ADAPTATION FUND

CLIMATE CHANGE ADAPTATION THROUGH PROTECTIVE SMALL-SCALE INFRASTRUCTURE INTERVENTIONS IN COASTAL SETTLEMENTS OF CAMBODIA

Submitted by the United Nations Human Settlements Programme (UN-Habitat)

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

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UN HABITAT
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PART I

ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	Regular
Country/Cities:	Cambodia
Title of Project/Programme:	Climate change adaptation through protective small-scale infrastructure interventions in coastal settlements of Cambodia
Type of Implementing Entity:	Multilateral Implementing Entity
Implementing Entity:	United Nations Human Settlements Programme (UN-Habitat)
Executing Entities:	National Council for Sustainable Development (NCSD)
Amount of Financing Requested:	US$ 5,000,000

Project Summary

The proposed project's main objective is "to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions". It is structured around the following three components:

Component 1: Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments (US$ 274,659)

Component 2: Government planning and technical capacity enhanced and knowledge captured and disseminated to sustain and enhance the project's adaptation benefits (US$ 361,541)

Component 3: Resilience built through investment in small-scale protective and basic service infrastructure and natural assets (US$ 3,517,307[1])

1 PROJECT BACKGROUND

The problem

Climate change is a major challenge for reaching national development goals

In recent years, the Kingdom of Cambodia was among the countries most affected by extreme weather events in the Asia Pacific region.[2] Cambodia constantly ranks among the most vulnerable countries in the world according to the annually published Climate Risk Index[3], as well as the Climate Change Vulnerability Index[4]. Between 1991 and 2014, extreme hazards, floods and storms led to the deaths of over 1500 people[5] and caused economic losses amounting to more than US$235 million. Figures show that the country's vulnerability to extreme weather events such as floods, and cyclones cause most losses in terms of both mortality and economic losses.[6]

Cambodia's vulnerability stems from its geography, which exposes it to multiple hazards, and it's severely limited adaptive capacity in its physical infrastructure and institutions, stemming from limited financial, technical and human resources.[7] Coastal zones, as well as nationwide infrastructure are amongst the most affected in the country.[8] This also affects the fast-growing tourism sector, especially in coastal areas, on which the economy increasingly relies. Rising sea levels can potentially impact coastal systems in multiple ways, including flood and storm damage, inundation, loss of wetlands, erosion, saltwater intrusion, and rising water tables.[9]

In addition, there is growing risk that severe weather events will impact Cambodia. Climate Change therefore makes it more and more difficult for Cambodia to continue achieving its main national development priority, which is to significantly reduce poverty rates while simultaneously fostering economic growth at a yearly rate of seven per cent, as outlined in its National Strategic Development Plan (NSDP) 2014-2018.[10] And although Cambodia managed to graduate from the status of low income country to lower-middle income country in 2016[11] as intended by its

[1] Note this is inclusive of a budget of $167,490 for Environmental and Social Safeguards measures associated with the physical investments in Component 3

2 Global Climate Risk Index, 2015. Online at https://germanwatch.org/en/9531
3 Global Climate Risk Index, 2016, p. 23. Online at https://germanwatch.org/fr/download/13503.pdf
4 Climate Change and Environmental Risk Atlas 2015. Online at https://maplecroft.com/portfolio/new-analysis/2014/10/29/climate-change-and-lack-food-security-multiply-risks-conflict-and-civil-unrest-32-countries-maplecroft/
5 Global Climate Risk Index, 2016, p. 23, online at https://germanwatch.org/fr/download/13503.pdf. UNISDR Global Risk Assessment 2017, online at http://www.preventionweb.net/countries/khm/data/. The International Disaster Database (EM-DAT), 2017, online at http://www.emdat.be/country_profile/index.html
6 Index for Risk Management (INFORM) Country Risk profile for Cambodia, 2017. Online at http://www.inform-index.org/Countries/Country-profiles/iso3/KHM
7 INFORM Country Risk profile for Cambodia, 2017. Online at http://www.inform-index.org/Countries/Country-profiles/iso3/KHM
8 Cambodia's Intended Nationally Determined Contributions, p. 2. Online at http://www4.unfccc.int/submissions/INDC/Published%20Documents/Cambodia/1/Cambodia's%20INDC%20to%20the%20UNFCCC.pdf
9 Second National Communication to the UNFCCC, p. xv. Online at http://unfccc.int/resource/docs/natc/khmnc2.pdf
10 National Strategic Development Plan 2014-2018, p. 4. Online at http://www.mop.gov.kh/LinkClick.aspx?fileticket=XOvSGmpI4tE%3d&tabid=216&mid=705
11 The World Bank, 2017. Online at http://data.worldbank.org/?locations=KH-XN

NSDP[12], the uncertainty and intricacy of increasing climate change risks and threats significantly hampers economic growth and development potential in the future.[13]

Economic context

Climate change is already causing economic losses but the government faces challenges in terms of financial resources and technical capacity to respond.

According to most recent statistics published by the World Bank, in 2019 Cambodia's Gross National Income (GNI) amounted to US$1,390 per capita, growing at around 7 per cent per year.[14]

Cambodia's economy is narrowly based however and driven by four main sectors: garment manufacture for export, tourism, construction and agriculture, with three of those predominantly urban sectors, heavily dependent on building resilient settlements and infrastructure. Agriculture, which is heavily dominated by rice paddy cultivation, is critical to rural and peri-urban areas. The economy of the target communes reflects the national economy and is, due to its coastal location, especially dependent on the tourism, construction and agriculture sectors. Productive share in Cambodia is relatively evenly distributed, with its services sector as the largest contributor at 37.8% of total gross output, followed by the industry sector at 31.3% and the agriculture sector at 30.9%. Intermediate inputs as a share of total cost of production in Cambodia is on average almost equally divided, i.e. 50% comes from domestic resources while the other half is imported.

The tourism sector shows high annual growth rates with high shares in total GDP.[15] The direct contribution of the sector to GDP was around US$2.3 billion (13.5% of total GDP) in 2015, and is forecast to rise by 6.3% per annum between 2016-2025, to US$4.58 billion (12.4% of total GDP) in 2025. Total contribution to GDP amounted to US$5.09 billion (29.9% of GDP) in 2015, and is forecasted to rise by approximately 6.5% annually to US$10.32 billion (28.0% of GDP) in 2025. In 2014, the total contribution of tourism to employment, including jobs indirectly supported by the industry, was 26.4% of total employment (2,221,500 jobs). This is expected to rise by 3.3% per annum to 3,199,000 jobs in 2025 (32.6% of total).[16] In the same year tourism investment was US$0.4 billion, or 15.6% of total investment. It is expected to rise by 6.4% per year within the next decade to US$0.8 billion in 2025 (14.1% of total).

The share of foreign visitors in 2015 amounted to nearly 15% of total visitors to the coastal area.[17] Securing continued economic, employment as well as investment growth will heavily dependent on the country's resilience along its coastal lines. Visitors to Preah Sihanouk and Kep have increased year by year. Based on the Provincial Investment Programme report, 2,032,881 tourists visited Preah Sihanouk in 2016, a 16.65 percent increase compared to 2015. As for Kep, visitors increased from 761,206 in 2015 to 1,079,493 in 2016.

Both provinces recognize tourism as an important industry and both provinces have a great potential for eco-tourism, with nature, livelihood, and community-based tourism activities. However, the tourism sector is also affected by climate change, especially beach erosion, as described in the Environmental Section below. For adaptation to climate change, natural resource enhancement and preservation is therefore necessary, as well as improvement of drainage and the management of water supply, sewage and waste. This will benefit tourism potential directly but also the poor and vulnerable, especially from livelihoods and basic services perspective.

Since the initial concept note was developed however, there has been a substantial change in the tourism model in the municipal area of Sihanoukville. The city has attracted very rapid and substantial investment, primarily from China. This has had profound changes in land management in the city, with up to 100 new hotels and other tourist

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12 National Strategic Development Plan 2014-2018, p. 4.
13 Cambodia Climate Change Strategic Plan 2014-2023, p. xv. Online at http://www.bb.undp.org/content/dam/cambodia/docs/EnvEnergy/CCCAProjects/Cambodia%20climate%20change%20strategic%20plan%202014-2023.pdf
14 The World Bank, 2017. Per capita GNI is displayed using the World Bank's Atlas method, which smoothens a country's GNI per capita by price variations and exchange rate fluctuations, taking into account the year of observation and the two previous years. It further adjusts the country's own and the international rate of inflation, with the international inflation rate being the euro area, the United Kingdom, the United States and Japan since 2001. Online at http://databank.worldbank.org/data/reports.aspx?source=2&country=KHM
15 Cambodia Climate Change Strategic Plan 2014-2023, p. xv.
16 Word Travel and Tourism Council, Economic Impact 2015 Cambodia. Online at https://www.wttc.org/-/media/files/reports/economic%20impact%20research/countries%202015/cambodia2015.pdf
17 Cambodia Tourism Statistics Report, 2015, p. 5.

facilities either opened in the last two years or under development. The city has seen up to 78,000 new residents, primarily from China, move to the city in the last year.[18] Because of this rapid change, the proposal no longer focuses its activities on the city of Sihanoukville. This is because the situation is still developing, and UN-Habitat and the Royal Government of Cambodia see undue investment risk in Sihanoukville City. Surrounding districts (such as Prey Nob) are unaffected by the rapid development.

Social context

Although the government recognizes the importance of resilience to natural disasters in the poor communities, they face limited financial resources and human capacity as well as comprehensive data sets.

Cambodia has a total population of 15.28 million (of which around 51.5 per cent are women)[19] and this figure is growing at a rate of 1.6 per cent annually. Urban areas are growing much more rapidly at 2.6 per cent each year.[20] This is one of the main reasons for the country's increasing demographic pressures over the past years. According to the Fragile States Index, in 2016 Cambodia was one of the few countries in the region that were labelled a high warning status with regard to its state of development, which even marginally worsened within the last decade.[21] And although the country has a relatively high share of payments to labour in relation to its GDP compared to its neighbouring countries,[22] uneven economic development only shows slightly improving trends.[23] While household poverty rates are highest in the north-east of the country, overall poverty rates remain high in the coastal area (Figure 1, left), especially considering its higher population density.

The population density map (Figure 1, right) shows that along the coast the cities of Sihanoukville, Kampot and Kep (from left to right) are among the most populated areas. The country's coastal population faces challenges such as low levels of education and poor health and basic infrastructure services. It further shows an on-going deterioration of inequality between the mid-1990s and 2007, despite an overall poverty reduction.

