

Economics of Gender Mainstreaming in Sectoral Climate Change Adaptation Investments



Asian Development Bank



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Abbreviations

ADB	Asian Development Bank
CCAI	climate change adaptation investments
°C	Celsius
CC CSP	Cambodia adopted in Climate Change Strategic Plan 2014-2023
CER	cost-effectiveness ratio
CO ₂	carbon dioxide
CSA	climate-smart agriculture
GCCC	Gender and Climate Change Committee
GCF	Green Climate Fund
kg	kilogram
INDC	intended nationally determined contribution
IRR	internal rate of return
km	kilometer
km ²	square kilometer
MOWA	Ministry of Women's Affairs
MPGCC	Master Plan on Gender and Climate Change
NAMA	Nationally Appropriate Mitigation Action
NAP	National Climate Change Adaptation Plan
NDC	nationally determined contribution
NPV	net present value
ppm	parts per million
RGC	Royal Government of Cambodia
UNFCCC	United Nations Framework Convention on Climate Change
WTP	willingness-to-pay

Executive Summary

Climate change is widely expected to significantly impact the poor and the vulnerable, women and girls, and the elderly. Agriculture and livelihoods of particular importance to women will be adversely impacted. Simultaneously, women are typically more vulnerable than men as a result of inherent social and income inequality. Hence, there is a growing acceptance for conscious gender-sensitive responses to the projected impacts of climate change. However, gender mainstreaming in the context of adaptation to climate change remains work in progress. Climate change adaptation strategies, plans, and programmes have thus far been less than successful at implementing gender mainstreaming. A lack of commitment, expertise, budget, and resources perpetuates the gap between gender mainstreaming intents and effective implementation.

Gender-mainstreaming in climate change adaptation investments implies (1) identifying the specific vulnerability faced by women and girls, (2) assessing their capacity and needs to address the gender-specific impacts of climate change, (3) ensuring that investment projects are explicitly designed to account for those different capacity and needs, and (4) monitoring project impacts with the support of gender specific indicators.

This important report aims to contribute to the currently limited literature on the economics of gender mainstreaming in sectoral climate change adaptation investment projects. The report draws on data and information from four (4) investment projects implemented in 4 provinces of the Kingdom of Cambodia (Battambang, Kampong Thom, Kampot, and Prey Veng) in 4 different sub-sectors (agriculture, irrigation, sanitation, and water supply). Each of these investment projects were designed to explicitly account for and respond to the specific needs of women.

Overall, the analysis clearly shows in all 4 cases that a gender-sensitive design of simple infrastructure such as water gates, or water wells or sanitation facilities, or home gardens and farms does not undermine the overall economic efficiency of the investment project. While gender mainstreaming entails higher investment costs (incremental cost relative to a baseline scenario without gender mainstreaming), such investments are economically viable.

This important result serves as a justification for the allocation of necessary budget and resources to ensure the effective implementation of gender mainstreaming in the context of climate change adaptation projects.

I. Introduction

Globally, the years 2016 and 2019 were the first and second warmest year on record since modern record keeping began in 1880 with an estimated 1.1°C above pre-industrial level in 2019. The past five years have been the warmest of the last 140 years (NASA 2020). Climate change has become one of the greatest risks facing humanity and is likely to remain among the highest priority of global concerns in the 21st century.¹

Achieving the targets set forth in the Paris Agreement – to limit global temperature increase to 2°C above pre-industrial levels – and to pursue effort to limit the increase to 1.5°C – requires rapid and significant reductions in the emissions of greenhouse gases, heading to net zero around mid-century (IPCC 2018). Instead, emissions are rising along with the atmospheric concentration of carbon dioxide (WMO 2020)² – and show no immediate sign of peaking.³ Current policies including the unconditional pledges and targets made in the context of countries' nationally determined contributions (NDC) would limit warming to approximately 2.8°C above pre-industrial levels. Exceeding the 1.5°C cannot be avoided unless NDC's commitments are increased very significantly and implemented immediately. It is generally believed that the goal of maintaining warming to 2°C may be out of reach (Brown et al. 2019).⁴

Climate change could undo the significant achievements enabled by economic development over recent decades in the Asia and Pacific region, including poverty reduction. Climate change impacts could include the deterioration of the Asian "water towers", prolonged heat waves, coastal sea-level rise and changes in rainfall patterns (ADB 2017). These changes could disrupt ecosystem services and lead to severe effects on livelihoods which in turn would affect human health, migration dynamics and the potential for conflicts (ADB 2012, World Bank 2018a). As the earth continues to warm up, the severity of these adverse impacts will continue to intensify and amplify.

Numerous studies have shown the gender-differentiated impacts of exposure to extreme weather events such as heatwaves and floods. Azhar et al. (2014) shows female mortality rates to be significantly higher than males' in the course of the 2010 heatwave experienced in Ahmedabad (India). In a more recent study in China, Wang et al. (2019) shows mortality rate associated with heatwaves in 27 densely populated cities of China over the period 1986-2005 to be 22.0 per one million females and 10.1 per one million males. It has also been noted in Indonesia that women are less likely to have access to weather-related early warning systems or be informed about oncoming rains and floods thus raising their exposure to flood hazards (ADB 2016). These gender-differentiated impacts of extreme weather events have been identified not only in emerging economies but in developed countries as well.⁵

¹ In its latest global risks report, the World Economic Forum identified extreme weather, climate action failure, natural disasters, biodiversity loss and human-made environmental disasters as the first five of the top 10 most likely global risks (WEF 2020).

² In 2017 and 2018, global average atmospheric concentrations of carbon dioxide (CO₂) were measured to be 405.6 and 407.8 parts per million (ppm) respectively. Preliminary data indicate that CO₂ concentration may have exceeded 410 ppm by the end of 2019. The average annual growth rate of global CO₂ concentration increased from 1.42 ppm per year over the decade 1985-1995 to 1.86 ppm per year over the decade 1995-2005 and to 2.06 ppm per year over the decade 2005-2015 (WMO 2020). Changes in coal use explain most of the change in global emissions of carbon dioxide (Peters et al. 2020).

³ The reduction in economic activity observed in the first half of 2020 as a result of the COVID-19 pandemic has enabled significant reductions in the emissions of greenhouse gases (Le Quéré et al. 2020). These reductions are estimated to be 8.8% in the first half of 2020 relative to the same period of 2019 (Liu et al 2020). However, emissions are expected to rebound with the expected recovery of economic activity (The Economist 2020).

⁴ In a preface to WMO (2020), the Secretary General of the United Nations wrote: "We are currently way off track to meeting either the 1.5°C or 2°C targets that the Paris Agreement calls for". Recent median estimates for the greenhouse gas cumulative abatement costs for the 1.5°C or 2°C targets are \$30 and \$15 trillion respectively (assuming a 5% discount rate) (van Vuuren et al. 2020).

⁵ For example, in New York City, Reckien and Petkova (2019) shows that women are 34% more likely to be significantly affected during heatwaves than men. Similarly, France reported approximately 15,000 incremental deaths associated with the unprecedented heatwave of August 2003. Controlling for the greater longevity of women, Fouillet et al. (2006) estimates the excess mortality rate for women to be 15% higher than for men (the uncontrolled excess mortality being 75% higher from women than for men).

Similarly, it has been clearly demonstrated that the poor, women, children and the elderly will be disproportionately affected by the impacts of climate change.⁶ Numerous factors have been identified contributing to these gender-differentiated impacts including inherent income inequality (Habtezion 2013, Mehar, Mittal and Prasad 2016, and Mersha and Van Laerhoven 2016), sociocultural and gender norms, as well as differing levels of access to resources and finance all contributing to a greater degree of vulnerability and lesser means of adaptation (Alston 2014, Boyland and Johnson 2018, and Mignaqy 2016). Research shows that women-headed farming households are more vulnerable to the impacts of climate change. In a rural context, the migration of men off-farm in search of livelihoods and income leave women to fend off the impacts of extreme weather events in absence of male support thereby increasing their vulnerability (Paris, Joyce, and Villanueva 2009, and Habtezion 2016). To the extent that migration from climate change impacts may at times represent an effective autonomous adaptation strategy, migration opportunities are generally more significant for men than for women, facilitated by higher levels of both income and education (Curran and Meijer-Irons 2014).

There is a growing recognition of the gender-based vulnerability to climate change and thereby a growing acceptance for gender-sensitive and conscious responses to it (Rakib et al. 2017). In particular, gender-differentiated adaptation strategies in rural settings have gathered increasing attention. Jost et al. (2016) has pointed out that focusing information, resources, technologies and practices for climate-smart agriculture (CSA) on women is an important strategy for catalysing adoption. Kritsjanson et al. (2017) points out that while access to agricultural and weather/climate related information is critical to adaptation, policies and programs often fail to recognize that information needs for men and women are different thus missing the opportunity to address not only information gaps between genders but overall social and economic inequality.⁷

Gender mainstreaming in the context of adaptation to climate change remains work in progress. Climate change adaptation strategies, plans, and programmes have thus far been less than successful at implementing gender mainstreaming (Ampaire et al. 2020). Huyer (2016) reaches a similar conclusion after a review of the inclusion of gender in intended NDCs, National Climate Change Adaptation Plans (NAPs) and Nationally Appropriate Mitigation Actions (NAMAs). In addition to a lack of commitment, expertise, budget, and resources which perpetuates the gap between gender mainstreaming intents and implementation (Parpart 2014), a lack of adequate research and gender-disaggregated data contributes to the difficulties for the effective implementation of gender mainstreaming (Nepal 2016). In the context of investment projects in particular, the general practice of traditional project assessment tools – such as cost-benefit analysis – typically do not account for the gender specific benefits of climate change adaptation investments (CCAI). Gender mainstreaming is then perceived to be a source of incremental costs without associated incremental benefits.

In an important study, UN Women (2017) tested the cost-effectiveness of projects differentially designed along a spectrum of gender-awareness approaches – from gender neutral to gender specific to gender transformative. In this study, a project is said to be *gender neutral* when there is no explicit recognition of the differential needs of women in project design and gender equality is not an explicit objective of the project. It is said to be *gender specific* when gender is reflected in project implementation, log frame and budget but does not aim towards social transformation and equality. Finally, a *gender transformative* project is a project for which gender equality is the primary objective, with gender integrated at all project stages from project conception, design, implementation, and monitoring.

Based on a case study in Bangladesh, the report shows that projects that adopt a gender-transformative approach exhibit more *cost-effective* climate change adaptation outcomes. A cost-effectiveness analysis – unlike a cost-benefit analysis – does not require the economic valuation of the benefits (positive impacts) of projects. This represents the simultaneous strength and weakness of a cost-effective analysis especially

⁶ Wang et al. (2019) estimates that without improvement in adaptation capacity, mortality in the female and male population of 27 densely populated cities of China will be 71.2–88.0 and 32.4–42.0 per million, respectively, at 1.5°C global warming, and will further increase to 93.9–114.4 and 43.4–55.4 per million, respectively, at 2.0°C global warming. Sorensen et al (2018) discusses in details the impacts of climate change on women's health.

⁷ In the specific context of Viet Nam, see McKinley et al. (2018), and Mishra and Pede (2017).

in a context where the overall economic efficiency of a proposed investment project – as measured by its net present value (NPV) or internal rate of return (IRR) – remains an important determinant of its acceptability for decision-makers and subsequent deployment of budgets and resources (Box I.1). For example, when assessing the “efficiency and effectiveness” of proposed investment projects, the Green Climate Fund (GCF) uses a number of indicators and provides the following instruction: “As appropriate, projects should provide an estimate of the expected economic internal rate of return and/or financial rate of return, depending on the needs of the project.” (GCF 2020).

Box I.1: Investment Decision at the Asian Development Bank (ADB)^a

ADB’s guidelines for conducting cost-benefit analysis distinguishes the situation when benefits are valued (the positive impacts of the project are monetized into benefits) from the situation when benefits (or many of them) are not valued.

1. When benefits are valued

When investment projects deliver benefits that are valued, the guidelines specify that the project’s net present value (NPV), internal rate of return (IRR), and cost-effectiveness ratio (CER), when appropriate, should all be calculated.

When there is only one project option, the project should be accepted if its NPV (calculated using the minimum required discount rate) is positive, or (equivalently) if the IRR is greater than the minimum required discount rate.

When different project options deliver different flow of (valued) benefits, then the NPV of all options should be estimated and the option with the largest NPV should be selected (provided that it is positive). Note that in such instances, the use of IRR and CER may yield to the selection of the option which does not maximize social welfare.

2. When benefits are not valued

As noted in the guidelines, for many social sector projects (such as education and health), some poverty targeting projects (such as rural roads and rural electrification), and projects that primarily generate environmental benefits (such as pollution control, protection of the ecosystem, flood control, and control of deforestation), economic benefits may be difficult to evaluate. In such circumstances, the economic viability of a project can be assessed based on cost-effectiveness analysis. Cost-effectiveness analysis aims to ensure that the chosen option represents the least cost among mutually exclusive, technically feasible project alternatives. The CER can be used to rank options with the option with the lowest CER being selected.

^a Asian Development Bank. 2017. *Guidelines for the Economic Analysis of Projects*. Manila.

