambodia	Department of Green Economy, National Council for Sustainable Development	Man	Vice Chief of Office
19	Sriharsha Masabathula	Cambodia	UNESCO Phnom Penh Office	Man	Associate Project Officer (Science)
20	Young Joo LEE	THAILAND	Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP)	Man	Director of CCOP

21	Dhiti Tulyatid Bustamam	Thailand	CCOP	Man	Regional Expert
22	Koetapangwa	Indonesia	UNESCO	Man	Project Assistant

Annex III: Summary of 2021 Community Consultations

This annex provides information on the community consultations held in 2021

Purpose

- Present the project approach and activities to participating pilot communities;
- Assess climate change knowledge and attitudes; and
- Collect preliminary information on gender and women's participation related to water and climate change.

Dates: February, March, and April 2021

Overview

Cambodia

The consultation in Cambodia involved representatives of 43 communities and additional stakeholders representing groundwater groups, including decision-makers such as provincial authorities and district governors. It was organized by the Department of Green Economy (DGE) of the General Secretariat of the National Council for Sustainable Development at the Ministry of Environment in April 2021.

In Cambodia, two pilot areas for the project have been identified: 1) Takeo, Kandal, Prey Veng and Svay Rieng Provinces as part of Upper Mekong Delta trans-boundary aquifers in Vietnam and Cambodia; and 2) Banteay Meanchey, Oddar Meanchey, and Siem Reap provinces as part of the North-West Cambodia – Eastern Thailand trans-boundary aquifers. The 43 communities and groundwater users participating in the consultation included 7 communities from Banteay Meanchey, 9 communities from Oddar Meanchey and 4 communities from Siem Reap, 5 communities from Prey Veng, 5 communities from Takeo, and 13 communities from Svay Rieng.

Methodology: Contact details of each community were collected through the coordination of Provincial Department of Environment in each target province. Community consultation has been conducted by phone call to all participants following the development of a consultation schedule in Annex 1. The consultation was conducted by DGE team as a structured discussion with communities and groundwater users following a standardized list of questions.

Findings: Respondents identified climate threats to Cambodian communities, such as prolonged drought, which might affect the household socio-economic status and livelihoods in rural areas, because most of the population in those areas rely on groundwater for agriculture, including rice production and other crops, and their day-to-day personal consumption. They reported that communities are experiencing groundwater shortages at the end of dry season. In addition, the quality of groundwater is poor in some areas along Cambodian-Vietnamese border. Arsenic and other contaminants hazardous to human health have been reported. Local authorities sometimes prevent people from using their groundwater for rice production during droughts in order to save groundwater sources for drinking and household use. This consultation indicated that technical assistance on sustainable consumption and management of groundwater as well as the improvement of groundwater quality would be helpful for rural Cambodian communities.

Gender gaps: The community representatives consulted in the Upper Mekong Delta region reported a gender imbalance in decision-making structures; i.e., few women are involved in local community councils and community services. The representatives in the Northwestern Cambodian communities bordering Thailand also reported a gender imbalance in decision-making structures.

Specific comments/suggestions included the following:

- *Importance of awareness-raising regarding groundwater use:* Disseminating clear messages containing simple and useful information on the impacts of climate change and/or water pollution in communities to help safeguard lives and livelihoods.

- *Importance of awareness-raising regarding climate resilience:* Communities should be informed on domestic water options, available escape routes from flood and storm, and how best to avoid damage and loss to property.
- *Need for information at the community level:* Weather forecasting and groundwater monitoring data should be available.
- *Need for water management infrastructure:* Communities should have access to a more resilient water supply and irrigation infrastructure.



Drought in the Kulen Water User Community, Seam Reap Province, Cambodia

Lao PDR

The consultation in Lao PDR involved 16 stakeholders, and of that number, 5 were women. Target participants included the following:

1. Department of Water Resources including the various Divisions that operate within the Department (DWR)
2. Department of Disaster Management and Climate Change (DDMCC)
3. Water Supply Enterprise (Nam Papa)
4. Center for Water Supply and Environment Health (Nam Saat)
5. Department of Irrigation (DOI)
6. National Agriculture and Forestry Research Institute (NAFRI)
7. Lao Women's Union
8. National University of Laos (NUOL), Faculty of Water Resources

Due to another outbreak of COVID-19 in the days prior to the workshop, there was incomplete representation of these stakeholder organizations.

The workshop was chaired by Dr. Inthavy AKKHARATH, Director General of the Department of Water Resources. The meeting conducted at the DWR office in Vientiane and officially opened at 8:30am on 21st April 2021 with the remarks made by Dr. Inthavy AKKHARATH.

Two presentations were also provided by Ms. Poupey KEOVONGDY representing IWMI: "Groundwater resources in the Greater Mekong Subregion: Collaborative management to increase climate change resilience"; and "Proposed Activities in the Lao Pilot Area."

All participants agreed with the proposed pilot area on the Vientiane Plain.



Workshop participants (left), Discussion Session (right), Vientiane, Lao PDR

A series of questions were posed to the participants (as given in italics below) during a structured discussion session, and the responses are summarized below:

- *How important is groundwater in the Vientiane Plain?*
Groundwater (GW) is a significant and important resource for the Vientiane Plain as it supplies water to people and communities in remote areas that cannot access surface water or piped water. GW provides ecosystem protection, water supply, agriculture, households, industries. Moreover, we can use solar energy to pump GW.
- *The main problems faced when developing GW?*
The main problems are lack of drilling management system and cannot manage GW user due to insufficient knowledge and research about detailed GW data, saline and chemical issues, cost of drilling, pumps, pumping water, lack of information about irrigated farming systems.
- *How to manage groundwater in better and sustainable way?*
There should be legislation, guidelines and regulations in GW management; accurate data by developing models of GW use, embedding GW use, information dissemination to communities using posters and other materials, various sectors contribute in management, build capacity and high roles, GW user should have understanding on GW use, registration of drilling companies, inventory of GW, permit of GW use, study and survey GW to issue the license for GW use, research and evaluation of GW quantity in aquifers system and vulnerability or risk assessment in development of several sectors.
- *How can GW users (households, farmers, business) contribute to managing GW?* Develop GW management committees at the local level and define regulation, roles and responsibilities clearly, establish management fund to protect and maintain the water system, collaboration of information providing, integrated using, plan together for GW management to avoid the conflict, use water sparingly, should be permitted.
- *Does GW have certain characteristics that make it attractive for helping communities to adapt to climate change?*
Groundwater can replace surface water that have dried up due to climate change, it can be assured of better quality compared to surface water, especially when supplied as drinking water and household, GW can address the drought area.
- *Is GW being threatened by the effects of climate change?*
Climate change will cause lack of rainfall and dry up surface water, reduction of groundwater volume, groundwater flow changes, contamination, changes in GW quality.
- *How do the roles of women and men differ when it comes to GW?*
Women will play a greater role in household water use, while men will be more involved in agriculture. However, women and men should be involved and have an equal role in joint groundwater management.
- *Is there an activity or activities that you think are missing and should be included?*
 - GW management database system should be developed in order to utilizing in the future (nationwide)
 - Develop the legislation and management activities for suppliers (Entrepreneurs) into the system

- There should be more groundwater drilling activities for water-scarce communities to encourage communities to improve their livelihoods
 - Increase activities that promote community responsibility and be able to monitor groundwater conditions in order to the project is sustainable and can be used effectively
 - Provide evaluation and monitoring activities after the completion of the project
 - Add video production activities in the pilot area to inform and disseminate lessons in groundwater management
- *Is there an activity or activities that seem unnecessary to you?*
All activities are considered necessary.

Thailand

The community consultations in Thailand involved a total of 70 stakeholders, including 39 women. The geographic focus of the consultation was Nong Khai and Surin, two provinces that will participate in the transboundary aquifer activities in the project. Participants consisted of local community leaders and local representatives who use groundwater for personal consumption and agriculture. A majority of interviewees (over 90%) are involved in the agricultural sector, specifically rice cultivation. Over half of interviewees were 40 – 60 years old, 11 people were younger than 40, and 9 people were over 60. All participants grow rice as a main crop and also do polyculture farming for extra income in the dry season.

Methodology: The consultations consisted of personal interviews, both individually and as a group.

Groundwater resources: All participants are aware of the importance of groundwater resources as it is the main water source for agriculture and domestic consumption during the dry season. Groundwater supplies have been developed by the Thai Government's Department of Groundwater Resources (DGR) in cooperation with local authorities. In Nong Khai, a great number of people tend to rely on groundwater more because the Mekong river level has dropped dramatically due to activities from Chinese and Laos dams. Most of participants informed that groundwater quality is better than surface water since it is clean and less contaminated. However, turbidity and salinity are present when there is greater demand of groundwater in the dry season. In addition, Nong Khai has recently experienced groundwater degradation due to overuse. In Surin, most participants reported that groundwater quality was good for agriculture but not as good as surface water because it is brackish and water hardness is present. In Sangkha the subdistrict, participants reported that there is water pollution issue due to wastewater from the nearby landfill contaminating surface water storage.

Gender: For Surin and Nong Khai, most participants perceived that females have played an important role in local community activities such as leading the meeting and have a high position in the local community. They said that drought has affected both women and men similarly.

Knowledge and attitudes related to climate change: In Nong Khai, over half of participants understand and are aware of the causes and impacts of climate change on their daily lives. They have experienced severe climate events such as long period of drought, rising temperatures, and unpredictable weather patterns. In contrast, over 80 % of participants in Surin are not aware of climate change, but they could identify its causes such as deforestation and burning crops. Participants from both provinces have suffered from climate change such as stress, less income and lower agricultural products.

Interview findings:

- Local communities can survive drought events by changing the agricultural practices from growing rice to growing low-water plants. However, climate change has triggered water shortages that reduce yields, leading to reduced income and health problems, especially stress, for many participants.
- Unlike most research results regarding climate change and gender equality, most participants felt that climate change affects both women and men similarly. This is probably because both genders live their lives similarly hold the same jobs, and the proportion of females having a significant role in politics is similar to the proportion of men.
- Governmental agencies play a critical role in drought mitigation by providing sufficient groundwater supply for local communities.
- Raising awareness regarding adaptation practices of climate change is necessary.



Day 2, Surin Province (left) and Day 2, Nong Khai Province (right), Thailand

Vietnam

UNESCO Vietnam, in partnership with the National Center of Water Resources Planning and Investigation (NAWAPI) - Ministry of Natural Resources and Environment (MONRE), organized a one-day provincial consultation workshop in An Giang province, Vietnam, on March 11, 2021.

Representatives from three target provinces in Vietnam (An Giang, Dong Thap and Long An provinces) were invited to the consultation workshop. Participants included local leaders and the following community stakeholders and organizations:

- Department of Natural Resources and Environment
- Department of Agriculture and Rural Development
- Sub-department of water resources
- Water supply companies from 3 provinces
- Representatives from participating districts in An Giang, Dong Thap and Long An Provinces
- Women Union
- Farm Union

Methodology: An audience-centered, gender-sensitive, and bottom-up approach was applied. It was agreed that during different discussion/consultation sessions, on-site moderators with a combination of qualifications including a basic grasp of the project proposal in general and of the consultation requirements in particular, together with good interpersonal skills, were to be used to moderate the workshop. The participants were first divided into two groups (by gender) for a focus group discussion to collect relevant information about community awareness and experiences with climate change and climate-risk using a gendered approach. They were then divided into three groups (by province) for a discussion of climate risk. Each focus group was led by an impartial moderator and documented by a note-taker from the organizers.