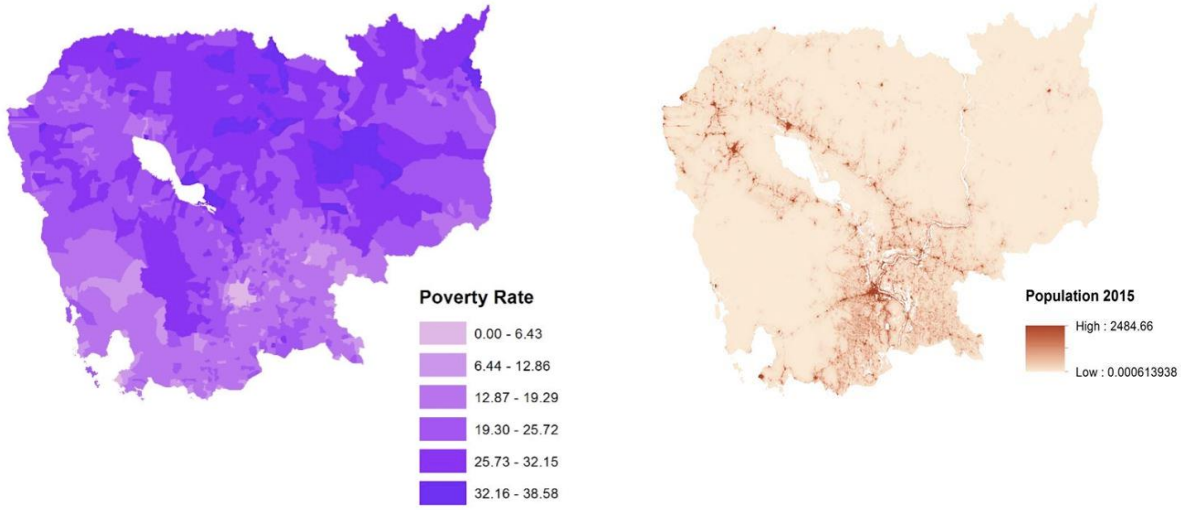


Figure 1 - Distribution (%) of household poverty rates by districts and population density in 2015[24]

[18] https://www.channelnewsasia.com/news/cnainsider/china-belt-road-casino-boom-sihanoukville-cambodia-phnom-penh-10846730
[19] National Institute of Statistics, (2019), General Population Census of the Kingdom of Cambodia, p.7
20 Displays data for the most recent available year 2015. The World Bank, World Development Indicators, 2017. Online at http://databank.worldbank.org/data/reports.aspx?source=2&country=KHM
21 The Fund for Peace 2017. Online at http://library.fundforpeace.org/library/fragilestatesindex-2016.pdf
22 56% of its economic gains are invested into labour force. Secretario, F. et al. 2009, p. 9. Online at http://depocenwp.org/modules/download/index.php?id=62
23 The Fund for Peace 2017.
24 Left: own illustration based on the United Nations Office for the Coordination of Humanitarian Affairs, 2015. Online at Open Development Cambodia. Right: Own illustration based on adjusted UN data from World POP. Online at World POP.

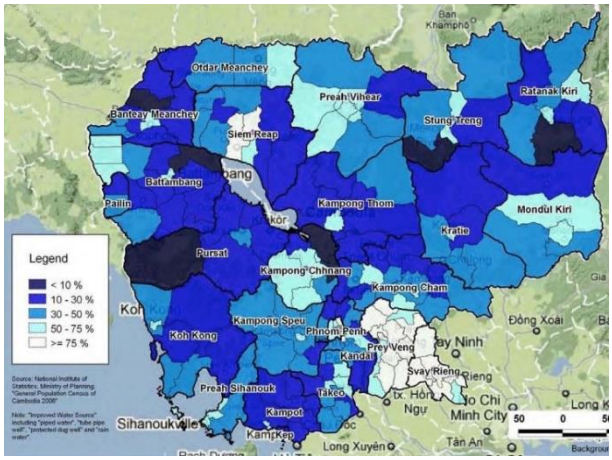


Figure 2 - Percentage of households with improved water sources

[25]The expected impacts of climate change (discussed below), are likely jeopardize poverty reduction and health targets, because hazards are likely to increase in frequency and intensity. This is because poor communities predominantly live in high-risk areas and already lack access to basic services. More frequent storms, inundation and salt water incursion are likely to enhance the spread of water- and vector-borne diseases, limit access to clean water and food, flood and expose unsafe sanitation facilities, and isolate the population from health and other emergency services and responses.

Notwithstanding advances in water, sanitation, and hygiene over recent years, climate change impacts are a present danger and cause loss of life and have long-lasting impacts on poverty and food security. People in the coastal area will be able to adapt to climate change when they have access to basic infrastructure services such as improved water management, drainage, coastal protection and sanitation.

As shown in Figure 2, the overall percentage of households that can access improved water sources is still low, ranging in most districts between 10 and 30 per cent. Prey Nob District, one of the two target areas for this project, is in-line with the national average, while Kep Province does not have any access to piped water.

Although the government intends to expand and improve basic infrastructure services throughout the country, the development and implementation of effective climate change strategies is constrained by limited financial resources and human capacity, a lack of reliable and comprehensive data sets, research to support greenhouse gas inventories, and vulnerability assessments. Natural disasters, intensified by climate change, have major impacts on basic services and need to be consequently addressed through adaptation measures as a means to alleviate poverty and foster economic growth.

In line with the government's Nationally Determined Contribution (NDC) under the Paris Agreement on Climate Change, an approach to establish this should focus on the resilience of coastal zones and infrastructure more generally as they are among the areas impacted most severely by climate change.

Gender Context

Women have particular and specific vulnerabilities in the coastal areas of Cambodia. However, these can become opportunities with effectively targeted adaptation actions

There is an emerging body of evidence that women and children face greater vulnerability to climate change than men, as a result of greater sensitivity and less adaptive capacity. Evidence suggests that in the 2013 floods, when over 377,000 households were affected throughout the country, women were more severely affected. Women were more likely to be in the home when floods hit, or unable to leave the home because of domestic care responsibilities. The resulting disruption to health care infrastructure and service left pregnant women to deliver in very critical conditions As demonstrated elsewhere in this concept note, the coastal area of Cambodia, including the areas targeted by this proposal such as flooded delivery rooms or worse, at home where immediate medical care was not available[26]., are especially at risk from flooding from inland waterways, heavy rain and coastal flooding from storm surges and sea-level rise.

25 Japan International Cooperation Agency, 2010, p. iv. Online at JICA

26 http://www.kh.undp.org/content/cambodia/en/home/presscenter/articles/2016/03/08/women-in-the-face-of-climate-change-the-driving-force-for-any-solution.html

Compared with some other least developed countries, women in Cambodia face comparatively little discrimination; they have equal protections under the law for example, and there are few if any formal restrictions on women's ability to work[27].

However, women's livelihoods, access to resources and capacity to adapt are different from men, and in many cases women face a more challenging landscape for social reasons. In Cambodia, women often have role in earning income for the household as well as domestic responsibilities such as care giving for the sick and elderly and raising and educating children.

Women in Cambodia are usually responsible for water collection, domestic tasks described above, small scale gardening, cropping rice, trade and rearing livestock – which is a greater range of responsibilities than men. Investment 3.7 of this proposed project, described in Part II, Section A, and here specifically targets the ability of women to continue trading – vital for their livelihoods – despite the increasing possibility of flooding in the future as a result of climate change.

Figure 3 - The roles of women in Cambodian society (the icons, from left to right, mean Water collection and domestic tasks; farming and marketing crops; Small scale gardening; and rearing livestock.

The same analysis showed that women often have access to water (as well as responsibility for sourcing it), and markets. However, they often lack support in terms of access to financial resources and access to educational services (men in rural Cambodia also struggle to access finance). Women in Cambodia tend to have lower literacy rates than men with 70.5 per cent of women literate nationwide, compared with 84 per cent of men[28]. This correlates with high school completion rates, which are lower for women compared to men. In many cases, this is because families do not feel it is safe for girls to travel to schools, though in some cases it is still because girls are encouraged to marry before they have completed senior high school.

In some areas, women have potential to increase their adaptive capacity. Analysis by UNDP shows that women tend to have strong informal and semi-formal social networks with one another in Cambodia (such as networks of women who sell goods in the market or process shrimp and crabs (a particularly important industry in Kep province).

As shown in Table 2, below, the proposal targets an equal number of males and female beneficiaries in its overall target area. However, there are several ways in which this project will have specific benefits for women. The activities under investment 3.7 will specifically benefit women who make up as many as 90% of traders in the market. Adapting the market to flooding so that it can function continuously year-round, even in during heavy rain events, will primarily benefit women – increasing their ability to trade and earn income. Numerous proposed investments (3.2a&b, 3.4 and 3.6) are designed to improve water access. As the above analysis shows, it is primarily the task of women in Cambodia to access water. These activities will ensure they have greater access to water in the dry season, that water quality improves, and that they have to travel less distance to get water. The remaining activities (investments 3.1, 3.3, 3.5 and 3.8) provide services to the general population, providing benefits to men and women equally. Wherever information is provided to the communities, it will be provided orally, through commune chiefs and radio broadcasts (in addition to any written information provided), recognising that women's literacy rates are lower than men's. Other provisions for mainstreaming gender are highlighted throughout this project proposal.

[27] https://www.adaptation-undp.org/sites/default/files/downloads/ccaf_info_1-gender_and_climate_change-7dec.pdf

[28] http://www.undp.org/content/dam/undp/library/Climate%20and%20Disaster%20Resilience/Climate%20Change/CCAF-Gender-Responsive-Adaptation.pdf

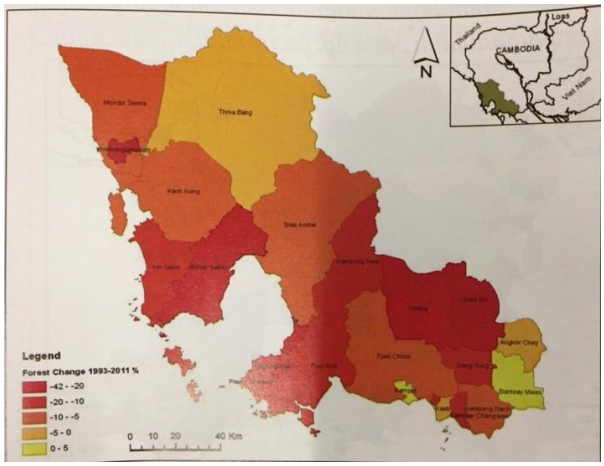


Figure 4 - Percentage reduction in forest area at the district level from 1993 to 2011

Environmental context

Sea level rise due to climate change and changes of the mangrove systems accelerate coastal erosion and reduce the climate change resilience.

