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SWP
SUSTAINABLE WATER PARTNERSHIP

FINAL REPORT
Sustainable Water Partnership

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Water security is the adaptive capacity to safeguard the sustainable availability of, access to, and safe use of an adequate, reliable, and resilient quantity and quality of water for health, livelihoods, ecosystems, and productive economies.

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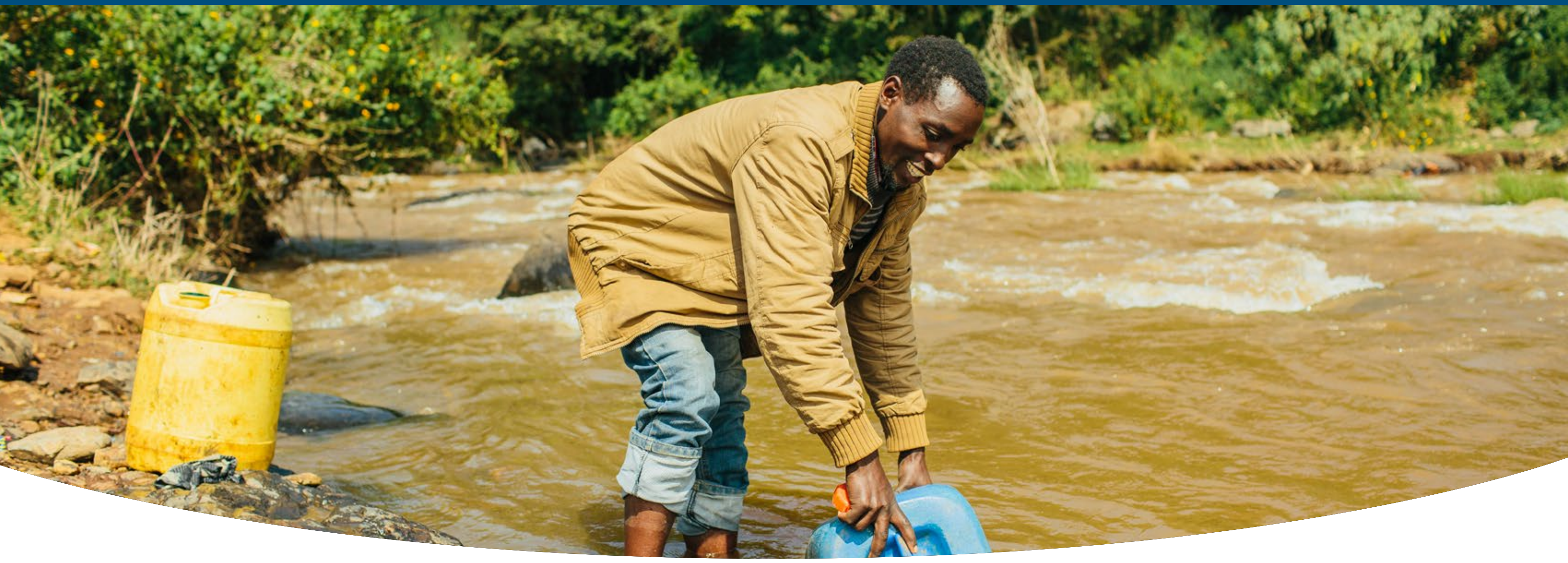
Acronyms

ADB	Asian Development Bank
ANDA	Administration of Aqueducts and Sewers
ATLAS	Adaptation Thought Leadership and Assessment
CLA	Collaboration, Learning, and Adaptation
CWA	Cambodian Water Supply Association
DSI	Department of Science and Innovation
FWUC	Farmer Water User Community
GESI	Gender Equality and Social Inclusion
GIS	Geographic Information System
GIZ	German Agency for International Cooperation
GPL	Greening Prey Lang Project
HAB	Harmful Algal Bloom
IR	Intermediate Result
ISC	Irrigation Service Center
IUCN	International Union for Conservation of Nature
IWMA	Integrated Water Management Activity
JTC	Joint Technical Committee
KAWAS	Karnali Water Activity
LVBC	Lake Victoria Basin Commission
LVBWB	Lake Victoria Basin Water Board
MOU	Memorandum of Understanding
MoWRAM	Ministry of Water Resources and Meteorology
MRB	Mara River Basin
NGO	Non-Governmental Organization
O&M	Operations and Maintenance
PDAFF	Provincial Department of Agriculture, Forestry, and Fisheries
PDE	Provincial Department of Education
PDISTI	Provincial Department of Industry, Science, Technology, and Innovation
PDWRAM	Provincial Department of Water Resource and Meteorology
PWO	Private Water Operator
RBMC	River Basin Management Committee
RDS	Robust Decision Support
RISE	Resilience in the Sahel Enhanced
RUWASA	Rural Water Supply and Sanitation Agency
SADC-GMI	Southern African Development Community Groundwater Management Institute
SAP	Strategic Action Plan
SC-RBMC	Stung Chinit River Basin Management Committee
SDG	Sustainable Development Goal
SEED	Social, Environmental, and Economic Development
SEI	Stockholm Environment Institute
STTA	Short-Term Technical Assistance
SWM	Sustainable Water for the Mara
SWP	Sustainable Water Partnership
TOC	Theory of Change
U.S.	United States
USAID	United States Agency for International Development
USG	United States Government
WAP	Water Allocation Plan
WASH	Water, Sanitation, and Hygiene
WEAP	Water Evaluation and Planning
WESTool	Watershed Ecosystem Services Tool
WRA	Water Resources Authority
WRUA	Water Resources User Association
WSI	Water Security Improvement
WUA	Water User Association
WWF	World-Wide Fund for Nature



Executive Summary

INTRODUCTION

CONTEXT

Water security is fundamental to human well-being, socioeconomic development, environmental sustainability, and political stability. Water underpins and cuts across nearly every development sector—including agriculture, food security, economic growth, energy, health, climate change adaptation, biodiversity, democracy and governance, and human rights. The Sustainable Development Goals (SDGs) underscore the centrality of water security for sustainable development, recognizing the multi-sectoral nature of water issues and emphasizing water's essential role for achieving the 2030 Agenda for Sustainable Development.

United States Agency for International Development (USAID)'s Sustainable Water Partnership (SWP) is a mechanism that aligns with and integrates key United States Government (USG) foreign policy goals, as well as USAID strategic priorities under the Global Water Strategy and Water for the World Act to build resilience to water security risks. SWP takes a holistic view of water issues, emphasizing the importance of engaging USAID Bureaus, Mission field staff, governments, and local stakeholders across sectors to assess, plan, and implement actions that address water-related risks at varying scales.

Water security is defined by SWP as the *adaptive capacity to safeguard the sustainable availability of access to, and safe use of an adequate, reliable, and resilient quantity and quality of water for health, livelihoods, ecosystems, and productive economies.*

FIGURE 1. SWP THEORY OF CHANGE

KEY ASSUMPTIONS:

- Strong political will at provincial and national levels to address water security
- Data available to support robust decision making
- Existing policy framework is supportive
- Ability to scale on the ground water security interventions
- Communities, and local and regional water user associations engaged in participating in water security

KEY STRATEGIES:

- Data analytics and development of robust decision support systems
- Capacity building at all levels of government
- Promotion of innovative water security interventions
- Private sector engagement
- Awareness creation and behavior change

IF stakeholders have improved awareness and participation in water security activities;

IF stakeholders have improved capacity and tools to assess water security risks;

IF stakeholders improve planning and water governance capacity;

IF improved water resource management strategies are implemented; and

IF there is increased collaboration, learning, and adaptive response to water risk

THEN there will be increased resilience to water security risks

GOAL

The overall goal of SWP is to promote water security and increase resilience to water security risks in basins, sub-basins, catchments, and communities. SWP assists USAID in integrating water security issues into Mission programming through two mutually reinforcing tactics.

> Through the Leader Award, SWP: a) supports and accelerates cross-cutting activities to advance USAID's global water security thought leadership, innovation, and action at all levels; and b) identifies and designs relevant Mission-specific initiatives, including analytical frameworks, data collection tools, and other products, with training programs for Headquarters and Mission staff on the use of these tools and products. In addition, SWP identifies, co-designs, and implements in-country activities that can yield measurable improvements in water security.

> Additional in-country activities can also be carried out through Associate Awards, which are streamlined procurement and implementation mechanisms for USAID Missions, using various funding streams. SWP also provides USAID Missions with access to the globally recognized technical expertise and field experience of the SWP team to operationalize the water security Results Framework.

FIGURE 2. SWP GOAL

SWP GOAL: INCREASED RESILIENCE TO WATER SECURITY RISK

IR1: Improved stakeholder awareness and participation in water security	IR2: Improved capacity & tools to access water security risks	IR3: Improved planning & water governance capacity	IR4: Improved capacity & behaviors to implement WRM measures	IR5: Increased collaboration, learning, & adaptive response to water risk
	2.1: Assessments & projections of water supply and demand completed	3.1: Social capital built around prioritized water security challenges	4.1: Structural, engineered, technological adaptation measures implemented	5.1: Capacity to access & use data improved
	2.2: Pollutant sources identified & water quality analyses completed	3.2: WSAPs developed & adopted	4.2: Non-structural or green infrastructure adaptation measure implemented	5.2: Knowledge of water security measures captured & stored
	2.3: Threats & vulnerabilities analyses completed for prioritized risks	3.3: Political will galvanized	4.3: Social behavioral change adaptation measures implemented	5.3: Tools & practice of knowledge sharing on water security established
	2.4: Governance & social behavioral change analyses completed	3.4: Partnerships developed to augment technical & financial resources	4.4: Policy, institutional, regulatory adaptation measures implemented	5.4: Learning catalyzed for replication & scaling

The SWP Theory of Change (TOC) and SWP Goal (Figures 1 and 2) assumed that the overall goal of improving resilience to water risks will be achieved if the following five Intermediate Results (IRs) were achieved by SWP, with the intention to improve:

Stakeholder awareness and participation in water security	Capacity and tools to assess water security risks	Planning and water governance capacity	Capacity and behaviors to implement water resource management measures	Collaboration, learning, and adaptive response to water risks

By improving resilience to water risks, SWP believed that water security will be sustainably enhanced in countries where SWP operates and leads activities, while USAID will strengthen its worldwide portfolio and technical leadership on water security.

These five IRs guide SWP activities and are also reflected in the Water Security Improvement (WSI) process that SWP developed and deploys.

The SWP Leader Award has four objectives (see below) that correspond to the types of activities implemented by SWP. These objectives are linked to the SWP IRs above. Mission support can address a single IR or multiple IRs, while the field-based pilot aligns with all of the SWP IRs. Leverage and Sustainability is a cross-cutting objective and is linked to IR3 for achieving sustained improvement of water governance. Finally, the Collaboration, Learning, and Adaptation (CLA) is linked to IR5 and implemented across all SWP activities. This report is organized by these four objectives; within each field-based pilot, the report is organized by IRs.

Mission support will provide USAID Missions and operating units with expertise to assist with strategy and program planning, scientific and technical assistance, capacity-building, and program implementation on all aspects related to assessing, planning, implementing, and collaborative learning for increased resilience to water security risk.

Field-based pilot activities will design and implement a limited number of field-based pilot activities that demonstrate the process and scope of water security assessment, planning, and implementation measures needed to achieve tangible outcomes for increased resilience to water security risk.

Leverage and sustainability will develop and formalize partnership arrangements with organizations wanting to contribute to the implementation and sustainability of site-based water security action plans.

Collaboration, learning, and adaptation will harness knowledge from a broad group of stakeholders working on water security; develop and refine tools and methodologies; provide thought leadership; test innovative approaches; and initiate a program of knowledge management, collaborative learning, and communication on best practices, lessons learned, tools, and other resources.

PROJECT ACTIVITIES AND RESULTS

MISSION SUPPORT

As USAID/Washington's main pathway to integrate water security into water activities at USAID Missions worldwide, SWP provided technical expertise in assessment, design, and coordination to address mission needs on water security. SWP's Mission support activities intended to be responsive to specific mission needs to advance USAID's goals related to water security and water resource management. In one case, SWP Mission support created a pathway to an associate award in Nepal, which is covered in the Associate Awards section. SWP provided a menu of specific services to missions to improve water security and resilience to water risks, such as:

- engaging stakeholders and promoting participation in water management
- providing guided processes to assist water decision-making
- proposing tools and models to assess water issues and plan water actions
- supporting the design and implementation of mutually supportive water activities—including infrastructure development, watershed management, behavior change, and institutional capacity building
- facilitating coordination, collaboration, learning, and adaptive management as it relates to water security

After specific information or resource gaps were defined through preliminary conversations with USAID Missions, SWP was able to provide assessments (El Salvador, Uzbekistan, Pakistan), coordination (South Africa, Nepal) or tools to advance specific mission goals. Details of mission support activities are included below.

Pakistan

At the request of USAID/Pakistan, SWP conducted a water governance assessment in September 2017 to assess its government-to-government contribution of $140 million for the completion of the Gomal Zam Dam and associated hydropower, irrigation infrastructure, and command area development. Irrigated agriculture is an essential source of livelihoods in the Khyber Pakhtunkhwa region, and the assessment aimed to better understand the successes and challenges of USAID/Pakistan's approach to addressing water management. In addition, the assessment informed USAID/Pakistan's further investments in the water sector through the Water Management for Enhanced Productivity, implemented by the International Water Management Institute. SWP concluded that livelihood benefits were achieved through year-round irrigation in large areas downstream of the dam. However, further livelihood benefits in the area of the Gomal Zam Dam were limited due to a lack of technical coordination between the dam and distribution operators, local government entities and authorities, and community stakeholders. Low institutional capacity of the counterpart organizations was also a barrier to establishing water user associations, supporting livestock management, crop diversification, horticulture, and value chain development, which reduced the desired impacts of USAID/Pakistan's activities. SWP shared these conclusions in a provincial-level stakeholder workshop and made recommendations for improved planning, design, procurement, implementation, and monitoring of future similar investments. As a result, USAID/Pakistan's current investments specifically address low governance and management capacity.

Southern Africa

SWP coordinated the Big Data Analytics and Transboundary Water Collaboration for Southern Africa ("the Collaboration") from 2018 to January 2021. The Collaboration focused on the Ramotswa aquifer (shared by Botswana and South Africa) and the Shire aquifer (shared by Malawi and Mozambique), two critical transboundary aquifers that provide groundwater that is essential water supply for household use and livelihoods in the region. Effective management requires high quality, widely available data to understand water availability and quality, but data is often not accessible to policy-makers due to limited funding, technology constraints, and low capacity. Transboundary aquifers face further data constraints as different countries may have different capacity levels, use different methods to collect and analyze data, and may lack incentives to share information that will improve overall aquifer management. To address this, USAID partnered with the Government of South Africa's Department of Science and Innovation (DSI), the Southern African Development Community Groundwater Management Institute

BOX 1. WHAT IS BIG DATA?