Findings:

- *Climate-related threats in the community:* In regards of climate-induced threats unpredictable soil erosions, droughts, salt intrusion, water shortage, unseasonal rainfall and floods, thunderstorms were progressively-damaged listed as significant climate events over last recent years (recent 5 – 10 years), leading to adverse impacts to the people's lives, namely limited access to clean water (hygiene, healthcare during dry season/water shortage), parts or all of life-time saving lost (income, lands, houses, utilities, crops etc.), while schooling activities have luckily been unaffected. The women's focus group made an interesting point, though; where seasonal floods normally are slow-rising floods bringing substantial rich natural aquatic resources, the last high flood was recorded with 5-10-year frequency that significantly affected aquaculture areas of the people.
- *Responses to climate threats:* When discussing community responses, the authority (central Government and local units) together with local business and people come up with various resilience activities such as relevant national support programs, policies (irrigation water supply projects for the mountainous areas, irrigation system regulations) to different structural and non-structural measures (in-place emergency water supply stations, canal dredging, cropping plan modifications, saving and storing water). With the question of how a theoretical stimulus payment of \$500 for supporting households in response to climate risks could be used, participants suggested expanding water storage capacity (digging more lakes and wells, water containers) or maintenance of agricultural production equipment or buying insurance (for lives and crops).

- *Gender and climate threats:* Participants observed that women were more affected by the impacts of drought and water shortages on hygiene (childcare, chores, psychology) of the whole family, while men are affected due to being in charge of cropping and manual tasks. While most of participants have expressed the participant/involvement of women holding high profile positions (leaders) in local government in all three provinces at an average level, account 10-30% in management authorities (ranked 1-3 over 5 points), both groups noted that there have been inherent obstacles such as childbirth and lack of family support in finding opportunities for capacity building. The participation of women in on-the-ground activities (community/hamlet/village meetings on awareness raising about environment protection, climate change) is quite high.
- *Self-assessed knowledge and awareness of climate change:* All participants responded instantly when naming factors contributing to climate change, such as temperature increases, decreased water levels, emissions of CO₂, population growth, and human activities especially which causing droughts, epidemics, soil erosions, ice melting, irregular extreme weather conditions. It reflected a fair knowledge of climate change and its impacts on local situation, which can be explained by fact that the Mekong Delta in Vietnam has been considered as a top priority of the Government of Vietnam in supporting climate change adaptation and mitigation over last 10 years (reflected by the Resolution 12/NQ-CP on Mekong Delta), and by the investment of many development partners in the region, where many projects have been implemented.

All of these participants marked climate change as “serious” to “very serious” problems (problem wise in female groups) or regions having “serious” to “very serious” impacts (region wise in male group). In terms of impacts on personal life, the men’s focus group raised a good point where climate change made people realize how badly humans have been doing with chemicals and gas emissions. Although considering most current frequent hazards includes drought and salt intrusion (in dry season), in regard to most severe climate change impacts, participants from all three provinces agreed that it was top soil erosion (in riverbanks), as it causes the largest damages in terms of money and people’s lives.

- *Climate risk identification:* All participants seemed to be very clear about the problems/issues that his/her provincial community have been facing which, apparently, vary province by province, especially in Long An and Dong Thap. When it comes to listing all the hazards and potential threats, Long An community representatives tended to refer more to big disasters such as droughts, salt intrusion, thunderstorms, tropical depressions, while participants from Dong Thap focused on more specific issues, including temperature increase, water table depletion, high mineralization, land slides, land subsidence, degradation of water quality.

Regarding to potential impacts and vulnerabilities, the participants from the three provinces shared opinions where livelihoods (agricultural and industrial production, and domestic uses) and incomes of residents, especially those belong to disadvantaged and vulnerable groups, and pressure applied to the authorities, ecosystem are among those with most adverse impacts. In the meantime, they all agreed that the best early warning systems are monitoring stations, and there were gaps in procedures, measures, warnings, logistics, awareness or knowledge.

- *Current adaptive measures:* In spite of lacking in-depth knowledge, residents, especially farmers, with coordination by local authorities, have been practicing various measures to combat climate change. For example, one measure is to adjust crop planning upon the area of ring dikes. In addition to normal interventions like increasing water storage, local authorities and residents are also on their way to working with “soft” measures such as agricultural insurance, taking into account its inherent complicated procedure. This shows the willingness to change of the people and the authorities to live with the situation.

Contributions: The participants suggested potential activities under the project as follows:

- Adding surface water monitoring stations and develop database of remote groundwater monitoring stations as well as groundwater early warning system for the people (An Giang province);
- Adding at least two groundwater monitoring stations adjacent to Cambodia, their connection to the national monitoring network and adding quantitative assessment of groundwater (Dong Thap province);
- Groundwater recharge structures/interventions for the whole Vietnam Mekong delta (Long An province);
- Carry out the assessment of groundwater quantity (groundwater accounting and maps) in order to improve management and allocation;
- Integrated regional planning for water management (fresh and groundwater);
- Capacity building and information sharing with most updated knowledge on what and how to cope with the ever-changing conditions of climate change impacts and development of surface and groundwater

water planning (reinvestigating the abstraction of groundwater) and investigation for the sources of recharge both to develop emergent scenarios (all three provinces).



Participants in the Three-Province Consultation, An Giang Province, Vietnam

Annex IV: Gender Analysis

This assessment is designed to conform to guidance from the Adaptation Fund Board on Gender.⁴⁷ It is seen as one component of the project's holistic approach to gender throughout the project cycle in the following way:

- This document represents a **gender analysis** as recommended under AF procedures.
- The **project framework** includes gender-specific activities, such as working to maximize women's participation in local risk reduction planning. It also includes targets for women's meaningful participation, and the project monitoring and evaluation budget supports the collection of gender-disaggregated data.
- In addition, the project will monitor the **share of women and men who are direct project beneficiaries**, and it will also monitor the nature of these benefits.
- Finally, project targets and activities will be monitored in **project reporting**, both in annual reports and in the mid-term evaluation and the terminal evaluation.

The initial gender assessment here provides country and regional context on gender issues and identifies areas relevant to project design and implementation in climate change adaptation and specifically for water management and related threats. The inputs for this analysis include a desk study and review of demographic data and research literature, expert consultations, and direct input from women and men in communities at risk of these hazards.

Regional and Country Context

As UN Women describes gender in the context of the project region, "The Asia and the Pacific region contains some of the world's most powerful economies—and two-thirds of its poorest people. Rich in political, cultural and other forms of diversity, it faces common challenges from stark socioeconomic disparities, including those linked to gender. Many countries have made formal commitments to gender equality, but implementation is undercut by a variety of factors, from limited resources to inconsistencies in upholding laws to upheaval from natural disasters." (UN Women 2020).

It should also be noted that there are broad and significant differences in gender equality in the participating countries, which are reflected in levels of participation, levels of discrimination, literacy, and economic activity (see the "Relative Measures" section below). Two of the participating countries, Thailand and Vietnam, have gender and development indexes (GDIs) that place them in the top ten in the world, while Cambodia (118th) and Lao PDR (114th) face different circumstances. In part, this is due to divergent trends in women's literacy: there is a 20-percentage-point difference across the four countries.

Even within individual participating countries, there are notable differences between women in urban and rural areas. As one regional study notes: "The aggregated HDI and GDI indicators do not differentiate between urban and rural women. The progress achieved by a large number of urban women across Asia disguises the low human development indicators and extreme gender inequality among rural women in many parts of the continent, especially in South Asia. The South Asian countries struggle under the burden of persisting **rural gender inequality** although women directly contribute to food production as cultivators, labourers and family workers in the agriculture sector. Rural women continue to struggle with dual responsibilities of economic production and domestic labour, and most are confronted by poverty, illiteracy, high health risks, inadequate access to productive resources, health and sanitation services and denial of market access in the profitable food sectors."⁴⁸ At a more basic level, the study notes that "The foremost obstacle to the advancement of rural women in the Asia and Pacific region remains the persisting traditional perceptions of women's lower social status."⁴⁹

Finally, communities across the four participating countries share a common problem: women are more vulnerable to climate change threats and are on the whole less resilient to these threats due to a number of socio-economic factors, including educational attainment, wage gaps, participation in decision-making bodies, and division of labor.

Cambodia

⁴⁷ AFB 2017.

⁴⁸ Balakrishnan 2005. <http://www.fao.org/3/af348e/af348e05.htm>

⁴⁹ Ibid.

Cambodia has a population of more than 16 million people. 51% of the population is comprised of women. In 2018, life expectancy for women was estimated at 71.6, while life expectancy for men was estimated as 67.3. As one 2020 report concludes, “Cambodia has moved forward on gender equality.... After several years of levelling off, a positive trend has returned, with a narrowing of average gender gaps in income, education and life expectancy. Cambodia’s score on the index remains weaker than some of its neighbours, however.”⁵⁰

Labor market participation for women was 77.2 percent in 2016,⁵¹ and a national report found that “Though women run 65 percent of all enterprises, men’s businesses are bigger than women’s enterprises on average. Therefore, women are engaging in less profitable businesses than men, and access to financial and business development services are crucial to the growth of women’s enterprises.”⁵² However, there have been some improvements in participation in professional sectors, and a recent report noted women’s rising shares in decisionmaking and executive positions, and higher levels of participation in higher education.”⁵³

Limited participation in decision-making has also been observed in community based natural resources management (CBNRM), and “Sometimes, marginalized groups such as women, widowers, young people and the very poor fail to gain benefits from CBNRM. They may not have the time, capacity or status to attend community meetings, meaning they are left out of decisionmaking and do not receive information about their rights.”⁵⁴ The same study notes that “Recent efforts to comprehensively integrate gender perspectives in CBNRM indicate growing recognition of women’s specific roles....Too often this becomes simply a focus on women, however, without examining power structures and how men and women relate to each other in decision-making,”⁵⁵ and “Powerful community members dominate decision-making and monopolize benefits while further marginalizing disadvantaged groups, especially women and the poor.”⁵⁶

Lao PDR

Lao PDR has a population of approximately 7.1 million people; in the 2015 census, there were approximately 101 males for every female. Life expectancy at birth is 70.8 years for women and 67.0 years for men. The women’s literacy rate is 79%.

65% of the population lives in rural areas. As of the 2015 census, 61% of households had access to improved water.⁵⁷ As the census noted, “Only seven percent had access to piped water, which suggested infrastructure for distribution of water through a community water system was still undesirably limited. As a consequence, a large proportion of households (36 percent) bought and consumed bottled water available commercially.”⁵⁸ The census report also noted that “Drinking water sources varied depending on where households resided....Ninety percent of urban households had access to improved sources of water, while only 13 percent who lived in rural areas without roads did so.”⁵⁹

72% of jobs are in the agriculture, forestry, and fishing sectors, and 51.3% of jobs in those sectors are held by women. Women comprise 48.9% of the labor market.⁶⁰

Thailand

The population of Thailand has been estimated at 69.4 million people (2018), and of that, 51 % are women (2012). More than half of people in Thailand were living in rural areas as of 2012 (NESDB); however, this statistic does not reflect internal migration for seasonal employment. Average life expectancy for women is 78; for men, it is 72. Female literacy is estimated at 92% (2018).