The existing report offers a contribution to the currently limited literature on the economics of gender mainstreaming in sectoral CCAI projects. The report draws on data and information from four (4) investment projects implemented in 4 provinces of the Kingdom of Cambodia (Battambang, Kampong Thom, Kampot, and Prey Veng) in 4 different sub-sectors (agriculture, irrigation, sanitation, and water supply). Each of these investment projects were designed and implemented to explicitly account for the specific needs of women.

Gender mainstreaming entails higher investment costs relative to a baseline scenario without gender mainstreaming (incremental costs of gender mainstreaming). However, the analysis shows that these incremental costs do not undermine the overall economic efficiency of the projects and that the projects remain economically viable. For reasons that will be explained further below, the analysis does not demonstrate that a project with gender mainstreaming delivers a higher NPV than its equivalent without gender mainstreaming (gender blind project). Nonetheless, the results obtained in this analysis should

serve as a justification for the allocation of necessary budget and resources to gender mainstreaming in the context of climate change adaptation projects.

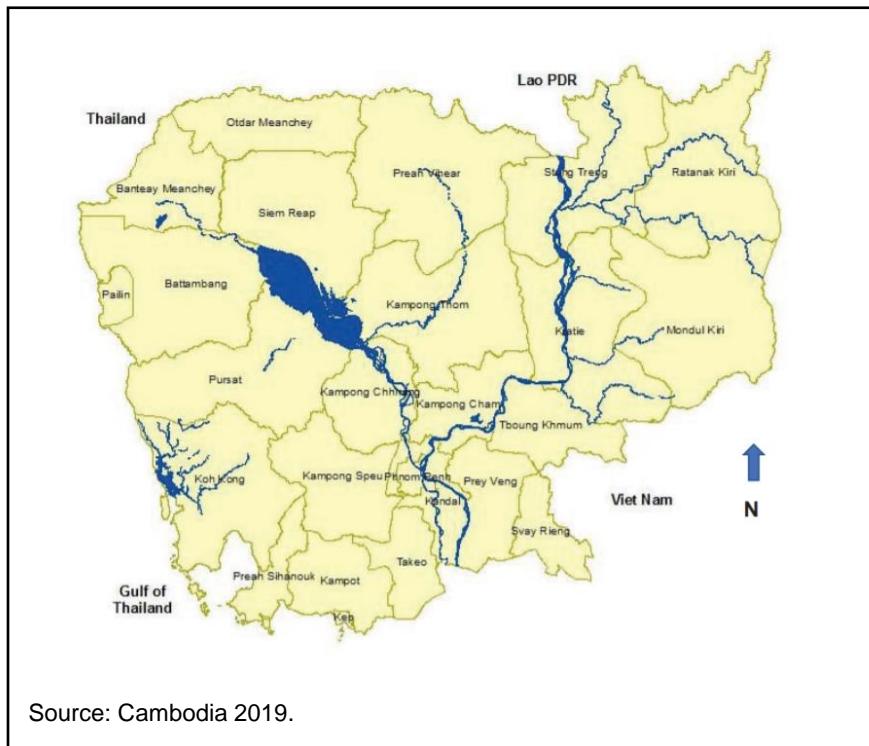
In the next section, we first briefly describe the four investment projects. For each project, we present a statistical description of the results of surveys conducted in November and December of 2019. This description is then followed with the outcomes of the economic analysis for each of the 4 projects. An analysis of this nature necessarily experiences a number of limitations. These are discussed in the context of concluding remarks in Section III along with potential avenues forward aimed at facilitating the effective implementation of gender mainstreaming in climate change adaptation projects.

II. The Economics of Gender Mainstreaming in Climate Change Adaptation Investment Projects: Case Studies in the Kingdom of Cambodia

II.1 Background

The Kingdom of Cambodia (henceforth Cambodia) is located in Southeast Asia bordered by Thailand, the Lao People's Democratic Republic, Viet Nam, and the Gulf of Thailand (Map II.1). Its 181,035 square kilometer (km^2) area comprises 24 provinces and 1 special administrative unit, Phnom Penh. In 2019, Cambodia's population was estimated to be 15,288,489 of which 51.5% being female (Cambodia 2019). Over the period 2008-2019 (2008 being the census year prior to 2019), Cambodia's population grew at an average annual rate of approximately 1.2%.

Map II.1: Cambodia in Southeast Asia



Along with many countries of Southeast Asia, Cambodia and its population are exposed and vulnerable to the impacts of climate change. Over the period 1999-2018, the country was ranked 12th globally in terms of climate risk index (Eckstein et al. 2020, Davies et al. 2015). Poverty, malnutrition, the high degree of dependence on agriculture (approximately 80% of the Cambodia's population lives in rural areas, and agriculture employs approximately 75% of the labor force), and the presence of settlements in flood-prone

areas all contribute to this high degree of vulnerability. The projected rise in temperatures and changes in precipitation patterns (with a projected increase in the intensity of heavy rainfall events and drier conditions in the course of the dry season) will adversely impact agriculture, fisheries, and labor productivity (USAID 2019). Climate change has been identified as a serious threat to food security and safety in Cambodia (Cambodia 2013). This vulnerability to climate change has been identified as a threat to future economic growth and development (IMF 2019, World Bank 2018b). Cambodia's gross domestic product could be reduced by 2.5 percent by 2030 and by 10 percent by 2050 as a result of climate change (Cambodia 2018a).

Cambodia officially became a member of the United Nations Framework Convention on Climate Change (UNFCCC) in March of 1996, ratified the Kyoto Protocol in 2002, and submitted its first *National Communication* in the same year (Cambodia 2002). In 2006, the Royal Government of Cambodia (RGC) established the National Climate Change Committee which then became the National Council for Sustainable Development in 2015. In 2013, Cambodia adopted its *Climate Change Strategic Plan 2014-2023* (CCCS - Cambodia 2013), and in 2015, it submitted its second National Communication to the UNFCCC (Cambodia 2015a) as well as its Intended Nationally Determined Contribution (INDC – Cambodia 2015b).

Upon recognizing that women are most vulnerable to climate change impacts because of their high dependence on agriculture and natural resources (for food, medicine, and firewood among other goods), the CCCSP asserts the need to mainstream gender into climate change response measures into policies, laws, and sectoral climate change strategic plans to ensure that it be supported by all national stakeholders and development partners (Cambodia 2013). Accounting for sectoral, regional, and gender vulnerability to climate change is thus one of the eight strategic objectives of the CCCSP. For this purpose, ensuring that climate change response is equitable and gender sensitive, and prioritizing women's needs in climate change adaptation are among the key guiding principles for purpose of implementing the strategic objectives of the CCCSP. The CCCSP furthers calls for integrating climate change response planning to promote adaptive social protection and participatory approaches in reducing loss and damage due to climate change (Strategic Objective 6).

Relevant ministries and agencies, including Cambodia's Ministry of Women's Affairs (MOWA), have developed their Sectoral Climate Change Strategic Plans alongside the CCCSP. In 2014, MOWA adopted its *Gender and Climate Change Action Plan* (Cambodia 2018b) which includes strategies and an action plan matrix (Table II.1).

Table II.1: Gender and Climate Change Action Plan – Action Plan Matrix

Strategies	Actions
Strategy 1: Strengthening institutional capacity and cross-sectoral coordination with a focus on women's role in climate change adaptation and mitigation.	<ol style="list-style-type: none"> 1. Strengthening gender and climate change capacities at all levels, especially at the sub-national levels in partnership with stakeholders. 2. Promoting integration of gender responsiveness in NSDP and sector plans to increase resilience capacity of women to cope with climate change impacts in cooperation with agencies concerned. 3. Promoting women's participation in decision making on climate change policy at all levels.
Strategy 2: Improving capacity, knowledge and awareness on women's role in climate change adaptation and mitigation.	<ol style="list-style-type: none"> 4. Conducting vulnerability assessments of women and girls to climate change impacts, including developing database and monitoring and evaluation framework on climate change gender responsiveness with line ministries. 5. Promoting education and awareness building on climate change impacts and disaggregated role of men and women in coping with climate change impacts.
Strategy 3: Promote climate change adaptation and mitigation measures for disadvantaged women and other groups.	<ol style="list-style-type: none"> 6. Developing and piloting gender-based climate change adaptation and mitigation projects or initiative in cooperation with sector ministries and other stakeholders.

In December of 2014, MOWA adopted its *Five-Year Strategic Plan for Gender Equality and Women's Empowerment 2014-218* (Cambodia 2014). A key strategic objective of the *Plan* is the promotion of gender equality in processes and policy implementation related to climate change. Key strategies include (1) strengthening the capacity and support of senior officials and technical staff in gender mainstreaming in the climate change, green growth and disaster risk management program; (2) reducing the impacts of climate change and disasters on women; and (3) creating new innovative schemes and activities to address gender issues in climate change, green growth and disaster risk management which are tested and proposed to line ministries for integration into regular on-going programs.

MOWA adopted its *Master Plan on Gender and Climate Change* (MPGCC) in 2018 (Cambodia 2018b). The vision of the MPGCC is “to institutionalize and internalize gender mainstreaming in adaptation, disaster risk reduction and mitigation investments for contributing to equitable, climate resilience and sustainable society of Cambodia. The mission is to mainstream gender in climate change adaptation, mitigation and disaster risk reduction as a part of institutional climate change investment policies, strategies, programs and projects for enhancing climate change resilience in Cambodia.” (MOWA 2018b). MOWA’s *Five-Year Strategic Plan* also calls for the creation and testing of new innovative schemes and activities as well as new pilot projects and studies to address gender issues in climate change.

For many years, ADB has provided technical as well as financial assistance to the RGC in support of its climate resilience agenda.⁸ This includes the recent technical assistance project *Mainstreaming Climate Resilience into Development Planning*.⁹ A key component of this assistance project includes integrating gender considerations in climate change adaptation in cooperation with MOWA. Activities include (i) integrating gender concerns into climate change action plans in at least three sectors, such as agriculture, water resources, and health; and (ii) implementing gender-responsive and gender-equitable adaptation pilots in three sectors, with a view to building an economic case for gender mainstreaming in adaptation projects.

It is in this precise context that four (4) case studies were implemented in 4 of Cambodia’s 24 provinces with the financial and technical support of the ADB-financed technical assistance project.

In September 2018, the Gender and Climate Change Committee (GCC) of MOWA requested the submission of expressions of interest for the implementation of gender mainstreaming projects. The technical assistance project team along with the GCCC shortlisted 8 adaptation projects among the 19 expressions of interest which were received. Field visits were conducted at each of the 8 potential project sites to assess the suitability of the project and readiness of the local population and implementing partners to proceed with implementation if selected. Of these, 4 projects were finally selected (Box II.1).

⁸ Tackling climate change and building climate and disaster resilience is one of the four operational priorities of the ADB's latest *Country Partnership Strategy Strategic Framework* with the RGC (ADB 2019a).

⁹ Referred to as TA8179-CAM in the ADB classification system.

Box II.1: Selection of Four Pilot Projects

The following criteria were used by the MOWA to finalize the selection of the 4 pilot projects to be supported by the project:

- *Sector priorities* – the project had to belong to at least one of the selected prioritized sectors (agriculture, health, infrastructure, and water resources);
- *Province priorities* – the project had to take place within the prioritized provinces where significant climate change impacts have been observed and are projected (Battambang, Kampot, Kampong Thom and Prey Veng provinces);
- *Formal institutional support* – the project had to be recommended and nominated by the respective government authority (for example, an agriculture sector project had to be nominated by the Ministry of Agriculture, Forestry and Fisheries);
- *Climate change* – the project had to provide some form of climate change rationale; and
- *Local and provincial commitment* – local and provincial stakeholders had to express a strong commitment to ensure the effective implementation of the project following the terms and conditions set by MOWA and the project team.

Project implementation was initiated in April 2019 and completed in October 2019. Each of the 4 projects was of a relatively small nature with a capital cost ranging between \$30,000 and \$35,000. A survey was conducted at each of the 4 project locations in November-December 2019 to preliminarily assess the potential impacts of the project.