Big data is a dataset whose size or type is beyond the ability of traditional relational databases to capture, manage, and process. Characteristics of big data include high volume, high speed of generation, and high variety. Big data analytics is the use of advanced analytic techniques to harness big data insights for better and faster decision making, modeling, and prediction of future outcomes.

(SADC-GMI), the IBM Africa Research Lab, the Water Research Commission of South Africa, and the United States (U.S.) Geological Survey to provide financial and technical support for four research projects exploring the use of big data analytics (Box 1) to improve knowledge creation and evidence-based management for regional transboundary aquifers. Using big data analytics to address the data gap presents an opportunity to organize large datasets from diverse sources while employing artificial intelligence techniques to analyze the data, despite gaps in data or information.

As the partnership's coordinator, SWP facilitated decision-making and consensus-building and helped broaden the scope of the Collaboration to create an inclusive process for regional water management partnerships, including the South African Department of Water and Sanitation and the Centre for Scientific and Industrial Research. SWP also provided planning support for the organization of joint events, fostered the creation and continued engagement of a Community of Practice in Southern Africa on transboundary water management and big data, and contributed to the technical reviews of the four research projects.

The research projects addressed how big data analytics and transboundary data-sharing can be used to enhance transboundary water management in alignment with USAID's regional focus on natural resources and water management. Specifically, the research projects explored new or relevant big data analytics methodologies to enhance understanding of shared groundwater resources; improve transboundary groundwater management and collaboration; and provided big data skills development, capacity-building, and networking opportunities for young Southern African researchers and professionals. All four research projects focused on the Ramotswa, which is a shared sub-basin that spans Botswana and South Africa and is a subsidiary of the wider Limpopo River Basin—which is located in Botswana, South Africa, Mozambique, and Zimbabwe. One of the projects also focused on the Shire River Basin, shared by Malawi and Mozambique. The projects were led by research teams comprised of experts from local universities, international consultants, and multinational organizations based in South Africa, Botswana, the Netherlands, and Germany.

To address capacity gaps for researchers on transboundary aquifer management and on big data, SWP organized three webinar series under the Collaboration. The webinars are publicly available as a resource on YouTube to serve as a further resource for those interested in 1) learning more about transboundary water management and 2) using big data for water resource management. In 2019, SWP organized a series of eight training sessions featuring experts from and methodologies used by the United States Geological Survey in management of groundwater and transboundary aquifers. In February and March 2020, the Collaboration organized a "Crash Course on Big Data for Water Security," featuring seven seminars with experts from IBM Research Africa. The series included seminars on the potential for big data analytics to enhance water security, with a special focus on East Africa and Southern Africa and the proposal for a blockchain data-sharing platform for the region. In August and September 2020, SWP and the International Union for the Conservation of Nature's (IUCN) Global Water Program and Environmental Law Centre presented a series of six webinars on transboundary water governance. The webinars covered a variety of topics relating to transboundary water governance, such as: international law on the subject, the future of transboundary water governance in Southern Africa, and the potential role of big data.

The outcomes of the Big Data Collaboration and research projects included: 1) a validated sustainability framework and supply strategy for groundwater management in transboundary aquifers, 2) a master dataset suitable for big data analytics, 3) a suite of analytic tools for integrated decision-making, and 4) tools for localized governance approaches. The intent is for these frameworks and datasets to inform Limpopo River Basin Commission and government departments. SWP also facilitated dialogue among members of the Collaboration for continued engagement beyond SWP's support. An important focus of the Collaboration going forward will be continuing the work on big data analytics and regional data sharing that is critical to effective transboundary aquifer management. As the Collaboration came to a close, SWP facilitated dialogue among members of the Collaboration for continued engagement after SWP's concluded. An important focus of the Collaboration going forward will be on big data analytics and regional data sharing.

Uzbekistan

In March 2021, USAID/Uzbekistan requested research support from SWP to understand potential water availability and water quality risks in the Karakalpakstan region. SWP prepared a water security desk review for USAID/Uzbekistan and delivered a presentation to the Mission. The presentation included details on the main river basins in Uzbekistan, the current status of water resources, climate change impacts on water resources, and more specific details on the Karakalpakstan region—where USAID had previous investments. The study also included a review of large projects by other donors in the region. Uzbekistan is an extremely water-stressed country; the main source of water for the Karakalpakstan region is the Amudarya River (which drains into the Aral Sea), with about 90 percent of its watershed in upstream countries (Tajikistan, Afghanistan, Kyrgyzstan). It is heavily used for irrigation to grow cotton; the drinking water supply relies on complex networks of pipelines and treatment plants from surface water and on local wells drawing on potential polluted groundwater. Coordinated donor programming is important to support water security in the region.

El Salvador

In January 2020, an algal bloom producing cyanobacteria overwhelmed the Las Pavas Water Treatment Plant on the Lempa River in El Salvador, resulting in odor and taste complaints from customers. To respond to this urgent crisis, the National Administration of Aqueducts and Sewers (ANDA) developed a contingency plan and early alert system for algal blooms at Las Pavas, improved treatment methods, and looked at long-term solutions to reduce pollution that cause algal blooms in the Lempa River. With growing urbanization in Central America, water management authorities will increasingly need to be aware of both watershed-level and utility management interventions to maintain safe, reliable water supply for urban areas.

To support these efforts, in June 2021, USAID requested that SWP conduct research on the pollution sources causing these harmful algal blooms (HABs) and high turbidity levels at the intake of the Las Pavas water treatment plant to identify strategies that would help mitigate future instances of harmful algal blooms, erosion, and sedimentation in the Lempa River that could negatively impact the Las Pavas Water Treatment Plant.

SWP conducted a preliminary analysis of point and nonpoint sources of pollution upstream of Las Pavas water treatment plant. The analysis assessed the pollution sources causing algal bloom and high turbidity levels at the intake of the Las Pavas plant and developed an evidence-based road map to identify strategies to help mitigate these sources. Given the findings that the main pollution sources originated from untreated sewage effluents in the Lake Güija by the Desagüe River—with a significant portion coming from Guatemala—the study recommended several actions that should be undertaken: gather more local information to bridge existing data gaps; support institutions in clarifying mandates and responsibilities, in monitoring water quality, and in engaging with local communities and municipalities for water resource management; implement transboundary cooperation between El Salvador and Guatemala to regulate upstream water source protection; and support the rollout of an expected Water Law in El Salvador. Additional investments in water treatment plants—both for wastewater upstream and at the intake of Las Pavas for drinking water—may also be necessary.

FIELD-BASED PILOT ACTIVITIES

Cambodia Stung Chinit Basin

SWP dedicated significant leader award resources to support activities that piloted the WSI process in two diverse regions of the world presenting different water security risks and opportunities to address them. In the Stung Chinit Basin of Cambodia, the SWP WSI process was applied on a basin scale, engaging a wide variety of public and community-based stakeholders to identify and address water security risks. Work in the Mara River Basin (MRB) of Kenya and Tanzania provided a unique opportunity to work with local-level stakeholders throughout the basin and also to engage with national- and regional-level actors managing transboundary aspects of water security. Both pilot activities were structured to mirror the IRs in the leader award.

The Stung Chinit ("stung" means river in Khmer), located primarily in Cambodia's Kampong Thom Province, is a major tributary of the Tonle Sap Lake, the country's largest and most important lake in terms of economy and water supply. The river's length is about 260 kilometers, merging downstream with the Tonle Sap River; its watershed size is approximately 8,000 square kilometers.

Water security is essential for the people living in this area of central Cambodia, particularly for the poor who spend more time collecting water, with reduced access to improved sanitation facilities and inadequate access to irrigation for crops and livestock. Groundwater is widely used for domestic water supply and is increasingly being used for small-scale irrigation. Agriculture is the primary source of income in the Stung Chinit basin, primarily rice farming (90 percent of agricultural land in the watershed is used for rice production), cassava, rubber, and cashew nuts, complemented by subsistence farming that serves as a nutritional safety net should crops fail. In downstream areas, fishing is a major source of food and livelihoods for residents. With 60 percent of households relying on agriculture, water plays an essential role in food and economic security in the Stung Chinit. However, the watershed's population is growing by 2 percent per year, which is increasing stress on the landscape and its water resources. Land use changes in the watershed (that provide critical ecosystem services) reduced forests by 43 percent between 2000 and 2018, primarily for conversion to agriculture for cash crops. Over 30 percent of deforested areas occurred in government-allocated economic land concessions allowing commercial tenants to clear land for industrial-scale agriculture, primarily for rubber plantations.

USAID/Cambodia provided concurrence on June 22, 2017, for SWP to conduct a four-year water security activity in Cambodia focusing on the Stung Chinit Basin and structured to mirror the steps of the WSI process (Figure 3). The SWP Cambodia activity aimed to increase resilience to water security risk in the Stung Chinit Basin.

FIGURE 3. SWP CAMBODIA RESULTS FRAMEWORK

GOAL: INCREASED RESILIENCE TO WATER SECURITY IN THE STUNG CHINIT WATERSHED

- **IR1: Improved stakeholder awareness and participation in water security**
  - 1.1: Stakeholders, including private sector, engaged and participating in WSI process
  - 1.2: Improved awareness on all levels of WSI
- **IR2: Improved capacity & tools to access water security risks**
  - 2.1: Stakeholders have knowledge/ skills to interpret and apply data
  - 2.2: Data to inform water security risk assessment identified/ available
  - 2.3: Tools to analyze data developed
- **IR3: Improved capacity & behaviors to implement Small-Scale Water activities**
  - 3.1: Demonstration (4 types of water security activity)
  - 3.2: Access to resources commune development plan
  - 3.3: RBMC and WGs established empowered to prioritize implementation of activities
- **IR4: Improved planning & water governance capacity**
  - 4.1: River Basin Management Committee (RBMC) established
  - 4.2: RMBC operational (incl. funds) – SAP validated
  - 4.3: Water activities coordinated in Basin (via Strategic Action Plan)
- **IR5: Increased collaboration, learning & adaptive response to water risk**
  - 5.1: Lessons learned documented recommendations developed, applied, adapted to activities
  - 5.2: Tools adapted and shared (toolkits) based on field testing (ex. behavior change research)

IR1: IMPROVED STAKEHOLDER AWARENESS AND PARTICIPATION IN WATER SECURITY

Overall, stakeholders in the Stung Chinit basin did not have a holistic view of water management. This was due to siloed institutional structures of water management, which approached water uses separately (e.g., irrigation, drinking water, environment), lack of basin-level planning processes and structures that engaged a diversity of water users, and insufficient or inaccessible water management and data use on the basin scale—preventing stakeholders from assessing challenges and opportunities. SWP addressed stakeholder awareness by performing a comprehensive, stakeholder-guided water risk assessment. Simultaneously, SWP worked to secure ongoing participation of key stakeholders—essential to the WSI process—by designing and implementing a WSI leadership training program to give standout stakeholders the skills necessary to engage and contribute to the WSI process in the Stung Chinit Basin. SWP Cambodia also facilitated structured opportunities and targeted activities to engage different stakeholder groups at different phases of the WSI process to raise awareness and sustain participation. Specifically, SWP helped local stakeholders form issue-specific working groups to define potential opportunities for improved water security. The working groups subsequently served as a platform for basin-wide planning and implementation of "quick-win" activities.

SWP also engaged stakeholders in a water risk assessment of the basin that included a seasonal water quality monitoring survey, stakeholder analysis, biodiversity evaluation, water balance calculation, Water Evaluation and Planning (WEAP) model of the basin, water governance assessment, and irrigation infrastructure inventory. A knowledge, attitudes, and practices survey on water security and water resource management also provided valuable insights into stakeholder understanding of water security risks. The results were communicated to stakeholders in an in-person workshop and executive summaries in Khmer.

WSI leaders. To prepare local stakeholders to lead the WSI process in their communities and facilitate equitable and meaningful participation alongside their government counterparts, SWP designed a community development soft-skills training series. Thirty village and commune leaders (including 17 women) identified through the stakeholder analysis, participated in trainings on leadership, community development, project planning and management, budgeting and financial management, and conflict resolution. The trainings improved leadership skills and built the capacity of the champions to guide the subsequent steps in the WSI process, including assessing water risks and planning and implementing water security actions. This set the standard for stakeholder participation going forward and helped ensure a broader range of ideas and water user needs in the WSI process.

Water security game. To address the difficulties SWP experienced in the first years of the activity, SWP developed a water security game for the basin. Beyond raising the awareness of stakeholders—ranging from provincial line department officers down to community leaders—the interactive applied water security game was designed to simulate the conditions under which local water security decisions are made. The game was developed to specifically reflect the water security risks in the Stung Chinit Basin and translated into Khmer. Unfortunately, COVID-19 restrictions prevented the SWP team from playing the game with stakeholders, but it was shared with the Stung Chinit River Basin Management Committee (SC-RBMC) and other influential basin actors to play with stakeholders once restrictions are lifted. The game can be found in English here and Khmer here.

IR2: IMPROVED CAPACITY AND TOOLS TO ASSESS WATER SECURITY RISKS

Basin managers and local stakeholders in the Stung Chinit struggle with assessing water risks because basin and sub-basin-level data does not exist, is not accessible, or is too convoluted to use for decision- making. To address this, SWP supported capacity building of stakeholders to analyze risks and uncertainty using the Watershed Ecosystem Services Tool (WESTool), Robust Decision Support (RDS) frameworks, WEAP model (Box 2), and improved water quality testing.

WESTool. Stung Chinit key decision-makers included mid-level provincial line department employees and district council personnel engaged in land and water planning. These stakeholders lacked the necessary resources to make informed planning decisions. To address this, SWP leveraged the WESTool, which is an interactive online map-based tool that estimates historical and potential future impacts of land use and climate change on ecosystem services in Cambodia. Originally developed under USAID/Cambodia's Supporting Forests and Biodiversity project, WESTool was designed to provide Cambodian decision-makers with objective, science-based information to balance conservation needs with development goals. Under SWP, the WESTool was refocused on water security and its layers were updated with the latest available data. Now it allows end-users to assess water security risks across spatial scales, from individual land concessions to the entire watershed. While COVID-19 restrictions prevented SWP from carrying out in-person training on the WESTool, the SWP team developed a set of three videos in Khmer to be used as independent training resources with an emphasis on interpretation of results for decision-making. The videos were uploaded to YouTube and were shared with provincial-line department staff.