The Ministry of Environment has identified forests, including mangrove forest, as vital in maintaining the country's ecosystems as well as a source of various non-timber forest products.

Deforestation is taking place in the coastal area, and the cutting of mangrove forests is a particularly pressing issue. IUCN has identified up to 4,000 hectares of former mangrove that has been converted into salt farms in Kep Province and neighbouring Kampot Province alone. A study by the Ministry of Environment (MoE et al. 2014) shows that mangroves in Prey Nob District in Preah Sihanouk Province are under threat by salt, charcoal use, and industrial development, as shown in Figure 4[29].

An estimated 3,446 hectares of land area in Preah Sihanouk Province and 343 hectares of Kep Province will be below mean sea level if the sea level rises by 1 metre in the future. The study by the Ministry of Environment also estimated that 3,530 hectares of mangroves in Preah Sihanouk Province and 13 hectares in Kep Province are located within 1 metre above today's mean sea level. Therefore, simultaneous occurrence sea-level rise and mangrove cutting for land use change will accelerate coastal erosion as well as reduce the adaptive capacity to climate change of the coastal ecosystem.[30]

Severe environmental degradation has taken place throughout the coastal area of Cambodia – especially in areas where there has been investment in infrastructure and tourism. Besides that, the often-informal nature of the target settlements creates environmental problems, especially in waste management. Moreover, the combined effects of sea-level rise, coastal flooding and on-shore development issues (especially disposal of wastewater) are causing coastal erosion.

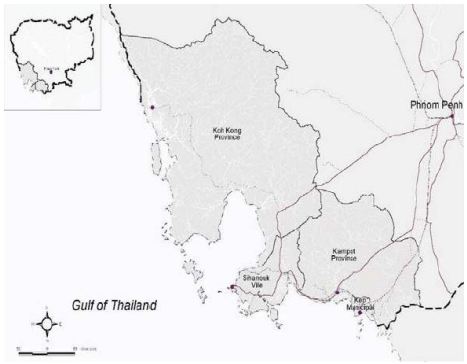
Figure 5 - Environmental Degradation in the Project's Target Area

29 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013
30 MoE, GEF and UNEP (2013), p. 190.

Climate change projections and expected impacts in the target area

Climate change projections

Cambodia's climate is governed by a monsoon weather cycle, with a wet season between May to November that is dominated by heavy rainfall and average temperatures of 28ºC and a dry season from November to May, with an average maximum temperature of 38ºC in April and an average minimum temperature of 17ºC in January. Over the last decades, mean temperatures in Cambodia have increased significantly, a trend that is predicted to continue with projected increases in monthly averages between 0.013ºC and 0.036ºC per year by 2099 with higher predictions for locations at low latitudes.[31][32]



Rainfall varies within the country and is strongly influenced by topography, declining in the central plains, and increasing in the upland areas. However, rainfall is heaviest along the 435km coastline stretching from Koh Kong Province bordering Thailand in the west, Sihanoukville Municipality which contains Cambodia's largest deep-water sea port, Kampot Province bordering Vietnam to the East, and Kep Province (see Figure 6). While lowlands may receive average annual rainfall of 1400mm per year, data shows that rainfall within coastal areas can be as high as 4000mm per year or higher (see Figure 7).[33]

Figure 6 - Cambodia's Coastal Provinces

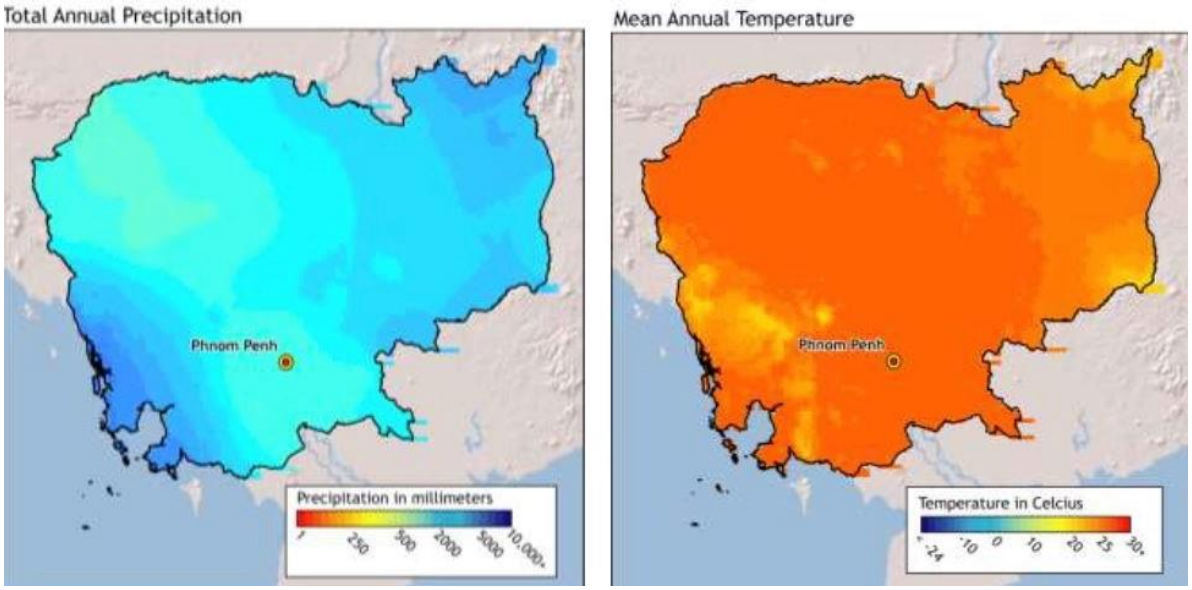


Figure 7 - Rainfall and Temperature Baseline Situation in Cambodia

31 Cambodia Climate Change Strategic Plan 2014-2023, p. 8.
32 Caption: Cambodia Coastal Situation Analysis, 2011, p. 6. Online at http://cms daa.iucn.org/downloads/cambodia_coastal_situation_analysis_final.pdf
33 Heng Chan Thoeun, 2015, p. 63. Online at http://dx.doi.org/10.1016/j.wace.2015.02.001

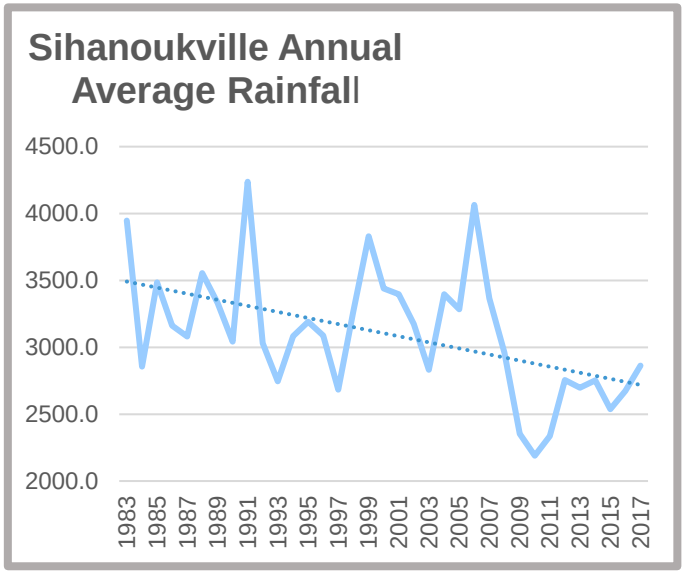


Figure 8 - Rainfall change since 1983 in Sihanoukville

Observed Trends, Hazards and Impacts

Due a history of civil conflict, there are only very few long-term historical datasets available for climate observations in Cambodia. However, a long-term dataset for Sihanoukville (the capital of Preah Sihanouk Province) was obtained, and it shows that annual average rainfall has substantially decreased in the last 35 years; the average rainfall in 2017 is now 20 per cent lower and if current trends continue, rainfall will continue to decline by 0.76% per cent per year, as shown in Figure 8

[34]Temperatures have too shown a significant increase in recent years. As shown in Figure 9, average annual maximum temperatures increased about 1.3°C between 1985 and 2008. This correlates with community level discussions with local people during the formulation of this proposal, where increased temperatures were the most frequently cited observable impact of climate change along the coastal area. Increasing temperatures also combined with decreasing rainfall to create pressure on water resources, as greater amounts of water evaporate into the atmosphere.

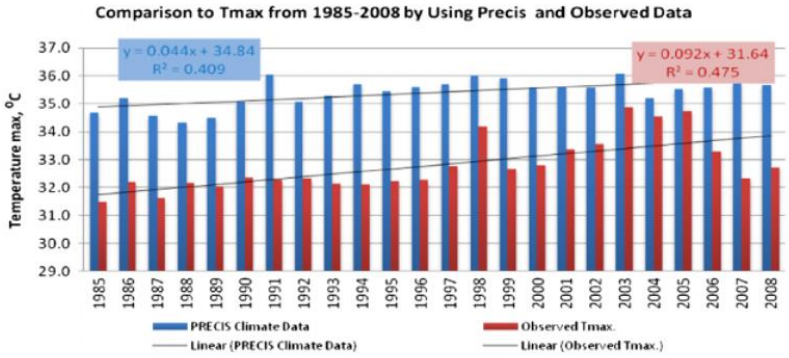


Fig. 5. Observed and predicted annual maximum air temperatures.

Figure 9 - Annual Maximum Air Temperatures in Cambodia[35]

The Intergovernmental Panel on Climate Change (IPCC), however, provides an overview of forecasting trends from 21 climate models for Southeast Asia. This summary states that i) for the period 2081-2100 temperatures will likely increase in the range of 1.5ºC to 3.7ºC; ii) while the number of hot days and nights will increase, cold days and nights will likely to become less frequent; iii) rainfall will most likely increase with projections ranging from a decrease of 2% to increases of up to 15%, with projected increases in the intensity of precipitation; iv) sea-levels in the region are forecasted to rise between 0.18 and 0.56cm by the year 2100, though some research has projected sea-level rises in the region of around 1 metre.[36]

Current and Expected Future Impacts

Cambodia is vulnerable to droughts, floods and sea-level rise. The coastal area is also increasingly affected by strong winds, which are often associated with the onset of thunderstorms.