Labor force participation for women is lower than for men in all income categories, and women’s unemployment is slightly lower than men’s unemployment, although both official rates are very low (.7 and .8, respectively).

⁵⁰ Cambodia NHDR 2020: 29.

⁵¹ Cambodia NHDR 2019 (Jan 2020): 24.

⁵² UNGA Report on Rural Women in CEDAW 6th Periodic Report.

⁵³ Cambodia NHDR 2020: 30.

⁵⁴ Ibid: 91-2.

⁵⁵ Ibid: 92.

⁵⁶ Cambodia NHDR 2019 (Jan 2020): 86.

⁵⁷ Lao Statistics Bureau (2015): 9.

⁵⁸ Ibid.: 92.

⁵⁹ Ibid.: 93.

⁶⁰ Ibid.: 80.

From 2000 to 2019, the share of women employed in agriculture dropped from nearly half of the women's workforce (47.6%) to 28.7%, while the share of women working in the service sector jumped from 35.1% to 51.6%, or just over half of the total women's workforce.⁶¹

A 2018 National Seminar on Promoting Women's Leadership and Political Participation summarized the state of women's participation as follows: "The seminar affirms gender inequality and discrimination remains in the Thai society and politics. High levels of inequality in the distribution of representation, voice, and influence between women and men in politics reveal the pervasive nature of conscious and unconscious bias against women. Social norms, traditional attitudes, and stereotypes discourage women from entering politics and put them in subordinate roles. Women's political participation is still limited by age, gender, social status and religious beliefs...Most lawmakers and decision makers at national and local levels are men, and there remain insufficient knowledge and understanding of gender equality issues among some government officials and politicians."⁶²

Vietnam

As of 2019, there were approximately 48.31 million females and 48.15 million males in Vietnam. The share of women working in agriculture dropped from 66% in 2000 to 39% in 2019, while the share of women working in industry increased over the same period from 10% to 23%.⁶³

While overall labor force participation was lower for women than men in all income categories, UN Women cites a report from the General Statistics Office from 2015 that found "In some rural areas, up to 63.4% of working women are in agriculture compared to 57.5% of working men. Rural women make substantial contributions to Viet Nam's economic growth. However, rural women and girls remain among those most likely to experience poverty and lack access to resources such as land, agricultural extension, finance, education and healthcare."

Approximately 27% of seats in parliament were held by women in 2018, but women held only 4% of ministerial jobs.⁶⁴

Gender Equality Policy and Institutional Framework

CEDAW and CEDAW reporting

Cambodia, Lao PDR, Thailand, and Vietnam are all parties to the UN Convention on the Elimination of All Forms of Discrimination against Women (CEDAW).

Parties to CEDAW are to file periodic reports to the Convention. Cambodia's most recent report was its Sixth Periodic Report, which was submitted in 2018.⁶⁵ Lao PDR submitted its 8th and 9th Periodic Reports in 2017.⁶⁶ Thailand submitted its combined 6th and 7th periodic reports in 2017, and Vietnam submitted its 7th and 8th periodic reports in 2018.

Relevant Legislation and Institutions

Key policies and regulations related to gender in the GMS are listed in Table 1.

Table A3.1: Key Gender-Related Legislation and Institutions in the Greater Mekong Subregion

County	Primary and Secondary Legislation	Key Government Agencies
Cambodia	The Constitution of the Kingdom of Cambodia	Ministry of Women's Affairs, the Cambodia National Council for Women, the Technical

⁶¹ World Bank Gender Data Portal. <https://www.worldbank.org/en/data/datatopics/gender/country/Thailand>

⁶² UN Women: <https://asiapacific.unwomen.org/en/countries/thailand/promoting-womens-leadership-and-participation-in-decision-making>

⁶³ World Bank Gender Data Portal. Accessed December 2, 2020.

⁶⁴ Ibid.

⁶⁵ https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/KHM/CEDAW_C_KHM_6_7162_E.pdf Accessed 1 Dec 2020.

⁶⁶ [CEDAW/C/LAO/8-9](#). Accessed 1 Dec 2020.

County	Primary and Secondary Legislation	Key Government Agencies
	National Strategic Development Plans (gender is mainstreamed)	Working Group on Gender, gender mainstreaming action groups in the government line ministries, and new women and children's consultative committees (WCCCs) at all levels of subnational government.
Lao PDR	Constitution National Socio-Economic Development Plan	Lao Women's Union (LWU) National Commission for the Advancement of Women (NCAW)
Thailand	Women's Development Plans under the National Economic and Social Development Plan process Gender Equality Act (2015) Gender-responsive budgeting	Office of Women's Affairs and Family Development (OWAFD), Ministry of Social Development and Human Security National Commission on Women's Affairs and Family Development
Vietnam	The Law on Gender Equality National Action Programme on Gender Equality over the 2016-2020	Ministry of Labour-Invalids and Social Affairs (MOLISA)

Source: Various, CEDAW reports.

Regional multilaterals institutions include UN Women, which has a regional office in Bangkok and country offices in the region, the OECD Southeast Asia Regional Program, and ESCAP (gender statistics).

It should also be noted that non-governmental organizations can play significant roles in women's awareness-raising and empowerment, and there are examples of NGOs that address women's issues in all participating countries. For example, in Thailand, Women Human Rights Defenders have prepared a CEDAW report card for the country, while the Indigenous Women's Network of Thailand (IWNT) and Asia Indigenous People's Pack (AIPP) submitted an NGO CEDAW Shadow Report for the country, which includes information on land and natural resources.

Regional NGOs include Asia Pacific Women's Watch (APWW), which is a large voluntary activism network based in the Asia and Pacific Region working on gender equality and women's advancement. APWW has Special Consultative Status with the United Nations Economic and Social Council.⁶⁷

In addition, all of the participating countries have adopted the 2015 UN Sustainable Development Goals (SDGs). As a result, they have committed to progress under SDG 5: "Achieve gender equality and empower all women and girls." As a result, countries are to take steps to achieve this goal, to achieve nine specific targets that include ensuring the provision of necessary public services and infrastructure (5.4) and ensuring women's access to communication technologies (5.B), and to monitor progress towards the targets established.

Relative Measures of Gender Equality and Discrimination

Gender Development Index (GDI)

In 2014, UNDP introduced a new measure into its Human Development Reports: the GDI. This measure is based on the sex-disaggregated Human Development Index, which is defined as a ratio of the female to the male HDI. As such, the GDI is meant to identify gender inequalities in three basic dimensions of human development: health (measured by female and male life expectancy at birth), education (measured by female and male expected years of schooling for children and mean years for adults aged 25 years and older); and command over economic resources (measured by female and male estimated GNI per capita). The 2016 GDI values for the participating countries and their relative global rankings are as follows:

⁶⁷ <https://apww-slwnogof.org/about/>

Table A3.2: GDI Values and Relative Ranking by Country (2016)⁶⁸

Country	GDI	Global Rank
Cambodia	.919	118
Lao PDR	.929	114
Thailand	.995	9
Vietnam	1.003	5

Social Institutions and Gender Index (SIGI)

This measure, which has been developed by the OECD and results in a score between 0 and 1, clusters 108 countries into five levels of discrimination: very low, low, medium, high and very high. In 2019, discrimination in the GMS countries was rated as follows:⁶⁹

Country	SIGI	Level of Discrimination
Cambodia	30%	Low
Lao PDR	26%	Low
Thailand	35%	Medium
Vietnam	25%	Low

Global Gender Gap Index (GGGI)

The World Economic Forum also calculates a gender index: the Global Gender Gap Index. Of the 152 countries covered by the World Economic Forum's Global Gender Gap Reports in 2019, the participating project countries have the following index and relative rank.

Country	GGGI	Global Rank
Cambodia	.694	99
Lao PDR	.650	110
Thailand	.776	22
Vietnam	.700	87

Gender Statistics

Countries in Southeast Asia have undertaken various statistical exercises related to gender, but there are differences in the availability of statistics across the participating countries. Some gender-disaggregated data are available from national census data (e.g. the Lao PDR 2015 HH census), while others are collected through some UN agency-supported publications (Facts and Figures on Women and Men in Viet Nam 2010-2015).

An ESCAP report on a September 2019 meeting on integrating gender into environmental statistics in Asia and the Pacific recommended that UN Environment and IUCN gender-environment indicator lists should be expanded and modified in order to capture regional needs and priorities. These included the following:

- Exposure to disasters
- Environment-related conflict, migration and displacement
- Gender-based violence in the context of environment
- Harnessing women's traditional ecological knowledge
- Women in environment conservation roles
- Rural women's leadership on environmental issues
- Small-scale industries; environment-related employment and livelihoods
- Sustainable production and consumption including sustainable agricultural practices, organic farming and waste management

As the report noted, "Some of these areas are either missing or inadequately covered in existing internationally agreed indicator frameworks. They have traditionally not been covered by household or person-based statistics

⁶⁸ UNDP 2017. Human Development Data. hdr.undp.org

⁶⁹ OECD 2019.

and thus, measurements mostly exist only at the macro level; or others are new and emerging areas and no international agreements yet exist regarding their measurement.”⁷⁰

Gender Issues in CC Adaptation, Water Management and Water-Related Threats

Climate and Gender

As the Executive Director of UN Women recently noted, “To confront the existential threat of climate change, rural women and girls are innovating, turning among other practices to climate-resilient agriculture and sustainable energy technologies. They need local and national governments to recognize and address the specific challenges rural women face in a changing climate and are calling for them to implement gender-responsive policies and programs that do this, in line with the targets of the Sustainable Development Goals.

“We are seeing some progress, with governmental efforts to support the resilience and adaptive capacities of rural women and their communities. Gender equality considerations are increasingly being integrated in rural and agricultural development and climate change frameworks. But these efforts must grow if infrastructure and public services are to be sufficient to meet the climate challenge sustainably, and to alleviate the household burdens that climate change intensifies. And rural women must be at the table when decisions are made that affect their future, so that their concerns shape investments in climate resilience and make them truly gender responsive.”⁷¹

Women also face special challenges in the face of threats such as the COVID-19 global pandemic. As Inger Andersen, the Executive Director of UNEP, noted upon the release of a report on women, climate, and security, “Unequal access to land tenure, financial resources, and decision-making power can create economic stress for entire households in times of crisis, leaving women disproportionately exposed to climate-related security risk.”⁷²

Participating GMS countries have taken some steps to mainstream gender issues into climate change policy and programming.