BOX 2: THE WEAP MODEL

Developed by SWP partner the Stockholm Environmental Institute, the WEAP model is a decision support tool that models possible outcomes and uncertainties in a watershed. WEAP is an integrated water planning system that models rainfall, runoff, infiltration, evapotranspiration, crop water requirements and yields, surface water/groundwater interaction, and instream water quality. WEAP engages users through a GIS-based interface using graphs, tables, and maps. See more information at www.weap21.org.

RDS and WEAP. To increase stakeholder decision-making under increasing uncertainty, SWP worked with the Stockholm Environment Institute (SEI) to build capacity using RDS and WEAP modeling. In 2018, SWP convened two workshops with provincial authorities and community representatives. In these workshops, stakeholders discussed a preliminary basin WEAP model and its findings detailing the basin's past and future risks. Given the language barrier and the stakeholders' limits experience with hydrologic models, a board game was developed to help teach stakeholders about uncertainty and water allocation. The objective of the game was to score the most points by planting rice, while simultaneously keeping river flows healthy enough to support fish. SEI updated the WEAP model based on the feedback and presented it to stakeholders. Participants used the stakeholder-verified WEAP model of the Stung Chinit Basin to discuss and agree on future vulnerabilities of the system, build consensus on the model, and prioritize the basin's water security risks. Overall, the RDS process and WEAP model helped guide stakeholder consensus about current and future risks to the basin and was used to inform the Strategic Action Plan (SAP).

After the completion of the basin WEAP model, SWP collaborated with SEI and The Asia Foundation to integrate gender and poverty into the Stung Chinit Basin WEAP model using a multidimensional poverty analysis framework developed by the Swedish International Development Cooperation Agency. As part of this process, SWP conducted targeted interviews and supported household surveys to gather additional data on gender and poverty, which was then used to recalibrate the WEAP model to be more sensitive to how inequalities affect the access to water in the basin. A notable finding was that the original model did not accurately represent shortages in irrigation supply experienced by most downstream users in the irrigation system. The results were summarized in an internal final report and "Social Hydrological Analysis for Poverty Reduction in Community-Managed Water Resources Systems in Cambodia," published in *Water* in July 2021.

Water quality. Staff at Provincial Department of Education (PDE); Provincial Department of Agriculture,

Forestry, and Fisheries (PDAFF); and Provincial Department of Water Resource and Meteorology (PDWRAM) lacked capacity and basic equipment to conduct environmental water quality testing. To address this gap, SWP conducted training for technical staff on ambient water quality monitoring field skills—such as water quality sample collection, calibration and use of field probes, and data management. While the scale and extent of the training was reduced due to COVID-19, SWP was able to train five staff on water quality monitoring and provide a probe to the SC-RBMC as part of SWP's disposition of equipment.

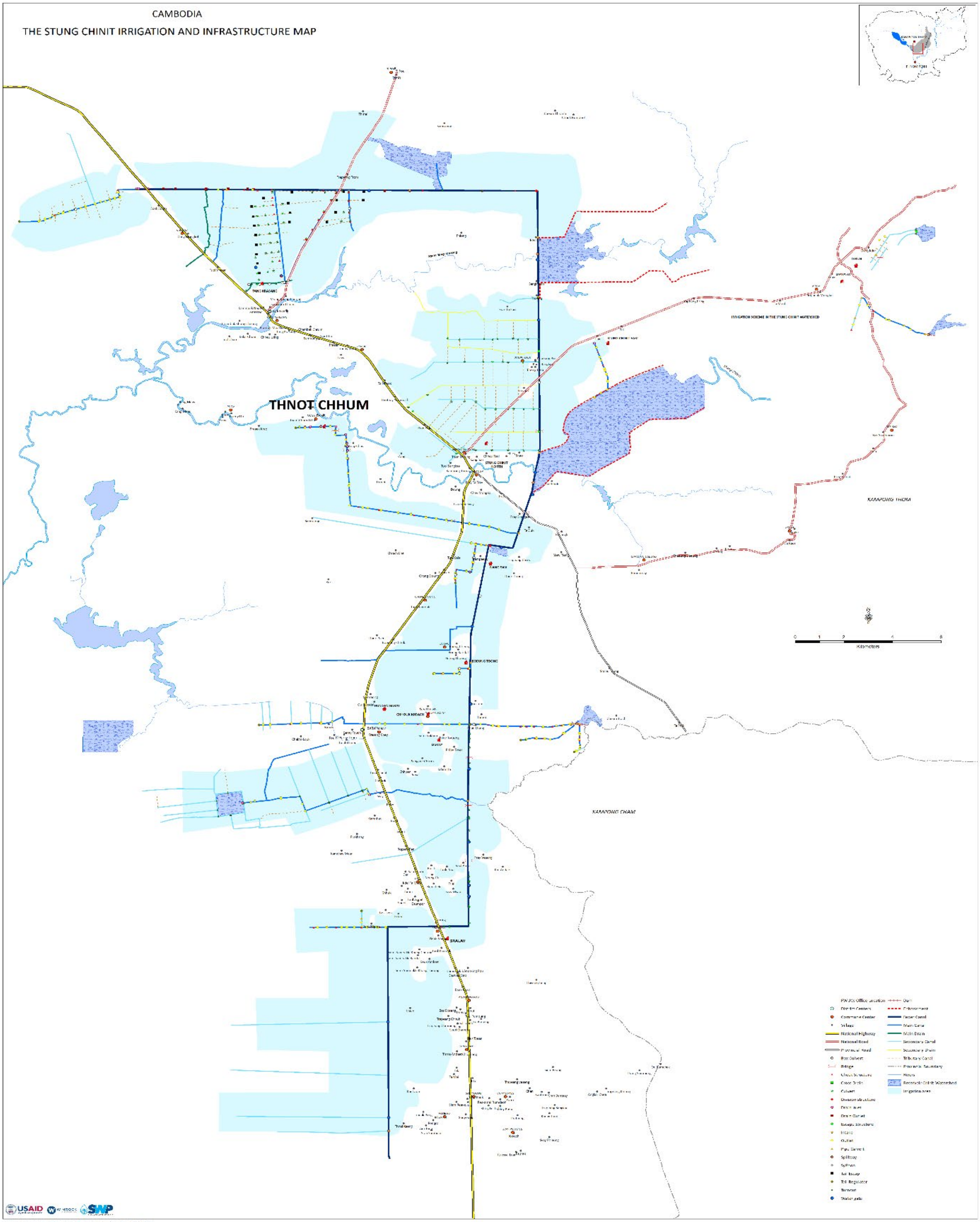
IR3: IMPROVE CAPACITY AND BEHAVIORS TO IMPLEMENT SMALL-SCALE WATER SECURITY ACTIVITIES

In the Stung Chinit Basin, SWP found that capacity to implement water security activities was limited at the community level. Stakeholders did not necessarily lack understanding of water security issues, but they either did not have the leadership capacity to design and implement water security interventions or see it as their responsibility. Within Farmer Water User Communities (FWUCs) especially, SWP identified specific capacity and information gaps on irrigation management and developed targeted trainings to strengthen capacity for implementation of small-scale water security activities.

Working groups. SWP worked with stakeholders to form four working groups based on prioritized water security risks identified in the assessment, i.e., upstream environmental degradation; agricultural pollution; irrigation and reservoir management and operation; and water, sanitation, and hygiene (WASH). Initially made up of WSI Leaders, SWP recruited additional members from across the basin to participate in the working groups, including provincial, district, and commune officials, as well as representatives of FWUCs, Community Forestry groups, and Community Fishery groups. Through a series of workshops, each working group drafted and validated Plans of Intervention, which detailed proposed water security activities, timelines, and budgets to address the key water security risks. The Plans prioritized quick-win community-level projects which could show results within two to three months using a relatively small budget (approximately $2,000). The quick-win projects, including 20 water security and WASH awareness-raising and clean-up events in communes across the basin, increased stakeholder buy-in by countering the widespread view that water security interventions would be expensive and time consuming. The Plans of Intervention also included larger, one- to three- year interventions, which were subsequently integrated into the Stung Chinit Basin SAP. In year five, SWP supported the development of two more working groups targeted on addressing water security risks surrounding rainfed agriculture and private water operators.

Building capacity for improved irrigation management. SWP found that irrigation management in the Stung Chinit Basin was not well coordinated across the Ministry of Water Resources and Meteorology (MoWRAM), Provincial Department of Water Resource and Meteorology (PDWRAM), FWUCs, international donors, local non-governmental organizations (NGOs), and communities. One of the key challenges was the lack of openly available, high-quality data on the irrigation systems. To address this information gap and to facilitate future planning, expansion, and maintenance of irrigation systems, SWP developed a detailed Stung Chinit Basin Irrigation Systems inventory map (Figure 4) and list using data provided by PDWRAM and Irrigation Service Center (ISC)—a local NGO. The updated map, its Geographic Information

FIGURE 4. STUNG CHINIT IRRIGATION AND INFRASTRUCTURE MAP



System (GIS) shapefiles, and comprehensive inventory was validated with relevant provincial departments and shared with all SC-RBMC members, including the basin's 12 previously identified FWUCs. Currently, nearly all actors involved in the management of irrigation systems in the basin have access to data. Now that this data is accessible—without prior politics and financial incentives—the SC-RBMC can better monitor the basin's numerous irrigation activities being implement by various actors, i.e., Asian Development Bank (ADB), MoWRAM, PDWRAM, district irrigation committees, and FWUCs, facilitating future collaboration between different actors. Perhaps, with everyone having access to the same baseline data, there will even be more collaboration in the future.

Empowering FWUCs to implement water security activities. FWUCs are important for water security in the Stung Chinit Basin and have the potential to be agents of change; however, they lack the required basic legal knowledge as well as technical assistance to strengthen management of irrigation systems from the bottom up. For example, by formally registering as a FWUC, they are legally entitled to access technical and financial support from PDWRAM and can make management decisions about the irrigation scheme they manage. With enough registered FWUCs requesting this support, PDWRAM is more likely to provide it or at least can make a better case to MoWRAM to provide it. To facilitate increased registration or re-registration, SWP developed a sequential checklist that simplified the requirements for a FWUC. The checklist was shared with all FWUCs and the PDWRAM and can be used as a future handout at FWUC specific trainings.

SWP also facilitated a series of soft-skills trainings for 11 FWUCs on conflict resolution, leadership, communication, and community mobilization. SWP partner, ISC, conducted two trainings for the Hun Baray FWUC and the Chhuk Khasch FWUC. The first session addressed FWUC legal framework, regulations, and policies. The second session focused on resilient irrigation scheme management and operations and maintenance (O&M), including a game to help participants learn about their irrigation scheme (see Irrigation Game Case Study). With SWP support, both FWUCs developed and piloted customized water distribution plan for portions of the Hun Sen Baray and Chhuk Khsach Irrigation Schemes during the receding rice season. As a result, there were no water shortages or water-related conflicts among any farmers participating in the water distribution schedule pilot. Implementing pilots in a relatively small area demonstrated that water distribution plans improved challenges of water availability and coordination at scale.

IR4: IMPROVED PLANNING AND WATER GOVERNANCE CAPACITY

One of the key water security risks in the Stung Chinit Basin was the lack of basin-wide planning and coordination among key government and community stakeholders. SWP facilitated enhanced basin-wide management and coordination by working with local stakeholders to develop a river basin management committee and a basin SAP.

Stung Chinit River Basin Management Committee. SWP facilitated the creation of the SC-RBMC, which was signed into law by the governor of Kampong Thom province on April 10, 2019. The SC-RBMC was comprised of a Secretariat, who was responsible for daily operations; a wider membership platform made up of provincial government and line-department leaders; representatives from the basin's FWUCs, Community Forestry groups, Community Fisheries groups; and all current or future Working Groups—including the six established under SWP. SWP also supported the Secretariat to develop the Stung Chinit Basin Strategic Framework, which outlined the priority water security risks and cross-cutting issues (e.g., data, gender equality, social inclusion) in the basin. The framework, which was validated by the SC-RBMC in June 2019, was a crucial step towards the development of the SC-RBMC's SAP.

Over the long-term, the SC-RBMC, led by the Secretariat, will be responsible for managing the implementation the basin-wide SAP, establishing basin management guidelines, investigating and reporting on priority and emerging water security risks, and communicating their actions and findings to the general public. To ensure continued leadership of the SC-RBMC, the Secretariat appointed two provincial representatives to the position of SC-RBMC Secretariat Coordinator. One represents Kampong Thom province, and one represents PDWRAM and works closely with the FWUCs. Together they will share leadership of the SC-RBMC.

All six Working Groups (see IR3) were integrated into the SC-RBMC. Each Working Group developed Terms of Reference, making them a legally recognized technical group. As technical working groups under the SC-RBMC, they would function more in an advisory position (whereas they were more planning- and implementation-focused under the SWP Cambodia pilot) and would conduct thematic technical coordination across multiple agencies and institutions.

Strategic Action Plan. SWP supported the development of a SAP to guide the SC-RMBC in developing specific plans and targets for WSI in the basin. With support from SWP, a SC-RMBC Task Force led the development of the SAP in consultation with the SC-RBMC members and the Secretariat. SWP facilitated three workshops with the Task Force to discuss the objectives, prepare the final outline, agree on priority actions, and validate the final draft. The objective of the SAP is: "To promote the sustainable development in the Stung Chinit Basin with particular emphasis on water security and protection of biodiversity through the implementation of interventions and established mechanisms for institutional coordination, data management, knowledge sharing, and inclusive participation of all actors in the basin." In support of this objective, the SAP presented targeted actions, many which

originated from the Working Groups' Plans of Intervention, that would be implemented to help improve water security for health and sanitation, agriculture, the environment, and climate resilience. It also outlined actions to strengthen the capacity of the SC-RBMC and its members. The SAP also addressed monitoring and evaluation and potential funding sources. After a final review, the Task Force presented the SAP to the Committee Chair for approval, which was received December 27, 2020. The official SAP launch event took place January 28, 2021 with all SC-RBMC members in attendance.

At the conclusion of SWP, the SAP was already being institutionalized within local management entities. All four of the basin's district or vice district governors committed advisory commune councils under their jurisdiction on how to integrate the priority activities into their commune investment plans. This will enable access to more sustained funding for water security activities.

IR5: INCREASED COLLABORATION, LEARNING, AND ADAPTIVE RESPONSE TO WATER RISK

SWP prioritized collaboration with other USAID/Cambodia activities implementing in the Stung Chinit watershed. SWP and the Greening Prey Lang (GPL) project collaborated on a reforestation project for the Prey Khum Sochet Community Forest in Kampong Thom province. This activity was proposed by the upstream environmental degradation working group on a reforestation project. SWP mobilized key commune and technical actors, and GPL provided technical oversight of the activity. Under this activity, local authorities, provincial Forestry Administration cantonment officials, Community Forest members, and the GPL project planted 2,500 saplings on three hectares of land selected for reforestation. Prey Khum Sochet Community Forest members pledged to work together to take care of the new trees to contribute to the water security of the Stung Chinit Basin.