34 The authors, based on data provided by the Provincial Department of Water Resources and Meteorology, Preah Sihanouk Province

35 Heng, CT (2015) Observed and projected changes in temperature and rainfall in Cambodia, Weather and Climate Extremes, 7, pp61-72, p.66

36 See for example Rahmstorf, S., 2007 and Ananthaswamy, A., 2009.

In 2011, floods resulted in the loss of around 4 per cent of gross domestic product[37]. Likewise, the 2013 floods caused economic losses of around US$356 million, of which US$153 million was the estimated value of the destruction of physical assets (damage) in the affected areas, and US$203 million the estimated losses in production and economic flows.[38]

Increases in sea levels are especially alarming for Cambodia's coastal areas that are already experiencing severe seawater intrusion, beach erosion, high tides, and frequent storm surges. Additional impacts such as land subsidence in the region may even further intensify its effects.[39] Especially low-lying areas such as coastal settlements, seaports, coastal fisheries, mangrove forests, and tourism facilities are increasingly affected. The effects of sea-level rise are also being exacerbated by the declining trend in rainfall, as in dry years less water in the rivers allows for greater sea-water incursion.

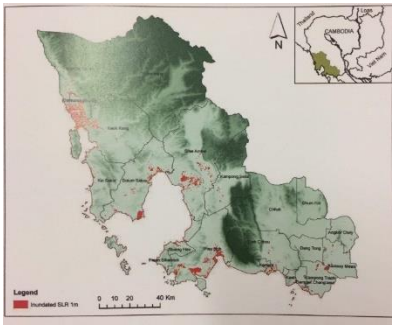


Figure 10 - Areas that would be critically affected by 1-metre sea-level rise"

Figure 10[40] shows that numerous areas along Cambodia's coast, including Prey Nob District and Kep Province, are likely to be affected by 1 metre sea-level rise. This area includes all eleven of the communes targeted by the investment component of this project.

In addition, substantial saltwater incursion and coastal erosion has been observed throughout the coastal area, including in all eight of the target communes. Considering the topography of the area; primarily flat coastal plain, characterised by rice paddy and poor settlements, erosion and seawater incursion is having a substantial impact on the ability of people to source their livelihoods. Figures 11[41] and 12 show coastal erosion in the target areas of the project.

Moreover, the government wants to promote the entire coastline, and especially Kep Province and Prey Nob District as areas for eco-tourism development. The ongoing problems of flooding, coastal erosion and sea-level rise threaten to severely hamper this aspiration in the future. Moreover, these coastal climate impacts also threaten the already severely limited provision of basic services such as water supply, both for domestic and agricultural use; lack of water consistently arose as a community priority in all communes surveyed during the full proposal development – either because water is lacking, or because otherwise abundant water supplies are increasingly being contaminated with salt water.

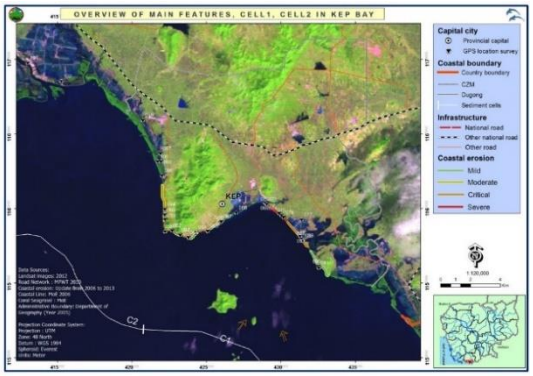


Figure 11 - Coastal Erosion in Kep Province

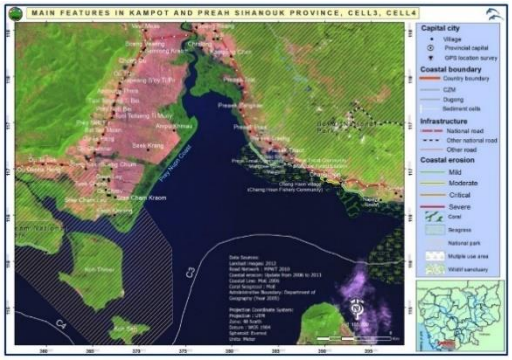


Figure 12 - Areas that would be critically affected by 1-metre sea-level rise

Focus of the Proposal

As described detail in the following section, the main objective of the proposed project is to enhance climate change adaptation and resilience of the most vulnerable coastal human

37 2011 GDP (current US$) amounted to US$12.83 billion (World Bank, online at http://data.worldbank.org/country/cambodia). The 2011 flood resulted in total economic losses of around US$0.521 billion (EM-DAT country profile).
38 Cambodia's Intended Nationally Determined Contributions, p. 3.
39 Erban, L.E., Gorelick, S.M. and Zebker, H.A., 2014, p. 1. Online at http://iopscience.iop.org/article/10.1088/1748932 6/9/8/084010/pdf

40 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013
41 MoE and UNEP (2014) - vulnerability assessment and adaptation programme for climate change within the coastal zone of cambodia considering livelihood improvement and ecosystems, p.8

settlements of Cambodia through concrete climate change adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.

To achieve this objective, the project focuses its actions on highly vulnerable settlements in Kep Province and Prey Nob District of Preah Sihanouk Province. All areas are along Cambodia's coastal area, a priority area for adaptation defined by the Ministry of Environment. In Kep Province, the project will target four sangkats/communes[42], with a total of 28,021 direct beneficiaries of the project's interventions. In Prey Nob District (in Preah Sihanouk Province), the project will target seven communes, with a total of 34,500 beneficiaries. Further in-depth information about the proposed beneficiaries can be found in Annex 1.

There are numerous climate hazards in the project's target area, as alluded to above. Sea-levels are rising, which, coupled with declining water flow (partially as a result of reduced rainfall), means that salinity in encroaching ever further in land. Commune leaders and individual households indicated that within the last few years, in many areas salinity has penetrated all the way to the main Kep to Preah Sihanouk highway – an unprecedented condition. Meanwhile, storm surges in the rainy season can affect the low coastal plains that characterise much of the project's target area.

Linked to this, surface and ground water availability is decreasing. In Kep Province, for example, inadequate reservoirs mean that people have insufficient water access and water is being wasted. A lack of distribution infrastructure also means that there is no water supply. In Teuk Thla, Teuk La'k and Samaki Communes in Prey Nob District, ground water wells have either gone dry or have been permeated with seawater, while in the remaining five communes of Prey Nob, water is also either saline or heavily polluted. Declining rainfall is driving the reduction in water availability, and poor management is exacerbating the problem.

Also linked to rising sea-levels and various land-based human factors such as salt farming is coastal erosion. The flat coastal plains that characterise the project area are all experiencing coastal erosion to some degree, with the problem being especially pressing in areas that are not protected by mangrove, and or those that have poor water management, such as Angkaol Commune in Kep Province.

Meanwhile strong winds associated by thunderstorms damage houses. In each of the 11 communes surveyed by the project formulation team, up to 200 houses are destroyed by strong winds every year and many more are damaged. While observed wind speeds in the target area are not high (registering highest recorded wind speeds of between 60-80 kilometres per hour), the resilience of housing is very low – people often use basic construction techniques and poor-quality materials.

The target areas for the project can be viewed through two interactive maps, for Kep Province and Prey Nob District

The following table gives a brief overview of the main climate hazards that impact the target area and the hard investments proposed by the project to adapt to them. It also relates these to the underlying vulnerabilities/barriers to adapt. This table summarises information derived from the consultations that took place in formulating the proposal. These consultations are detailed further in Part II, Section H. More details can be found in the action planning documents provided in Annex 1 and in the investments proposed under Component 3, introduced in Part II, Section A and detailed in full in here.

Table 1

Summary of Climate hazards and underlying vulnerabilities in the target area

42 Note that sangkats and communes are the same level of local government. A unit of local government is referred to as a Sangkat in urban areas and a commune in rural areas.

Climate Change Hazard	Impact at Community Level	Underlying Vulnerability/Barriers to Adaptation	Target Communes Affected	Investments Proposed
Strong wind	Destroyed or damaged houses Damage to crops Coastal erosion Limited ability to find shelter Fishing boats capsize	Poor house construction Limited education, skills and capacity to make housing more resilient Limited access to finance Lack of weather information, broadcasts/early warning systems Deforestation	**Prey Nob District:** Teuk Thla, Teuk La'k, Samaki **Kep Province** Angkaol and Pong Teuk	Train local people on resilient housing construction techniques (Output 3.5) Install tide gauge and broadcast system (Output 3.8)
Sea level rise and saline instruction	Unusable ground water Declining agricultural output/inability to grow crops Coastal erosion, including the loss of beach and productive land along the coast Soil infertility	Poor water management and insufficient infrastructure Loss of mangrove forest Salt farming and other damaging land use practices	**All target communes**	Mangrove restoration (Output 3.1) Green-grey protective infrastructure (Output 3.6)
Drought	Lack of water in reservoirs – leading to a lack of water for drinking and agricultural purposes Poor crop yields, leading to low incomes Poor soil quality	Old and insufficiently maintained reservoirs Lack of supporting infrastructure, such as canals and water gates No water supply/distribution system	**Kep Province –** Pong Teuk and Angkaol Communes	**and** Bank strengthening work at Roness Reservoir to provide additional water retention and safety. (Output 3.4) Channels and Embankments construction (Output 3.3) Water gate repairs (Output 3.2 (a)
Flooding	Inundation of urban areas, especially markets, infrastructure and houses Contamination with dirty water Health issues Loss of income	Lack of drainage Lack of other water management Pollution from waste water and solid waste	**Kep Province** Angkaol and Pong Teuk Communes **Prey Nob District** Veal Rinh, Ou Ohkna Heng and Prey Nob Communes	Channels and Embankments construction (Output 3.3) Water gate repairs[43] and canal rehabilitation (Output 3.2a and b) Market Rehabilitation (Veal Rinh) (Output 3.7) Green-grey protective infrastructure[44] (Output 3.6)

43 Please note that the channels and embankments construction and water gate repairs are designed to adapt to both floods and droughts

44 Please note that the raised sea wall, embankment and water gate repair is designed to prevent both flooding and salt water incursion

Table 2

Population of the Target Communes in 2018

Municipality/ District	No.	Name of Sangkat/Commune	Total Population*	Female Population	Location
Prey Nob District	1	Tuek Thla	5,455	2,720	Coastal
	2	Tuek L'ak	4,413	2,198	Coastal and River
	3	Samakki	3,641	1,919	Coastal and River
	4	Veal Rinh	10,717	5,636	Coastal and River
	5	O Chrou	6,053		Coastal and River
	6	Prey Nob	7,944	3,976	Coastal and River
	7	Ou Oknha Heng	9,006	4,559	Coastal and River
		Sub-Total	**47,229**	**24,332 (50.85%)**	
Kep Province	1	Angkaol	8,566	4,280	Coastal
	2	Pong Tuek	10,987	5,574	Coastal
	3	Prey Thom	8,521	3,994	Coastal
	4	Kep	4,917	2,358	Coastal
	11	**Sub-total**	**32,991**	**16,206 (48.92%)**	

Table 3 below, shows the poverty rate and the percentage of people whose primary water source is considered unsafe, for communes in Prey Nob District and Kep Province, according to the vulnerability assessment carried out by the Ministry of Environment in 2015. It clearly shows that a lack of access to safe water is a critical underlying vulnerability.