In **Cambodia**, “Gender has been mainstreamed into the Cambodia Climate Change Strategic Plan 2014-2023 and the National Action Plan for Disaster Risk Reduction 2014-2019. New institutional arrangements for climate change have been put in place, including the establishment of the National Council for Sustainable Development and its General Secretariat in March 2015....Neary Rattanak IV includes a Gender and Climate Change Action Plan, and Gender and Climate Change Committees in line ministries have been established. The Mainstreaming Climate Resilience into Development Planning Project 2016-2018, led by a consortium of agencies with four government institutions, involves an outcome for enhanced institutional and technical capacity to integrate gender concerns in climate change initiatives. These include development of a strategy, guiding principles and implementation plans for mainstreaming gender concerns into climate change adaptation and mitigation investments.”⁷³

Recently, a 2020 gender learning report found that “Issues that contribute directly to women’s increased vulnerability during disasters include a lack of representation in government, increased vulnerability and lack of protection at safe sites, gendered health concerns, and not being identified and targeted in preparedness and response activities. Furthermore, differences in educational access may contribute to ability to work and obtain and understand knowledge, including access to disaster and climate change information.”⁷⁴

Water-Related Threats

Water-related hazards in the project region include both flooding and droughts. A consultative group meeting for the Global Facility for DRR found that women “typically face greater mortality, health risks, and domestic and sexual violence in hazard events....” and may face greater challenges to accessing social protection

⁷⁰ ESCAP (2019): 12.

⁷¹ <https://eca.unwomen.org/en/news/stories/2019/10/statement-ed-international-day-of-rural-women>. Accessed October 31, 2019.

⁷² UNDP (2020). “Gender lens essential to addressing linked climate and security crises.” Press release. <https://www.undp.org/content/undp/en/home/news-centre/news/2020/Gender-lens-essential-to-addressing-linked-climate-change-and-security-crises.html>. Accessed July 13, 2020.

⁷³ CEDAW/C/KHM/6. Paragraph 126. p.28.

⁷⁴ Clingeffer, K.: 5

mechanisms such as insurance and safety nets.”⁷⁵ The same study suggested “Increasing access to information and participation in risk management and early warning systems.”

In addition, the study noted that humanitarian response efforts also run the risk that post-disaster needs assessments will fail to capture and compensate the unpaid work that women do in their communities, and the possible increase in their unpaid work following disasters in the form of caring for affected community members. Two conclusions of the study are directly relevant to the proposed project:

- “Women’s economic empowerment is key to resilience— removing constraints to economic activities and increasing women’s participation in income-earning opportunities and access to productive assets in pre and post-disaster context.
- Need to better capture gender disaggregated and losses in post-disaster assessments.”⁷⁶

Other literature has addressed women’s higher vulnerability to natural disasters. For example, “Studies have shown that disaster fatality rates are much higher for women than for men due, in large part, to gendered differences in capacity to cope with such events and insufficient access to information and early warnings.”⁷⁷ The same review indicates that there are additional factors, such as a “direct relationship between women’s risk of being killed during disasters and their socio-economic status.”⁷⁸ That said, country-specific knowledge of the differential effects of climate change impacts on women and different coping strategies used is at its inception, and there are many knowledge gaps.⁷⁹

However, it is also important to keep in mind the 2018 CEDAW general recommendation on gender-related dimensions of DRR in the context of climate change: “The vulnerability and exposure of women and girls to disaster risk and climate change are economically, socially and culturally constructed and can be reduced.”⁸⁰

Gender and Water Resources Management

In **Lao PDR**, the most recent CEDAW report found that “Women in rural areas rely on rainwater and rivers for agriculture production. However, due to climate change in the past years, Lao people, especially women and girls, are vulnerable to flooding from the forests and to draught. Most of flooding occurs during the months of May to October. On top of that, the consequences of storms include heavy rains and strong winds that cause quick flooding and take the lives, houses, animals and other assets as well as destroying their production land. Women still have limited knowledge and skills in environmental preservation and adaptation to climate change to mitigate the impact of climate change and natural disasters. At the same time, access to information, ownership, management and involvement for the reduction of pollution and the conservation of biodiversity remain limited.”⁸¹ The report also found that “Increasing and enhancing women’s participation in the design and implementation of the local development plan with a view to mitigating social and environmental impacts as well as ensuring the needs of rural women are the priorities in the policies of the government of Lao PDR in improving the livelihood quality and in reducing poverty amongst different ethnic groups nationwide especially the rural women.”⁸²

Recent research on access to water resources and sanitation is more difficult to come by, but an ADB/WB 2012 country gender assessment found that “Both women and men are benefiting from improved access to water and sanitation, but this access varies greatly depending on location, with people in more remote and poorer areas having the least access. However, in places where access is limited, the burden of water collection falls heavily on women and girls. Women are also generally responsible for family health, hygiene and food security, which suffer from limited access to water and sanitation services.”⁸³ The assessment also provided a specific recommendation on climate change: “Mainstream gender considerations into climate mitigation, adaptation actions and disaster planning, and ensure that women participate in related consultation and decision-making processes at local, regional and national levels.”⁸⁴

⁷⁵ GFDRR 2016: 5.

⁷⁶ Ibid.

⁷⁷ Ikeda in UNDP 2013: 5.

⁷⁸ Ibid.: 3.

⁷⁹ ADB 2014: xiii.

⁸⁰ CEDAW (2018): 3.

⁸¹ [CEDAW/C/LAO/8-9](#), Paragraph 125. p. 34.

⁸² Ibid., Para 126: 34.

⁸³ ADB and WB 2012: 2.

⁸⁴ Ibid.: 5.



Community Consultation in An Giang, Vietnam, March 2021 (Photo Credit: NAWAPI)

Implementing Entity Activities on Gender and Water Resources

UNESCO-IHP (International Hydrological Programme) advocates for more equitable water resources management and human development opportunities for both women and men (see for instance: <https://unesdoc.unesco.org/ark:/48223/pf0000233579> or <https://en.unesco.org/genderequality>).



Gender equality is one of UNESCO's global priorities, with a commitment to promote equality between women and men across the Organization's mandate. Gender equality is not only a fundamental human right, but a necessary foundation for the creation of sustainable and peaceful societies.



Woman working on a farm irrigated with groundwater, Cambodia

Recommendations

In general, the project should encourage women's participation, empowerment, and access to justice in all project activities as recommended in the CEDAW General Recommendation No. 37. Women are more than project beneficiaries: they are a valuable resource for the project. As a 2018 CEDAW report notes, "The categorization of women and girls as passive 'vulnerable groups' in need of protection...is a negative gender stereotype that fails to recognize the important contributions to disaster risk reduction, post-disaster management and climate change mitigation and adaptation strategies that women are already making."⁸⁵

It should also be noted that the project provides an excellent opportunity to study how improvements in information related to water management may affect men and women differently. The project should not only collect gender-disaggregated data, but it should provide this data and other project findings to other organizations and promote the use of this information in reporting to relevant UN conventions. In addition, the project provides an opportunity to develop training and professional development opportunities that can benefit women. Project interventions that are designed and implemented using a gendered approach should be documented and shared as a part of the project's knowledge management activities, and the project's M&E plan should consider recommended indicators that measure aspects of gender and environment.

Recommendations for Project Components

- *Component 1:* The vulnerability assessment conducted under Component 1 should pay careful attention to differences in vulnerability and resilience between men and women, including intermediary factors such as employment, skills, monetary and non-monetary resources, and education. Furthermore, as groundwater monitoring under Component 1 will involve valuable professional opportunities for researchers, the project should work with UNESCO and other national and regional actors to ensure that women students and professionals are aware of and encouraged to undertake these opportunities.
- *Component 2:* Dialogues and guidelines around groundwater use priorities should aim for gender balance, which may require project staff and consultants to tailor the format, location, scheduling, and leadership of dialogues in order to maximize women's active participation. All guidelines should be clear to and accessible to women, and they should incorporate women's views and priorities. Water management and planning bodies at all levels should support women's active participation regardless of land tenure status. Furthermore, the project should take active steps to ensure that the decisions of water management bodies take lower-income households or households that do not own farmland or other property into account.
- *Component 3:* The implementation of the pilot projects should include gender monitoring throughout the finalization of the design of the pilots and during implementation and evaluation. The project should also ensure that work with institutions on their roles and responsibilities includes an understanding by staff of gender issues related to climate change and water resources management.

⁸⁵ UNISDR and UNDP in CEDAW (2018): 4.

- *Component 4:* Regional cooperation should encourage women’s active participation, and the project should work with UNESCO and other national and regional actors to ensure that women students and professionals are aware of professional opportunities in this area and encouraged to undertake them.
- *Component 5:* Project interventions that are designed and implemented using a gendered approach should be documented and shared as a part of the project’s knowledge management activities. Learning and capacity development activities should aim for gender balance, which may require project staff and consultants to tailor the format, location, scheduling, and staffing profiles in order to maximize women’s active participation. Furthermore, literacy levels should be considered in all training plans and communication strategies.

Cross-Cutting Approaches for Mainstreaming Gender in Project Management

This proposal explicitly emphasizes the participation and accrued benefits of women and girls via active, engaged and balanced participation of women in all interventions suggested in this proposal, such as:

- Ensuring gender-balanced representation on the Project Steering Committee;
- Supporting gender-balanced participation in initial project workshops inception phase;
- Pro-actively encouraging participating governments and national partners to include women in their project teams and in the communities of practice, both locally as well as nationally;
- Supporting gender-balanced participation in project activities, such as setting up and managing the Information Management System IMS (IT capabilities), designing and carrying out groundwater and other field surveys/assessments (field work);
- Using gender-inclusive language (as defined by the 2019 UNESCO guidelines for gender-inclusive language⁸⁶ under the agency’s Priority Gender Equality Guidelines) in project documentation and outreach materials;
- Ensuring participation of female experts in the project ICT and data components (user interfaces of IT systems, websites, data collection questionnaires, etc.);
- Ensuring gender-balanced participation in expert meetings, advanced and community-based training sessions; and
- Promoting the recognition of (ground)water related work and services performed by women as an essential element of climate resilient water supply and use systems.

⁸⁶ https://en.unesco.org/system/files/guidelines_for_pp_-_annex_3.pdf

Gender Action Plan

UNESCO as the Adaptation Fund IE notes that it is responsible for providing support on gender capacity to executing entities and local communities and stakeholders as per AFB 2017 (II.10). Through project design and implementation, the IE will comply with key UN mandates on gender equality and the empowerment of women, including the 1979 Convention on the Elimination of All Forms of Discrimination of Women (CEDAW), the 1995 Beijing Declaration and Platform of Action, and the Sustainable Development Goals.