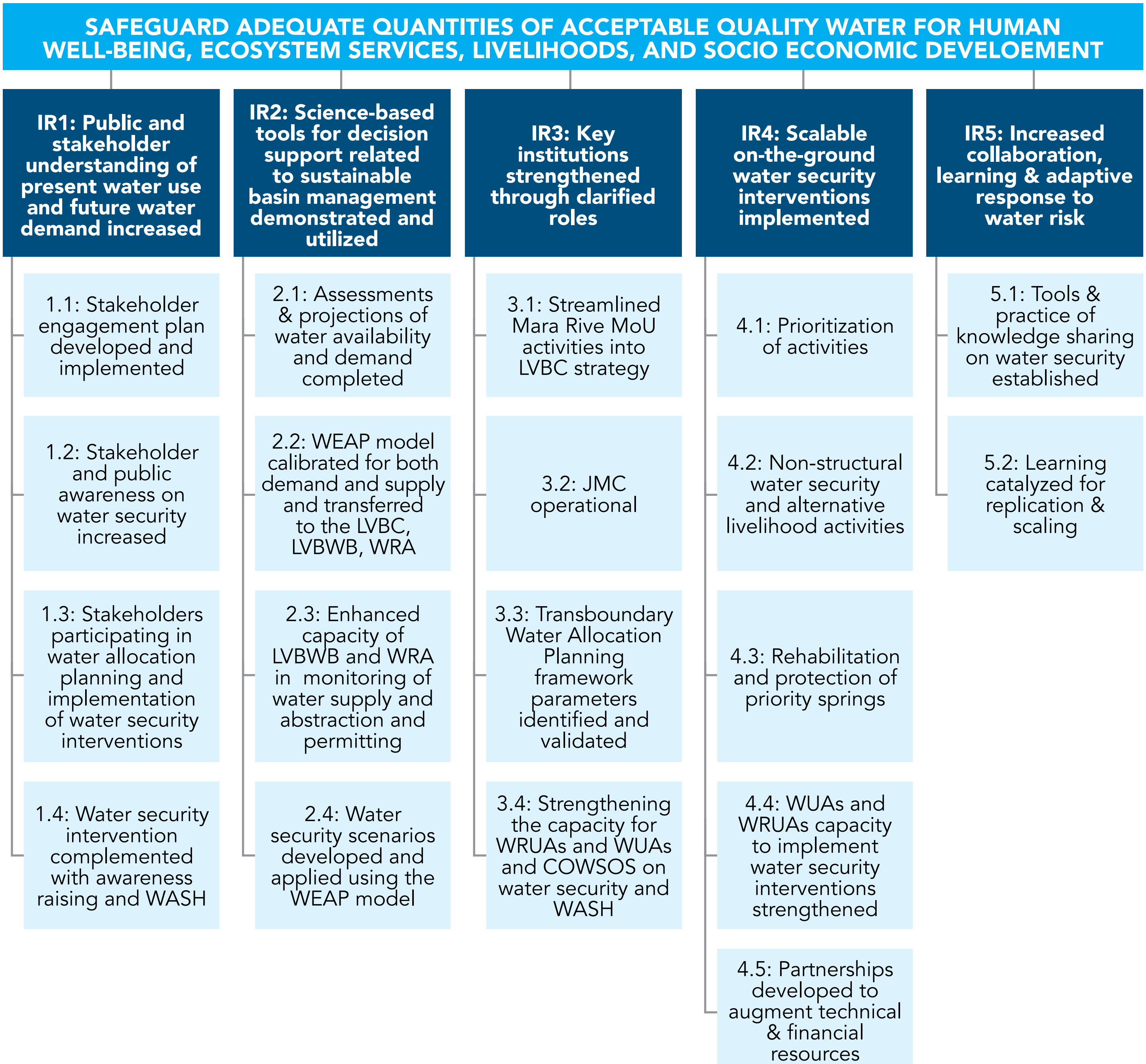
SWP worked with the USAID/Washington-funded WASH-Fin project and their partner Cambodian Water Supply Association (CWA) to develop specialized capacity building training for private water operators (PWOs) in the basin. SWP coordinated a strengths, weaknesses, opportunities, and threats assessment of the PWOs with USAID/WASH-Fin and CWA to inform development of a customized training module and then prepared training materials that were transferred to the Provincial Department of Industry, Science, Technology, and Innovation (PDISTI) for it to use with the SWP-supported PWO working group. SWP also identified and brought together all of the PWOs as members of CWA to enable them to access ongoing trainings. Unfortunately, COVID-19 interfered with the ability of PDISTI to deliver the PWO training; however, when the COVID threat has passed, PDTISI will be equipped with the tools it needs to implement the training.

In addition to collaboration with other projects, SWP produced a number of case studies, learning assessments, technical briefs, and webinars. These are further detailed in the thought leadership section of this report.

Kenya and Tanzania Mara River Basin

Originating from the Mau Escarpment in Kenya's Great Rift Valley, the transboundary MRB covers approximately 13,750 square kilometers (65 percent is in Kenya and 35 percent is in Tanzania). Home to wildlife in the Maasai Mara National Reserve in Kenya and the Serengeti National Park in Tanzania, the MRB holds global significance for conservation efforts and is important for the economic development of local communities in the MRB and for the national economies of Kenya and Tanzania. Risks to water availability and quality in the MRB are growing and threatening development and conservation gains. Population growth is estimated to be more than three percent annually and land use changes from increased agriculture are affecting the basic hydrology and ecosystem functions in the MRB, impacting seasonal availability of water and water quality. Water pollution caused by unregulated wastewater discharge and lack of solid waste management from urban centers,

FIGURE 5. SWP MARA RESULTS FRAMEWORK



mining, and agricultural activities is contaminating surface and groundwater supplies, potentially hampering access to WASH services and negatively impacting health, livelihoods, and overall development outcomes.

SWP's three-year Sustainable Water for the Mara (SWM) activity in the MRB (Figure 5) implemented strategic interventions at the transboundary, national, and sub-catchment levels to address these critical risks and improve water security. SWP's activity strategically built on past and current USAID investments in the MRB (in particular, USAID/Kenya and East Africa's PREPARED Program) to directly support the Memorandum of Understanding (MOU) for Joint Water Resources Management in the Mara Basin. Throughout our activities, we worked with key governance institutions in the MRB, including the Lake Victoria Basin Commission (LVBC), Ministries of Water in Kenya and Tanzania, Kenya's Water Resource Authority, and the Lake Victoria Basin Water Board (LVBWB) in Tanzania, Kenyan water resource user associations, Tanzanian water user associations, and service delivery providers.

In 2017, with support from USAID/Kenya and USAID/East Africa, SWP started a three-year water security activity focusing on the transboundary (Kenya/Tanzania) MRB. The Mara activity results framework outlined the goal to safeguard adequate quantities of acceptable quality water for human well-being, ecosystem services, livelihoods, and socioeconomic development.

IR1: PUBLIC AND STAKEHOLDER UNDERSTANDING OF PRESENT WATER USE AND FUTURE WATER DEMAND INCREASED

To improve transboundary cooperation and understanding of water use in the MRB, SWP collaborated with the World Wildlife Fund and the LVBC to draft a white paper on water sharing principles in the MRB. The intention of this document was to inform negotiations between the governments of Kenya and Tanzania through the Joint Technical Committee (JTC), as stipulated in the MRB MOU between the governments of Kenya and Tanzania. This paper highlighted different examples of water sharing arrangements around the world and provided scenarios related to transboundary water-sharing arrangements in the MRB for JTC consideration. It was shared with the LVBC—which serves as the interim secretariat of the Joint Management Committee—for initial input. Unfortunately, largely due to COVID, discussions of the draft water-sharing principles with the JTC was not possible during the life of the SWP activity. SWP initiated conversations with German Agency for International Cooperation (GIZ) and World-Wide Fund for Nature (WWF) and shared the latest information on the water-sharing principles with USAID/Kenya and USAID/Tanzania, so that other programs could utilize similar water-sharing principles.

IR2: SCIENCE-BASED TOOLS FOR DECISION SUPPORT RELATED TO SUSTAINABLE BASIN MANAGEMENT DEMONSTRATED AND UTILIZED

In the Mara, SWP identified a need for increased access to science-based tools to support planning on both the larger transboundary basin level and the sub-catchment basin level. This is critically important as climate change, population growth, increasing conversion of land use to agriculture, and climate change threaten the environmental, economic, and food security that the MRB provides. Without considering the diversity of factors that influence water availability and quality in the basin, stakeholders are unable to effectively plan for future water allocation needs.

Water allocation planning. To assist stakeholders in the Mara River Catchment to respond to the current challenges and risks from over-allocation, over-abstraction, and illegal abstraction, SWP facilitated development and final approval of the Tanzania Water Allocation Plan (WAP), which was developed using scientific analyses and stakeholder consultations.

Several critical analyses that informed the WAP, including water demand, availability, and abstraction assessments were completed in partnership with IHE Delft and mWater.

The water abstraction survey completed with mWater helped the LVBWB identify 499 abstraction points and was critical for the development of the water allocation plan since it provided information on water uses by different sectors in each sub-basin of the lower MRB. The innovative mobile application, used by mWater to complete the abstraction survey, was adopted by the LVBWB to be deployed more broadly.

Overall, the WAP provided guidance water distributions and water permitting under different water availability scenarios. The plan contained multiple options for allocating water depending on water availability and current-, medium-, and long-term demand. The WAP was formally approved by the Ministry in Winter of 2021 and a formal launch event took place in Spring of 2021.

Robust decision support. RDS assists stakeholders in finding common understanding of water systems, uncertainties that it confronts, and management strategies that promote a water systems' sustainability. To support informed planning at the basin level, SWP engaged SEI to build local capacity for robust decision-making and to develop a basin-level hydrological model using SEI's WEAP model to analyze key risks and uncertainties and assess potential water security scenarios based on historical, current, and future use through the WEAP model. By exploring the WEAP model, participants could see how water demands from households, livestock, agriculture, tourism, wildlife, and mining were impacted under different future scenarios. Through the problem formulation and scenario analysis workshops, local stakeholders were able to collectively better understand key risks to water security in the Mara Basin and identify additional factors—such as population growth and land use changes—to add to the model to provide more informed results. The RDS process not only improved the quality of the model but enabled participants to see the complexity of the entire basin and brainstorm policy solutions that could better address the future needs of the basin.

Sub-catchment management plans. SWP coordinated with Water Resources User Associations (WRUAs) in the Talek and Nyangores sub-catchments to update and revise sub-catchment management plans covering the time period of 2019–2023. The plans were comprehensive and covered catchment and water resource protection, improvement of knowledge on water resources management, water allocation, water security, institutional strengthening, resource monitoring, and livelihood enhancements. Notably, the sub-catchment management plans incorporated climate projections and identified budget monies to implement their activities. The livelihoods activities—carried out in cooperation with the Talek and Nyangores WRUAs in collaboration with SWP—resulted from these plans.

IR3: KEY INSTITUTIONS STRENGTHENED THROUGH CLARIFIED ROLES

SWP identified key stakeholders at multiple levels throughout the MRB. Because the Mara is a transboundary basin, SWP engaged existing transboundary bodies to address overall basin management, complemented with local engagement to build capacity to address localized water security risks.

Joint Technical Committee. Building on the MOU signed in 2015 by Kenya and Tanzania, SWP developed a draft Terms of Reference defining roles and responsibilities of the JTC. The Terms of Reference presented guidelines for convening, developing workplans, budgeting, and fundraising. In addition, SWP prepared operating principles outlining short- and medium-term strategic actions necessary to fulfill the JTC's responsibilities as outlined in Article 6 of the MRB MOU. Both the terms of reference and the operating principles were presented to the LVBC in Fall of 2020 for discussion during the next JTC meeting.

Enhancing the sustainability of WUAs and WRUAs. Over the course of SWP's work in the Mara, SWP built capacity of WRUAs in Kenya and Water User Associations (WUAs) in Tanzania to improve their management of water resources and their ability to generate income to support water management. To enhance the ability of the WUAs and WRUAs to generate income, SWP utilized grant mechanisms and partnered with the Maasai Beekeeping Institute and the Tanzania Forest Service to establish beekeeping demonstration sites and provide trainings in apiary management and artisanal beehive manufacturing and establish indigenous tree nurseries. Beekeeping would provide the WUAs and WRUAs revenue from sale of honey and honey products produced at demonstration sites, beekeeping trainings delivered to interested community members at the demonstration sites, and sale of artisanal beehives manufactured by the WUAs and WRUAs. These revenues would fund indigenous tree nurseries and fund catchment conservation and reforestation efforts using their propagated seedlings from the nurseries. Initial results were encouraging, with 366 beehives manufactured, 81 kilograms of honey produced, and nearly 40,000 seedlings propagated.

Improving local capacity to manage source water protection improvements. To ensure that community water demands, use practices, and other concerns were sustainable, SWP worked with WUAs and WRUAs in 11 sites to manage protected springs and rehabilitated boreholes in coordination with Rural Water Supply and Sanitation Agency (RUWASA) and LVBWB in Tanzania, and Water Respirces Aitjprotu (WRA) in Kenya. Each set of trainings drew upon national guidelines and training resources for local management of water points. The topics covered in these trainings included governance (constitution), operations and maintenance of site infrastructure, financial management, and site maintenance of protected source water resources, which included practical hands-on activities around the installed infrastructure.

IR4: SCALABLE ON-THE-GROUND WATER SECURITY INTERVENTIONS IMPLEMENTED

Spring protection. To complement capacity improvements for WUAs and WRUAs to manage water sources, SWP completed spring protection and rehabilitation activities of six sites in Kenya (Nyangores sub-catchment) and three springs and two boreholes in Tanzania (Mara Wetlands). In response to initial assessments that identified challenges—such as human and livestock encroachment, poor water quality, and poor drainage—SWP constructed spring boxes, cattle troughs, fencing to prevent encroachment, and retainer walls to prevent degradation and protect water quality. In boreholes in Tanzania, SWP replaced pumps—including a solar operated submersible pump at Kirumi Borehole—and improved water storage and fencing.

Income generation for WUAs and WRUAs. As mentioned under IR3, SWP built the capacity of WUAs and WRUAs to carry out income-generating apiary and tree nursery activities. Initial results were encouraging, with 366 beehives manufactured, 81 kilograms of honey produced, and nearly 40,000 seedlings propagated. In addition, SWP finalized Letters of agreement with MBI, WRA, and the forest service in Kenya and the Tanzania Forest Service and LVBWB in Tanzania to ensure long-term commitment to technical support in beekeeping and basin-level oversight of WUA and WRUA commitment to catchment conservation. WUAs and WRUAs also committed to reinvesting ten percent of revenues generated through beekeeping into management of tree nurseries and catchment conservation.