Table 3

Poverty level and people with unsafe water.

		Sensitivity					
Municipality/ District	No	Name Of Sangkat/ Commune	Poverty (%)	Unsafe Water (%)	No. With Unsafe Water	Total Sensitivity	Over-All Vulnerability
Prey Nob District	1	Tuek Thla	20.2	50.5	2,754	67	5
	2	Tuek L'ak	20.1	47.6	2,100	62	5
	3	Samakki	19.2	70.3	2,559	61	5
	4	Veal Rinh	26.3	24.5	2,625	47	3
	5	O Chrou	19.8	91.8	6,134	73	3
	6	Prey Nob	18.6	96.1	7,634	56	5
	7	Ou Oknha Heng	18.0	71.0	6,394	76	5
Kep Province	1	Angkaol	18.5	77.1	6,604	67	5
	2	Pong Tuek	18.5	88.5	9,723	66	4
	3	Prey Thom	14.3	90.9	7,745	57	4
	4	Kep	6.4	99.1	4,872	50	3
		TOTALS	**17,528 (below poverty line)**		**73,043**		

2.0 PROJECT OBJECTIVES

Main objective

The proposed project's main objective is to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.

To accomplish this, and to respond to the previous comments of the Adaptation Fund secretariat, the project proposes three specific components, which are also summarised below in Table 4. For more detail of how the project's activities benefit women, please see the results framework in Part III, Section E.

Component 1: Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments

- This is in line with:
    - Adaptation Fund Outcome 3 – Strengthened awareness and ownership

of adaptation and climate risk reduction processes at local level

Component 2: Government planning and technical capacity enhanced and knowledge captured and disseminated to sustain and enhance the project's adaptation benefits

- This is in line with:
    - Adaptation Fund Outcome 2 – Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses

To a lesser extent, this component also addresses:

- Outcome 4 – Increased adaptive capacity within relevant development and natural resource sectors
- Outcome 7 – Improved integration of climate-resilience strategies into country development plans

Component 3: Resilience built through investment in small-scale protective and basic service infrastructure and natural assets

- This is in line with:
    - Adaptation Fund Outcome 2 – Increase adaptive capacity with relevant development and natural resource sectors,
    - Adaptation Fund Outcome 5 – Increase ecosystem resilience in response to climate change and variability-induced stress,
    - Adaptation Fund Outcome 6 – Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted area.

3.0 PROJECT COMPONENTS AND FINANCING

Table 4

Project Components and Finance

Project Components	Expected Concrete Outputs	Expected Concrete Outcomes	Amount (US$)
Component 1 Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments	**Output 1.1.** Community capacity built to collect and manage solid waste and waste water	**Outcome 1.** Communities in the target areas are able to manage their infrastructure, maintain its functionality and autonomously adapt to the future impacts of climate change	**$101,395**
	Output 1.2. Communities in target areas have been trained on resilient house construction techniques		$82,995
	Output 1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3		$90,269
		TOTAL	**$274,649 (6.61%)** of project activities
Component 2 Government planning and technical capacity enhanced and knowledge captured and disseminated to sustain and enhance the project's adaptation benefits	**Output 2.1.** Government officers at the provincial and district levels trained to plan effectively for sustaining and enhancing the project's adaptation benefits	**Outcome 2.** Capacity enhanced at the provincial and district level to manage, monitor and maintain the project's benefits, as well as enhance and replicate its approach.	$75,684
	Output 2.2 Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure		$121,695
	Output 2.3 Institutional systems strengthened to monitor adaptation investments and replicate their benefits		$88,856
	Output 2.4		**$75,306**

	Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement		
		TOTAL	**$361,541 (8.7%)**
Component 3 Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	**Output 3.1.** 134ha of Mangroves restored in Kep and Angkaol Communes, Kep Province	**Outcome 3.** At least 62,521 people, at least 50% of whom women, have access to protective natural and social assets and/or benefit from physical infrastructure to reduce the climate vulnerability. (AF outcome 4 and 5)	$294,470
	Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol (a) 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province (b)		$5,341 (a) $76,050 (b)
	Output 3.3 Prevention of saltwater ingress through improved channels		$197,841
	Output 3.4 3.4 Bank strengthening work at Roness Reservoir to provide additional water retention and safety.		$1,384,000
	Output 3.5 Resilient Housing designs developed and demonstrations constructed (Both provinces		$171,000
	Output 3.6 Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province		$303,280
	Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province		$814,655
	Output 3.8 Weather Station and Tide gauge with early warning system broadcast capabilities installed (Tide Gauge in Ou Okhna Heng Commune, Prey Nob District)		$102,380

	Amount budgeted for compliance with the Environmental and Social Policy of the Adaptation Fund through the Environmental and Social Management Plan		$167,490
		TOTAL COMPONENT 3 (inc ESS)	**$3,517,307 (84.68)**
	5. Project/Programme Execution cost (9.5 %)		**454,788**
	6. Total Project/Programme Cost		**4,608,295**
	7. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable) (8.5 %)		**391,705**
		Amount of Financing Requested	**5,000,000**

Projected Calendar:

MILESTONES	EXPECTED DATES
Start of Project/Programme Implementation	06-2020
Project/Programme Closing	06-2024
Terminal Evaluation	09-2024

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. PROJECT COMPONENTS

As the introduction to this proposal notes, Kep Province and Prey Nob District, the target areas of this proposal, are highly exposed to multiple hazards; sea-level rise, increasing temperatures and dramatically changing rainfall patterns, which in turn cause drought, strong winds and flooding, salt water incursion and coastal erosion. Underlying vulnerability to those hazards, in the form of poverty, inadequate infrastructure, a lack of basic services, ecosystem degradation and mismanagement of water resources exacerbate their impacts and make the target area highly vulnerable to climate change.

To achieve the project's overall objective; ''to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions'. The project works with national and sub-national government to achieve adaptation through improved protective and basic service infrastructure, ecosystems, and capacity at the community and local government level.

The actions proposed by the project have been designed to target the poorest and most vulnerable people in two of Cambodia's most vulnerable areas; Kep Province and Prey Nob District (in Preah Sihanouk Province). To do this, an interdependent set of soft and hard measures has been proposed to ensure that resilience at the household and commune level is strengthened sustainably. The soft measures focus on increasing community capacity and the capacity of officials and institutional systems at the sub-national level. All capacity building activities are designed to support, enhance and sustain the 'hard' investments that the project will make. Such an approach is also in line with Cambodia's Nationally Determined Contribution of "promoting and improving the adaptive capacity of communities, especially through community-based adaptation actions (..) and, "strengthening technical and institutional capacity… and mainstreaming of climate change into sector and sub-sector development plans".

The hard investments made by the project will all be in small-scale protective and basic service infrastructure and ecosystems. These investments have been fully identified, costed and through a comprehensive environmental and social safeguard compliance analysis. They are presented in brief below and in full in Annex 3.

The specific needs of women, people with disabilities and youths will be considered at all stages of the project. Extensive consultations have been conducted in formulating the project proposal, which are detailed in Part II, Section H and in Annex 1, while the implementation will use, where possible, the people's process, where community groups are formed and sustained throughout all stages of the project and through which communities participate in project implementation and monitoring.[45] At the community level, women will have a decisive stake in the implementation of the project. All commune level committees and groups working under the People's Process will be made up of 50% women. Women will also contribute their labour equally at the community level, and will be encouraged to participate in the physical works. Women will make up at least 30 per cent seats on the national and provincial level committees. In Cambodia, data suggests that women are still very underrepresented in government positions. In 2015 it was estimated that only 16.5 per cent of commune councillors, 11.3 per cent of undersecretaries of state and 19.5 per cent of parliamentarians were women.[46]In this regard, 30% women in decision-making positions represents a high watermark of representation

The components of the project are as follows:

Component 1: Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments

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45 Development driven by people/Support Paradigm: when people stays at the centre of development planning process, the resource can be optimized with greater utility impacting larger number of people: http://sopheapfocus.com/wp-content/uploads/2010/06/Picture-31.png People's process of development can be witnessed through the evolvement of people's desire to improve their lives. Humans developed their settlement from living in caves, then building shelters, and now home. Along this settlement evolution, they had also established certain norms, standards, and a mutual understanding surrounding their community. That is called the people's process of development.

[46] UN-Habitat (et al), 2017, Mainstreaming Gender into Adaptation Investments, p.13

- This is in line with:
    - Adaptation Fund Outcome 3 – Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level

This component is made up of three outputs, which are also shown in Table 4:

1.1) Community capacity built to collect and manage solid waste and waste water
1.2) Communities in target areas have been trained on resilient house construction techniques
1.3) Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3

This component works directly with the communities in the target areas and is critical to the sustainability of the investments planned under Component 3.

Activities under Output 1.1. are critical because waste water and especially solid waste are ongoing problems in the target area. In several communes in the target areas, communities and commune leaders reported that their drainage or water management infrastructure was inadequate. However, upon inspection by the project team this infrastructure was completely blocked by solid waste, much of which had originated from the local area. With this in mind, management of solid waste becomes a critical issue; critical infrastructure, and especially activities to repair water gates, canals and embankments (see Output 3.2a, 3.2b and 3.6), can't function to its full potential if it is blocked or the water it manages is polluted with solid waste. Effective community scale management of solid waste is, therefore, both a critical sustainability activity and an enabler of enhanced adaptation effectiveness.