II.2 Sanitation Project in Battambang Province

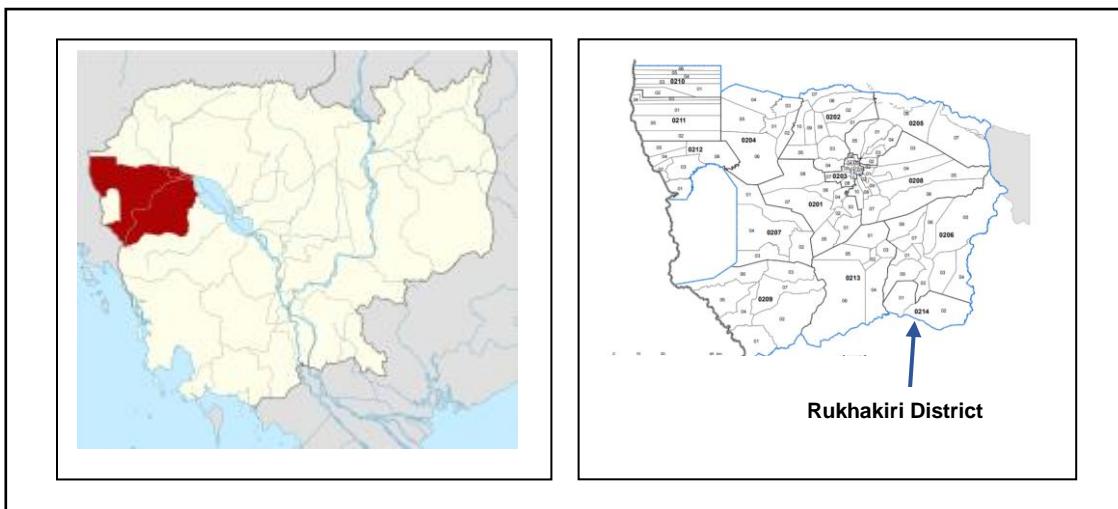
II.2.1 Description of Case Study

The province of Battambang comprises an estimated 987,400 people (Cambodia 2019) dispersed over a surface area of 11,702 km². It is located in the country's northwest region (Map II.2). Its capital city, Battambang Municipality is located approximately 290 kilometers (km) from Phnom Penh. The province is known as the rice bowl of Cambodia as a result of its fertile rice fields. The province is prone to extreme weather events including extreme precipitation causing floods. The district of Rukhakiri is one of 13 districts¹⁰ of the province comprising approximately 38,600 people.¹¹

¹⁰ The district is further sub-divided into 5 communes (Prek Chik, Prey Tralach, Mukh Reah, Sdok Pravoek, and Basak) comprising 32 villages.

¹¹ The provisional population results from the 2019 census does not yet provide population estimates at the district level. In 2008, the population of the Rukhakiri district was estimated to be 39,967. Between 2008 and 2019, the population of Battambang province declined at an average annual rate of 0.3%. If this percentage were to apply homogeneously throughout the province, then the population of Rukhakiri district would be approximately 38,600.

Map II.2: Battambang Province and Rukhakiri District



Poor sanitation and limited access to improved latrines and hygienic facilities, including in public markets result in frequent outbursts of water and vector borne diseases. Most women and girls in Prek Chik and Prey Tralach communes of the Rukhakiri District lack access to improved latrines and have limited opportunity for hygienic practices in their households and public places (Figure II.1). For instance, there are no public latrines located in the temporary markets established in the two communes in Rukhakiri District that are clean and environmentally friendly, and only 10 percent of the whole population of the district are able to access improved latrines, sanitation and hygiene. For women attending public markets, accessing washroom facilities implied going to the fields or forests or going home.

Climate change impacts the use of latrines – this impact being more severe for girls and women – in two different ways. First, as a result of increased extreme precipitation leading to larger areas being flooded more frequently and for longer periods of time, accessing washroom facilities (whether open air or at home) had become increasing difficult and more time intensive. Furthermore, as noted in Azhar et al. (2014), in order to avoid having to relieve themselves in areas deemed unsafe, or to avoid shame and sexual harassment, girls and women generally have to limit their intake of water thereby increasing the risk of dehydration. Along with projected increasing extreme temperatures and more intense drought periods, this risk is projected to increase with the absence of improved gender-sensitive latrines.

The pilot project focused on the construction of 2 compounds of latrines (6 toilet beds per each compound) together with hand washing facilities in the communes of Prek Chik and of Prey Tralach. The project also included training and capacity building on gender mainstreaming issues. As indicated in Table II.2, the design and construction of the gender-sensitive latrines represented approximately 68% (\$23,743) of the total cost (\$35,000) of this pilot project.



Figure II.1: Public Latrines Prior to Project

The 2 compounds were explicitly designed to be gender-sensitive: (1) toilet stalls are clearly delineated with a set of 3 stalls to be used exclusively by men and another 3 sets to be used exclusively by women; (2) all 3 female stalls comprise toilet cuvettes to facilitate use while only 1 of the men's stalls comprise cuvettes; (3) a ramp facilitates access to the stalls which greatly facilitate access to the stalls especially to elder women as well as pregnant women; and (4) a hand washing station facilitates proper hygiene (Figure II.2).

The project directly benefits an estimated 720 individuals (estimated population of the 2 communes), including 468 women (Cambodia 2018c). Project cost components are presented in Table II.2.¹²

The project was implemented by the (provincial) Department of Gender and Health, the Department of Gender and Education, and the Department of Economic Development under the coordination and assistance of GCCC.



**Figure II.2: Public Latrines
After Project**

¹² In all 4 pilot projects, it is assumed that financial costs stand in for economic costs without adjustments (shadow pricing). In the case of Cambodia, this leads to over-estimating economic costs and therefore under-estimating the true economic efficiency of the pilot projects.

Table II.2: Estimated Cost of Gender-sensitive Latrines in Battambang Province

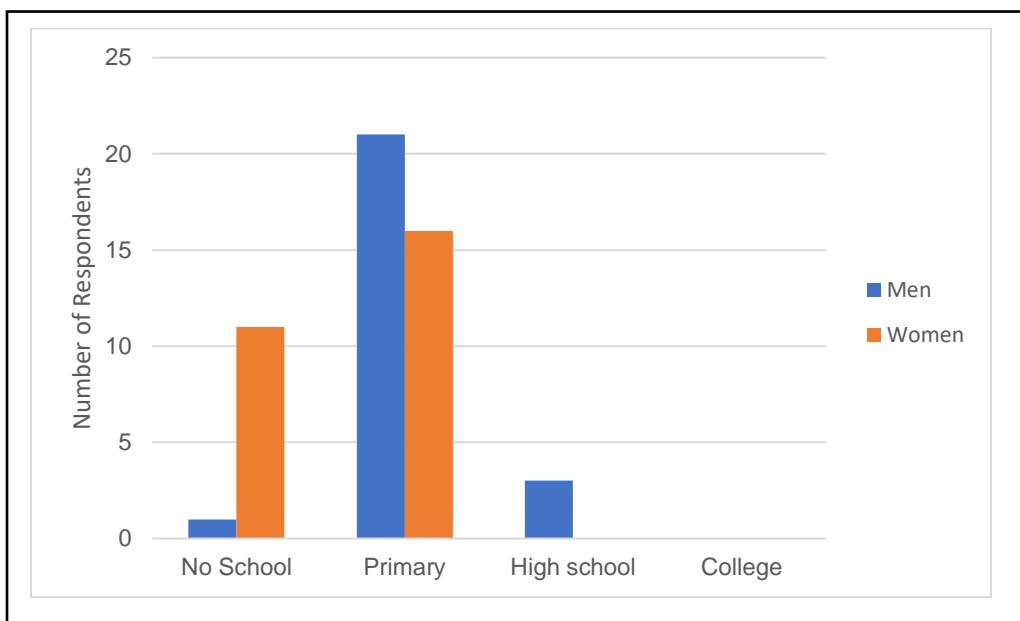
Description	Total Cost (USD)
Output 1. Conduct capacity needs assessment of the target beneficiaries on gender mainstreaming in WASH investment initiatives.	951
Organize two workshops on sex-disaggregated baseline data collection and capacity needs assessment at commune level.	351
Produce a workshop report.	50
Produce and publish a guidance brochure on gender mainstreamed design of hygienic latrines and sanitation.	550
Output 2. Strengthen institutional and community capacity on gender mainstreaming in WASH for target beneficiaries.	5,820
Conduct capacity building training based on the identified capacity gaps and needs for the provincial, district, communes, communal market management committee and local communities.	4,256
Quantify the incremental costs of gender mainstreaming.	1,564
Output 3. Construct two climate resilient and gender sensitive communal latrines.	23,743
Design climate resilient and gender sensitive communal latrines.	200
Field visit to selected communal market sites with commune councils and district governor.	543
Construction of latrines.	18,000
Land allocation	5,000
Output 4. Produce and distribute guidance manuals for climate resilient and gender sensitive communal latrines.	1,404
Establish communal latrine management team.	550
Training of communal latrine management team and market management committee with a focus on girls, women, and elderly.	427
Training on fee collection, recording, and monitoring of latrines use and maintenance.	427
Output 5. Quantify the costs of gender mainstreaming in the WASH initiative and the lessons learned.	1,620
Identify the scope and additional costs for mainstreaming gender in the process of hygiene latrine building, management team establishment, gender responsive operational manual and management.	190
Consultation with provincial, district, and commune officials and community beneficiaries.	1,190
Produce consultation report.	240
Project administration and monitoring	1,462
Total project cost	35,000

II.2.2 Survey Results and Economic Analysis

A total of 52 project beneficiaries – including 27 women – were interviewed on-site in December 2019. It is of importance to note that these beneficiaries voluntarily attended a meeting at a local government office and participate in the survey. There may be reason to assume that survey participants represent a sample of individuals who benefited most from the project. This will be accounted for explicitly below when estimating project benefits.

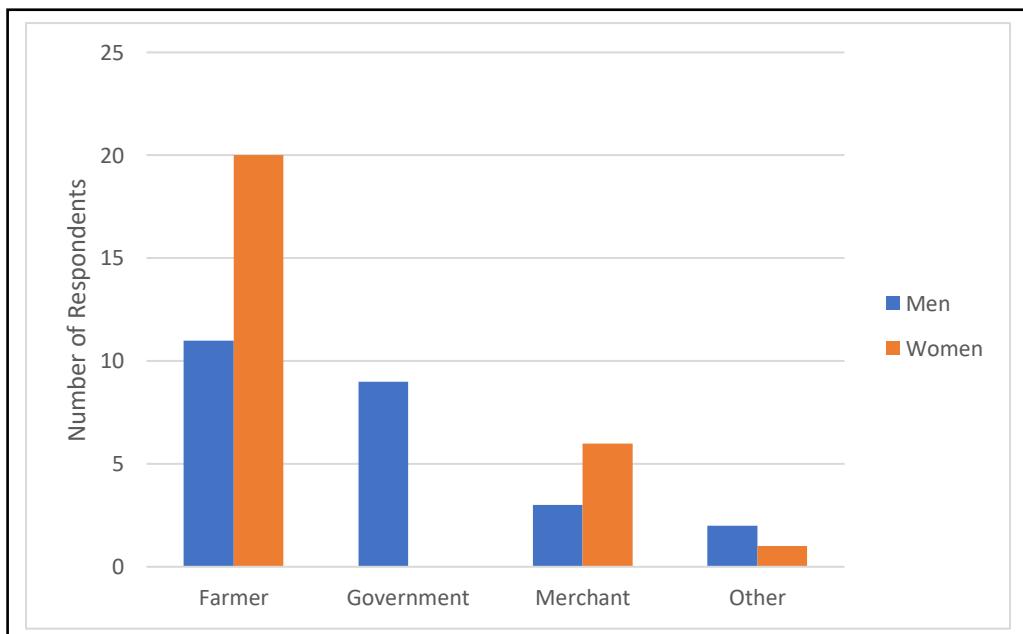
In this subset of beneficiaries, 41% of women (11) declared having no school and no women completed more than primary school. Their male counterpart had a significantly different education profile: only 1 of the 25 men (4%) had no school, 21 (84%) completed primary school, and 3 (12%) achieved high school (Figure II.3).

Figure II.3: Battambang – Level of Education in the Sample



Similarly, profession profile differs significantly between genders (Figure II.4). Twenty (20) of the 27 women (74%) reported being farmer and 6 (22%) reported being merchant. No woman reported having a government position. On the other hand, 11 of the 25 men (44%) reported being farmer, 9 (36%) having a government position. Only 3 (12%) reported being merchant.

Figure II.4: Battambang – Reported Profession by Men and Women



This indicates that women more so than men (in the sample of 52 beneficiaries participating in the survey) are mostly associated with farming and the activities of the public market. Women have indeed reported going to the market and spending more time at the market than men (Table II.3). Based on the reported answers, male respondents spend on average a total 15.4 hours per week at the market while female

respondents spend an average of 26.7 hours at the market. Improvements of sanitary conditions at the market are therefore likely to benefit women more significantly than men.

Table II.3: Time Spent at the Market by Men and Women

	Women	Men
On average, how many times per week do you go to the public market?	7.9	6.9
On average, how many hours do you spend for each visit at the market?	3.4	2.2
Estimated number of hours per week spent at the market	26.7	15.4

Prior to project implementation, men and women were using various facilities for sanitation purposes. A significantly higher proportion of women indicated going home for sanitation purposes (Table II.4). To the extent that using home facilities require more time, time savings are thus likely to be more significant for women. A higher proportion of men are using other private facilities. This is partly correlated to a higher proportion of men occupying a government position. An approximately equal proportion of men and women satisfy their sanitation needs outdoor. However, most women (19 out of 27) said not feeling safe when using facilities other than their home.

Table II.4: Sanitation Facilities Used by Men and Women Prior to Project Implementation

Type of Facilities	Women^a	Men
Home	9 (27.2%)	3 (13.6%)
Other private facilities (neighbor, healthcare center, government office)	10 (30.3%)	10 (45.4%)
Outdoor (canal, pond, forest)	14 (42.4%)	9 (40.9%)

^a Note that the number of responses is larger than the 27 women participating in the survey as some women indicated using more than 1 type of facilities.

Following project implementation, all respondents, men and women, reported using exclusively the newly constructed latrines. The positive impacts of the project are multiple. Some of these have been quantified in the context of this analysis. These are summarized in Table II.5.