IR5: INCREASED COLLABORATION, LEARNING, AND ADAPTIVE RESPONSE TO WATER RISK

SWP had significant success collaborating with other actors working in the Mara Basin. These organizations have long-standing presence in the region and provided valuable insight and credibility to SWP activities. Specifically, SWP collaborated with IHE Delft on assessments to support environmental flows study in the Lower Mara Basin with support from GIZ. WWF was a crucial partner in all aspects of WUA and WRUA engagement, including facilitating introductions and supporting tree nursery and beekeeping activities. In terms of collaboration with other USAID activities, the Adaptation Thought Leadership and Assessment (ATLAS)'s activity conducted a climate vulnerability study for the Mara Basin focused on the Nyangores sub-catchment and Mara Wetlands. SWP was able to facilitate introductions to local stakeholders to participate in the assessment. Results were incorporated into the sub-catchment management plans in both Nyangores and Talek.

ASSOCIATE AWARDS

Under SWP's Leader with Associate structure, USAID missions or offices can make associate awards to the leader award recipient (Winrock and the SWP consortium). Associate awards can vary in scope and size but are linked to SWP's overall goal to increase resilience to water security risks while meeting a specific mission or bureau need.

At the time of this report, SWP had two associate awards: TerresEauVie in Burkina Faso and Niger, and the Integrated Water Management Activity (IWMA) in Nepal. These two awards illustrate very different approaches to Associate Awards. TerresEauVie is a large project ($38.9 million) out of the Sahel Regional Office with funding from multiple funding streams and distinct goals and objectives to meet the needs of those funding streams. Its management is coordinated with, but largely independent of, SWP core staff. In contrast, IWMA is a small award, directly tied to the leader award and managed by core SWP staff.

Burkina Faso and Niger—TerresEauVie

In 2018, USAID's Sahel Regional Office awarded the Water Security and Resilience (later re-named TerresEauVie) activity to Winrock as an associate award under SWP. TerresEauVie is part of Resilience in the Sahel Enhanced (RISE) II. It is a five-year (2019–2024) activity that will address RISE II's first objective, to "enhance social and ecological risk management systems." TerresEauVie has three components: 1) improved water security; 2) enhanced sustainable productive land use; and 3) improved management of shocks, risks, and stresses. The activity covers 25 communes in Niger (Maradi, Tillaberi, and Zinder regions) and 15 communes in Burkina Faso (Centre Nord, Est, and Sahel regions). SWP partner TetraTech plays a key role on TerresEauVie, overseeing the second component.

Nepal—Integrated Water Management Activity

From 2018–2020, SWP implemented an innovative SWP associate award aimed at improving cooperation between USAID projects in Nepal around the shared goal of water security. Facilitated by SWP, the two-year IWMA worked with ten USAID projects, implemented by a diverse group of USAID implementing partners, to improve water security in two target watersheds in western Nepal. Nepal has a broad portfolio of activities in which water plays a role, including work on multiple-use water systems, disaster risk management, biodiversity, and maternal and child health. Until IWMA, these projects had limited collaboration. To address this, IWMA applied a five-step water security integration process based on SWP's WSI process and the Integrated Watershed Management Framework developed by USAID Nepal's Social, Environmental, and Economic Development (SEED) office.

IWMA facilitated five workshops with USAID implementing partners to develop a water security integration plan for each watershed. During the workshops, stakeholders identified water security risks they could work together to address, then designed six field-level water security activities to address them. These activities, which involved two or more USAID projects, allowed the implementing partners to pool resources and knowledge to improve local water security. Two of these activities are illustrated below.

Following the conclusion of IWMA, USAID Nepal took steps to build on the activity's accomplishments. Specifically, the SEED Office is applying lessons learned and best practices identified by IWMA to improve water security integration within USAID Nepal programs with practices such as:

- Establishing integration working groups led by the mission
- Using watersheds as the unit of geographic focus for future water-related projects
- Prioritizing collaboration with local governments to build their capacity to address water security risks
- Developing and incorporating water security integration language to be included in future awards
- Sharing a record of collaboration activities among implementing partners to facilitate the design of future activities

Lessons learned from IWMA also informed further mission programming in the Karnali Water Activity (KAWAS), implemented by DAI from 2021–2026.

El Salvador, Guatemala, Honduras—Upper Lempa Watershed Project

In March 2022, USAID awarded a final associate award under the SWP mechanism to implement recommendations from the study conducted as part of the Mission support to El Salvador in 2021. The Upper Lempa Watershed Project is a five year (2022-2027) activity that will apply the WSI process to improve the management of water resources in the Upper Lempa River Basin, shared by the three countries. The project has three components: 1) improved collaboration and capacity of transboundary and national institutions, 2) improved management of water security risks in nine municipalities of the region, 3) mechanisms for financing water resources management assessed and utilized. The activity is expected to continue expanding the knowledge base for the WSI process, including by looking into issues of gender-based violence, biodiversity, and climate change adaptation.

Thought Leadership and Communications

One of SWP's major achievements was the facilitation, creation, and dissemination of water security products to raise awareness of water security as a concept; provide valuable information to decision- makers on water security through assessments and tools; share lessons learned from SWP activities through case studies and briefs; and provide expertise on water security at conferences, seminars, webinars, and workshops (Table 1).

Tools and guides. SWP's tools and guides provided practical guidance and learning opportunities for water security decision-makers to understand water security concepts, envision water security processes, and practice water security decision-making. Of particular note was the WSI process toolkits, developed at the onset of SWP and updated with relevant examples from SWP's implementation in year 5 of the project. The toolkits guided practitioners through the five steps of SWP's WSI process and could be used as a set or on an ad hoc basis. Another notable tool was the ECO Game: Water Security. Designed for use in Cambodia (and available in Khmer and English), the ECO game is a Winrock tool designed to engage practitioners in hypothetical situations where they must make decisions about water and land use that balance community well-being and watershed environmental sustainability. These decisions determine overall resilience as well as gains and losses in income (tokens) and water resources. The game was an innovative tool to help water security decision-makers think holistically about water security.

Profiles. The Water Resources Profile Series synthesized information on water resources, water quality, water-related dimensions of climate change, and water governance and provided an overview of the most critical water resources challenges and stress factors for USAID Water for the World Act High Priority Countries. The profiles included a summary of available surface and groundwater resources, analysis of surface and groundwater availability and quality challenges related to water and land use practices, discussion of climate change risks, and synthesis of governance issues affecting water resources management institutions and service providers.

Case studies. SWP's case studies drew on experience implementing pilot activities and associate awards to share more information about water security processes, methodologies, and successes. The case studies provided practical insight into the how the WSI process worked in diverse contexts and scales.

Technical papers and products. Technical products and papers included studies and methodologies that informed implementation of on-the-ground water security activities. They provided in-depth information on technical processes and the status of water security in the Stung Chinit and Mara basins—such as water availability assessments, updated WEAP models, and water balances.

Conferences, webinars, seminars, and workshops. Throughout the life of SWP, staff and partners represented the project at numerous conferences, events, workshops, and seminars. SWP not only raised the profile of water security as a concept for people working in the water and development sectors, but also shared successes and lessons learned. SWP contributed to events on the basin level as well as in the larger international water sector. Notable events included SWP's participation in multiple World Water Weeks, a series of in-person and streamed seminars titled *Sustainable Water, Resilient Communities* at the Wilson Center, featuring introduction and solutions for common water security challenges, and annual participation at the University of North Carolina's Water and Health Conference.

Blogs, newsletters, and social media. Through SWP's dedicated website, mailing list, and social media channels, SWP disseminated thought leadership pieces to over 3,000 followers across Facebook, Twitter, and LinkedIn—as well as sharing through a quarterly newsletter with nearly 1,500 subscribers. SWP's thought leadership and communication deliverables will continue to be available to the public on the Global Waters site at https://www.globalwaters.org/swp.

TABLE 1. THOUGHT LEADERSHIP DELIVERABLES

Type	Key Thought Leadership Deliverable	Basin	Fiscal Year
Profiles	18 country profiles for USAID high priority countries (Afghanistan, Democratic Republic of the Congo, Ethiopia, Ghana, Haiti, India, Indonesia, Kenya, Liberia, Madagascar, Mali, Mozambique, Nepal, Nigeria, Senegal, South Sudan, Tanzania, Uganda)	Global	2021
Tools and Guides	Toolkit 1: Improving Water Security	Global	2017 (updated 2021)
	Toolkit 2: Water Security Assessment	Global	2017 (updated 2021)
	Toolkit 3: Water Security Planning	Global	2017 (updated 2021)
	Toolkit 4: Funding Water Security	Global	2017
	Toolkit 5: Water Security Implementation	Global	2017
	Toolkit 6: Monitoring the Improvement of Water Security	Global	2017 (updated 2021)
	Water Security Institutional Capacity Development Process and Tool	Global	2019
	ECO Game: Water Security	Cambodia	2020 (updated 2021)
Case Studies	Integrated Watershed Management Activity: Enabling Collaboration to Improve Water Security	Nepal	2020
	Using the WSI Process to Assess and Plan for Source Water Protection in the Mara River Basin	Mara	2021
	Collaborating on Big Data Analytics for Transboundary Aquifer Management in South Africa	South Africa	2021
	Engaging Farmers to Improve Management of Irrigation Infrastructure	Cambodia	2021
	Promoting Self-Reliance among Water User Associations to Improve Water Security in the Mara River Basin	Mara	2021
	Water Allocation Planning for the Lower Mara River Basin in Tanzania	Mara	2021
	Engaging Stakeholders to Improve Water Security in Cambodia's Stung Chinit Basin	Cambodia	2021
	Using Scenario Analysis to Assess Water Security in an Uncertain Future	Mara, Cambodia	2021
	Water Allocation Planning for the Lower Mara River Basin in Tanzania	Mara	2021
Technical Papers	Private Sector Engagement in the Water Security Improvement Process	Global	2017
	Analytical Tools to Support Water Security Decision-Making	Global	2018
	Environmental Flows Technical Guidance Manual: Ensuring Water Security through Preservation of Natural Flows	Global	2018
	Cambodia WEAP Model	Cambodia	2018
	Lower Mara River Basin Water Demand Assessment	Mara	2019
	Lower Mara River Basin Water Availability Assessment	Mara	2019
	Lower Mara River Basin Water Abstraction Survey	Mara	2019
	Mara River Basin WEAP Model	Mara	2020
	Data for Water Security: Improving Water Data Access and Use	Global	2020
	Lower Mara River Basin Future Scenarios	Mara	2020
	Mara River Basin WEAP Model	Mara	2020
	Water Balance for the Stung Chinit Watershed, Cambodia	Cambodia	2020
	Strategic Action Plan for the Stung Chinit	Cambodia	2020
	Water Allocation Plan for the Mara River Catchment	Mara	2021
	Key Lessons Learned from SWP Pilot Activities in the Mara River and Stung Chinit Basins	Mara	2021
	The Case for Source Water Protection in Wash Systems: Entry Points and Opportunities	Global	2022

Type	Key Thought Leadership Deliverable	Basin	Fiscal Year
Webinars and Seminars	Wilson Center Series: Sustainable Water, Resilient Communities—The Challenge of Too Much Water	Global	2018
	Wilson Center Series: Sustainable Water, Resilient Communities—Water as a Tool for Resilience in Times of Crisis	Global	2019
	Wilson Center Series: Sustainable Water, Resilient Communities—The Challenge of Too Little Water	Global	2018
	Wilson Center Series: Sustainable Water, Resilient Communities—Solutions for Dirty Water	Global	2018
	Wilson Center: Ground Truth Briefing: Avoiding a Water Crisis—What's Next for Cape Town and Beyond	Global	2018
	Mitigating Transboundary Water Conflict and Improving Water Security in the Mara River Basin	Mara	2018
	Wilson Center: A More Resilient World—The Role of Population and Family Planning in Sustainable Development	Global	2018
	Wilson Center: Water at Wilson—50 Years of Water, Conflict and Cooperation	Global	2019
	Wilson Center Series: Sustainable Water, Resilient Communities—Water as a Tool for Resilience in Times of Crisis	Global	2019
	Wilson Center: A More Resilient World—Feeding a Thirsty World: Harnessing the Connections Between Food and Water Security	Global	2019
	Adaptation Community Meeting: Water Security in an Uncertain Future—Enhancing Water Resources Management and Planning by Reducing Climate and Weather-Related Risks	Global	2019
	USGS/SWP Water Security Series (8 webinars)	South Africa	2019
	IBM/SWP Big Data for Water Security Series (7 webinars)	South Africa	2020
	IUCN/SWP Transboundary Water Governance Series, with IUCN (6 webinars)	South Africa	2020
	SWP Closeout Webinar for Pilot Activity in Mara River Basin	Mara	2021
	Water Resources in Peril: A Discussion of Challenges and Opportunities (Country Profile Launch)	Global	2021
	Advancing Water Security: A Close-out Event from the Sustainable Water Partnership	Global	2021
Conferences	World Water Week 2017: Showcase Participant Water Security Overview	Global	2017
	University of North Carolina Water and Health Conference presentation "Enhancing climate resilience of WASH systems and activities through water security"	Global	2017
	World Water Week 2018: Sofa presentation—Safeguarding Water-Related Ecosystems in the Mara and Tonle Sap Basins	Mara	2018
	University of North Carolina Water and Health Conference panel—Fit-for-purpose partnerships in the SDG era	Global	2018
	Vietnamese International Water Week	Cambodia	2019
	Southern African Development Community Groundwater Conference "Transboundary Water Management and SDGs Reporting in the SADC Region"	South Africa	2019
	SEI Policy and Innovation Forum: Natural Resources for Development Session	Mara	2020
	Gates Foundation MEDS Annual Convening: Stakeholder Engagement in the Stung Chinit	Cambodia	2020
	University of North Carolina Water and Health Conference presentation "Water Allocation in the Mara River Basin"	Mara	2020
	World Water Week 2021: Conservation in WASH Systems— Collaborating on Source Water Protection	Mara	2021

LESSONS LEARNED AND RECOMMENDATIONS

LOOKING AHEAD

Water resources around the world are stressed from over-abstraction, poor water quality, and climate change impacts. Water stress impacts economic development, public health and well-being, and ecosystem services. Water security is defined as the adaptive capacity of communities to safeguard the sustainable availability to, and safe use of an adequate, reliable, and resilient quantity and quality of water for health, livelihoods, ecosystems, and productive economies. Water security acknowledges that demand for water is shared among different types of water users and environmental functions, and that these interconnections can translate into complex challenges and risks. However, sustainable improvements in water security can lead to co-benefits for water users and the environment.