Key Points	Supporting Actions	Indicator	Responsible Party/Parties
Component 1			
Identify and analyze differences in vulnerability and resilience between men and women, including intermediary factors such as employment, skills, monetary and non-monetary resources, and education, under the vulnerability assessment	<p>Ensure that gender-related data collection and analysis are included in the scope of work for the vulnerability assessment.</p> <p>Review the draft document for gender-related findings as part of the technical and editorial review process.</p> <p>Consult with women of diverse backgrounds during the assessment and mapping process</p>	The vulnerability assessment identifies differences between men and women in their exposure to climate risks and their adaptive capacity.	CCOP-TS Project CTA
Ensure gender-balanced participation in the vulnerability mapping process	<p>Establish an appropriate target for women's participation in the vulnerability assessment exercise and development of monitoring protocol.</p> <p>Monitor levels of participation and adjust outreach strategy as needed.</p>	At least a certain percent (TBD) of participating researchers are women [OR the project actively encourages the participation of women researchers in the assessment]	CCOP-TS
Component 2			
Dialogues and guidelines around groundwater use priorities should aim for gender balance	<p>Project staff and consultants to tailor the format, location, scheduling, and leadership of dialogues in order to maximize women's active participation.</p> <p>Ensure an appropriate mix of male and female project workers to conduct focus groups and planning activities</p>	Percentage of women (TBD) participating in dialogues and guidelines around groundwater use priorities.	CCOP TS Project Director, CTA
Support active women's participation in water management and planning bodies at all levels	Monitor the participation of women in the activities and ensure that activities are scheduled for appropriate times and places	At least three women's focus groups convened during the vulnerability assessment and pilot intervention design and planning sessions.	CCOP-TS, in-country consultants

Key Points	Supporting Actions	Indicator	Responsible Party/Parties
	<p>Take active steps to ensure that the decisions of water management bodies take lower-income households or households that do not own farmland or other property into account.</p> <p>All guidelines should be clear to and accessible to women, and they should incorporate women's views and priorities.</p>	Number of pilot regions in which community governance mechanisms take lower-income households or households that do not own farmland or other property into account.	
Component 3			
Ensure that pilot projects are monitored for gender-differentiated benefits and other consequences	<p>Provide administrative support to encourage women's participation in the planning, implementation, and monitoring of the demonstration projects.</p> <p>Determine roles for women in the pilot projects that are sensitive to cultural norms but also ensure meaningful participation.</p>	All annual reports include information on the gender-differentiated perceptions and impacts of the demonstration projects.	CCOP-TS, consultants
Component 4			
Ensure that opportunities for professional development through regional cooperation are utilized by both women and men	Ensure that women receive sufficient information to apply for and participate in regional exchanges and extended capacity strengthening activities.	Number of women participating in regional exchange activities.	CCOP-TS, contractor, local partners
Component 5			
Women and men have equal access to information generated by project activities.	<p>Use information on cultural norms, literacy levels, and women's media preferences to target outreach and knowledge products to women.</p> <p>Ensure that training times and formats consider women's needs.</p>	<p>Number of project knowledge products that use a gendered approach.</p> <p>Number of women attending training and information sessions (absolute numbers and as a % of total participants).</p>	CCOP-TS UNESCO Project Manager
Monitoring and Evaluation / Project Management			
Increase understanding of how project benefits may vary by gender	<p>Undertake gender-disaggregated surveys on project outcomes</p> <p>Ensure equal participation in bottom-up reporting mechanisms and include women (and girls as appropriate) in monitoring activities</p>	<p>Gender-disaggregated data are available</p> <p>Report on gender differences in project benefits; e.g. changes in self-reported access to information</p>	CCOP-TS, UNESCO

Key Points	Supporting Actions	Indicator	Responsible Party/Parties
<p>Raise awareness regarding climate change adaptation opportunities in the water sector of the GMS</p>	<p>Consult both men and women in the development of promotional materials</p> <p>Collect baseline data on awareness and knowledge levels among men and women</p> <p>Assess the most appropriate communication channels for information, keeping in mind that they may be different for women and men.</p>	<p>Increase in awareness levels regarding CCA measures in the water sector among both men and women</p> <p>Baseline data available for both men and women</p> <p>Project communication strategy reflects both men's and women's communication channels</p>	<p>CCOP-TS</p>
<p>Ensure that the PMC Secretariat staff, project staff, consultants, and national partners have a solid understanding of gender mainstreaming in project implementation</p>	<p>Offer a training block on gender mainstreaming (with an emphasis on data collection, participation strategies, and gender and water issues) during the project inception workshop or at a stand-alone training during the first operational quarter of the project.</p> <p>Ensure that women have leadership roles in project implementation</p>	<p>Training block on gender mainstreaming in the project inception workshop and/or utilization of the UNESCO eLearning unit on gender mainstreaming.</p> <p>Project organogram indicates women in leadership roles</p>	<p>CCOP-TS Project Director, UNESCO Project Manager</p>

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Annex V: Environmental and Social Screening Information

Table AV.1 provides an overview of the risk screening procedure for the project and proposed measures to mitigate project-related risks. When co-designed pilot interventions are developed and activities defined (i.e. exact locations, target groups, types of groundwater use), additional risk screening and (when required) mitigation measures, will be applied as part of the ESMP (see Section III.3). This will include screening and ESMP development for the individual USPs proposed for the pilot communities.

Table AV.1: Risk screening and proposed mitigation (where indicated) in compliance with the Environmental and Social Policy of the Adaptation Fund.

	Checklist of environmental and social principles	Potential impacts and risks	Risk Level	Need for measures?	Further assessment procedure and mitigating measures
1	<p>Compliance with the Law; Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>Pilot interventions could theoretically be designed that were not in accordance with national environmental and water legislation.</p>	Low	Yes	<p>Relevant national authorities were consulted during the proposal development process to ensure compliance with all relevant laws. Pre-project assessments indicate the proposed interventions do not require an EIA and do not conflict with any existing environmental legislation.</p> <p>An environmental assessment at each pilot area will be carried out for each pilot intervention in compliance with national environmental laws and AF policy. Specific procedures are in place for each pilot intervention for screening and monitoring – they are described in the ESMP steps in the body of the funding proposal.</p> <p>Transboundary aquifer management will operate within prevailing laws and regulations in the participating countries as well as any applicable international laws. In case of potential conflicts or unclear laws and regulations, the project will recommend clarifications and consensus seeking measures. Training on applicable laws and regulations will be provided to project partners in the participating countries to facilitate and ensure compliance.</p>
2	<p>Access and Equity; Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>Water resource governance decisions or pilot measures might disadvantage women or vulnerable groups by reproducing discriminatory patterns of resource allocation</p>	Low	Yes	<p>Local-level implementation involving different water users and farmers' and women's groups will ensure that resilience measures are demonstrated on the basis of participative processes that are gender-sensitive and enable participation of vulnerable and marginalized groups.</p> <p>The project will take specific steps in Component 2 and Component 5 to support outreach to women and empower them through training and meaningful participation in decision-making. Access to a low-cost and stable water supply for primary livelihood and WASH purposes will be supported for women and men.</p> <p>Project activities in Component 2 will specifically monitor and support women's equitable participation in project activity. Women's participation will be scrutinized in reporting, analysed, and closely monitored.</p>

	Checklist of environmental and social principles	Potential impacts and risks	Risk Level	Need for measures?	Further assessment procedure and mitigating measures
3	<p>Marginalized and Vulnerable Groups: Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the</p>	Water resource governance decisions might disadvantage low-income households	Low	Yes	<p>A needs assessment will be carried out to identify the most vulnerable communities within the pilot areas.</p> <p>Vulnerable groups will be supported in their access to low-cost and stable water supply. Project documentation will be provided and community awareness meetings will be held to ensure consultation and compliance.</p>
4	<p>Human Rights: Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>		No risk	No	National Stakeholder consultations and literature review revealed that there are no elements within all the components of the project that negatively affect human rights.
5	<p>Gender Equity and Women's Empowerment: Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men (a) have equal opportunities to participate as per the Fund gender policy; (b) receive comparable social and economic benefits; (c) receive comparable social and economic benefits; and (b) do not suffer disproportionate adverse effects during the development process.</p>	Project activities could potentially limit women's access to water resources due to women's differing roles in accessing natural resources.	Low	No	<p>During the project design phase, workshop discussions (see Annex IV) focused on gender and the role of women in relation to the possible project interventions. Women's groups/leaders have not raised gender equality concerns during the stakeholder engagement process or the community consultations.</p> <p>The project will pursue and support gender equity and women's involvement in all activities through its core approach to direct stakeholder involvement in resource management. This aspect will be closely monitored for positive impacts under Component 2 of the project and will be considered and comprehensively reported as one of the outcomes of the project.</p>
6	<p>Core Labour Rights; Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.</p>		No risk	No	Project implementation will to some extent rely on collaboration with local staff and workers. ILO labour standards will be respected, and adherence to prevailing national labour rules and standards. The project does involve any components that fail to co national or international labour practices, nor does it involve any components that could involve child labor or forced labor.

	Checklist of environmental and social principles	Potential impacts and risks	Risk Level	Need for measures?	Further assessment procedure and mitigating measures
7	<p>Indigenous Peoples: The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous people.</p>		No risk	No	<p>The pilot sites are located in open terrain and in accessible locations in the vicinity of the Mekong River. Due to their accessibility and connectivity with nearby centres of population, the pilot site areas have been subjected to considerable change, development and movements of people over the past decades. While they are home to significant local community populations, consultations undertaken during the project's preparatory phase did not encounter persons or communities identifying as indigenous peoples.</p> <p>However, as people and communities in the participating countries move and shift with time, it cannot be assumed that indigenous persons will never be encountered during the implementation of project activities. In the event that a person or community identifying as indigenous should be encountered in the context of project implementation, any engagement will take place in strict conformity with Adaptation Fund's ESP and the project's ESMP, in accordance with the UN Declaration on the Rights of Indigenous Peoples, the principles of Free, Prior and Informed Consent, and the UNESCO Policy on engaging with Indigenous Peoples.</p> <p>The project will in addition build awareness on indigenous peoples' rights as applicable to this initiative and document associated outcomes. Dedicated training will be provided to pilot site teams with particular reference to vulnerable groups and indigenous peoples (see Table 14, page 68-69).</p>
8	<p>Involuntary Resettlement; Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on</p>		No risk	No	<p>The project neither requires, necessitates or encourages resettlement of any community or population. The project will ensure that any groundwater use and conservation related activities will not require, recommend or necessitate resettlement measures. Measures involving resettlement will not be eligible as USPs.</p>
9	<p>Protection of Natural Habitats: The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as</p>		No risk	No	<p>The project sites will not involve communities that are located in critical natural habitats.</p>

	Checklist of environmental and social principles	Potential impacts and risks	Risk Level	Need for measures?	Further assessment procedure and mitigating measures
10	<p>Conservation of Biological Diversity: Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.</p>				<p>In accordance with the project's objectives, a contribution will be made towards the conservation of biodiversity (viz. by enhancing the protection of wetlands, forested recharge areas, land use planning supporting recharge, etc.). Interventions and proposals for future action developed in the context of project implementation will be examined for any possible adverse effects on biological diversity in the GMS region, and shall be designed to avoid any such detrimental effects. Where relevant, the project will engage UNESCO-designated sites within the pilot areas (notably the Tonle Sap Biosphere Reserve and Angkor World Heritage Area in Cambodia).</p>
11	<p>Climate Change: Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.</p>		No risk	No	<p>Project implementation will not result in any increase in greenhouse gas emissions or other drivers of climate change.</p>
12	<p>Pollution Prevention and Resource Efficiency; Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.</p>	<p>12.1 Improvement in groundwater management could lead to increased resource extraction</p> <p>12.2 Water quality could be affected by run-off sources or storage</p>	Medium	Yes	<p>12.1 GW extraction can increase, but the additional water resources that are harnessed from MAR will provide a reserve upon which to draw.</p> <p>It will be important for community water use to stay within the limits of sustainable use. Component 2 of the project will focus explicitly on sustainable groundwater management, and the governance arrangements put into place will allocate groundwater resources and prevent over-extraction.</p> <p>Training and capacity building in Component 5 will increase understanding in the pilot regions that groundwater is a limited resource.</p> <p>12. 2 Resource use and aquifer recharge measures will be developed in an energy-efficient manner and by taking utmost care for protecting existing resources from pollution.</p> <p>Project activities will not involve the generation of hazardous or non-hazardous waste, and project activities will not involve a significant use of energy.</p> <p>Interventions and proposals for future action developed in the context of project implementation will be reviewed and designed to ensure maximal energy efficiency, minimal resource use and waste/pollution release.</p> <p><u>Water quality monitoring</u> will be conducted at MAR sites throughout their operation. Pilots in Vietnam (Pavelic 2019) have indicated that MAR wells in project communities did not differ significantly in water quality from control wells in neighboring communities.</p>