Prior to project implementation, women used sanitation facilities 1.41 times per day on average, and men 1.48 times per day. Both men and women have indicated using washroom facilities a much larger number of times following project implementation. However, the increase was significantly larger for women than for men: Women increased their use of sanitation to 2.85 times per day after the project, a 102% increase of sanitation use; men increased their use of sanitation by 62%. This increase would indicate not only an improvement in overall physical comfort but also suggest a potentially important health benefit to the extent that a greater use of sanitation facilities could indicate the drinking of more liquid. In fact, all 52 respondents have indicated drinking more water knowing the possibility of using the new sanitation facilities available at the public market. This important benefit is likely to become more significant as warming continues to increase bringing along a (projected) higher frequency of days with extreme heat.

As indicated in Table II.5, on average women gained 33.8 minutes per use of sanitation while men gained 29.3 minutes per use. Following project implementation, women spent 23.4 minutes per day to sanitation – down from 59.2 minutes per day prior to the project. Note that this amount of time per day devoted to sanitation accounts for a larger number of uses per day following project implementation. If the frequency of use had remained at pre-project level – 1.41 times per day – then each woman would have devoted 11.6 minutes per day to sanitation. The gain is also significant for men who gained on average 29.3 minutes per use. Following project implementation, on average each man devoted 14.6 minutes to sanitation, down from 52.4 minutes.

In addition to the health benefits associated with the drinking of more water, most respondents have indicated experiencing less diseases following the implementation of the project. These are associated with cleaner facilities as well as the presence of 2 hand washing stations. Of the 21 women experiencing diarrhea and/or skin diseases prior to project implementation, only 2 of them revealed continuing to

experience these diseases after project implementation – a reduction of 90.5%. Among men, 76.5% indicated not experiencing health issues following project implementation.

It thus clearly appears that while the implementation of gender-sensitive latrines provided benefits to both men and women, these benefits have particularly accrued to women.

Table II.5: Benefits of the Project

Issues	Before the project	After the project
Access to sanitation	<p>Women used sanitation facilities 1.41 times per day.</p> <p>Men used washroom facilities (indoor or outdoor) on average 1.48 times per day.</p>	<p>Women use facilities 2.85 times per day.</p> <p>Men use new washroom facilities 2.4 times per day.</p>
Time allocated to sanitation purposes	<p>On average, women devoted an average of 38.3 minutes per use of the sanitation facilities. Given their using these facilities 1.41 times per day, each woman devoted on average 54.0 minutes per day to sanitation.</p> <p>On average, men devoted 29.0 minutes per use of the sanitation facilities. Given an average use of facilities of 1.48 times per day, each man devoted on average 42.9 minutes per day to sanitation.</p>	<p>On average, women are devoting 9.5 minutes per use of the sanitation facilities – a gain of 28.8 minutes per use. On average, each woman devotes 27.1 minutes per day to sanitation.</p> <p>On average, men devote 8.1 minute per use of the sanitation facilities – a gain of 20.9 minutes per use. On average, each man devotes 19.4 minutes per day to sanitation.</p>
Diseases	<p>21 women interviewed indicated experiencing diarrhea and/or skin diseases believed to be associated with the lack of clean sanitation.</p> <p>17 men interviewed indicated experiencing similar health difficulties.</p>	<p>Of the 21 women who had indicated experiencing health problems, 19 said not experiencing these problems after project implementation – a reduction of 90.5%.</p> <p>13 men (out of 17) have ceased experiencing health problems – a reduction of 76.5%.</p>

In principle, the *economic* benefits of an investment project should be assessed and estimated using society's maximum willingness-to-pay (WTP) for the incremental goods and/or services delivered by the project relative to a no-project scenario. As is often the case, the actual measurement of economic benefits provides an estimate of the WTP, not necessarily of the maximum WTP. As is also often the case, different approaches may be used to assess these economic benefits. Different approaches deliver different estimates. Confidence is enhanced when different estimates all indicate the project to be economically efficient.

The economic value of the reduced time spent for sanitation purposes can serve as an estimate of the economic benefit of the investment – in all likelihood an under-estimate as this approach does not provide an estimate of the maximum WTP for the services produced by the project. This approach is regularly used when an important benefit of a proposed investment project is time saving – for example when a transport project reduces travel time or when a water supply project reduces water collection time.

In the context of the Battambang sanitation project, this assessment proceeds in the following manner: (1) using survey results, estimate the amount of time devoted to sanitation with and without project scenarios, and provide an estimate of “time saved” as a result of the project; (2) transform “time saved” into a monetary measure using income (or gross domestic product) per capita; and (3) assuming that the sample of respondents is representative of the entire population of beneficiaries, extrapolate survey results to the population of estimated beneficiaries. Details of the methodological approach are presented in Box II.2.

Box II.2: Calculation of Estimated Economic Benefits for the Battambang Pilot Project

Before the project

On average, each man used sanitation facilities (including outdoor) 1.48 times per day and spent 29.0 minutes each time, representing an average total of 42.9 minutes per day. On average, each woman used sanitation facilities (including outdoor) 1.41 times per day and spent 38.3 minutes each time, representing 54.0 minutes per day on average

After the project

On average, each man's use of sanitation facilities increased from 1.48 to 2.4 times per day, spending 8.1 minutes per use for a total of 19.4 minutes per day. On average, each woman's use of sanitation facilities increased to 2.85 times per day, spending 9.5 minutes each time for a total of 27.1 minutes per day.

Impact of the project

For purpose of estimating the impact of the project, it is assumed that *without* the project, the "before the project" situation would have continued to prevail. Hence, without the project, it is assumed that each man and each woman use of sanitation (including outdoors) would have been as before the project. In the absence of the project, it is thus assumed that each man and each woman would continue to devote 42.9 minutes and 54.0 minutes per day respectively to sanitation. Hence, on average, each male survey participant gains 23.5 minutes per day; each female survey participant gains 26.9 minutes per day. While the gain for women may not appear significantly larger than man's benefit, note that women's use of the sanitation facilities almost doubled following completion of the gender-sensitive sanitation facilities. The benefit of increased frequency of sanitation usage is not included in this analysis but is likely to be significant.

Economic benefit of the project

Annual gross domestic product per capita in Cambodia is estimated to be \$1,620 in nominal terms in 2019.^a Assuming 2,496 working hours per year (52 weeks; 6 days per week; 8 hours per day), GDP per capita per working hour is \$0.6.

The economic benefit of the project is estimated to reach \$0.25 per day for men, and \$0.29 per day for women. In order to compute annual benefits and to be consistent with the above assumption of 6 working days per week, it is assumed that time savings occur 6 days per week (in other words, it is assumed that there is no time saving when men or women are already at home on a non-working day). On an annual basis, the economic benefit is estimated to be \$79.25 per man, and \$90.88 per woman.

As indicated in text, direct project beneficiaries are estimated to be 468 women and 252 men. If all direct beneficiaries were to similarly benefit from the project as survey participants, then annual economic benefits for men and women would reach \$19,970 and \$42,533 respectively. This may however be an unlikely scenario. For example, men and women who willingly came to participate in the survey may have been among those benefiting most of the newly constructed gender-sensitive sanitation facilities. It is thus assumed that the estimated economic benefit of the project applies to 25% of the estimated direct beneficiaries. Under this assumption, annual economic benefits for men and women would reach \$4,992 for men and \$10,633 for women. Total annual benefits reach \$15,625.

^a International Monetary Fund. 2020. *World Economic Outlook – GDP per Capita*. Retrieved 30 March 2020.

Per these calculations and assumptions, the economic benefit of the gender-sensitive sanitation facilities would reach a total of \$15,625 on an annual basis, \$4,992 for men, and \$10,633 for women. Women would thus capture approximately 68% of the estimated benefit of the pilot project.

For purpose of estimating the economic efficiency of the project, the following assumptions were made: (1) the annual maintenance cost amounts to 1% of the capital cost - \$350;¹³ (2) the expected life-time of the sanitation facilities is 10 years; and (3) a discount rate of 9% is used per ADB's guidelines (Box II.3)

Box II.3: Selection of a discount rate

The selection of an appropriate social discount rate remains a topic of discussion among economists. However, in the context of ADB investment projects, clear guidance is provided in Paragraph 194 of ADB (2017)^a:

"ADB uses a discount rate of 9% as the minimum required [economic internal rate of return] EIRR to accept or reject a project and to choose the least-cost (or most efficient) project option for all investment projects such as transport, energy, urban development, and agriculture. This rate acts as a rationing rate to ensure efficiency in the use of its resources and as proxy for the opportunity cost of capital in individual developing member countries. But for social sector projects, selected poverty-targeting projects (such as rural roads and rural electrification) and projects that primarily generate environmental benefits (such as pollution control, protection of the ecosystem, flood control, control of deforestation, and disaster risk management), a lower discount rate of 6% can be applied as the minimum required EIRR. When the lower rate is used, a clear rationale should be provided."

^a ADB. 2017. *Guidelines for the Economic Analysis of Projects*. Manila.

Given all of the above assumptions, the NPV of the project is estimated to reach \$57,546 when benefits to all project beneficiaries are accounted for. It delivers an IRR of 41.8%, well in excess of the required 9% (Table II.6). When one accounts for benefits to women only, the NPV remains positive and the IRR – while reduced to 25.6% - remains above the required 9%. For every \$1 dollar invested in the gender-sensitive designed sanitation facilities, the benefit reaches to \$2.7 for the entire group of beneficiaries and 1.8 to women only.

**Table II.6: Estimated Economic Efficiency of the Battambang Pilot Project
(using time saving as a measure of economic benefit)**

	B/C ratio ^a	NPV (\$)	IRR (%)
All direct beneficiaries	2.7	57,546	41.8
Female beneficiaries only	1.8	27,615	25.6

^a Benefit/cost ratio

Instead of estimating the economic value of time saving, an alternative approach is to use payments to use the sanitation facilities as an estimate of the economic benefit of the project (revealed WTP).

In the sample of 25 men, on average men are paying \$0.0970 (404 Cambodian riels) per use of the sanitation facilities; on average, women (in the sample of 27 women) are paying on average \$0.1032 (430 Cambodian riels). Given the voluntary nature of these payments, it is of interest to note that women's WTP is slightly higher than men's WTP, this being consistent with earlier finding that women benefit more than men from the gender-mainstreamed sanitation facilities.

The economic benefit associated with the use of the sanitation facilities must be larger than the actual cost of using the facility. Men and women have indicated using the facility 2.4 and 2.85 times respectively per day. On a daily basis, men have revealed a WTP of \$0.233 and women of \$0.294. On an annual basis (assuming, as above, 52 weeks and 6 working days), this amounts to \$72.6 per man, and \$91.8 per woman.¹⁴

¹³ Per recommendation of the Ministry of Environment. This may over-estimate the actual annual maintenance cost as the 1% is applied to the entire project cost and not solely to the cost of the sanitation facilities infrastructure.

¹⁴ This difference between men and women is consistent with the gender-sensitive sanitation facilities providing greater benefits to women than men.

Applying these annual values to 25% of the estimated number of project beneficiaries, then total annual benefits for men and women reach \$4,574 and \$10,736 respectively for a total of \$15,310. Using these values, the NPV of the project is estimated to be \$50,176 with an IRR of 40.8% (Table II.7). Using benefits to women only, the NPV of the project is \$30,333 with an IRR of 26.0%. If this project were to deliver benefits only to women, then every dollar invested in gender-sensitive sanitation facilities would provide benefits of \$1.9. Using time saving or willingness-to-pay as a measure of economic benefit delivers very similar results.¹⁵

**Table II.7: Estimated Economic Efficiency of the Battambang Pilot Project
(using willingness-to-pay as a measure of economic benefit)**

	B/C ratio	NPV (\$)	IRR (%)
All direct beneficiaries	2.5	50,176	40.8
Female beneficiaries only	1.9	30,333	26.0

The above estimate indicates the economic efficiency of the gender-sensitive design of the sanitation facilities in Battambang. A gender-sensitive design of the sanitation facilities improves society's welfare.

The interest maybe as well to estimate and compare the *incremental* costs and benefits of the gender-sensitive design of the investment project. This analysis can only partly address this issue. It has been estimated that the same project without gender sanitation facility (no gender-sensitive training and capacity building and reports and a sanitation facility comprising only 3 unisex stalls, no cuvette, and no hand washing facility) would have cost approximately \$14,500 (instead of \$35,000). The *incremental* cost of the gender-facility is estimated to be \$16,500. It was not possible to estimate the incremental benefits of the gender-mainstreamed facilities – relative to a gender-blind design – in the context of this effort. These benefits would have to be approximately 40% higher than the benefits of a gender-blind design to justify the incremental cost. While this may seem a significant increase, it should be recalled that the benefits estimated above – as in most economic analyses of investment project – under-estimate the true economic benefits of the project.