It is complex to assess and understand water stress. Indices, such as the Falkenmark Index and SDG 6.4.2, provide useful starting points for measuring water stress using national-scale metrics. However, water stress is most evident at regional or local scales. Water may be abundant in a country but have significant disparities in where water is located. Countries may also experience significant variability in water availability across seasons or from year-to-year. Climate change is also changing seasonality and leading to more frequent and extreme storms, as well as raising temperatures and increasing drought. Governance capacity and resourcing is critical to address water stress and achieve water security. Despite these challenges, there is increasing investment in innovation, capacity, and systems to improve the stewardship of water resources and improve water quality.

Challenges to Water Security

Surface water is critical for agriculture, industry, and municipal water supply as well as ecosystem services. However, growing demand for irrigated agriculture and other uses have increased risks of over- abstraction and led to increased erosion and sedimentation, making surface water less reliable and impacting critical environmental flows needed to sustain biodiversity and water quality. Poor sanitation systems, municipal waste management, and industrial effluent monitoring are also reducing surface water quality and degrading aquatic ecosystems, particularly around urban areas. Chemical pollution, algal blooms, and pathogenic contamination in key surface water bodies seriously degrade biodiversity, affect livelihoods, and increase public health risks. For example, as highlighted in SWP's country profiles on WRM, the Senegal River Valley and approximately 30 percent of Lake Guiers (a key source of municipal water) is affected by eutrophication and plant growth. Similarly, untreated industrial effluent, wastewater, and agricultural runoff have led to algal blooms and mass fish die-offs in Lake Victoria. Large and small-scale mining has also discharged toxic chemicals and hard metals into surface water and increased sedimentation and erosion, particularly along riverbanks. Fecal matter and untreated sewage affect water quality and human health, leading to outbreaks of waterborne diseases—such as typhoid, cholera, and shigella, common throughout the Democratic Republic of the Congo—or as new threats, like the Haiti cholera outbreak.

Groundwater is a critical resource for drinking supply, particularly in rural communities and where water is scarce. Highly concentrated withdrawals have significantly lowered water tables in urban areas, increasing the cost of abstraction and make groundwater less reliable. Many communities around the world also depend on springs for drinking, domestic use, and their livelihoods; however, declining water tables are lowering outflows from springs and potentially drying up springs altogether. In Nepal, for example, freshwater springs supplement dry season river flows in some regions, but land use practices and climate change have affected groundwater recharge and spring replenishment. Naturally occurring contaminants, including fluoride and arsenic, also pose public health risks, particularly for rural communities who rely on groundwater for drinking, with increased exposure due to reliance on groundwater, lack of water quality monitoring, and hot spots linked to mining and industrial activities. Poor sanitation systems and leaching municipal and industrial waste are contaminating groundwater, while rising sea levels are leading to saltwater intrusion into coastal aquifers, which may irreversibly degrade key sources of drinking water supply.

Climate change is changing wet season and dry season patterns, making precipitation less predictable for the millions of people who depend on rainfed agriculture. In some cases, total precipitation may be increasing but is received within a shorter period of time and can lead to damaging floods. Rising temperatures and more frequent drought also stresses surface water and accelerates glacier and snowpack melt, which are natural storage mechanisms that replenish surface water. More intense and extreme storms are also increasing risks of extreme flooding and widespread damage.

Management and governance of water resources is key to resolving challenges related to surface water, groundwater, and climate change. Water management responsibilities are often fragmented or distributed across different ministries or institutions, which can make coordination and collaboration difficult. At the transboundary level, institutions often lack the resources and political will to address concerns like over-allocation of water, dams, and water pollution. Low funding, technical capacity constraints, and understaffing further constrain planning and implementation systems, which can stall necessary improvements to infrastructure, increase costs, and lower revenues. Water management institutions also struggle to collect reliable data and are increasingly dealing with uncertainty of climate change impacts. Lack of data—let alone good data—undermines planning and informed decision-making. Management institutions are also dealing with increased competition for water at the transboundary level down to local watersheds. It is increasingly necessary to mobilize political will and resources to facilitate more sustained transboundary water governance.

Overall, addressing water security is essential for ensuring community well-being and public health, protection and sustainability of ecosystem services, sustainable economic development, and resilience to climate change.

Water security programming

SWP offers three overall lessons learned from its water security programming. First, water security is an effective lens for connecting different stakeholders, including programs, partners, missions, and approaches across geographies and sectors. Because water security is so wide-reaching, it incentivizes participation from a variety of stakeholders who can easily see how improving water security will also improve their ability to reach objectives and goals. However, because water security can involve so many stakeholders, it is essential that adequate investment be made in coordination and collaboration to ensure that efforts are not duplicated or at odds with each other.

Second, water security approaches need to be iterative to leverage lessons learned and scale WSIs. Over a relatively short period of time, USAID and implementers need to prioritize feasible measures that can demonstrate tangible improvements and be scaled. WSI measures will not address every aspect of water security, particularly in a large geography, but it is important to assess what works well and where improvements are necessary to ensure that future investments are targeted thoughtfully and ensure more sustained and scalable impact.

Third, defining water security risks with precision and depth is important for developing responsive and impactful interventions. This requires assessing root causes and considering potential scenarios, especially when data is lacking or when there is significant uncertainty. Data gaps and uncertainty can be mitigated through thoughtful engagement with a variety of stakeholders who may have first-hand knowledge of, or experience with, key water security risks, as well as collection and in-depth analysis of data to inform water security inventions prior to enacting change.

Recommendations for Future Water Security Programs

SWP offers several recommendations for future water security programs. These recommendations are informed by experiences and lessons learned from SWP's pilot activities and Mission Support.

Stakeholder engagement. Water security programming should continue to center around stakeholder engagement. Understanding the needs, priorities, and motivations of stakeholders is critical to success, and stakeholder mapping and engagement strategies should be integrated into future programming. Political economy assessment is a methodology that can be powerfully applied to identify how power dynamics interact with water security to best target interventions.

Address the root of the problem. For best chances of success, adequate time and resources should be allocated to precisely define WSI risks, goals, and methods of measurement and monitoring. Program planning should emphasize how important this step is to successful and effective implementation.

Build on lessons learned. Equally important is ongoing reflection on what is effective and what is not. These reflections should occur systematically and on a regular basis between donors, implementing partners, and stakeholder counterparts to adapt, replicate, and scale activities. This may require flexibility and, in some cases, hard decisions, but should not compromise the quality of programming or implementation.

Governance across scales. Water security programming needs to engage with local, basin, regional, national, and perhaps transboundary institutions, policies, and governance frameworks as warranted. While countries have national-level water management policies or plans, application may be uneven at the basin or provincial levels. There are opportunities to translate high-level strategy into specific water security risks and activities to address those risks at the basin and provincial levels. This process could be deployed in only a few targeted basins or provinces, or scaled nationally, depending on the amount of investment and the country context.

Incentivize USAID implementing partners to collaborate on water security activities. Implementing partners lack incentives to coordinate and collaborate with other USAID-funded projects, especially on water security activities as it often falls beyond project objectives and indicators. USAID can incentivize projects to collaborate more by including objectives related to collaboration or coordination more explicitly and identifying deliverables and indicators that monitor collaboration and coordination.

LESSONS LEARNED FROM IMPLEMENTING THE WSI PROCESS IN THE PILOT ACTIVITIES

The WSI process was primarily implemented under SWP's two pilot activities in the Stung Chinit and MRBs. While the WSI process was generally adhered to in both basins, the distinct contexts and stakeholders in each geography resulted in diverse lessons learned. In Cambodia, SWP adhered more vigorously to the WSI process, moving through the steps systematically—whereas in the Mara, steps were applied in a more ad hoc and less comprehensive way. Applying the entire WSI process as a coordinated set of interventions requires a significant amount of time, resources, and engagement from stakeholders. This is further exacerbated at a transboundary scale, such as in the Mara. However, even in Cambodia, at a provincial scale, SWP found that the process took longer than expected. USAID and implementers interested in WSI should explore opportunities to opportunistically apply parts of the WSI process to meet specific stakeholder needs in a given geography using a demand-driven approach. This will enable the WSI tools and approaches to have a broader reach beyond "water security" specific activities and support integration of a water security lens into a variety of projects in other sectors (e.g., WASH, natural resource management, climate change, and agriculture).

Improved Stakeholder Awareness and Participation in Water Security

The nature of water security risks and solutions requires a large variety of stakeholders at different levels (e.g., community, regional, basin, national, transboundary), and with different skill sets (technical water management, planning, community mobilization), and in different sectors. SWP found that in both Cambodia and the Mara, incentivizing stakeholder participation is critical to ongoing success in the WSI process. The WSI process is demanding of participants in terms of technical skills, time, and the opportunity cost of their engagement. One lesson learned is that investment in skilled facilitation is important to ensure stakeholders have full understanding of the WSI process and its benefits and potential outcomes.

On the community level, SWP had the most success incentivizing participation of community-level stakeholders, either through opportunities and access to technical training and capacity building, or by demonstrating quick-win activities that validate how improving water security can improve the lives of those who live in or around a basin.

Engaging higher-level stakeholders requires a different strategy and level of investment; for example, in the Mara, SWP was less successful in incentivizing high-level transboundary stakeholders to engage in water security activities. If high-level stakeholders do not have strong willingness, a more in-depth strategy should be developed to engage them. In the Mara, the identified goals were lofty without a clear understanding of precisely how SWP would support and fund the work. Communicating and managing expectations and possibilities is essential for identifying a realistic path towards achieving water security goals.

Improved Capacity and Tools to Assess Water Security Risks

Water security risks are complex and it is essential to understand and clarify the root causes of these risks to identify capacity gaps and appropriate tools to mitigate them. Assessments grounded in data can provide a compelling picture to stakeholders of what the causes are of water security risks and then dispel misinformation about who is responsible and how to best address risks. SWP utilized the WEAP model to better understand current and future scenarios in both basins. SWP found that while the WEAP model was useful, more intentionality in the sequencing and integration of complex models would have elevated WEAP from a more academic exercise in the early part of the WSI, to tools that could be integrated into decision-making. It is also essential to engage the right stakeholders in highly technical assessments; for example, in Cambodia, SWP found that language and technical capacity hindered understanding of WEAP.

In the Mara, the assessment process identified degradation as a problem. While SWP could have targeted its efforts into restoration or reforestation, it was clear that restoration activities should be carried out in the long-term by water user associations. Building their capacity to be self-reliant and carry out restoration activities in the long-term was a better solution. In Cambodia, assessments provided opportunities to build community consensus that showed—based on data—that sanitation was the primary cause of contaminated surface water, followed by agricultural pollution. From there, SWP was able to identify specific interventions to address these issues.

Improved Planning and Water Governance Capacity

Coordination is a clear challenge in the water security sector. Water security encompasses many sectors and actors with diverse and differing goals and incentives. In Cambodia, coordinating all of these different actors to collaborate on a basin-level SAP was only partially possible because of the basin's location within Kampong Thom province. The support of the provincial government gave the RBMC and the SAP the necessary credibility to unite diverse groups and incorporate them under a single, better- coordinated body while still respecting their integrity as individual ministries, organizations, and administrations.

One constant constraint to success on a larger scale is resources. This was a challenge in both pilots. Without a plan for long-term resourcing, targeted bodies will not be able to carry out effective planning and water governance. In the Mara, SWP was able to work with water user associations to develop and implement plans for long-term financial support (apiary and tree nurseries). However, at higher levels, SWP did not have adequate resourcing to engage in a long-term vision for implementing water security. One success, in spite of the resourcing challenge, was deployment of SWP partner mWater's user-friendly and low-cost mobile application with the LVBWB to conduct an abstraction survey. Because the tool was free, there was minimal resourcing barriers, and the LVBWB has since scaled up use of the tool in other areas and it was adopted by the USAID/Tanzania funded WARIDI project to improve the abstraction permitting process in Tanzania.

Improved Capacity and Behaviors to Implement WRM Measures

SWP found multiple pathways to implementing WRM measures on the community level. In the Mara, SWP successfully built capacity of water user associations and basin water board to collect, clean, and analyze water security data, enabling them to take long-term management responsibility over understanding and managing localized water security situations. In Cambodia, SWP used initial working groups as a platform to identify water security actions and quick-win activities that could be rapidly implemented to both improve water security and demonstrate effectiveness of water security approaches. This worked particularly well with the WASH-focused working group.

SWP had varying degrees of success implementing WRM measures at a higher level. In Cambodia, SWP successfully established the RBMC as a coordinating body on water security issues in the Stung Chinit Basin. However, resourcing and long-term sustainability for this new body continued to be a challenge. In the Mara, the larger political economy dynamics at the transboundary level inhibited SWP from being able to push forward meaningful change on shared management of the Mara Basin—while SWP provided support to develop technical materials, the pilot simply did not have the resources to engage higher-level institutions.

Increased Collaboration, Learning, and Adaptive Response to Water Risk

Throughout the development of WSI as a new process and approach for addressing water security risks, SWP would have benefited from incorporating a rigorous and systematic analysis of lessons learned and adapting its approach more frequently. In both pilots, resource and staff constraints reduced the ability of pilot teams to take a more active role in reflecting on and learning from application of the WSI process. Learning and evaluation activities should be built into the WSI process and workplans throughout implementation, taking a holistic view of how water security changes are measured. Changes in water security take time, and measurement must be defined and calibrated to capture different dimensions of that change. For example, while the RBMC and the SAP are in nascent stages, acknowledging the improvement in institutional capacity to address water risks is an accomplishment that demonstrates success in the WSI process that will be reflected in more tangible water security gains in the future.

Gender Equality and Social Inclusion (GESI)

While both pilot activities had representation from women in community-level groups, SWP took a more deliberate approach to integrating GESI into pilot activities in Cambodia where a stakeholder management specialist with expertise in GESI played a significant role in sharing the importance of GESI integration with stakeholders at all levels. While participation is an important first step, empowering women as leaders in the water security space creates a pathway to more meaningful WSIs for all community members. GESI should be integrated more deliberately into the WSI process, including reflection on how stakeholder participation impacts participation. For example, in Cambodia, SWP successfully engaged with FWUCs, but the FWUC power structure largely mirrors larger societal inequality. While women FWUC leaders were supported, FWUCs themselves only represent the farmers that live close enough to irrigation systems to receive water, leaving out potentially more vulnerable rain-fed farms that do not participate in these governance structures. In addition to earlier and more deliberate GESI integration, future activities should focus on not only engaging women but also more deliberately targeting indigenous groups, youth, and the disabled to ensure more equitable benefits across communities.