At present, formalised waste collection is available in Prey Nob and Kep only on the major roads. This means that, in communities away from the major roads, there is no formalised waste collection at the present time. This largely explains why so much waste ends up in canals and streams. With the awareness raising and capacity building provided under output 1, communities will have increased awareness of the damage caused by solid waste disposal in canals and streams and will be organised to transport waste the short distance required to collection points on the main road.

Activities under Output 1.3. are critical to ensuring that communities have the capacity required to monitor the use of and maintain their ecosystems and infrastructure. Much of the recurring maintenance of the infrastructure will be technically straightforward and will not require specialist labour or equipment. This will therefore be most effectively managed by the communities that benefit from the protection and services that the infrastructure provides. This also includes the mangroves, to be planted or restored under the investments in Output 3.1 To do this, activities under this output will organise communities and provide selected community members with the basic training required to perform basic monitoring and maintenance of the infrastructure. In the case of the mangrove planting and restoration, the specific nature of the training will be outlined in the Mangrove Planting and Monitoring Plan (MPMP), described further in the Investment Sheet. In particular, this relates to the infrastructure and ecosystem investments under the following outputs: 3.1, 3.2a, 3.2b, 3.4, 3.6, 3.7. The investments are presented in more detail below.

Activities under 1.3 will be implemented in close collaboration with the Communes through the Local Commune Committee (See Part III, Section A for the management structure). Moreover, the engagement of government at the commune, provincial and national level will make ensure that the government has the ownership of and responsibility for maintenance beyond the life of the project. In the past, some projects, including in the target area, have failed to sufficiently engage both the communities and the local and national government, which has resulted in infrastructure falling into disrepair after the period of the project implementation

Component 2: Government planning and technical capacity enhanced and knowledge captured and disseminated to sustain and enhance the project's adaptation benefits

- This is in line with:
    - Adaptation Fund Outcome 2 – Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses

To a lesser extent, this component also addresses

- Outcome 4 – Increased adaptive capacity within relevant development and natural resource sectors
- Outcome 7 – Improved integration of climate-resilience strategies into country development plans

This component is comprised of four outputs:

2.1. Government officers at the provincial and district levels trained to plan effectively for sustaining and enhancing the project's adaptation benefits

2.2. Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure

2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits

2.4. Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement.

Activities under Output 2.1 will work with officials involved in sub-national planning and budgeting, particularly from the National Committee for Sub-national Democratic Development (NCDD), Department of Economy and Finance, Department of Planning, Department of Environment and Department of Water Resources and Meteorology. It will focus on how the adaptation infrastructure constructed or repaired under the investment programme in Component 3 can be incorporated into sub-national budgets and new infrastructure can be constructed at the subnational level in the future.

Output 2.2 will increase government technical capacity. This technical capacity will focus on maintenance and management of infrastructure and ecosystems that is beyond the technical capabilities of the community. That said, activities under Output 2.2 should be seen as complementary to activities under Output 1.3. In particular, the technical capacity built will be in support of the infrastructure and ecosystem investments described in Component 3. This output includes training for government officials on the technical nature of mangrove planting and maintenance. The specific nature of the training will be outlined in the Mangrove Planting and Monitoring Plan (MPMP), described further in the investment sheet.

Output 2.4 will capture successful practices at the local level, based on the project's implementation. It will document lessons learned and make recommendations about where improvements can be made in the future. The primary target audiences of this improved knowledge management are twofold. Communities and local government will benefit from the demonstration of successful adaptation practices, especially where these can be replicated with little or no cost, while on the other the national government will benefit from knowledge management that influences future policy direction and strategic planning.

As in Component 1, government engagement at all levels is of critical importance. Ensuring that government has the capacity – defined as the ability and willingness – at the commune, provincial and national level to support the continued management and maintenance of the infrastructure is critical to the sustainability of the project.

Finally, activities under Output 2.3 are designed to build institutional capacity. This both distinguishes them from, and makes the complementary to, activities under Output 2.1. Activities under Output 2.1 focus on individual capacity, whereas those under Output 2.3 focus on institutions. To that end, this activity works more closely with the national level through the Project Management Committee and the National Council for Sustainable Development to increase vertical integration and coordination between the sub-national and national levels. This will contribute to ensuring that the adaptation benefits provided by the investments under Component 3 are sustained and can be replicated beyond the two provinces targeted by the project. These activities therefore make a linkage to national level adaptation.

Component 3: Resilience built through investment in small-scale protective and basic service infrastructure and natural assets

- This is in line with:

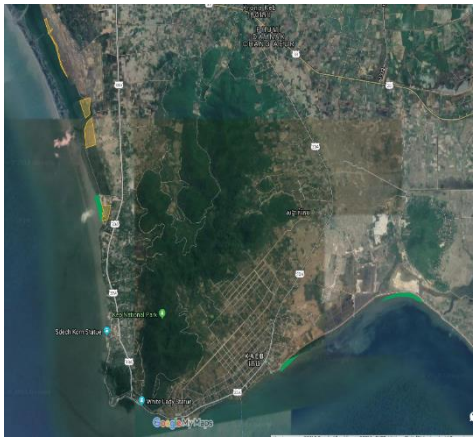
- Adaptation Fund Outcome 2 – Increase adaptive capacity with relevant development and natural resource sectors,
- Adaptation Fund Outcome 5 – Increase ecosystem resilience in response to climate change and variability-induced stress,
- Adaptation Fund Outcome 6 – Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted area.

This component is comprised of eight outputs[47]. Each output is the result of one investment. The investments are summarised below and further detail is presented in Annex 3.

Output 3.1

134ha of Mangroves restored in Kep Province

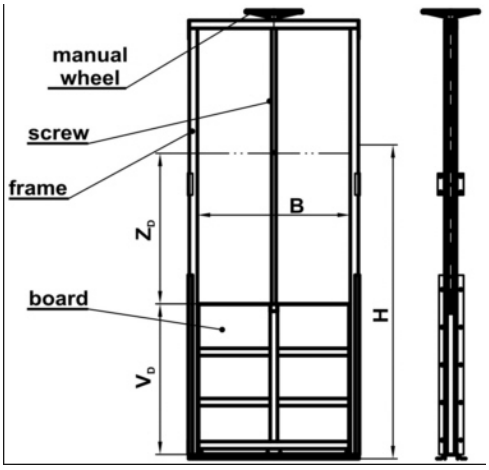
Location	Prey Thom, Kep and Angkaol Communes, Kep
Issues	Coastal land is unprotected, saltwater incursion damages water sources and livelihoods
Brief Activities	Planting and protecting mangrove areas
Adaptation Benefits	Land and water sources protected from saltwater, increased fish population, Eco-tourism potential
Budget	$294,470



Output 3.2a

Water gates repaired in 3 locations in Pong Teuk and Angkaol (a),

Location	Pong Teuk and Angkaol Communes, Kep
Issues	Water gates are broken leading to ineffective water storage
Brief Activities	Repairing the water gates with climate-resilient designs
Adaptation Benefits	Local people enhance their ability to store and manage water
Budget	$5,341



47 Note that two of the outputs contain two investments. This is where two separate investments are interdependent; one can't succeed without the other.

Output 3.2b

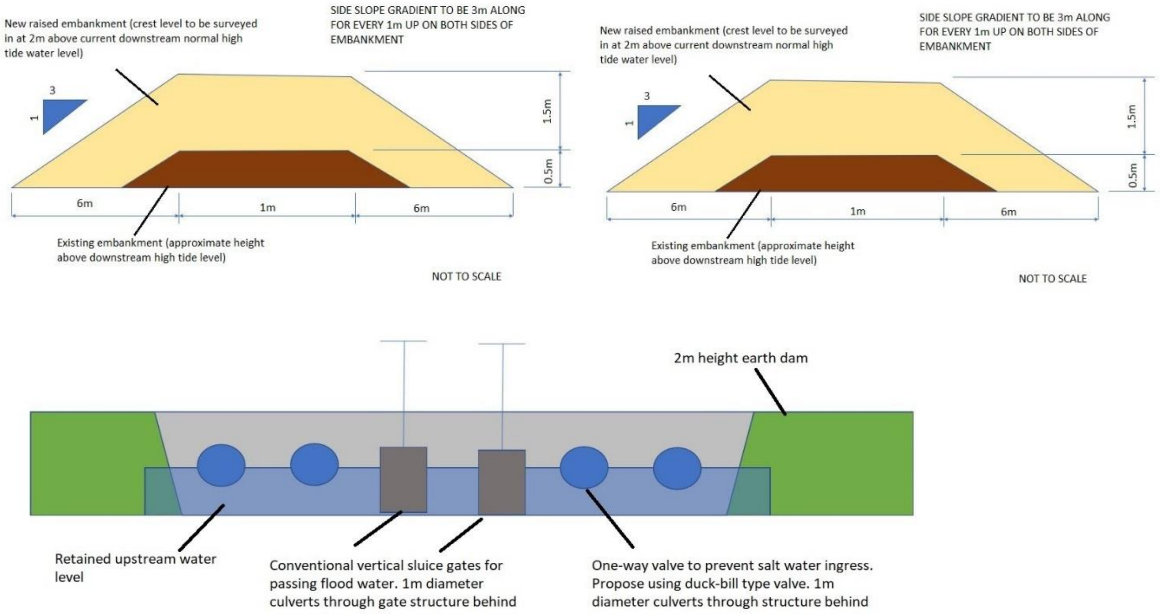
2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province

Location	Pong Teuk and Angkaol Communes, Kep
Issues	Canals are overgrown, filled with waste, prone to erosion and unable to effective story and transport water
Brief Activities	Dredging the canals
Adaptation Benefits	More effective water storage and management
Budget	$76,050

Output 3.3

Prevention of saltwater ingress through improved channels

Location	Pong Teuk and Angkaol Communes, Kep
Issues	Sea-level ride and saltwater affects rice paddies and in-land water sources
Brief Activities	Fill the embankments and re-design the water gates
Adaptation Benefits	3,500 people benefit from land and water sources that are protected from salt-water incursion and SLR
Budget	$197,841



Output 3.4

Bank strengthening work at Roness Reservoir to provide additional water retention and safety

Location	Pong Teuk Commune, Kep
Issues	Roness Reservoir is unable to effectively store and distribute water, and its embankment is unsafe
Brief Activities	Reinforcing the embankment and detailed technical investigation
Adaptation Benefits	All people living in Pong Teuk and Angkaol Communes benefit from increased water storage and distribution in the dry season
Budget	$1,384,000