II.3 Agriculture Project in Kampong Thom Province

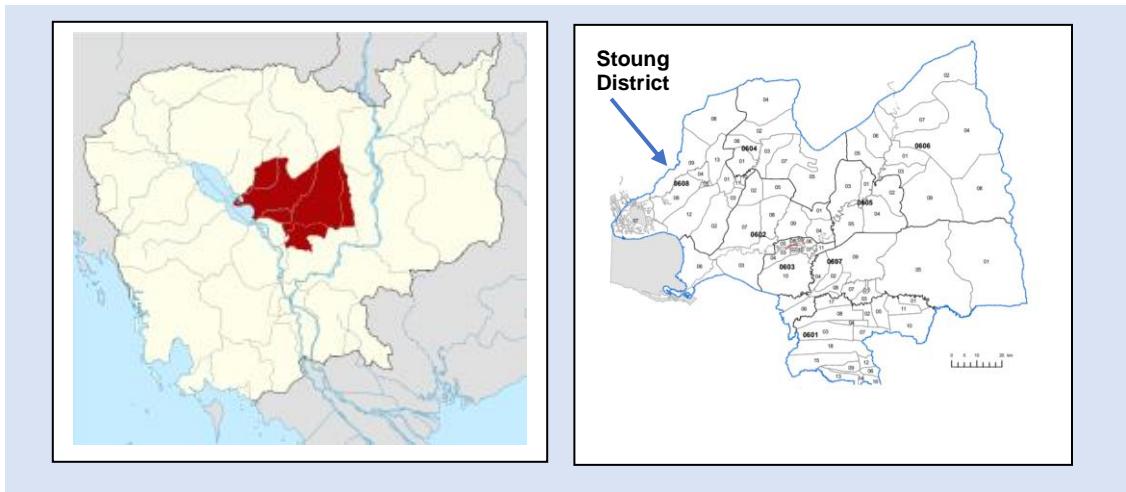
II.3.1 Description of Case Study

The province of Kampong Thom comprises 677,260 people (Cambodia 2019) dispersed over a surface area of 13,814 km², the second largest province of Cambodia in area. Its capital city, Stung Saen, is located approximately 170 kilometers from Phnom Penh (Map II.3). As one of the nine provinces bordering Tonle Sap Lake, Kampong Thom is part of the Tonle Sap Biosphere Reserve. The province is made of 8 districts one of which being Stoung District with an estimated population of approximately 111,037 (in 2019).

Kampong Thom is prone to natural disasters, especially flood, drought, storms and heat waves which cause severe death and loss of agriculture products. Flood and drought were the key causes of severe impacts, such as illness and death, lack of access to agriculture inputs, limited access to cultivation land during the rainy season, and limited access to water supply during the dry season. Historically, flood events have generated losses for many thousands of hectares of agriculture land in Kampong Thom province as most of the province sits on the flood plain of the Tonle Sap lake.

¹⁵ Note that these two measures of economic benefit could not be added together as a measure of aggregate benefit since time saving is likely to be an important rationale of the willingness-to-pay to access the gender-sensitive public latrines.

Map II.3: Kampong Thom Province and Stoung District



The pilot project aims to improve the capacity of rural women to address the impacts of climate change with CSA practices and enhance the climate resilience of their livelihoods. The pilot project works with farmers from 6 villages of Pralay and Trea Commune in Stoung District.¹⁶ The total number of direct beneficiaries is estimated to be 650 including 430 women.

The pilot project focuses on 3 commodities including vegetables (3 types), fish (2 species) and chicken (1 species). Each of these activities were designed to be gender-responsive particularly in terms of enhancing women's capacity in-crop intensification and animal farming for sustainable livelihood to adapt to climate change issues. In particular (and unlike traditional climate change resilience activities):

- based on their respective experience and interest, women, men and children decide together which vegetables should be grown on the family farm;
- women, men and children segregate their roles of responsibilities on the family farm based on their available time, physical ability, skills and opportunities;
- while investment and operations decisions are traditionally made by men, decisions are now made collectively by the household unit;
- unlike what is generally observed, while participating in the family farm's activities, children – both boys and girls continue schooling; and
- importantly, women keep revenues from the selling of farm's outputs.

The project was implemented by the (provincial) Department of Agriculture and the Ministry of Agriculture, Forestry and Fisheries under the coordination and assistance of GCCC. The total cost of the pilot project was estimated to be \$33,000 (Table II.8).

¹⁶ Stoung District comprises 13 communes comprising more than 130 villages. The communes of Pralay and Trea comprise 14 and 16 villages respectively.

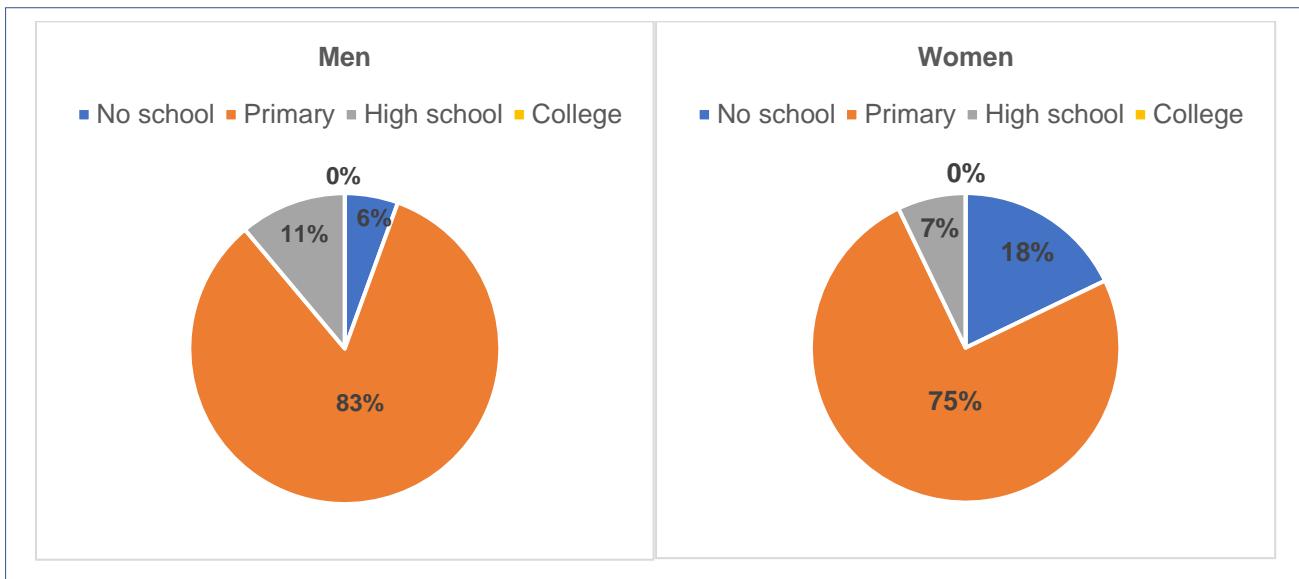
Table II.8: Estimated Cost of Gender-sensitive Agriculture in Kampong Thom Province

Description	Total Cost (USD)
Output 1. Conduct capacity needs assessment on mainstreaming gender responsive and women's economic empowerment in SMART agriculture technology	1,601
Organize two workshops on sex-disaggregated baseline data collection	351
Produce the reports and submit	50
Produce two training materials packages on climate SMART agriculture technique and gender responsive and women's economic empowerment	1,200
Output 2. Strengthen gender responsive particularly women's capacity in crop intensification and animal farming for sustainable livelihoods	17,688
Deliver 2 workshops on chicken raising with SMART climate approach	6,696
Deliver 2 workshops on fish raising with SMART climate approach	4,896
Deliver 2 workshops on vegetable growing with SMART climate approach	6,096
Output 3. Strengthen institutional gender responsive capacity in crop intensification and animal production related sustainable livelihoods to adapt to climate change issues.	5,104
Conduct capacity building training based on the identified capacity gaps and needs for the provincial, district, communes' levels on gender responsive and women's economic empowerment approach in response to climate change problems	2,952
Training on quantification of the costs and benefits analysis of gender responsive and women's economic empowerment approach in climate change adaptation	2,152
Output 4. Quantify the cost and benefits of gender responsive and women's economic empowerment in implementing the SMART agriculture technology	1,500
Identify the scope and additional costs for gender responsive and women's economic empowerment in implementing the SMART agriculture technology	190
Facilitate 2 stakeholder consultations in 6 target villages on the identified costs and benefits for gender responsive and women's economic empowerment in implementing the SMART agriculture technology	1,070
Produce summary report on the findings and disseminate to community beneficiaries and national levels	240
Project administration and monitoring	7,107
Total project cost	33,000

II.3.2 Survey Results and Economic Analysis

A total of 46 project beneficiaries were interviewed on-site in December 2019 of which 28 were women (and 18 men). While only 6% (1 out of 18) of men in the set of respondents have no schooling, approximately 18% (5 out of 28) of women have no schooling (Figure II.5). A higher proportion of men (94%) have achieved primary and secondary school – compared to 82% for women. Perhaps as a result of the nature of the pilot project in Kampong Thom, all male and female respondents identified themselves as farmers (and none as merchants or holding a government position).

Figure II.5: Kampong Thom – Education Level for Men and Women



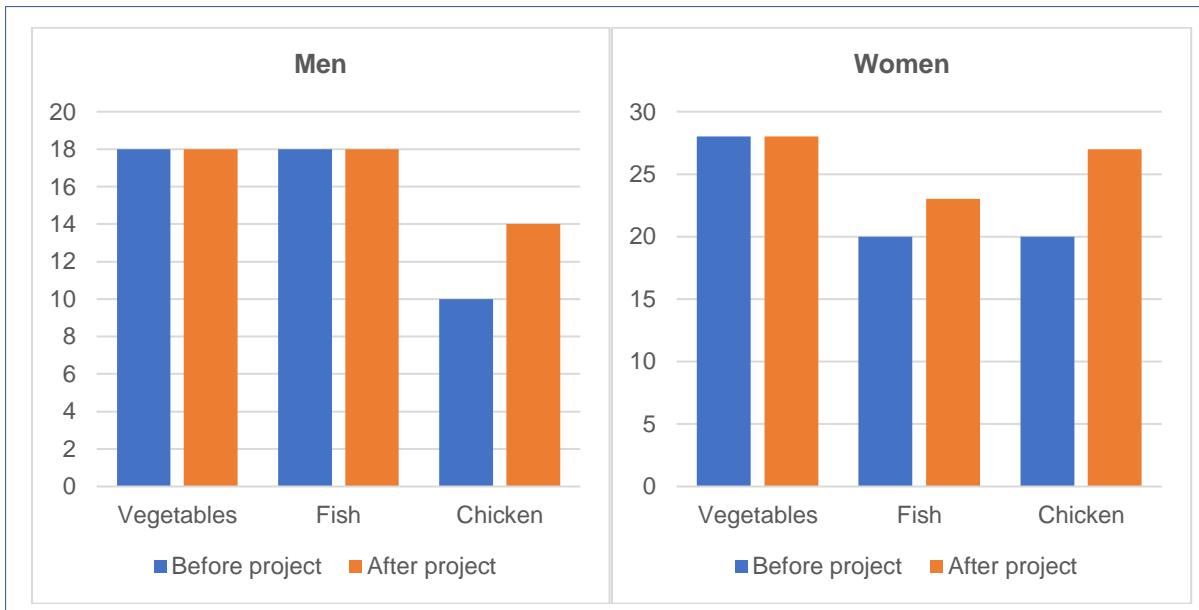
All respondents ate vegetables (at least) once a day both before and after the project. A smaller proportion ate fish and chicken before implementation of the project (82.6% and 65.2% respectively). This proportion increased considerably (to 89.1% for both fish and chicken) following project implementation (Table II.9).

This however hides an important difference among gender. All men ate fish once a day while 10 men out of 18 ate chicken every day (Figure II.6). On the other hand, only 20 of the 28 women consumed fish and chicken before project implementation. These numbers increased to 23 and 27 respectively after project implementation. To the extent that a more varied diet provides health benefits, it appears that women have benefited slightly more than men from the increased diet diversity resulting from the project. As indicated in Table II.9, considerably more farmers engage in the selling of fish and chicken following project implementation.

Table II.9: Number of Participants Consuming, Producing and Selling Farm Produce Before and After Project Implementation

Activity	Produce	Before the project	After the project
Eat at least once a day...	Vegetables	Yes = 46	Yes = 46
	Fish	Yes = 38	Yes = 41
	Chicken	Yes = 30	Yes = 41
Do you produce...	Vegetables	Yes = 42	Yes = 38
	Fish	Yes = 6	Yes = 14
	Chicken	Yes = 46	Yes = 43
Do you sell...	Vegetables	Yes = 37	Yes = 38
	Fish	Yes = 0	Yes = 5
	Chicken	Yes = 24	Yes = 40

Figure II.6: Number of Men and Women Consuming Vegetables, Fish, and Chicken Before and After Project Implementation



The project allowed a significant increase in the production of vegetables from a total of 48.9 kilograms (kg) to 82.1 kg after the project (Table II.10). This increase was particularly significant for women with an increase of production from 38.8 kg to 63.4 kg. Similarly, the production of chicken more than doubled with the project from 6.5 kg to 14.8 kg. As for vegetables, this increase (in absolute terms) was particularly significant for women.