CROSS-CUTTING LESSONS FROM MISSION SUPPORT, ASSOCIATE AWARDS, AND LEARNING

Mission Support and Associate Awards

To engage individual missions on water security, SWP developed a brochure, conducted outreach based on mission-specific needs based on high level assessment, and held a webinar illustrating SWP's process and value. SWP also relied on the network of relationships held by the SWP team, including USAID staff.

SWP's engagement with missions had some notable successes. SWP identified the following factors to success:

Team with strong networks and relationships on the ground	Engagement by stakeholders	Leadership from USAID missions	Response to specific and targeted needs or crises

For example, SWP was able to contribute high-quality inputs in a relatively short time period in El Salvador. SWP utilized global datasets to rapidly assess pollution, aided by a knowledgeable and well-connected team that had good engagement from key ministries on the ground. While the short timeframe limited SWP from producing a more comprehensive assessment, the connections and knowledge of the team resulted in a product that was useful to the mission. Similarly, in Pakistan SWP benefited greatly from an excellent local team that had pre-existing relationships with stakeholders who knew key information to inform the assessment.

In South Africa, sustained support from the USAID Global Development Lab and the SWP team ensured ongoing collaboration between a wide variety of stakeholders including the private sector, government, academia, and scientist. Similar to the IWMA activity in Nepal (see below), SWP was able to motivate and coordinate various actors leading to an ultimately productive collaboration.

Learning

SWP produced a large set of case studies, country profiles, newsletters, blogs, conference presentations, and briefs on water security issues. However, there are several things to be gleaned from SWPs learning activities that can inform implementation of future learning-focused projects.

In general, with learning products, defining a specific audience is crucial to effective communications (water generalists, USAID missions, public). Once an audience is identified, specific strategies for dissemination will be more effective. Learning documents should not shy away from failures, as these are some of the most important lessons we can draw on; being honest about those challenges can inform other activities in ways that celebrating successes cannot.

For living products, such as the WSI toolkits, projects should be proactive about when and how they are going to update documents with new information and lessons learned. The WSI process was developed and published prior to the WSI pilots testing them. Thus, there was a large amount of feedback and learning that was not integrated until the end. It may have been beneficial to provide more frequent updates to the toolkits as opposed to waiting for accumulated lessons after the end of each pilot activity.

LEVERAGE AND SUSTAINABILITY

SWP struggled to record the fund mobilization to meet the targets originally envisioned in the early stages of the project, despite additional funding being generated and allocated towards WRM. Public resources and revenue streams such as the water extraction permitting in Tanzania, allowed by the survey using mWater, were not recorded and counted by SWP. This target could also have been better anticipated by having a more deliberate strategy for fund mobilization for water stewardship, particularly on private sector engagement. In the pilot activities, private sector actors were consulted as part of stakeholder mapping or engagement efforts; however, SWP focused engagement largely on building local, regional, and national government capacity on water security, instead of building relationships between private sector entities and government. In Cambodia, the private sector is viewed as a widely uncooperative and unengaged stakeholder in water security outcomes, as many of the private sector companies working in watersheds are foreign-operated and extractive by nature. Despite attempted engagement with rice associations, organic farmers, and cashew nut associations, there was not adequate incentives to convince people that they should participate in the WSI process. In the Mara, there was improved engagement with the private sector with shared interest in water security—for example, with the hotelier's association that benefits from ecotourism in the MRB. Regrettably, substantive collaboration was halted due to COVID-19 impacts on the hotelier industry. Future activities should leverage partnership with other USAID activities that are more aligned with the private sector and should emphasize flexibility to integrate the private sector more proactively into activities more opportunistically.

In the leader award, SWP failed to catalyze partnerships with partners who had the skills and capacity to mobilize funding from the private sector or other major donors. Again, a more deliberate strategy for engaging these partners in SWPs workplans—both on a global and pilot level–would have been beneficial. Cultivating private sector relationships and transforming them into meaningful collaboration on water security requires significant time and effort, which was not adequately prioritized.

Where SWP did see success was integration and collaboration across existing in-country programs, both USAID and non-USAID funded. In the Mara, SWP developed a fruitful relationship with WWF, which has a long-established history and relationship with stakeholders in the region. WWF's relationships helped give SWP much-needed credibility with high-level stakeholders, and they will continue to carry forward activities done in collaboration with SWP after SWP activities in the Mara ended. In Cambodia, SWP had fruitful collaboration with both the GPL and WASH-FIN activities, enabling SWP to introduce water security concepts into broader thematic areas than it otherwise would have had access.

PROJECT MANAGEMENT

COVID-19

The COVID-19 pandemic was a challenge for SWP, primarily in the context of Cambodia activities. Various national lockdowns inhibited in-person training, travel, and workshops, and created a particular challenge for remote communities with limited ability to access resources virtually. Ultimately this resulted in several activities being cancelled (community fish refuge pilots and watershed management training in collaboration with GPL) or being incomplete—for example, the WESTool and water security game were both developed with instruction materials but staff were unable to hold training; the agrochemical subcontract was also incomplete. In the Mara, on-the-ground activities were less affected, however, prioritization of COVID-19 by national governments likely reduced the level of attention towards water security. The launch of the Water Allocation Plan was delayed beyond the life of SWPs activities in the Mara and was eventually held without SWPs support. While COVID-19 was unprecedented, future activities should emphasize flexibility to adapt to changing circumstances when required.

Pilot Structure

SWP's pilot structure focused large amounts of effort on the two activities in Cambodia and the Mara. While there were capable in-country teams working on both pilots, central management of pilot staff, poor coordination between different partners with in SWP, and centralized monitoring and evaluation resources all presented management challenges. While there was frequent communication between headquarters' teams managing the different pilot activities, it was not always clear to the pilot teams how they fit in with the leader award, and the two pilot activities were somewhat siloed with very different trajectories and applications of the WSI process. This made it challenging to compare success and lessons learned in a meaningful way. It is recommended that future projects thoughtfully assess how pilot or in-country activities contribute to the overall objectives of the leader award and develop a clear plan for learning and sharing information over the course of those pilot or in-country activities so that learnings can be amplified to a wider audience. Future activities should also explore opportunities to provide more on-demand support for water security activities through short-term technical assistance (STTA) or other short-term models of engagement.

Annexes

ANNEX A: TECHNICAL BRIEF, SUSTAINABLE WATER FOR THE MARA

Improved stakeholder awareness and participation in water security: how can the SWP water security process involve appropriate stakeholders to ensure the benefits of water resource interventions accrue equitably?

Stakeholder engagement is a core element of the WSI process and for SWM it was important to find the right partners to achieve the pilot activity's goals and objectives. The nature of the water security challenges and the geographic extent of the basin required SWM to collaborate and coordinate activities with key management entities, communities, NGOs, and the private sector. There are two main lessons learned from SWM's experience with stakeholder engagement in the MRB.

Incentives help increase stakeholder participation in the WSI process. SWM approached partner engagement with the aim of supporting the goals and objectives of the partners, including communities, basin management entities, NGOs, and the private sector. For this to be effective, stakeholders needed clear incentives to participate and engage. For example, water user associations were critical partners who provided valuable insights into the risks the project addressed—such as water allocation planning—and served as liaisons to communities as SWM implemented spring protection measures. To facilitate their ongoing participation in the WSI process, SWM supported water user associations with water security planning and management capacity building as well as resources to generate necessary funding and indigenous trees to support their catchment conservation efforts. SWM was well positioned to provide these resources that were valuable to the water user associations, thus incentivizing their participation in activities that improved water security, both in their communities and on a larger scale in the basin. By contrast, SWM had limited ability to incentivize transboundary work at a high level, so had less ability to influence those actors to address water security in a timely way.

1) **Stakeholders need to be engaged as partners, not beneficiaries, in the WSI process.** SWM partnered with key management entities, including basin managers in Kenya and Tanzania, water user associations, and representatives from national ministries to lead the water security assessment and plan for WSIs. This allowed SWM to leverage the knowledge and experiences of each stakeholder and build trust among stakeholders. For example, early and sustained participation by water user associations in the assessment and planning phases helped ensure they remained committed to the WSI process despite delays in implementing beekeeping, tree nursery, and spring protection activities due to COVID-19. Similarly, early engagement with the LVBWB in Tanzania and Tanzania's Ministry of Water Resources in the planning phases—as well as through structured working groups—helped facilitate the development and approval of the WAP for the Lower MRB. While the Basin Water Board was a critical partner in writing the plan, it would not have been enacted without Ministry approval of national guidelines for water allocation planning and the Basin Water Board's final WAP.

Improved capacity and tools to assess water security risks: how are water security risks most appropriately defined for measurement, analysis, and comparison?

The WSI process is premised on defining specific water security risks and addressing these risks through targeted interventions. Water security risks may be related to the physical status of water resources and landscapes, challenges or issues in governance and management, or uncertainty related to climate change. It is also important to consider how risks are interrelated and how risks can be monitored most effectively as this can help inform more impactful interventions and guide tracking of WSIs.

2) **Understanding the root cause is key to defining water security risks.** SWM's water security assessment confirmed that land use change in the basin is one of the principal water security risks in the MRB. Deforestation, widespread agriculture, and animal husbandry have increased erosion and sedimentation in the basin, impacting water quality and environmental flows. Mining, industry, and tourism are also sources of key contaminants. However, for the WSI process to be effective, it was also important to understand the root causes of these risk factors. One of the key root causes of catchment degradation identified by SWM was the inability of water user associations to be self-reliant. Water user associations are supposed to play a critical role in managing water user practices and conserving landscapes and water resources; however, they lacked the necessary funding and capacity to fulfill their mandates. SWM initially explored opportunities to directly support reforestation and landscape restoration efforts, but there was concern about the ability of the water user association to replicate and scale these efforts. By focusing on water user association capacity as the key risk, SWM decided to invest in building the capacity of the water user associations to become self-reliant by establishing tree nurseries and beekeeping as revenue-generating activities.

Improved planning and water governance capacity: how does the WSI process improve planning and governance capacity to deliver co-benefits or multiple water security benefits, including improved WASH outcomes?

The WSI process engages stakeholders as active participants in the assessment, planning, and implementation steps. Trainings or capacity building may be needed to develop stakeholder capabilities and improve planning and governance systems, but they should be streamlined into the WSI process.

Capacity for the WSI process is sustained when stakeholders are able to use new, low-cost tools to fulfill their mandates. The WAP is a tool that the Basin Water Board can use to guide permitting and water allocation decisions under different water availability scenarios. Development of the WAP involved multiple stages, including data collection, scenario analysis, and writing. SWP trained the LVBWB to use the mWater platform to implement the abstraction survey for the WAP. The platform, which is free and user-friendly, allowed the stakeholders to easily survey water users within the Lower MRB and in the process identify and register water users without valid abstraction permits. Through the survey, the Board was able to significantly improve their data on water users and increase revenues through new permits. Additionally, they expanded the survey to other catchments using their own resources to identify new water users and significantly increase the number of issued permits. Selecting a tool that was user-friendly and required few additional financial resources was critical to its uptake.

3) **Stakeholder-led water security activities need to be designed with replication and scale in mind.** Capacity building and WSIs at a basin-scale can take time to demonstrate results. Quick-win activities can show the benefits of WSIs, but stakeholders need to be supported to scale targeted interventions, not just sustain the quick-win improvements achieved under the WSI process. SWP's decision to support the water user associations with beekeeping and the tree nurseries was informed by the need to scale catchment conservation efforts. The water user associations developed three main funding streams through beekeeping: a) manufacturing and sale of artisanal beehives, b) community trainings using beekeeping demonstration sites, and c) sale of produced honey from the demonstration beehives. SWP also supported the establishment of indigenous tree nurseries to help the water user associations address reforestation goals and overcome the challenge of seedling shortages in local markets. Looking ahead, the use of beekeeping to fund conservation efforts will allow the water user associations to slowly build up reforestation and catchment conservation efforts throughout the Mara Basin. SWP facilitated partnership agreements with local private sector partners, the basin managers, and forest services to ensure continued technical support in the future.

Improved capacity and behaviors to implement WRM measures: what types of water security skills and capacity facilitate clear and concise actions and interventions to support water resource management and WSIs?

Water security assessments, planning, and interventions need to be data-driven, facilitated, and led by stakeholders. For these efforts to be effective, stakeholders should have the necessary skills and capacity to lead the process and replicate efforts in the future. There are two key lessons from SWP's experience in the MRB.

Understanding political economy is key to the WSI process as many participants will not engage with equal or consistent interest. The WSI process in the Mara Basin was effective in engaging water user associations, basin managers, and national ministries in Kenya and Tanzania when efforts focused on WSI activities within specific sub-catchments in their respective countries. Early trust-building measures led to sustained engagement because there was a clear understanding of key mandates, goals, and incentives that influenced how the different stakeholder groups would engage.

SWP was less successful in its efforts to bring these institutions together to support transboundary management of the Mara Basin. In 2015, Kenya and Tanzania signed an MOU for the shared management of the Mara Basin. One of the key elements of the MOU was the establishment of a Joint Management Committee—comprised of a steering committee, technical committee, and implementation committees—to guide joint management of the Mara Basin. Representatives from the governments of Kenya and Tanzania made up these committees while the East Africa Community's LVBC served as the interim chair. Convening the transboundary stakeholders was challenging due to resource constraints, differing priorities, and a lack of clear and agreed-upon operating procedures. SWP did not have the resources to overcome these challenges and instead focused on supporting the transboundary institutions for future engagement. Specifically, SWP prepared a draft operations framework and terms of reference for the JTC as well as a guidance note on water sharing principles. These were submitted to the LVBC for first review and were shared with the member states for future discussion.

4) **Stakeholders need to know how to deal with uncertainty.** Dealing with uncertainty requires that stakeholders know how to collect, manage, and analyze data. As part of the WAP process, SWP trained stakeholders from the basin water board and water user associations to collect and clean the data and analyze the findings. SWP also facilitated trainings and workshops for stakeholders on RDS and WEAP modeling. RDS is a process through which stakeholders can collectively define and analyze key uncertainties to water resources in the Mara Basin, including climate, development policies, and potential sources of demand. These risk factors were then integrated into a WEAP model that visualized the impacts of the risk factors on water resources. While the WEAP model is a useful tool, stakeholder understanding of data gaps and how to address issues of future uncertainty in planning frameworks is a critical factor for improved water security.

Increased collaboration, learning, and adaptive response to water risk: how can we efficiently measure WSIs?

Efficient measurement of WSIs is necessary to ensure responsiveness to key risks and adjustments as challenges arise and lessons are learned. Because water security considers the interconnections between the needs and demand from different types of water users, risks and challenges to water availability and quality, and management and governance, it is important to use multiple sources of data to provide a complete picture.