	Checklist of environmental and social principles	Potential impacts and risks	Risk Level	Need for measures?	Further assessment procedure and mitigating measures
13	Public Health: Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.	Drinking water quality could be affected run-off sources or storage	Low	Yes	Although adverse impacts are highly unlikely and not expected, this aspect will be monitored during project implementation in compliance with national environmental laws and other relevant guidelines (e.g. drinking water standards, groundwater quality). <u>Water quality monitoring</u> will be conducted at MAR sites throughout their operation. Pilots in Vietnam (Pavelic 2019) have indicated that MAR wells in project communities did not differ significantly in water quality from control wells in neighboring communities. Detailed sampling will be carried out during both the wet and dry seasons for a comprehensive suite of physical-chemical and microbiological parameters, including water quality parameters of serious concern from the perspective of human health, irrigation or environmental quality to ensure compliance with national water quality standards and best practice.
14	Physical and Cultural Heritage; Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.		No risk	No	Pilot regions do not contain sites that are designated as physical and cultural heritage sites. The project sites will not include important cultural resources such as burial sites or buildings or monuments of archaeological, historical, artistic, religious, spiritual or symbolic value. The project will not utilise tangible and/or intangible forms of cultural heritage.
15	Lands and Soil Conservation; Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services	Project risks could be incurred by the storage of groundwater and the project could result in change in groundwater quality and quantity in pilot.	Medium	Yes	Interventions and proposals for future action developed in the context of project implementation will be reviewed and designed to ensure that soil and land degradation is avoided. Although adverse impacts are highly unlikely and not expected, this aspect will be monitored during project implementation in compliance with national environmental laws and other relevant guidelines.

Unidentified Sub-Projects (USP): Groundwater Management Options

The project will pilot concrete adaptation measures in the three transboundary communities described in detail in Annex I and Annex III. These pilots may involve one or more of the following three approaches to groundwater management:

1. Managed Aquifer Recharge (MAR)

A recent comprehensive assessment of MAR at the global scale highlights that levels of knowledge and experience in managed aquifer recharge (MAR) in the Greater Mekong Subregion lags behind that of many other regions⁸⁷. To mitigate the risks associated with relatively new technology, a staged, step-wise approach could be followed, guided by norms that tend to be followed internationally.⁸⁸ Under this regional project, the following steps are proposed for establishing MAR as a viable and concrete groundwater management option for increasing the resilience of groundwater to climate variability and climate change:

1. Preliminary assessments of the potential for MAR at each of the pilot case study areas using common methods wherever possible to establish the likely scope for MAR
2. Consultations across each of the pilot areas to verify the prospects and established the perceptions, needs and interests in MAR amongst different stakeholder groups in groundwater, irrigation, water supply, environment and other domains of interest
Site suitability across case study areas would be ranked and pilot scale testing initiated where the biophysical potential for MAR and support from stakeholders were highest. Consideration to implement MAR in areas outside of the pilot areas would also be given if prospects and interests were sufficiently high.
3. The MAR trial would provide:
 - (a) a visual demonstration of MAR and testing to enable the performance and impacts to be established from technical, and socioeconomic perspectives
 - (b) opportunity for researchers and students to investigate specific aspects of MAR that are of scientific or practical merit. Potentially, small innovation grants could be offered to enable activities of this kind to be pursued
4. Pathways to scaling up across the countries and region would be explored based on the MAR trial results and suitability mapping. The following activities are envisaged:
 - Training and consultation workshops targeting policy makers, technical agencies, researchers etc.
 - Policy briefs and communication products intended to reach different audiences

2. Supplemental solar-powered groundwater irrigation

Irrigation provides a powerful adaptation solution to boost agricultural productivity and to overcome vulnerability associated with the growing uncertainties in the quantity and patterns of monsoonal rainfall. Irrigation schemes are predominantly supplied by surface water (98%) and smallholder farmers in rainfed areas remote from surface water could benefit greatly by tapping into groundwater.

Solar-powered groundwater pumping for irrigation offers a tremendous opportunity to improve food security, adapt to climate variability and climate change, and reduce greenhouse emissions with a conducive enabling environment. Important questions still remain on behalf of governments and donors concerning the sustainability implications of solar pump expansion, given that solarized pumps can abstract unchecked for up to 10 hours per day at no marginal cost, providing little incentive to use water resources efficiently. Unsustainable exploitation of groundwater affects many regions of the world, which adds to sea level rise⁸⁹ and must be avoided in the Mekong under a trajectory of expanded water use.

The major contribution from this study would be the development of an online solar suitability assessment tool for the Mekong, building upon earlier IWMI work covering Sub-Saharan Africa.⁹⁰ This interactive tool is intended to help users identify suitable areas for solar-powered irrigation for different water sources and pump characteristics. This platform will be useful to investors and governments in the Mekong region for planning and sustainable implementation of solar-based irrigation under pressure from climate change, which offers broad social and economic benefits such as increased crop yields, reduced labour, livestock watering, domestic uses and off-grid energy, for enhanced livelihoods for smallholder farmers, especially women.

3. Groundwater desalination

Desalination methods used to turn seawater into potable water can also be used for treating saline groundwater. They allow using groundwater that would otherwise be unsuitable for consumption. Salinity of groundwater can

⁸⁷ Dillon P., Stuyfzand P., Grischek T. *et al.*, (2019). Sixty years of global progress in managed aquifer recharge. *Hydrogeology Journal* 27(1): 1–30. <https://doi.org/10.1007/s10040-018-1841-z>

⁸⁸ International Association of Hydrogeologists Commission on Managing Aquifer Recharge (IAH-MAR), <https://recharge.iah.org/>

⁸⁹ <https://www.un-igrac.org/news/global-groundwater-depletion-leads-sea-level-rise>

⁹⁰ http://waterdata.iwmi.org/applications/l_solar/

be anywhere between 0 (freshwater) and several g/L (brines), superior to the salinity of seawater. Groundwater with salinity equal or lower than that of seawater (± 3 g/L) is considered brackish. As desalination costs are proportional to the salinity of water, desalination of brackish groundwater is less expensive than desalination of seawater. For this reason, desalination plants in coastal areas are often located some hundreds of meters inland. Nevertheless, desalination methods remain costly due to high energy consumption and they are usually implemented where no other source of water is available. In GMS, there might be a potential to use desalination in the Khorat Plateau and in the delta area.

Implementing desalination plants falls beyond the scope and the budget of the project. They rely on advanced and expensive engineering technologies and require long feasibility studies. Instead, it would be possible in this project to map and investigate where groundwater desalination might be applicable and to what extent. This would imply the following activities:

- Produce a regional, harmonized map of groundwater salinity. This is to identify where saline groundwater is available and how saline it is. The map should also show at what depth saline groundwater is available (saline groundwater is usually deep).
- Make a preliminary feasibility assessment. Potential impacts of saline groundwater pumping and desalination would be discussed. For instance, concentrated brines produced during desalination need to be disposed or evacuated properly, otherwise they can cause important damages to the environment. Pumping saline groundwater can also perturb groundwater flows in adjacent aquifers containing freshwater.
- Estimate the costs of desalination. This estimation would be based on standard costs of desalination techniques (e.g. reverse osmosis) corrected for actual groundwater salinity. Costs should be estimated for capital expenses (CAPEX) and operating expenses (OPEX). The depth of saline groundwater is a significant factor in CAPEX because it determines the depth of the boreholes needed to reach it.

Annex VI: Detailed budget and budget Excel sheets

Sheet 1: Summary project budget

Project Component		2023 Year 1	2024 Year 2	2025 Year 3	2026 Year 4	4 years Total US \$
ANNUAL TOTALS PER COMPONENT						
Component 1		505 500	312 200	116 200	246 100	1 180 000
Component 2		101 000	203 500	169 500	21 000	495 000
Component 3		130 900	313 100	410 500	125 500	980 000
Component 4		66 000	98 500	175 500	165 000	505 000
Component 5		121 700	314 500	395 300	169 879	1 001 379
	Subtotals	925 100	1 241 800	1 267 000	727 479	4 161 379
Project Execution Costs 8.3 %		83 259	112 122	113 670	65 473	374 524
	Subtotals	1 008 359	1 353 922	1 380 670	792 952	4 535 903
Management Fee 8 %		80 669	108 314	110 453	63 436	362 872
	Totals	1 089 028	1 462 236	1 491 123	856 388	4 898 775

Sheet 2: Explanation and breakdown of the project Execution costs

		2022 Year 1	2023 Year 2	2024 Year 3	2025 Year 4	4 year Total US \$
	Project/Programme Execution cost 8.3 %					
Exec.-1	Project coordination cost	35,000	45,000	50,000	25,000	155,000
Exec.-2	Support staff cost	24,759	26,895	28,291	16,079	96,024
Exec.-3	Operational costs	8,000	17,000	12,000	3,000	40,000
Exec.-4	Project related travel (mission cost)	8,000	8,227	8,379	6,394	31,000
Exec.-5	Audit	7,500	15,000	15,000	15,000	52,500
	Subtotal	83,259	112,122	113,670	65,473	374,524

Sheet 3: Budget disbursement schedule with time-bound milestones.