Table II.10: Quantity (kg) Produced per Week Before and After Project by Men and Women

		Vegetables	Fish	Chicken
Men	Before project	10.1	1.1	2.8
	After project	18.7	1.7	8
Women	Before project	38.8	0.3	3.7
	After project	63.4	1	6.8
Total	Before project	48.9	1.4	6.5
	After project	82.1	2.7	14.8

Some of the incremental production is consumed by the farmers themselves, and some is sold to the market. Weekly income generation is presented in Table II.11. On average, men's income increased from \$12.1 to \$31.3 per week while women's income increased from \$26.5 to \$50.0. In absolute terms, on average women's income increased slightly more than men's income (\$23.5 vs \$19.2). Assuming that the income reported by respondents is a reliable estimate of average weekly income over the course of an entire year, annual average income would have increased from \$629.2 to \$1,627.6 for men, and from \$1,378 to \$2,600 for women.

Table II.11: Income (\$) Generated per Week from Selling Farm Production

		Vegetables	Fish	Chicken
Men	Before project	4.1	0	8.0
	After project	8.1	0	23.2
Women	Before project	17.5	0	9.0
	After project	28.6	1.7	19.7
Total	Before project	21.6	0	17.0
	After project	36.7	1.7	42.9

For purpose of the economic analysis, the following assumptions are made: (1) similar to the previous case study, a time horizon of 10 years and a discount rate of 9% is used in the analysis; and (2) it is assumed that net income amounts to 15% of total income (in other words, that input costs – including labor costs – amount to 85% of total income).¹⁷ As for the pilot project in Battambang, it is again assumed that these benefits apply to only 10% of the estimated total number of beneficiaries. Details of the computation of economic benefit are presented in Box II.4.

Given these assumptions, this pilot project delivers a positive NPV even if one were to include only the economic benefits to women. The IRR reaches 23.4% when benefits to all direct beneficiaries are included (Table II.12). For every \$1 dollar, this project generates a benefit of \$1.6, including a benefit of \$1.1 for women alone.

Table II.12: Estimated Economic Efficiency of the Kampong Thom Pilot Project

	B/C ratio	NPV (\$)	IRR (%)
All direct beneficiaries	1.6	19,667	23.4
Female beneficiaries only	1.1	4,222	12.3

¹⁷ In a recent (2019) agriculture project in Cambodia funded by ADB, a profit margin of approximately 33% was estimated (ADB 2019b).

Box II.4: Calculation of Estimated Economic Benefits for the Kampong Thom Pilot Project

Before the project

On average, men's annual income from producing and selling vegetables, fish, and chicken reached \$629.2 per man on average. Women's annual income from the same activities reached \$1,378 per woman.

After the project

On average, men's annual income from producing and selling vegetables, fish, and chicken reached \$1,627.6. Women's annual income from the same activities reached \$2,600.

Economic benefit of the project

For purpose of estimating the impact of the project, it is assumed that *without* the project, the “before the project” situation would have continued to prevail. Hence, without the project, each man and each woman would have continued to generate the same level of annual income as prior to project implementation. Hence, on average, each man's and woman's income increased by \$748.8 and \$972.4 respectively on an annual basis. Assuming a profit margin of 15%, the annual economic benefit for each man and woman would respectively be \$112.3 and \$145.6.

As indicated in text, direct project beneficiaries are estimated to be 430 women and 250 men. If all direct beneficiaries were to similarly benefit from the project as survey participants, then annual economic benefits for men and women would reach \$28,080 and \$62,720 respectively for a total of \$90,800. This may however be an unlikely scenario. For example, men and women who willingly came to participate in the survey may have been among those benefiting most of the pilot project. It thus assumed that the estimated economic benefits of the project apply to 10% of the estimated direct beneficiaries (a smaller percentage than in the Battambang project as all household members were identified as direct beneficiaries). Under this assumption, economic benefits for men and women would reach \$2,808 for men and \$6,272 for women. Total benefits would reach \$9,080.

As in all case studies included in this analysis, the above analysis does not explicitly account or assess the benefits of the gender-mainstreaming features of project design. For this purpose, the cost and benefit of a similar project without these features should be assessed to allow the computation of the *incremental* cost and benefit associated with gender mainstreaming.

In the context of this assessment, the project team undertook a comparative analysis of the cost of key individual project activities with and without gender-mainstreaming (Table II.13). On average, it was estimated that gender-mainstreaming cost approximately 28.6% of baseline cost (gender-blind design).

Table II.13: Incremental Cost of Mainstreaming

Activities	Cost without gender-mainstreaming	Cost with gender-mainstreaming	Cost	
			\$	%
Household home gardening	560.75	742.00	181.25	32.3
Fish farming	608.50	786.00	177.50	29.2
Chicken raisin	720.50	897.75	177.25	24.6

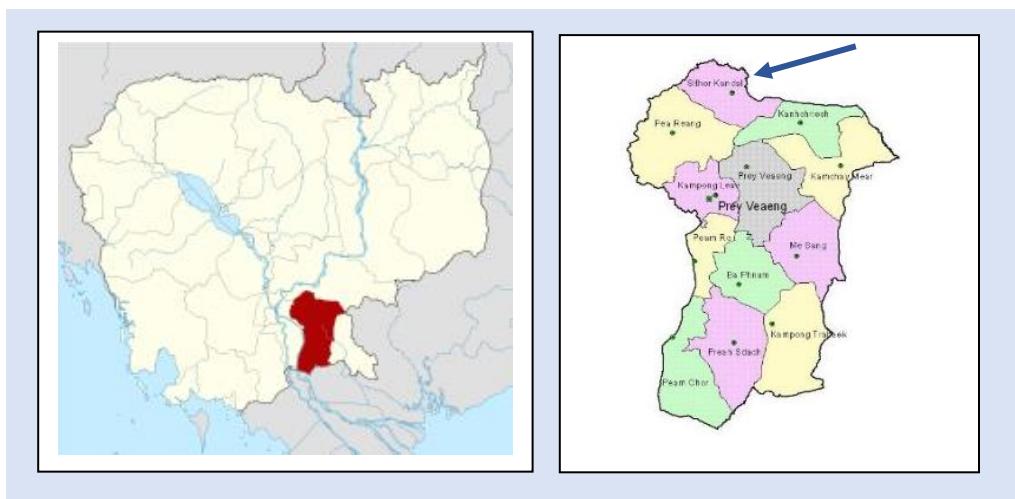
Assuming the incremental cost of gender-mainstreaming being on average 28.6% over the baseline cost, then this pilot project without gender mainstreaming would have cost approximately \$25,660, representing an incremental cost of \$7,340. Given the 10-year horizon period and the use of 9% discount rate, the incremental benefits of gender mainstreaming to women would have to be approximately \$1,225 to justify this incremental cost. Given the economic benefits of \$6,272 for women, incremental benefits associated with gender mainstreaming would have to represent 19.5% of these benefits. Further research shall indicate the possibility of these incremental benefits reaching this level.

II.4 Prey Veng Province

II.4.1 Description of Case Study

With a surface area of 4,880 km² and a population of approximately 1.06 million people in 2019 (Cambodia 2019), the province of Prey Veng is the third most populous province of Cambodia, located on the east bank of the Mekong river (Map II.4). Its capital city, Prey Veng, is located approximately 110 km from Phnom Penh. More than 60% of the land of the province is devoted to agriculture, and 80% of its population is occupied in farming. The main crop is rice. Sithor Kandal is one of the 12 districts of the province located in the north of the province, with a population of approximately 69,000 people in 2019.

Map II.4: Prey Veng Province and Sithor Kandal District



The province of Prey Veng is one of the less wealthy areas of the country with an estimated 50% of the population living below poverty line. Like the rest of the province, the district of Sithor Kandal is severely affected by natural disasters, especially extreme weather events such as droughts and floods. In the course of the dry season, there is only limited access to water supply for irrigation purposes. The district lacks a proper irrigation system where water can be stored, moved and navigated reliably during the rainy and dry season. The lack of appropriate infrastructure for water management has adversely impacted households in Phnov I and Prek Changkran communes, especially women who depend on access to water to support their livelihood.

Sithor Kandal is a district of Prey Veng province located in the north of the province, with a population of approximately 69,000 people in 2019.¹⁸ With the technical and financial support of the project, an old and nearly non-functional water gate was rehabilitated. The water gate helps store water which is then diverted to provide household water supply and irrigate farmland of Phnov I and Prek Changkran.

A traditional gate design would comprise a single board of concrete. Due to the heavy weight of such gate, only men could operate it up and down to control the flow of water supply. Unlike this traditional gate design, the water gate designed and funded by the project is made of 3 separate concrete slabs which are sufficiently light to allow operation by women (Figure II.7).

The introduction of this gendered-sensitive design of the water gate system was deemed to be crucial to enhancing equitable access to water supply and promoting women's role in household and community decision-making. The total cost of the project was \$33,000 (Table II.14). The construction of the water gate

¹⁸ Prey Veng province comprises 12 districts in addition to Prey Veng municipality. These 12 districts are further subdivided into 116 communes and more than 1,100 villages.

itself represented 61% of project's cost. Significant efforts were allocated to gender awareness capacity building and training. The number of direct beneficiaries was estimated to be 815, with 575 women (and 240 men).

Figure II.7: Rehabilitated Gate and Gender Awareness Training in Prey Veng



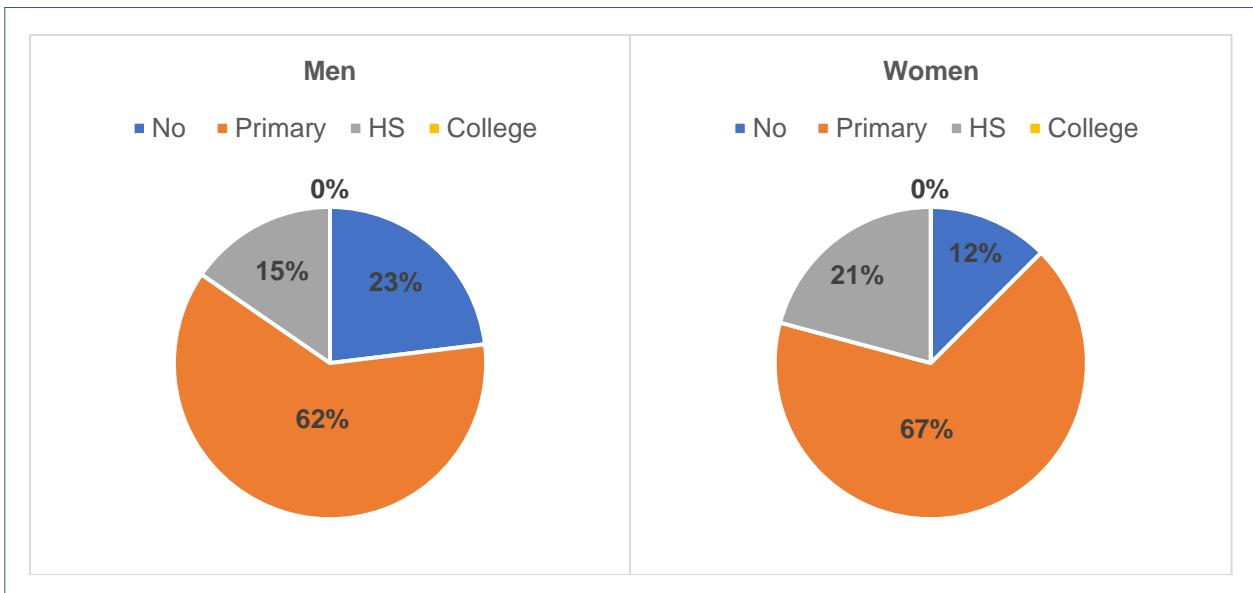
**Table II.14: Estimated Cost of Gender-sensitive Water Supply Infrastructure
in Prey Veng Province**

Description	Total Cost (USD)
Output 1. Strengthen institutional and technical capacity on gender mainstreaming in climate change adaptation and disaster risk reduction investments	6,281
Follow up assessment on gender mainstreaming in climate change and climate disasters adaptation	351
Conduct awareness raising to the target beneficiaries on gender mainstreaming into water gate facility management	3,600
Produce action plans for gender mainstreaming in climate change adaptation and climate disaster risk reduction investment plans of target communities	130
Facilitate the integration of action plans into commune development and investment plans	130
Conduct a consultative workshop with stakeholders in Prey Veng province including provincial line departments, district and commune officials, civil society organizations and community members to validate action plans	1,640
Publication of materials on gender mainstreaming in climate change adaptation and climate disaster risk reduction investment	430
Output 2. Watergate rehabilitated and operated with gender inclusive and responsive management system	20,133
Design and rehabilitate the water navigation gate facility	13,500
Facilitate gender inclusive and responsive water navigation gate management system together proper operation manual describing on roles and responsibilities of different stakeholders	458
Conduct capacity needs assessment or the Watergate Facility Management Team	823
Deliver capacity building to those who involved in applying the operational manual of facility management system	1,200
Regular monitoring the progress and ongoing backstopping supports to beneficiaries and stakeholders	4,152
Output 3. Quantified the costs and benefits of gender mainstreaming in the Water navigation gate facility	1,620
Identify the scope and additional costs for mainstreaming gender in the water navigation gate facility development	190
Facilitate the consultative workshops with stakeholders on the identified costs and benefits of gender mainstreaming	1,190
Produce summary report on the findings and disseminate to community beneficiaries and national levels	240
Project administration and monitoring	4,966
Total project cost	33,000

II.4.2 Survey Results and Economic Analysis

A total of 37 project beneficiaries – from different households – were interviewed on-site in December 2019 of which 24 were women (and 13 were men). Unlike in Battambang and Kampong Thom, it appears that women have achieved a greater level of education than men in this set of respondents in Prey Veng (Figure II.8). All respondents reported being farmers.