5) **Be clear about the specific improvements desired and what data is required to measure or monitor those improvements.** SWP used multiple sets of indicators for monitoring WSIs. These indicators focused on physical improvements to landscapes and water resources as well as governance and capacity strengthening. While some of these were tracked using traditional monitoring and evaluation methodologies, SWP also utilized site surveys and water quality testing to document the extent of improvements and additional actions. For example, SWP used a number of different tools to inform planning and response measures for spring protection activities. Sanitary surveys and transect walks helped stakeholders analyze potential sources of contamination around springs selected for protection in the Nyangores sub-catchment in Kenya and the Mara Wetlands in Tanzania. These are simple methodologies that stakeholders will be able to use in the future to track improvements. Water quality tests were also conducted at the springs and indicated pathogenic contamination, likely from livestock. To address this, SWP designed improvements to separate water uses and protect the spring eye using indigenous vegetation and fencing, however, subsequent water quality tests indicated that pathogenic contamination remained high. SWP worked with the Water Resources Authority in Kenya and LVBWB in Tanzania to conduct shock chlorination, which raised water quality to national standards.

GESI: How can considerations of gender, vulnerability, and social equity be better integrated into the WSI process and water security interventions?

As a stakeholder-driven process, the WSI process depends on a concerted effort to understand and address how women and vulnerable communities interact with water differently. Clearly understanding the relationship between women and vulnerable communities with water security will help clarify the opportunities and steps needed to facilitate equitable and sustained participation.

Issues of social equity, vulnerability, and participation need to be addressed early in the WSI process. SWP's activities in the Mara Basin were generally gender-balanced due to widespread interest from local communities. Addressing these issues requires more than just the participation of women, youth, and vulnerable groups. All facets of the WSI process need to be viewed through a GESI lens to ensure that assessments, plans, and interventions are equitable. In the Mara Basin, SWP did not specifically address issues of gender and social equity or vulnerability in the water security assessments and as a result, specific impacts on particular communities and stakeholder groups were likely missed. This information could have been used to inform potential activities with water user associations, capacity and skills building with basin managers, and field-based interventions and ensure that they address the needs of all community members.

ANNEX B: TECHNICAL BRIEF, CAMBODIA

Improved stakeholder awareness and participation in water security: how can the SWP water security process involve appropriate stakeholders to ensure the benefits of water resource interventions accrue equitably?

- **Pairing quick-wins and incentives can help mobilize stakeholder participation in the WSI process.** SWP used quick-wins as incentives to motivate and mobilize stakeholders in the WSI process in Cambodia. Early on, SWP used trainings to generate interest, understanding, and engagement. For example, SWP delivered a soft-skills training series which focused on leadership, community mobilization, and basic budgeting and resource management to community leaders. Following the trainings, SWP facilitated quick-win measures that required stakeholders to apply their soft-skills training. For example, the WASH Working Group proposed the installation of billboards in important locations around the basin to remind water users of how their behavior affected their downstream neighbors. Coordinating with SWP and two local artists, the Working Group designed the imagery and messaging for eight WASH/Water Security Educational Billboards, which were then installed in high traffic sites in the midstream, like the Stung Chinit Reservoir, which is used for irrigation and recreation. Through these early trainings and quick-win activities, SWP was able to generate the necessary interest to advance stakeholder participation in the subsequent assessment, planning, and implementation steps of the WSI process.

- **The WSI process depends on drawing out a common understanding of "water security."** In Cambodia, different stakeholder groups had their own definitions of water security. For some, water security was only an issue of drinking or household access to water. For others, water security meant securing water for their livelihoods. A broader understanding of water security in which multiple uses and ecosystems are considered was lacking. To overcome this, SWP developed a communication and awareness-raising strategy with the intent of socializing a broader definition of water security among participating stakeholders. A shared understanding of water security was necessary for the WSI process in order for stakeholders to discuss water security risks and negotiate improvement measures more clearly.

Improved capacity and tools to assess water security risks: how are water security risks most appropriately defined for measurement, analysis, and comparison?

Assessments are key to understanding water security risks and their linkages, to dispel misinformation, and provide common evidence for discussion among stakeholders. Stakeholders participating in the WSI process identified water quality as a key risk in the basin; however, the stakeholders offered different explanations about the source of these risks. For example, despite assurances from provincial officials that mining was no longer taking place upstream, stakeholders were convinced that upstream mining was making them and their cattle sick. SWP supported water quality testing and analysis did not show any evidence that upstream mining was contaminating surface water. However, the tests showed contamination from poor sanitation systems. These water quality tests were performed as part of the water security assessment and the results helped inform stakeholder-led prioritization of the water security risks.

- **Calibrate tools with the intended audience.** In Cambodia, SWP trained 15 participants from national ministries, provincial technical line departments, research institutes, and universities to use SEI's WEAP model to better understand uncertainty in the basin. However, the participants lacked the technical skills and capacity to understand the training, which was held in English with a Khmer assistant. While the training was not completely unsuccessful, participants were unable to independently continue to apply the WEAP model. Although tools are valuable, they should be adequately resourced and targeted to the correct user to ensure ongoing application.

Improved planning and water governance capacity: how does the WSI process improve planning and governance capacity to deliver co-benefits or multiple water security benefits, including improved WASH outcomes?

- **Water security planning benefits from vertical and horizontal integration.** In the Stung Chinit Basin, there is a complex network of water-related stakeholders and institutions that are responsible for water management. The institutions and stakeholder groups operate at different scales with specific mandates, and almost all of them have their own strategy or plan to guide their efforts. This can lead to duplication of efforts and missed opportunities for collaboration. To address this, SWP supported the development of a SAP for the Stung Chinit Basin for the new River Basin Management Committee. This plan outlined priority risks and targeted interventions to improve water security and resilience in the watershed. To avoid duplication and improve coordination among stakeholders, SWP integrated activities from the plans managed by the stakeholder groups and institutions in the basin into the basin-wide SAP.

Improved capacity and behaviors to implement WRM measures: what types of water security skills and capacity facilitate clear and concise actions and interventions to support water resources management and WSIs?

- **Facilitate engagement and collaboration across a wide variety of stakeholder groups.** SWP worked with local stakeholders to form technical working groups that covered agriculture, WASH, and other sectors. These working groups were valuable platforms for stakeholders to come together and discuss key challenges and plan tangible WSIs. Within the WSI process, the working groups were important for building a foundation for future engagement that will ultimately help sustain the River Basin Management Committee and implement the SAP. However, each working group was comprised of different types of stakeholders who represented their own interests or were informed by specific risks and challenges in their part of the basin (e.g., upstream, midstream, downstream). For these working groups to be effective, stakeholder leaders had to be prepared to facilitate discussions and manage potential conflicts between stakeholders. As part of the quick-win trainings, SWP trained community leaders to step into these facilitation roles through a series of capacity building activities.

Increased collaboration, learning, and adaptive response to water risk: how can we efficiently measure WSIs?

- **From the start, clearly define what is by "improved water security."** WSIs can take time and results are not always perceptible or easily measured. Activities designed to improve physical properties or chemical characteristic of surface water, for example, take years before quantifiable change is observable. Similarly, water security activities targeting capacity improvements can take time and often require sustained support in order to be sustainable. For SWP, it was therefore important to make sure that all stakeholders involved in the WSI process had a shared understanding of what "improvements" were desired. SWP's limited scope and resources meant that it could not make significant investments in green or gray infrastructure, and capacity improvements had to be targeted.

GESI: how can considerations of gender, vulnerability, and social equity be better integrated into the WSI process and water security interventions?

- **The active participation of women, youth, and vulnerable stakeholders in the WSI process requires support and sustained leadership.** Many women, youth, and vulnerable stakeholders did not participate in water management in the basin. To ensure this dynamic was not replicated in the WSI process, SWP hired a stakeholder engagement officer with a background in GESI. She played an important role in mainstreaming GESI considerations into the WSI process through a series of community discussions, focus groups, and capacity building activities. SWP brought attention to how past and current water management practices reinforced social and economic inequalities and worked with stakeholders to use this insight to design and implement water security activities so they would deliver equitable benefits for all stakeholders.

ANNEX C. INDICATOR ACHIEVEMENT AGAINST TARGETS

#	Type	Indicators	Project Target	% to Project Target	Project Results	Notes
1	HL.8.5-1	Number of people benefiting from the adoption and implementation of measures to improve water resources management as a result of USG assistance	500,000	35%	173,044	This indicator was partly met throughout the LOP but failed to meet its targets. SWP anticipated that activties under the SAP in Cambodia would be implemented. Due to persistent COVID lockdowns in Cambodia during the project implementation, these activities did not take place. Overall, the Mara and Cambodia activities were designed to pilot the WSI process and the initial phases of WSI were undertaken but, because of COVID, we were hampered in the implementation phase of WSI, hence the reduction in achievement. A lesson learned from implementing the WSI process, of which the SAP in Cambodia and the WAP in the Mara were outcomes, is the need for time and resources, especially for the latter portions of the process:
2	HL.8.4.-1	Value of new funding mobilized to the water and sanitation sectors as a result of USG assistance	$9,770,000	37%	$3,616,266	SWP underperformed on this indicator through the LOP. SWP anticipated this indicator to benefit from financial support to the SAP in Cambodia. However COVID delayed the development and operationalization of the SAP, so it could not be integrated into Commune and District Development Plans during the pilot's final year. SWP was able to ensure the ownrership of the SAP by local authorities but because of limitation in our ability to thorouhly engage with financing partners due to the COVID pandemic and because certain existing partnerships did not come the fruition (e.g. water.org) we were not able to attain the necessary leveraging for this target.
3	HL.8.3-3	Number of water and sanitation sector institutions strengthened to manage water resources or improve water supply and sanitation services as a result of USG assistance	50	130%	65	SWP overachieved on this indicator through the LOP, including year 5 work with FWUCS, Cfis, CFs, and provincial departments in Cambodia and ten spring committees in the Mara. SWP utilized the capacity assessment score card to measure these results.
4	Custom	Number of water security processes that include at least three types of stakeholders (gov. officials, NGO reps, community leaders) participating in water security decision-making	11	91%	10	With no additional processes during the Y6 of LOP, this indicator remained slightly under the projected targed.
5	Custom	Number of water security processes that include the inputs of women and other marginalized groups	11	91%	10	With no additional processes during the Y6 of LOP, this indicator remained slightly under the projected targed.
6	Custom	Number of water security risk assessments completed	28	107%	30	With the 18 Country Profiles, assessments for USAID/Uzbekistan and USAID/El Salvador, and an Integrated Water Security Assessment of Stung Chinit integrating updated information done during Y5, this indicator slighlty overperformed compared to the LOP target.
7	Custom	Number of people educated on tools, approaches, and/or methods for water security, integrated water resource management and/or water source protection as a result of USG assistance	1500	142%	2,133	With the addition of participants from various USAID Missions to the demonstration of the ECO Game; Water Security in Y6, this indicator increased slighlty, overachieving significantly the LOP target. The people educated or trained on tools under this educated were comprised of 602 female and 1,531 males.
8	EG.11-1	Number of people trained in climate change adaptation supported by USG assistance	450	77%	348	Anticipated trainings in Cambodia on the WESTool and the Water Security Game were not able to be completed due to COVID-19 before these pilot activities closed in Y5, leading to underperforming for this indicator during the LOP.

#	Type	Indicators	Project Target	% to Project Target	Project Results	Notes
9	EG.11-2	Number of institutions with improved capacity to assess or address climate change risks supported by USG assistance	50	128%	64	With no additional activity during Y6 of the project, this indicator was achieved over the course of the project.
10	Custom	Number of policies, laws, agreements, regulations, or investment agreements (public or private) that promote access to improved water supply and sanitation	6	100%	6	This indicator was met during the LOP, through activities such as the SAP in Cambodia, and the Kampong Thom Provincial Administration sub-decree establishing the River Basin Management Committee.
11	Custom	Number of formal partnerships facilitated for improved water risk management as a result of USG assistance	10	80%	8	This indicator had limited results during the LOP, with no additional partnerships in Y5 and Y6, hampered in part by COVID restrictions around the Cambodia SAP application.
12	EG.11-4	Amount of investment mobilized (in USD) for climate change adaptation as supported by USG assistance	$50,000	193%	$96,369	This indicator reached almost double of its anticipated targets and did not include additional activities towards the latter years of implementation, in part with the delays and limited follow-up of the Cambodia SAP which was expected to bring even stronger results but was stalled by COVID restrictions.
13	EG.3.2-24	Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance	500	11%	57	This indicator was completely off track bu the end of the project, due to lack of adequate monitoring evidence collected by SWP to meet the indicator definition (in particular for 79 cambodian farmers frained in Y5), and the cancelation of farmer-related activities in Cambodia given the restrictions from COVID in the final years of implementation.
14	EG.10-2-2	Number of hectares of biologically significant areas under improved natural resource management as a result of USG assistance	500,000	58%	289,220	No additional hectares were added in Y6, leaving this indicator underperforming by the end of the project.
15	HL.8.1-3	Number of people receiving improved service quality from an existing basic or safely managed drinking water service as a result of USG assistance	0	N/A	0	This indicator had no defined target and was not achieved by SWP. It is replaced by the standard indicator HL.8.1-1 which had significant results as none of the beneficiaries of the Mara River Basin springs met the criteria for basic access to safe water prior to the intervention, which would have been a pre-requisite for this indicator.
	HL.8.1-1	Number of people gaining access to basic drinking water services as a result of USG assistance	23,976	41%	9,872	This indicator is added to the final report to account for beneficiairies of the construction activities of water points in the Mara pilot, replacing the indicator 15 HL.8.1-3. The reported achievement does not reflect underachievement by the project, but the proportion of beneficiaries of the project who completely meet the criteria required for access to basic drinking water services (9,872) against the total number of beneficiaries who gained access to safe drinking water (23,976, some of who may not live within 30mn distance or collecting sufficient water to be counted under the indicator). The 9,872 people counted under this indicator are composed of 4,396 male and 4,396 female, all in rural setting.
16	Custom	Number of discrete visits or "hits" to SWP-supported knowledge management portal	20,000	215%	43,044	With additional visitors to SWPWater.org during Y6 of the activity, the target for this indicator was more than doubled over the LOP.
17	Custom	Number of convening and collaborative events held as a result of USG assistance	53	115%	61	With the addition of the USAID event around the ECO Game: Water Security in Y6, this indicator overperformed over the LOP.
18	Custom	Number of tools and methodologies on water security risks developed or shared.	27	130%	35	With the addition of a climate change and water integration report, an update of the ECO Game: Water Security done jointly with USAID, a private sector engagement analysis, and the collaboration with TNC for Source Water Protection in WASH Systems during Y6, this indicator was largely overachieved during the LOP.

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