Output 3.5

Resilient Housing designs developed and demonstrations constructed (Both provinces)

Location	Kep and Prey Nob
Issues	Strong winds frequently damage houses – especially those of the poor
Brief Activities	Piloting designs and training local people on resilient construction techniques
Adaptation Benefits	People can adapt autonomously through improved house construction
Budget	$171,800

Output 3.6

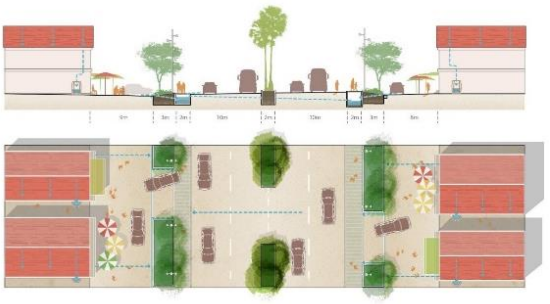
Green-Grey infrastructure protection in Ou Okhna Heng Commune

Location	Ou Okhna Heng Commune, Prey Nob District
Issues	The existing sea-wall has sunk and provides inadequate protection. Mangroves in the area are unhealthy and insufficiently dense to protect communities. Water gates are broken
Brief Activities	Repairing two critical water gates and planting/restoring 257ha of mangroves
Adaptation Benefits	All people in 3 communes (Approx 20,000 people) benefit from protection from sea water, increased agricultural production and more access to fresh water
Budget	$303,380

Output 3.7

Drainage and Rainwater Harvesting installed at Veal Rinh Market, Prey Nob District, Prey Sihanouk Province

Location	Veal Rinh Commune, Prey Nob District
Issues	The market floods when it rains. Run off is polluted, causes local flooding
Brief Activities	Building a storage and draining system, and installing rainwater harvesting
Adaptation Benefits	The market doesn't flood and the downstream water quality is improved. Better water access and livelihoods
Budget	$814,655



Output 3.8

Weather station and Tide gauge with early warning system broadcast capabilities installed in Ou Okhna Heng Commune, Prey Nob District, Prey Sihanouk Province

Location	Ou Okhna Heng and Teuk La'k Communes, Prey Nob District
Issues	Local government and people have inadequate access to weather information and EWS
Brief Activities	Install tide gauge and broadcast facilities
Adaptation Benefits	Local people are equipped with greater information and have more ability to protect their houses and property from severe climate conditions
Budget	$102,380

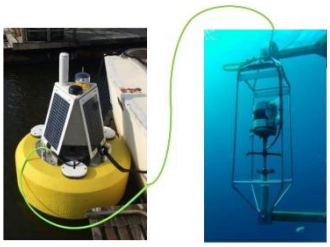


Table 5

Interventions, costs and beneficiaries of the proposed project

Concrete Interventions		Target Commune	Estimated Cost (US$) and Cost-Effectiveness of Direct Beneficiaries (Area Within the Commune)	AF Environmental and Social Principle Triggered
Adaptation to Main Climate Hazards	**Investment (For More Detail, Please See Link)**			
Adaptation to strong winds	Output 3.5 - Resilient Housing designs developed and demonstrations constructed	All target communes	Total Cost $171,800. Total beneficiaries 9,720. Cost per beneficiary $17,67	AF Principle 2, 3, 5, 6, 11, 12, 13
	Output 3.8 Weather station and tide gauge with early warning system Ou Okhna Heng Commune, Prey Nob District	The tide gauge will be located in Ou Okhna Heng Commune	Total cost $102,380. Total beneficiaries 30,000. Cost per beneficiary $3.41	AF Principle 9, 10, 11, 14
Adaptation to droughts	Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol	2 Communes in Kep Province; Pong Teuk and Angkaol	Total cost: $5,341. Total beneficiaries – 19,553. $76,050.	AF Principles 6, 8, 9, 12, 13
	2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	2 Communes in Kep Province; Pong Teuk and Angkaol	Total $81,378. 19553 beneficiaries, cost per beneficiary (a+b) $4.16	
	Output 3.3. Prevention of salt water ingress through improved channels		Total Cost: $197,841. Total beneficiaries – 3500. $56.52 per beneficiary	AF Principles 4, 6, 8, 9, 12, 13, 15
		Located in Pong Teuk, benefitting Pong Teuk and Angkaol Communes	Total Cost: $1,384,000 . Total beneficiaries 24,470 Cost per beneficiary = $56.56	AF Principles; 4, 6 8, 9, 10, 12, 13, 15
Adaptation to Sea-level rise and salt water incursion	Output 3.1 134ha of Mangrove planted/restored in Kep	4 Communes in Kep Province (Angkaol, Kep, Prey Thom and Ou Krassar) and 1 in Prey Nob (Prey Nob Commune	Total Cost $294,470. Total ha 124.. Total Beneficiaries 177,54 Beneficiaries. Cost Per beneficiary = $16.59	AF Principles 6, 8, 9, 10, 15

	Output 3.6 Green-***Grey infrastructure protection in Ou Okhna Heng Commune***	The location is in Ou Okhna Heng Commune. Beneficiaries in Ou Oukhna Heng, Boeung Taprom, Prey Nob and Samrong Communes	Total Cost $303,280 Total Beneficiaries 20,000. Cost Per beneficiary - $15.16	AF Principles 2, 3, 4, 6, 8, 9, 10, 12, 13, 14, 15
Adaptation to Floods	Output 3.7 – Drainage and Rainwater Harvesting installed at Veal Rinh Market, Preah Sihanouk Province	Veal Rinh Commune, with Potential secondary benefits to all communes in Prey Nob	Total Cost $814,655. Total Direct Beneficiaries; 4500, Cost per beneficiary $181.03 55,776 Direct and Indirect beneficiaries. Cost per all beneficiaries $14.61	AF Principles 2, 3, 4, 5 6, 8, 12, 13

B. ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS

According to the consultations undertaken in the development of this concept note and full proposal, people face serious economic challenges as a result of saltwater incursion, inability to access water and flood and storm damage. The investments listed in Part II, Section A are designed to bring economic, as well as adaptation benefits. A more detailed analysis and quantification of economic benefits is provided below, in Part II Section C.

Meanwhile, a lack of protective infrastructure and high exposure to storms and coastal flooding means that people regularly lose assets and/or productive capabilities. Damage to houses is common in all 11 of the target communes, while damage to agricultural lands was also frequently highlighted by both local government officials and communities themselves. People often invest their minimal savings into home repairs and reconstruction after being damaged by storms.

The project will bring numerous social benefits. Activities implemented under Component 3 will specifically include women because communities themselves will be in charge of construction and maintenance. This means that instead of using external contractors, the project will hire communities where unskilled labour is required for construction. In this regard, the project can guarantee that 50% of those engaged in the project at the community level will be women. Activities under Output 3.7, which will undertake flood management and rainwater harvesting at Veal Rinh Market are specifically designed to benefit women. The consultations undertaken in the formulation of the proposal estimate that 90% of the vendors in the market are women. This activity will specifically support their adaptation to climate change and make a direct contribution to improving their livelihoods by reducing the number of days on which they are unable to earn.

The project will also bring substantial environmental benefits. By planting 391 hectares of mangrove, the project will provide environmental benefits over and above the adaptation benefits of the mangrove provides. Large, healthy mangrove areas have been shown to benefit fish and crab populations (Kep especially is famed for its crab fishing) and boost the growth of seagrass on the near-shore area. By preventing saltwater incursion, the mangroves will also support the protection of the land-side environment.

Table 6

Economic, Social and Environmental Benefits

Type of Benefit	Baseline	With/After Project
Economic	Tourism, which provides employment to over a quarter of Cambodia's workforce, is threatened by climate change	Areas with significant potential for tourism development will be protected, more resilient and have more robust ecosystems that are necessary to continue to support tourism development and thus greater levels of employment
	Households face damage and financial losses as a result of various climate change related hazards, primarily floods and storms	Households will not have to invest their savings in repairs to their homes
	People's land and productive capacity is damaged by seawater and/or a lack of fresh water	Target areas will have access to year-round, water, are less likely to have to buy bottled water and increase their productive capacity Flood defences, will contribute to reducing and eliminating loss and damage occurring because of climate change hazards

	Skill levels are low, and employment largely restricted to the agricultural sector	Using the people's process as a means to implement the project's investments will directly contribute to higher incomes and have the co-benefit of improving vocational skill levels, which will enable people to earn higher wages. Improved protective infrastructure will have the co-benefit of protecting agricultural areas and other service infrastructure, which will also benefit livelihoods.
Social	Regular droughts, sea-water incursion, storm damage and floods due to climatic impacts cause, and make worse pre-existing drivers of vulnerability, such as disease, poverty and migration	Improved protective infrastructure will have the co-benefit of protecting agricultural areas and other service infrastructure, which will also benefit livelihoods.
	Poor quality housing and infrastructure in the target areas further drives vulnerability and create additional challenges such as a lack of safety, while facilitating the spread of disease.	Alignment with the commune/district investment plans and increased capacity for officials at those levels to plan for and manage climate resilient investments will ensure that infrastructure and settlements are more resilient in the long term.
	Increasing inequality in Cambodia, including in coastal areas shows that the poorest are not sharing in the proceeds of the country's rapid economic growth	The communities including the poor and vulnerable areas increase capacities and opportunities to gain income from eco-tourism.
Environmental	Severe environmental degradation has taken place throughout the coastal area of Cambodia – especially in areas where there has been investment in infrastructure and tourism	Interventions in mangrove prioritise the environment, while other investments made by the project aim to strengthen the ability of people to live symbiotically with their environment The soft intervention of improving solid waste and wastewater management is designed to rectify a local environmental problem and prevent further damage to the environment from a lack of solid waste management and wastewater issues.
	The combined effects of sea-level rise, coastal flooding and onshore development issues (especially disposal of wastewater) is causing coastal erosion	Better onshore management of water will contribute to reducing coastal erosion effects

C. COST EFFECTIVENESS

Maximising concrete over soft

The project will maximise the amount of investment in concrete interventions over soft ones. 86% of the project's implementation budget will be directed to the investments proposed under Component 3. Where the project makes investments in soft activities, these will be either a) directly supportive of the concrete investments (i.e. training in installation or operation and maintenance), or b) investments to strengthen commune/district level planning – which will help to sustain and replicate the benefits of the project, and make more effective use of national finance in the future. This approach maximises the adaptation benefits per dollar invested; a greater soft

component focus would risk not translating into adaptation benefits, while a greater concrete focus may risk not building sufficient capacity to sustain or replicate them.