Figure II.8: Prey Veng – Education Level for Men and Women



Prior to project implementation, most respondents used “lake (reservoir)” or “water wells” as their main source of water supply (Table II.15). Of the 37 respondents, only 7 indicated that “men and boys” were responsible for the collection of water supply. Thirty (30) respondents indicated women being responsible, occasionally with girls or with men. Respondents have indicated access to water supply to be of particular concern and difficulty in the course of the dry season, occasionally leading to complaints and conflicts with the local commune councils. All have reported water being significantly easier to access following project implementation. This is particularly significant as the survey took place approximately 2 months into the onset of the dry season.¹⁹ This easier access to water resulted in a larger number of respondents being able to irrigate their home gardens, which few were able to do prior to the rehabilitation of the project.

Table II.15: Water Source, Access and Use Before and After the Project

Issues	Before the project	After the project
Water source	19 of the 37 interviewees reported “water wells”, and 20 reported “lake (reservoir)” as being a main source of water supply. ²⁰	All respondents reported the water gate system as their main source of water supply; 10 respondents indicated using “water wells” in addition to the water gate system.
Access to water on a daily basis	All 37 interviewees indicated that access to water was difficult or very difficult during the dry season (October to April), and a source of conflicts between households, and between households and the commune community council.	All 37 interviewees indicated that accessing water is easy or very easy (this being the case even at the time of the survey in December 2019, well into the dry season).
Use of water for irrigation home gardens	23 interviewees indicated not being able to access water to irrigate home gardens; only 14 interviewees indicated using water to irrigate home gardens.	25 interviewees indicated accessing water for irrigation purposes, representing a significant gain in the household production of vegetables.

¹⁹ The dry season in Cambodia generally covers the period October to April. The survey took place in December 2019.

²⁰ Some respondents indicated 2 main sources of water supply.

In a project of this nature, economic benefits are generally estimated by the gains in agricultural productivity enabled by access to irrigation. Given that the survey took place shortly after implementation was completed, this was not possible in this case. Two economic benefits have been estimated for the sample of respondents.

First, the water gate project has significantly reduced the amount of time that both men and women devote to the collection and management of water supply (Table II.16). On average, the water gate reduced hours devoted by men and women to water collection and management. Noting the relatively small size of the sample, this gain appears to be significantly larger for women than for men with a gain of 2.23 hours per day for women compared to 1.58 hours for men. It is assumed that the gains from reduced time collecting and managing water occurs mostly in the course of the peak dry season or 35 days.²¹ Hence, on annual basis, each man has gained (on average) 55.2 hours, and each woman has gained 78.0 hours.

**Table II.16: Time Spent to the Collection and Management of Water Supply
(number of hours per day)**

	Before Project	After Project	Reduction
Average men	3.69	2.12	1.58
Average women	4.10	1.88	2.23

This time has an important economic value and less time spent to water collection and management is an important source of economic benefits. As for the analysis of the Battambang pilot project (Box II.1), this analysis assumes a GDP per capita of \$0.6 per hour. These time savings represent an economic benefit of \$170.3 for each man and \$240.8 for each woman.

A second important economic impact of the project is the reduction in gasoline consumption associated with the pumping of water. All respondents have indicated reduced spending on gasoline following project implementation. As indicated in Table II.17, expenditures on gasoline consumption fell by approximately 50% following project implementation.

**Table II.17: Pumping (fuel) Costs Before and After Project
(\$ per week)**

	Before Project	After Project	Reduction
Average men	52.46	25.38	27.08
Average women	68.50	32.46	36.04

Reduced expenditures on gasoline consumption can be used as an estimate of this economic benefit.²² This economic benefit is estimated to reach approximately \$135.4 on average for men, and \$180.2 for women on annual basis. The sum of these two components of the economic benefit of the project reaches \$168.5 for men and \$227.0 for women. Details are presented in Box II.5.

As for the pilot project in Kampong Thom and for the same reasons, we assume that these benefits apply to 10% of the estimated number of direct beneficiaries.

²¹ In all likelihood, this assumption leads to under-estimating the true impact of the project.

²² To the extent that fuel consumption is heavily subsidized in Cambodia, fuel subsidies would have to be added to provide a correct estimate of this economic benefit. Using consumers' expenditures on fuel consumption under-estimates the true economic benefit.

Box II.5: Calculation of Estimated Economic Benefits for the Prey Veng Pilot Project

Before the project

Time devoted to water collection and management

On average, each man devoted 3.69 hours per day to water management, and women devoted 4.10 hours per day. For purpose of this analysis, it is assumed that this amount of time devoted to water collection and management occurred only at the peak of the dry season, for a period totaling 35 days. Given this assumption, on an annual basis, men and women would devote 129.2 hours and 143.6 hours to this activity.

Fuel consumption

On average, each man in the survey spent \$52.56 per week for fuel consumption (for purpose of pumping water) and each woman spent \$68.50 per week. For consistency purposes, it is also assumed that (most of the) pumping takes place at the height of the dry season for a period of 35 days or approximately 5 weeks. Hence, on an annual basis, each man and woman would spend \$262.3 and \$342.5 for fuel consumption.

After the project

Time devoted to water collection and management

On average, each man devotes 2.12 hours per day to water collection and management and women 1.88 hours. Over the same period of 35 days, on an annual basis, each man devotes 74.0 hours to water collection and management and each woman 65.6 hours.

Fuel consumption

Following completion of the water gate, expenditure of fuel consumption is reported to be \$25.38 per week on average for men and \$32.46 for women. On an annual basis, this amounts to \$126.9 for men, and \$162.3 for women.

Impact of the project

Time savings

For purpose of estimating the impact of the project, it is assumed that *without* the project, the “before the project” situation would have continued to prevail. Hence, without the project, each man and woman would have continued to devote the same amount of time to water collection and management as the situation prevailed before the project. Hence, on average on an annual basis, each male survey participant gains 55.2 hours and each female participant gains 78.0 hours.

Reduced fuel consumption

On average, each man's expenditures on fuel consumption was reduced by \$135.4, and each woman by \$180.2.

Economic benefit of the project

Assuming a GDP per capita of \$0.6 per hour (see Box II.2), these time savings represent an economic benefit of \$33.1 for each man and \$46.8 for each woman.

On an annual basis, the sum of the economic value of time savings and reduced fuel consumption is estimated to be \$168.5 for men and \$227.0 for women.

As indicated in text, direct project beneficiaries are estimated to be 575 women and 240 men. It remains unlikely that similar benefits apply to all direct beneficiaries. Men and women who willingly came to participate in the survey may have been among those benefiting most of the newly constructed gender-sensitive sanitation facilities. It thus assumed that the estimated economic benefits of the project apply to 10% of the estimated direct beneficiaries. Under this assumption, economic benefits for men and women would reach \$4,044 for men and \$13,054 for women.

Given the above estimates, the NPV of this pilot project is estimated to reach \$54,691 with an IRR of 45.2%. Every dollar of investment delivers a benefit of \$2.4 of which \$1.8 to women.

Table II.18: Estimated Economic Efficiency of the Prey Veng Pilot Project

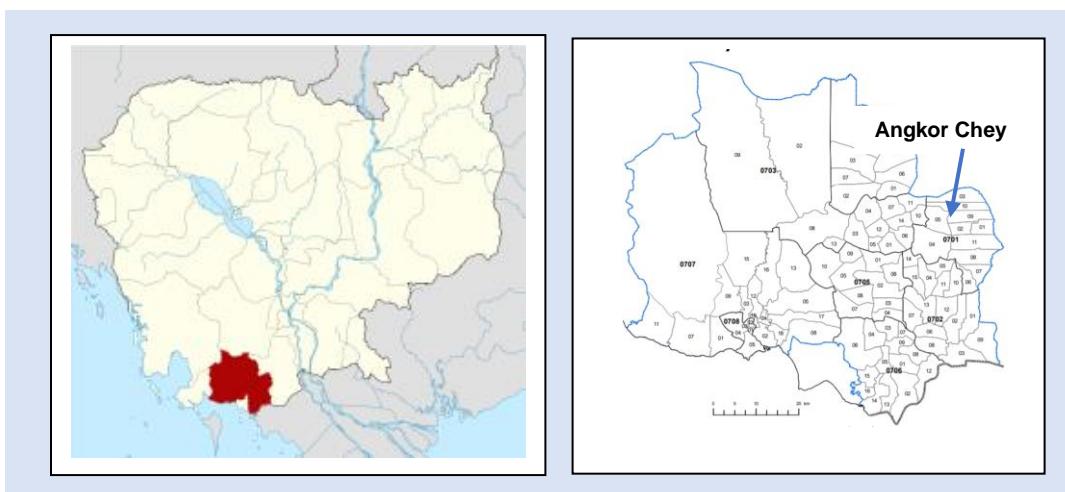
	B/C ratio	NPV (\$)	IRR (%)
All direct beneficiaries	2.4	54,691	45.2
Female beneficiaries only	1.8	32,448	31.6

II.5 Groundwater Wells Project in Kampot Province

II.5.1 Description of Case Study

With a surface area of 4,873 km² and a population of approximately 592,845 million people in 2019, the province of Kampot is located in the southwest part of Cambodia (Map II.5). Its capital city, Kampot Municipality, is located approximately 135 km from Phnom Penh. The province is known to be rich in low arable lands and has abundant natural resources. It is subdivided into 7 districts, one of which being Angkor Chey with an estimated population of 85,484 in 2019, where the pilot project is taking place. Kampot province is prone to extreme weather events of which floods are of particular concern as floods cause severe pollution of the water system and reservoirs and create increased risk of disease infection from waterborne disease agents carried in water contaminated by poor sanitation.

Map II.5: Kampot Province and Angkor Chey District



In the communes of Phnom Kong and Tani in the Angkor Chey district, the consumption of contaminated water and poor water storage facilities were identified as a main cause of health problems. In 2016, only 49.9 percent of the people in Angkor Chey district had access to clean and safe drinking water while 55.8 percent could access better sanitation structures (Cambodia 2018d). These deficiencies in the provision of clean water and sanitation create more stresses and burdens for women and girls who are mostly responsible to supply households with their water needs. Given climate change projections, these deficiencies are expected to increase significantly in the course of coming years and decades.

The project provided for the construction of 5 groundwater wells in three villages of the district. These wells were designed to be gender responsive. In particular, the wells are located in proximity to dwellings, are well lit to facilitate safe and secure access during night time, and are equipped with pump systems which can easily be operated by women and girls (Figure II.9)

The pilot project directly benefits a total of 148 households or 568 individuals, including 302 women (and 266 men). The total cost of the project was \$33,000 (Table II.19).



Figure II.9: Groundwater Well in Kampot Province

Table II.19: Estimated Cost of Gender-sensitive Waterwells in Kampot Province

Description	Total Cost (USD)
Output 1. Build institutional and operational structure for clean and safe water access and sanitation in three villages.	17,986
Establish community water user groups.	1,186
Construction of five clean and safe water wells in three target villages.	16,800
Output 2. Build capacity on gender mainstreaming in climate change adaptation and resilience through clean and safe water access	8,870
Conduct sex-disaggregated baseline for provincial, target district, two communes and community representatives along with civil society organizations working in the areas	186
Organization of consultative workshops to build awareness of local authorities, provincial line departments and community people especially women, children and vulnerable on climate change adaptation and resilience for rural women	4,012
Develop gender responsive community water user operational system and manual describing on roles and responsibilities of different stakeholders	420
Conduct consultative workshops on gender mainstreaming in climate change adaptation and resilience with local community and other stakeholders	1,266
Organization of consultative forum on clean and safe water consumption	1,642
Regular monitoring the progress and ongoing backstopping support to beneficiaries and stakeholders	1,344
Output 3. Quantified the costs and benefits of gender mainstreaming	1,160
Identify the scope and additional costs for mainstreaming gender in the process of water wells' construction, operation and management and related livelihood activities in relation to the sex disaggregated baseline findings.	190
Facilitate stakeholder consultation on the identified costs and benefits of gender mainstreaming in the overall process of water wells' construction, operation and management and related livelihood activities.	730
Produce summary report on the findings and disseminate to community beneficiaries and national levels.	240
Project administration and monitoring	4,984
Total project cost	33,000

II.5.2 Survey Results and Economic Analysis

A total of 46 project beneficiaries were interviewed on-site in December 2019 of which 31 were women.

A similar proportion of men and women in the sample of respondents have completed primary school (Figure II.10). However, a lower proportion of women than men have no school, and a higher proportion of women have achieved high school and college. Most women (90.3%) have reported being farmers (Figure II.11). On the other hand, a significant share of men (26.7%) have reported occupying a government position. Thirty-six of the 46 respondents have indicated women having responsibility – occasionally with girls, and occasionally with men – in the collection and management of water for the household.