Payment	Upon Agreement signature	Year 1	Year 2	Year 3	Year 4	Total %	Total Amount
Scheduled Date	30/09/2022	30/03/2023	30/09/2023	30/09/2024	30/09/2025	(US \$)	
Project Funds, incl. Exec. costs	11,02% 500 000	11,21% 508 359	29,85% 1 353 922	30,44% 1 380 670	17,48% 792 952	100,00%	4 535 903
Implementing Entity Fee	9,65% 35 000	12,59% 45 669	29,85% 108 314	30,44% 110 453	17,48% 63 436	100,00%	362 872
Total	\$ 535 000	\$ 554 028	\$ 1 462 236	\$ 1 491 123	\$ 856 388		\$ 4 898 775

Sheet 4: Detailed project Activity budget

Activity	Project Component	Outcome(s)	Cost items	Year 1	Year 2	Year 3	Year 4	Total US \$	Indicative output contribution
	Component 1: Groundwater Resource assessment and monitoring	Harmonised regional GW resource inventory supporting regional GMS approach to address challenges of climate change and resilience; information-based policy to manage resources and further develop new GW based resilience strategies and practical interventions.							
Incept-1	Component work package Inception & preparation		National expert time, TA time	15,000				15,000	1.1, 1.2
Incept-2	Inception visits 4 countries and data collection		National expert time, TA time, travel & stay, data costs	90,000				90,000	1.1, 1.2
Incept-3	Inception report contributions		National expert time, TA time	9,600				9,600	1.1, 1.2
Activ. 1.1	Component technical coordination and support		national expert time, TA time	7,000	9,600	9,600	7,000	33,200	1.1, 1.2
Activ. 1.2	Database and GIS systems set-up and management, 3 pilot areas; groundwater related data inputs and costs		GIS expert time, data files	50,000	25,000	25,000	15,000	115,000	1.1, 1.2
Activ. 1.3	4 Country Workshops on project scope and setting up project network (CoP)		Workshop costs, TA time, travel & stay, consumables	125,000				125,000	1.1, 1.2
Activ. 1.4	Groundwater resources & aquifer status reports, 3 pilot areas		TA time, national expert time		50,000			50,000	1.1, 1.2
Activ. 1.5	Development of basic groundwater monitoring system in 3 pilot areas, installation of equipment		National expert time, TA time,	19,200				19,200	1.2
Activ. 1.6	Equipment costs (3 pilot areas)		Equipment costs	120,000	35,000	20,000		175,000	1.2
Activ. 1.7	Pilot area localised data collection approach and practicalities, with participation of stakeholders and groundwater users		National expert time, travel & stay, consumables	16,000				16,000	1.1, 1.2
Activ. 1.8	Pilot areas resilience potential characterization; 1 central workshop for four pilot areas		National expert time, TA, workshop costs, travel & stay		55,000			55,000	1.1, 1.2
Activ. 1.9	Mid-term evaluation of groundwater resources status of pilot areas, 3 dedicated workshops, at the end of year 2		Workshop costs, TA time, national experts time, travel & stay, consumables		68,000			68,000	1.1, 1.2
Activ. 1.10	Regional project Conference (Siem Reap, Cambodia) and field visit; participants from 4 countries, national expert teams, TA support team, invited speakers, and supporting resource		Workshop costs, TA time, national experts time, travel & stay, consumables				155,000	155,000	1.1, 1.2
Activ. 1.11	Support Mid-term review and Project Steering Committee meeting		TA time, national expert time		7,000	9,000		16,000	1.1, 1.2
Activ. 1.12	National technical expert inputs for Project Steering Committee meetings (6 times)		National expert time, TA time	9,200	9,100	9,100	9,100	36,500	1.1, 1.2
Activ. 1.13	Output dissemination visibility products in and outside the region		National expert time, TA time, consumables	2,000	3,000	2,000	2,000	9,000	1.1, 1.2
Activ. 1.14	Evaluation by expert		Expert time	3,000	5,000	5,000	18,000	31,000	1.1, 1.2
Activ. 1.15	General consumables and logistics		Consumables	2,000	2,000	2,000	2,000	8,000	1.1, 1.2
Activ. 1.16	National pool of experts time (4 countries, multiple institutions)		National expert time	27,500	28,500	22,500	26,000	104,500	1.1, 1.2
Activ. 1.17	International TA support, pool of experts		TA expert time, travel & stay	10,000	15,000	12,000	12,000	49,000	1.1, 1.2
			Subtotal	505,500	312,200	116,200	246,100	1,180,000	

Activity	Project Component	Outcome(s)	Cost items	Year 1	Year 2	Year 3	Year 4	Total US \$	Indicative output contribution
	Component 2: Priority use and stakeholders	Increased participation by GW users in different sectors who are aware of resource management issues and have access to information and guidelines that support more sustainable use region-wide.							
Incept-4	Component work package Inception & preparation		national expert time, TA time	6,000				6,000	2.1, 2.2
Incept-5	3 pilot areas; visits to communities and local government, NGO's		national expert time, travel & stay	32,000				32,000	2.1, 2.2
Incept-6	Inception report contributions		national expert time, TA time	3,500				3,500	2.1, 2.2
Activ. 2.1	Resilience strengthening pilots		national expert time, TA expert time, operational costs, travel & stay		45,000	35,000	15,000	95,000	2.1, 2.2
Activ. 2.2	Materials & equipment, installation costs in 3 pilots		materials & equipment		40,000	3,000		43,000	2.1
Activ. 2.3	Pilot areas socio-economic and water users characterization		national expert time, external consultant services	28,000	28,000			56,000	2.1
Activ. 2.4	Gender balance programme set-up and implementation		national expert time, TA expert time, operational costs, travel & stay	3,000	11,000	11,000		25,000	2.2
Activ. 2.5	Information products on vulnerability issues for each of the four pilot areas, for different groundwater user groups		national expert time, TA expert time, travel & stay		24,000	36,000		60,000	2.1, 2.2
Activ. 2.6	Dialogue meetings with national policymakers and experts on strategic importance of groundwater resources in the overall climate change adaptation discussion		national expert time, TA expert time, operational costs, travel & stay		27,000			27,000	2.1
Activ. 2.7	Pilot for regional water-supply companies that use groundwater information on groundwater management tools		time, operational costs, travel & stay			34,000		34,000	2.1
Activ. 2.8	Resilience Agenda, Atlas, interAction in pilot area meetings (product preparation, local workshops)		national expert time, TA expert time, operational costs, travel & stay		14,000	37,000		51,000	2.1
Activ. 2.9	Output dissemination visibility products in and outside the region		National expert time, TA time, consumables	2,000	2,000	2,000	2,000	8,000	2.1, 2.2
Activ. 2.10	Evaluation by expert		Expert time	3,000	3,000	3,000	3,000	12,000	2.1, 2.2
Activ. 2.11	National pool of experts time (4 countries, multiple institutions)		National expert time	12,000	7,000	6,000		25,000	2.1, 2.2
Activ. 2.12	International TA support, pool of experts		TA expert time, travel & stay	10,000				10,000	2.1, 2.2
Activ. 2.13	General consumables and support services		Consumables	1,500	2,500	2,500	1,000	7,500	2.1, 2.2
			Subtotal	101,000	203,500	169,500	21,000	495,000	

Activity	Project Component	Outcome(s)	Cost items	Year 1	Year 2	Year 3	Year 4	Total US \$	Indicative output contribution
	Component 3: Resource management, information tools and equipment	Greater resilience and sustainable GW resource use, with protection of low income and vulnerable user groups. Transboundary groundwater policies more robust and climate change ready.							
Incept-7	Component work package Inception & preparation		national expert time, TA time	9,000				9,000	3.1, 3.2
Incept-8	Expert meeting on resource management information concepts and tools; option and start up development		TA expert time, national expert time, travel & stay	32,000				32,000	3.1, 3.2
Incept-9	Inception report contributions		national expert time, travel & stay	3,500				3,500	3.1, 3.2
Activ. 3.1	Application of database and GIS tools; specialised information products that can be derived from it What do the results tell us (statistics in the database, geographical info. .		TA expert time, national expert time, travel & stay	52,000	32,000	32,000		116,000	3.1, 3.2
Activ. 3.2	Tailored database and GIS tools development and demonstrations, data hosting and provision services		External services; supporting TA expert time, national expert time, travel & stay;		45,000	45,000	25,000	115,000	3.1, 3.2
Activ. 3.3	Prepare resilience potential assessment		Supporting TA expert time, national expert time		56,000	42,000		98,000	3.1
Activ. 3.4	Pilots supported with groundwater monitoring and management information and applicatin to develop resilience options		Supporting TA expert time, national expert time, travel & External services; supporting TA		36,000	56,000	31,000	123,000	3.1, 3.2
Activ. 3.5	Groundwater, with national expert and MRC, supporting organisations		expert time, national expert time, travel & stay;			38,000	22,000	60,000	3.1
Activ. 3.6	Actual Management interventions like MAR or other		Regional TA expert time		42,000	28,000	12,000	82,000	3.1, 3.2
Activ. 3.7	Supporting resilience measures in 4 pilot areas, including installations and equipment		Material costs; supporting TA expert time, national expert		60,000	98,000		158,000	3.1, 3.2
Activ. 3.8	Output dissemination visibility products in and outside the region		National expert time, TA time, consumables	2,000	2,000	2,000	2,000	8,000	3.1, 3.2
Activ. 3.9	Evaluation by expert		Expert time	3,000	6,000	5,000	8,000	22,000	3.1, 3.2
Activ. 3.10	National pool of experts time (4 countries, multiple institutions)		National expert time	15,000	23,000	33,000	11,500	82,500	3.1, 3.2
Activ. 3.11	International TA support, pool of experts		TA expert time, travel & stay	13,000	3,600	24,000	8,000	48,600	3.1, 3.2
Activ. 3.12	General consumables and support services		Consumables	1,400	7,500	7,500	6,000	22,400	3.1, 3.2
			Subtotal	130,900	313,100	410,500	125,500	980,000	

Activity	Project Component	Outcome(s)	Cost items	Year 1	Year 2	Year 3	Year 4	Total US \$	Indicative output contribution
	Component 4: Regional cooperation, coordination and information exchange.	A regionally coherent policy for climate adaptation through sustainable GW resource management; level playing field for all sectoral users in the region, efficiency gains in common approach and support tools.							
Incept-10	Component work package Inception & preparation		national expert time, TA time	9,000				9,000	4.1, 4.2
Incept-11	Research and documentation of policy context and practical cases; documentaiton packages for 4 countries		TA expert time, national expert time, travel & stay	24,000				24,000	4.1, 4.2
Incept-12	Inception report contributions		national expert time, travel & stay, TA expert time	3,500				3,500	4.1, 4.2
Activ. 4.1	Documentation on transboundary aquifer systems; resource status, transboundary implications and policy		National expert time, TA expert time		16,000	16,000		32,000	4.1, 4.2
Activ. 4.2	Pilot areas workshops (3x) on transboundary climate policy		Workshop expenses			45,000	40,000	85,000	4.1
Activ. 4.3	Application of TBA Assessment Methodology on the three pilot ar		National expert time, TA expert time, Travel & stay,			27,000	26,000	53,000	4.1
Activ. 4.4	Working group on sharing & co-development of tools		National expert time, TA expert time, Travel & stay,		24,000	24,000	24,000	72,000	4.1, 4.2
Activ. 4.5	Working group on national policy and strategy		National expert time, TA expert time, Travel & stay,		24,000	19,000	24,000	67,000	4.1
Activ. 4.6	Regional policy coordination; preparation of White paper for ASEAN forum, emphasizing climate adaptation in transboundary		National expert time; support services, TA xpert time		12,000	10,000	12,000	34,000	4.2
Activ. 4.7	Documentation materials for pilot regions		National expert time			8,000	8,000	16,000	4.1, 4.2
Activ. 4.8	Output dissemination visibility products in and outside the region		National expert time, TA time, consumables		2,000	2,000	2,000	6,000	4.1, 4.2
Activ. 4.9	Evaluation by expert		Expert time		3,000	8,000	13,000	24,000	4.1, 4.2
Activ. 4.10	National pool of experts time (4 countries, multiple institutions)		National expert time	12,000	7,000	6,000	7,000	32,000	4.1, 4.2
Activ. 4.11	International TA support, pool of experts		TA expert time, travel & stay	16,000	8,000	8,000	8,000	40,000	4.1, 4.2
Activ. 4.12	General consumables and support services		Consumables	1,500	2,500	2,500	1,000	7,500	4.1, 4.2
			Subtotal	66,000	98,500	175,500	165,000	505,000	