Figure II.10: Kampot – Education Level for Men and Women

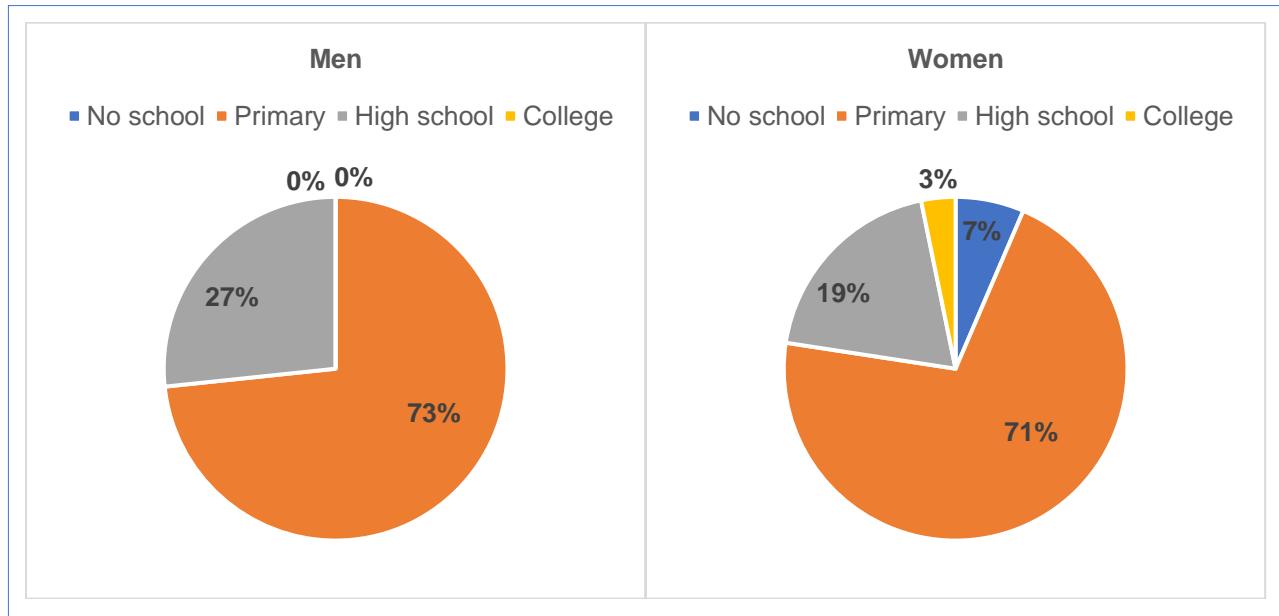
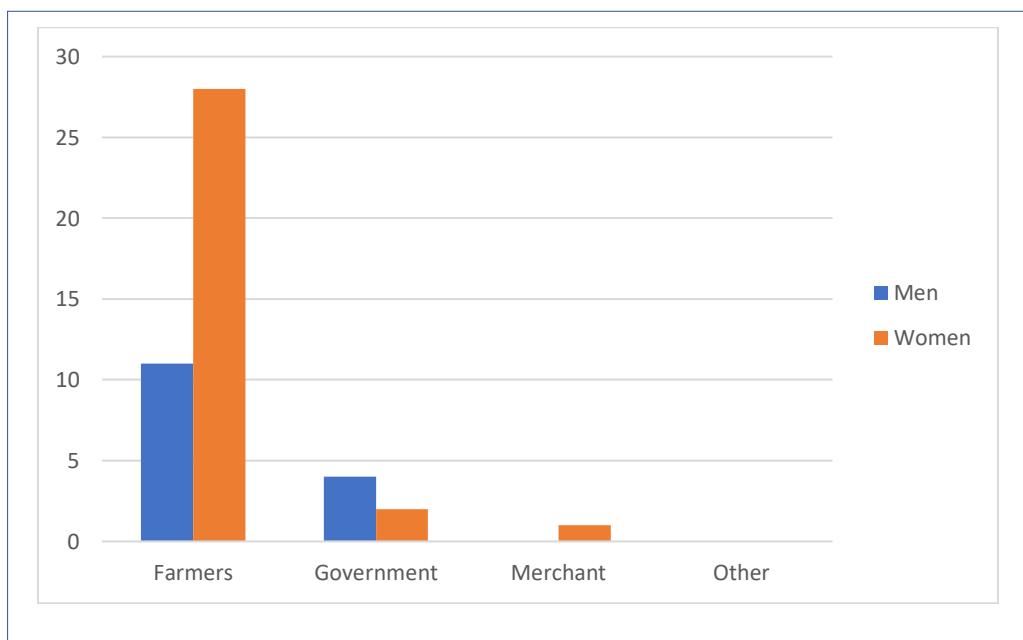


Figure II.11: Kampot – Reported Profession by Men and Women



As indicated in Table II.20, most respondents, open waters such as ponds and lakes represent a main sources of water supply for a majority of respondents. Following project completion, the newly constructed water wells served as main source of water. The design of these wells explicitly accounted for the needs of women collecting groundwater. First, the wells were designed to be operated by a single woman or girl without additional help or support. Second, the wells were lit so that they could be accessed safely by women and girls at any time of the day.

This substitution from open sources to groundwater wells has brought upon a number of important positive impacts.

Table II.20: Impacts of the Project in Kampot

Issues	Before the project	After the project
Sources of water	27 interviewees indicated open waters (ponds and lakes) to be their main source of water supply. 28 interviewees indicated water sold by private sellers to be the main source of water supply (some indicated accessing both open waters and private sellers)	All 46 interviewees access groundwater wells and have stopped using open waters and buying water from private sellers.
Access to water on a daily basis	All 46 interviewees indicated that access to water was difficult or very difficult at all times of the year, and very difficult during the dry season.	All 46 interviewees indicated that accessing water has become easy or very easy.
Minutes per day spent collecting and managing water	31 interviewees indicated spending more than 60 minutes per day securing water to satisfy household needs. On average, each interviewee spent 106 minutes per day to the management of water.	No interviewees indicated spending more than 30 minutes per day securing water to satisfy household needs. On average, each interviewee spent 15 minutes per day to the management of water.
Expenditures per week accessing water	On average, each interviewee spent \$9.90 per week to securing access to water (mostly buying water from private sellers).	No interviewee incurs any expenditures securing access to water.
Water treatment	42 interviewees indicated boiling water every day using firewood.	11 interviewees indicated boiling water

In the context of this economic analysis, 2 important benefits have been quantified.

First, respondents have indicated access to water became significantly easier with implementation of the project. On average, men have indicated saving 75.0 minutes per day collecting water and women have indicated saving 82.7 minutes per day (Table II.21). On an annual basis, these gains amount to 456.3 hours for each male respondent, and 503.3 hours for each female respondent.

Table II.21: Time Spent Collecting Water (minutes per day)

	Before Project	After Project	Reduction
Average men	96.0	21.0	75.0
Average women	98.2	15.5	82.7

The economic value of these time savings provides a measure (an under-estimate) of the economic benefit of the water wells. On an annual basis, these amount to \$273.8 and \$302.0 for each man and woman respectively. Details are provided in Box II.6.

Though not documented in the course of the survey, this greater access to water may have led to higher level of water consumption with associated health benefits. Similarly, most households have indicated

treating water before its consumption prior to the project. Only 11 respondents continue to do so once the gender-designed water wells were completed. The reduction in time, energy use, and cost of water treatment are a benefit of the project. These reductions have also not been captured at the time the survey was conducted. Second, male and female respondents indicated spending \$9.91 per week in buying water from water vendors prior to project implementation. All respondents have completely seized such activity. Assuming that buying water takes place only at the peak of the dry season, on an annual basis this saving represents an economic benefit of \$49.6 per person. Aggregate annual benefits (of time savings and reduced expenditures) amount to \$323.3 and \$351.6 for each man and woman respectively.

Box II.6: Calculation of Estimated Economic Benefits for the Kampot Pilot Project

Before the project

Time devoted to water collection

On average, each man devoted 96 minutes per day to water collection, and women devoted 98.2 minutes per day. Assuming this activity takes place every day of the year, on an annual basis, this amounts to 584.0 hours on average for men, 597.5 hours for women.

Buying water

On average, each man and each woman participating in the survey have reported spending \$9.90 per week to buying water from water vendors or markets. For consistency purposes, it is assumed that (most of the) water buying takes place at the peak of the dry season for a period of 5 weeks. Hence, on an annual basis, each man and woman would spend \$49.6 to buy water.

After the project

Time devoted to water collection and management

On average, each man devotes 21.0 minutes per day to water collection and women 15.5 minutes per day. On annual basis, this amounts to 127.8 hours for men, and 94.2 hours for women.

Buying water

Following completion of the water wells, all survey participants have indicated not buying water anymore.

Impact of the project

Time savings

For purpose of estimating the impact of the project, it is assumed that *without* the project, the “before the project” situation would have continued to prevail. Hence, without the project, each man and woman would have continued to devote the same amount of time to water collection and management as the situation prevailed before the project. Hence, on average on an annual basis, each male survey participant gains 456.3 hours per year, and each female survey participant gains 503.3 hours per year.

Buying water

On average, expenditures for buying water was reduced by \$49.6 per year for each man and woman.

Economic benefit of the project

Assuming a GDP per capita of \$0.6 per hour (see Box II.2), these time savings represent an economic benefit of \$273.8 for each man and \$302.0 for each woman.

On an annual basis, the sum of the economic value of time savings and reduced expenditures for buying water is estimated to be \$323.3 for each man and \$351.6 for each woman.

As indicated in text, direct project beneficiaries are estimated to be 575 women and 240 men. It remains unlikely that similar benefits apply to all direct beneficiaries. Men and women who willingly came to participate in the survey may have been among those benefiting most of the newly constructed water wells. It thus assumed that the estimated economic benefits of the project apply to 10% of the estimated direct beneficiaries. Under this assumption, economic benefits for men and women would reach \$8,600 for male direct beneficiaries and \$10,618 for female direct beneficiaries.

Given the above estimates, the NPV of this pilot project is estimated to reach \$57,276 with an IRR of 46.7%. Every dollar of investment delivers a benefit of \$2.2 of which \$1.2 to women.

Table II.22: Estimated Economic Efficiency of the Kampot Pilot Project

	B/C ratio	NPV (\$)	IRR (%)
All direct beneficiaries	2.2	57,276	46.7
Female beneficiaries only	1.2	9,973	16.6

III. Conclusions

Climate change is widely expected to significantly impact the poor and the vulnerable, women and girls, and the elderly. Gender-mainstreaming in climate change adaptation investments implies (1) identifying the specific vulnerability faced by women and girls, (2) assessing their capacity and needs to address the gender-specific impacts of climate change, and (3) ensuring that investment projects are explicitly designed to account for those different capacity and needs.

To a large extent, gender-mainstreaming remains an aspiration set forth in strategies and frameworks, but lack the commitment of resources to ensure its effective implementation in actual action plans and investment projects.

In the context of investment projects, it may be argued that the incremental costs may not justify the benefits (if any) of gender mainstreaming – though the empirical evidence in support of such beliefs lacking. This paper aimed to provide a better understanding of the economics of gender-mainstreaming in sectoral climate change adaptation projects. Despite numerous limitations, the analysis clearly shows that a gender-sensitive design of simple infrastructure such as water gates, or water wells or sanitation facilities, or home gardens and farms does not undermine the overall economic efficiency of the investment.

The analysis comprises three limitations worth of mention.

First, assessing the true incremental costs and benefits of gender-mainstreaming would in principle require that the costs and benefits of similar types of investment (e.g. water gates or groundwater wells or sanitation facilities or agriculture project) be assessed *with* and *without* gender-mainstreaming. As a result of time and resource limitation, the true incremental benefits of gender-mainstreaming have not been reliably estimated by means of surveys for both types of designs. Future effort aimed at estimating the incremental costs and benefits of gender-mainstreaming should explicitly set for this purpose. However, we can conclude from this analysis that gender-mainstreaming in climate change adaptation sectoral investments does not undermine the overall economic efficiency of the investment despite the incremental cost associated with gender-mainstreaming.

Second, the pilot projects described in this report were implemented over the period April to October 2019. Surveys took place in November-December 2019. It remains possible that the direct beneficiaries may not have fully experienced the full impacts of the project, both negative (if any) and positive.

Finally, in the context of Cambodia, which experiences different climate conditions over the course of a calendar year, it would appear of importance that a full assessment of the costs and benefits of the project captures the performance of the project over a full season-cycle.

These limitations provide support for the conduct of additional effort of this nature to ensure that gender-mainstreaming becomes more than aspiration, but reality.

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Economics of Gender Mainstreaming in Sectoral Climate Change Adaptation Investments

Gender-mainstreaming in sectoral climate change adaptation investments often remains an aspiration but lacks the commitment of resources to ensure its effective implementation in actual action plans and investment projects. This report aims to provide a better understanding of the economics of gender-mainstreaming in sectoral climate change adaptation projects. The analysis clearly shows while gender-mainstreaming entails incremental investment cost, it does not undermine the overall economic efficiency of the investment. This should provide a foundation for effective gender-mainstreaming in investment project.

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