Activity	Project Component	Outcome(s)	Cost items	Year 1	Year 2	Year 3	Year 4	Total US \$	Indicative output contribution
	Component 5: Capacity building and training	Internal capacity in the GMS region to develop CCA policy and practical resilience enhancing interventions, to use state-of-the-art tools and work with CoP, stakeholders and vulnerable groups.							
Incept-13	Component work package Inception & preparation		national expert time, TA time	9,000				9,000	5.1, 5.2
Incept-14	Inception report contributions		national expert time, travel & stay	3,500				3,500	5.1, 5.2
Activ. 5.1	Training programme in MAR, ASR and other storage and GW potential strengthening techniques, connected to pilots (2x)		Training workshops		37,500	37,500		75,000	5.1
Activ. 5.2	Higher education scholarships (10 MSc positions) for promising young BSc graduates		Scholarships for training in the region	50,000	50,000	20,000		120,000	5.1
Activ. 5.3	Transboundary aquifer management; training programme (IGRAC)		Training workshops		42,500	37,500		80,000	5.1
Activ. 5.4	GGMN – the next level training for the Lower Mekong SubRegion; training and learning-by-doing (IGRAC)		Training workshops	42,500		42,500		85,000	5.1
Activ. 5.5	Co-management of surface and groundwater; training workshop with MRC experts		Training workshops		42,500		42,500	85,000	5.1
Activ. 5.6	Information and resources sharing & cooperation on formal training programmes in institutes, recognition of each other certificates, etc.		Training workshops		42,500	40,000	25,000	107,500	5.2
Activ. 5.7	Learning and knowledge management subcomponent; Information repository and sharepoint		Web services, resource materials, national expert		40,000	40,000	20,000	100,000	5.2
Activ. 5.8	Pilot area (3x) on site training stakeholders and groundwater users; development of training materials for end-users		national experts time, TA time, materials			32,000	18,000	50,000	5.1
Activ. 5.9	Support to professional and higher education formal training programmes in the region		TA expert time, national expert time, travel & stay		20,000	40,000	20,000	80,000	5.1
Activ. 5.10	Regional Conference on Capacity building, Knowledge management, Studies; Groundwater management and Climate Change Adaptation		Conference costs, national expert time, TA expert time			75,000		75,000	5.1, 5.2
Activ. 5.11	Output dissemination visibility products in and outside the region		National expert time, TA time, consumables		1,000	1,000	2,000	4,000	5.2
	Evaluation by expert		Expert time		14,000	9,000	24,379	47,379	5.1, 5.2
Activ. 5.12	National pool of experts time (4 countries, multiple institutions)		National expert time	8,000	12,000	6,000	6,000	32,000	5.1, 5.2
Activ. 5.13	International TA support, pool of experts		TA expert time, travel & stay	7,200	8,000	8,000	8,000	31,200	5.1, 5.2
Activ. 5.14	General consumables and support services		Consumables	1,500	4,500	6,800	4,000	16,800	5.1, 5.2
			Subtotal	121,700	314,500	395,300	169,879	1,001,379	

Annex VII: Project Linkages with Agenda 2030

SDG 1 No poverty

The project contributes to reducing the number of people living in poverty, by enhancing clean water availability and food security, and providing water resources for economic purposes / livelihoods. The project contributes significantly to enhance resilience of communities in poverty to climate change-associated environmental shocks and disasters.

SDG 2 No Hunger

The project contributes to achieving food security by ensuring sustainable supply of groundwater for food production, domestic needs and livelihoods.

SDG 3 Good health and well-being

The project ensures improved standards for groundwater quality including monitoring on arsenic and other pollutants and by ensuring groundwater availability for domestic use to contribute to reducing threats of water-borne health risks.

SDG 4 Education

The project targets and supports community groups (women, men and young adults) to develop basic skills and awareness about groundwater/water use related topics. In the three pilot areas, a community-of-practice will develop and disseminate knowledge and guidelines for improved groundwater management.

SDG 5 Gender

The project fosters gender-inclusion and the empowerment of women and girls, as detailed under 'Promoting Gender Equality' (see Section II.C and Annex IV above).

SDG 6 Water

The project contributes significantly to SDG 6 targets by enhancing the knowledge, skills and overall capacities (including resource assessment, policy development, training and demonstration) to manage groundwater and conserve resources for priority use, to reduce water wastage, stimulate water conservation and re-use, improve water use efficiency, reduce water scarcity and improve understanding of (ground)water-ecosystems linkages.

SDG 11 Sustainable Communities

The project contributes to more sustainable communities through awareness and involvement (participatory planning & management) in resource management and use.

SDG 12 Sustainable Production and Consumption

Project interventions contribute to ensuring that people in the pilot areas have access to relevant information and enhanced awareness for sustainable development and lifestyles in harmony with nature, including the management of groundwater resources.

SDG 13 Climate

The project significantly enhances resilience and adaptive capacity against climate change impacts at all levels through the full suite of project activities including training, knowledge availability and application of best practices, fostering the human capacity for climate-change-impact-reduction. Implementation of the project will not generate any negative climate impacts.

SDG 15 Life on land

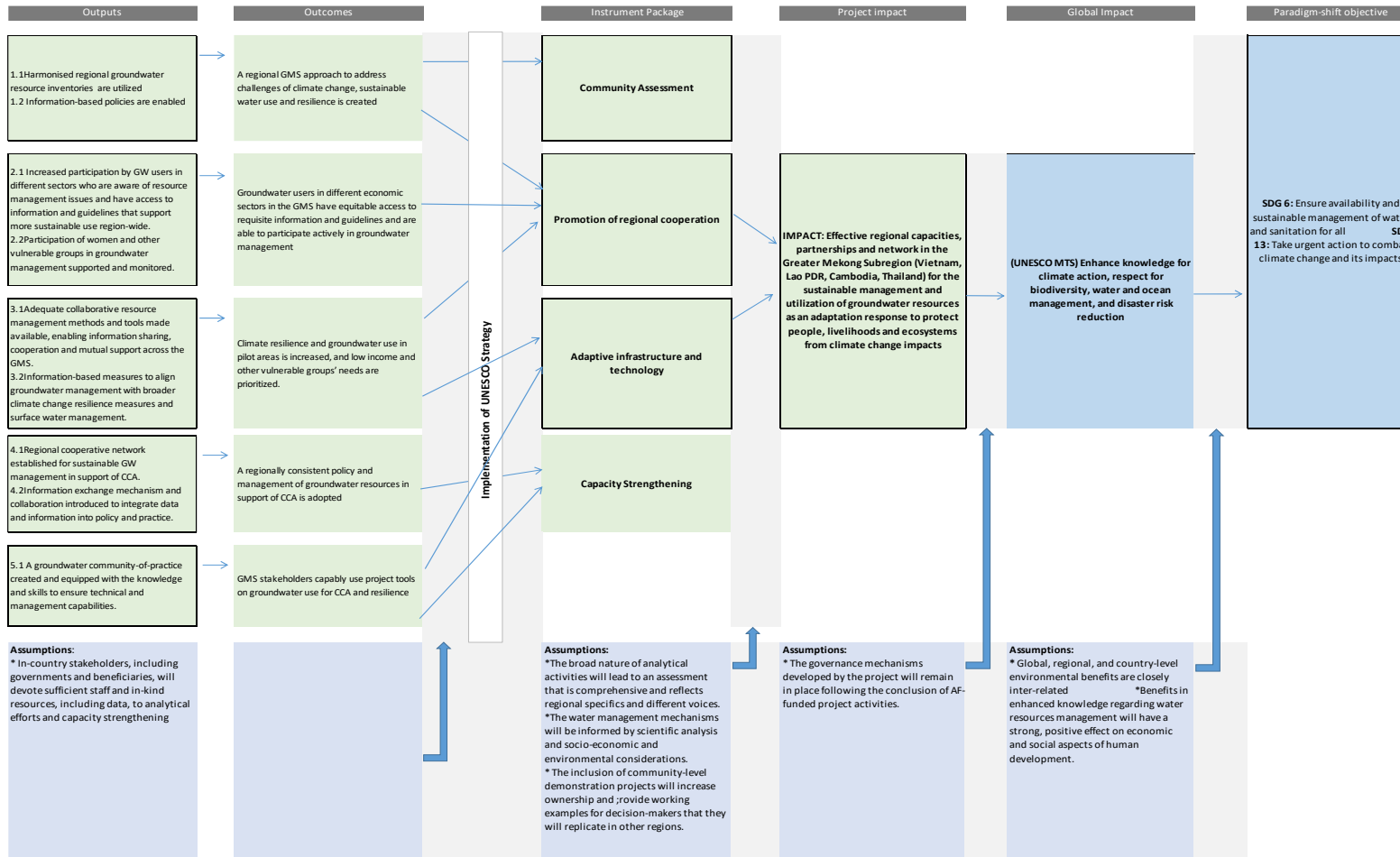
The project contributes to improved understanding of fresh (ground)water-ecosystem linkages, engages in water-ecology assessments, wetland utilization (as protected recharge areas), develops and engages in conservation supporting measures, and supports the application of nature-based solutions.

SDG 17 Partnerships for the Goals

The project contributes to the mobilization of financial resources and local partner commitment to regional cooperation to further the SDGs; it enhances south-south cooperation between the four participating countries on natural resources management and knowledge sharing; and promotes the transfer of environmentally sound technologies to low-income countries while focusing on vulnerable groups.



Annex VIII: Theory of Change



Annex IX: Abbreviations

ADB	Asian Development Bank
AF	Adaptation Fund
ASEAN	Association of Southeast Asian Nations
AVID	Australian Volunteers for International Development
ASR	Aquifer Storage and Recovery
AWP	Annual Work Plan
CCA	Climate Change Adaptation
CBDRM	Community-based Disaster Risk Management
CBNRM	Community-based Natural Resource Management
CBOs	Community Based Organizations
CCOP-TS	Coordinating Committee for Geoscience Programmes in East and Southeast Asia – Technical Secretariat
CoP	Community of Practice
DFAT	Department of Foreign Affairs and Trade
DMH	Department of Meteorology and Hydrology
DGE	Department of Green Economy (Ministry of Environment, Cambodia)
DGR	Department of Groundwater Resources (Thailand)
DRR	Disaster Risk Reduction
DWRPIS	Division for Water Resources Planning and Investigation in the South of Vietnam
GEF	Global Environment Facility
GGMN	Global Groundwater Monitoring Network
GGIS	Global Groundwater Information System
GMS	Greater Mekong Subregion
GW	Groundwater
GWES	Groundwater for Emergency Situations
IHP	International Hydrological Programme
IMS	Information Management System
INGO	International Non-governmental Organization
IGRAC	International Groundwater Resources Assessment Centre
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
MAR	Managed Aquifer Recharge
M&E	Monitoring and Evaluation
MIE	Multilateral Implementing Entity
MONRE	Ministry of Natural Resources and Environment
MRC	Mekong River Commission
MSL	Mean Sea Level
NAWAPI	National Center for Water Resources Planning and Investigation (Vietnam)
PCCP	Potential Conflict to Cooperative Potential
QGIS	Quantum GIS – Geographic Information System
SDGs	Sustainable Development Goals
TBA	Transboundary Aquifer
TWAP	Transboundary Water Assessment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WASH	Water, Sanitation and Hygiene

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