Choosing Cost effective investments

A cost effectiveness and basic cost-benefit analysis has been conducted in the preparation of this proposal, and as a means to select investments that bring economic benefits in addition to their adaptation benefits. The cost per beneficiary figures are presented in Table 5. A more detailed cost effectiveness analysis is presented below in Table 7.

Table 7

Cost Effectiveness and Economic Benefits

Investment (Output)	No of Beneficiaries	Cost Per Beneficiary	Economic Benefit	Logic
Output 3.1	17,754	$16.59	Increased rice yield and greater fish production: $96 per household per year according to the conservative scenario or $400 per household per year according to the more ambitious scenario	Currently most agricultural land yields 2.5 tonnes per hectare and achieves US$245 per tonne. Conservative scenario assumes 1142 hectares of land will be protected by the mangrove investment and there will be US$600 benefit in the fishery sector per hectare of additional mangrove[48]
Output 3.2	19,553 (of which 9,526 are paddy farmers)	$0.27 (a) $3.89 (b)	Increased yield will generate $245 per HH per year over the business as usual scenario. The total value of the investment is $480,200, based purely on increased agricultural yields	Only calculates based on the agricultural families (no economic value assigned to water availability for non-agricultural families)
Output 3.3	3,500	$56.53	Increased yield will generate $245 per HH per year over the business as usual scenario. The total value of the investment is $176,400, based purely on increased agricultural yields	Only calculates based on the agricultural families (no economic value assigned to water availability for non-agricultural families)
Output 3.4	24,470	$56.56	Those households depending on the reservoir for irrigation will gain $735 per household relative to a business as usual scenario.	Assumes that the 600ha of agricultural land will benefit from increasing from 1 to 2 rice crops per year at the same yield (2.5 tonnes per hectare). The BAU is that 1 crop per year will decline to 2 tonnes per hectare. The cost of rice is assumed to be constant.

48 Statistics provided by the Fishery Administration, Kep Province

Output 3.5	9,720	$17.67	Each household who benefit from this intervention will save on average $1,100 each over the next five years from avoiding repairs due to damage	Assumes that there will be a steady increase in the number of homes damaged and destroyed. Assumes that a damaged home costs on average $500 to repair and a destroyed home costs $1,500 to re-build (a conservative estimate)
Output 3.6	20,000	$15.16	Increased yield will generate $245 per HH per year over the business as usual scenario. The total value of the investment will be $1,008,230 once complete	Assumes that 4115ha will benefit. Only rice production is calculated. Other adaptation benefits are not estimated.
Output 3.7	4500 (Direct)	$181	Avoided loss of $300pp per yr. Total benefit = $1,350,000 Payback period = 210 days	The analysis conducted by the formulation team found that about 9% of the market's annual income is lost to floods. The investment will ensure that the market is operational 365 days per year, allowing people to make $300 per person more, and bringing a total benefit of $1,350,000

Cost effective implementation

UN-Habitat will ensure that the unskilled labour required to construct the investments described in Part II Section A will use the People's Process. This implementation approach has been shown to reduce implementation costs by 20-30 per cent over the life of the project by using community labour instead of external contractors, and by procuring local materials where they are available. The alternative implementation model to the People's Process is to use external contractors, which, as highlighted above, is more expensive and less likely to foster local ownership.

Table 7, above, demonstrates the cost-effectiveness logic of the selection of investments to be implemented under the project. This shows that the benefits provided, especially in terms of improved livelihood was a key consideration in the selection of investments that would be carried forward to the proposal.

The procurement of all materials required according to the investments in Outputs 3.1 to 3.8 of the project will be conducted according to Ministry of Economy and Finance guidelines to ensure that equipment is procured transparently and at the lowest possible cost. Re-evaluating the actions proposed under this project through a comprehensive vulnerability assessment and action planning process also ensures that investments are the most appropriate, with the greatest adaptation benefits, which also ensures their cost-effectiveness

Table 8

Brief cost and alternatives analysis of proposed adaptation options.

Proposed Action	Cost Effectiveness Criteria		Alternative Action	Cost Effectiveness Criteria	
3.1 134haof Mangroves restored in Kep City and Angkaol	Future cost of climate change	✓	Building sea-walls	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗

Communes, Kep Province	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
3.2a Water gates repaired in 3 locations in Pong Teuk and Angkaol 3.2b 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	Future cost of climate change	✓	New water treatment plant	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	✓
3.3 Prevention of salt water ingress through improved channels	Future cost of climate change	✓	Building a sea wall	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
3.4b Bank strengthening work at Roness Reservoir to provide additional water retention and safety.	Future cost of climate change	✓	New reservoir	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	✓		Environmental and social safeguarding risks	✗
3.5 Resilient Housing designs developed and demonstrations constructed (both provinces	Future cost of climate change	✓	Relocation	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	Greater risk
3.6 Green-grey protective infrastructure in Ou	Future cost of climate change	✓	Building sea walls	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	✗

Ohkna Heng Commune, P. Sihanouk Province	Community involvement	✓		Community involvement	✗
	Cost/feasibility	~		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	Future cost of climate change	✓	Relocating the market/constructing a new market	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
3.8 Tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Okhna Heng Commune, Prey Nob District	Future cost of climate change	✓	Taking no Action	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	Greater risk

D. CONSISTENCY WITH NATIONAL OR SUB-NATIONAL STRATEGIES

The project has been designed to align with national and sub-national development policies, strategies and plans on development, climate change and disaster resilience and decentralization reform.

As Goal 13 of the Sustainable Development Goals and Article 1-5 of the Paris Agreement on Climate Change[49] indicate, global society is committed to adapt to climate change and reduce its impact. In support of this aspiration, the Royal Government of Cambodia also adopted several policies and strategies to reduce the impact of climate change by enhancing the adaptive capacity and resilience of climate change, such as the Cambodia Climate Change Strategic Plan (CCCSP) (2014-2023), the Climate Change Action Plan (CCAP), and the Nationally Determined Contribution (NDC). To align with these global and national climate goals and plans, the proposed project aims to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.

The Rectangular Strategy for Growth, Employment, Equity and Efficiency: Building the Foundation Toward Realizing the Cambodia Vision 2050. The Rectangular Strategy outlines prioritised policies in its Rectangular Strategy Phase IV (See Figure 13). This strategy puts acceleration of governance reform at its core, along with contributing

49 Cambodia entered the Paris Agreement on Climate Change into force on 18th of March 2017. See. http://unfccc.int/paris_agreement/items/9444.php

elements: i) Human Resource Development, ii) Private Sector and Job Development, iii) Inclusive and Sustainable Development, and iv) Economic Diversification.

The Cambodian government has also set environmental sustainability as one of their prioritized actions. Actions on environmental sustainability include reducing the impact of climate change by enhancing the adaptive capacity and resilience to climate change, particularly through the implementing the Cambodia Climate Change Strategic Plan (CCCSP) (2014-2023).

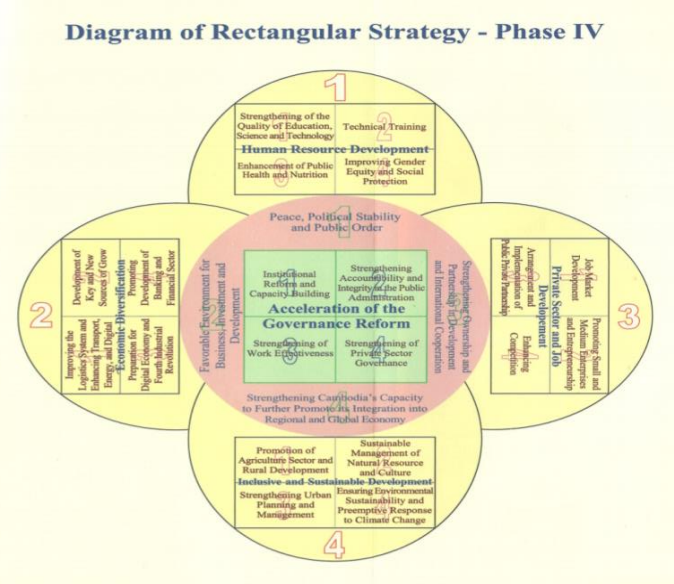


Figure 13 - The Rectangular Strategy

The CCCSP details Cambodia's strategic response to climate change, and forms the basis of the Nationally Determined Contribution. It will be implemented, in the initial stage, through the Climate Change Action Plan (CCAP). The CCCSP's vision is to develop "towards a green, low-carbon, climate-resilient, equitable, sustainable and knowledge-based society". To achieve its vision, Royal Government of Cambodia (RGC) sets eight strategic objectives. Among the eight strategic objectives, this project aligns with strategic objectives (SO) 2, 3, 5, and 7. Strategic Objective 2 aims to reduce sectoral, regional, gender vulnerability and health risks to climate change impacts through existing and new vulnerability and risk assessments (strategy a). It also aims to improve coastal zones and protected areas (strategy g). Strategic Objective 3 pursues climate resilience of specific locations including protected areas. Encouraging eco-tourism is highlighted as one of the most cost-effective approaches for addressing climate change (strategy b). Strategic Objective 5 aims to improve capacities, knowledge and awareness on climate change responses through trainings, while Strategic Objective 7 targets strength of "institutions and coordination frameworks for national climate change responses" through mainstreaming climate change into national and sub-national development plans (strategy a).

Note that as of writing, the updated National Strategic Development Plan (NSDP) and Rectangular Strategy have been approved in parliament but English versions (official or unofficial) are not presently available.

The overarching CCAP was finalized in 2016 to guide the initial phase of implementation of the CCCSP, with 17 initial actions identified by the Ministry of Environment. Action 2 of the CCAP is to implement national and sectoral climate change vulnerable assessment. Testing specific management options to handle climate change is also included in Action 3. Action 11 aims to promote and improve the adaptive capacity of communities to respond to climate change. Finally, Action 13 is capacity building of national institutions coordinating the implementation of climate change response. These actions (2, 3, 11 and 13) are addressed by this project.

There are 15 sector CCAPs as of 2018. In many cases, the first phases of these expire in 2018 and updates are currently being developed. However, this project is in line with the Climate Change Action Plan for Water Resources and Meteorology, for example, which prioritises, *inter alia,* reservoirs, dams and weirs, and river bank and coastal areas[50]. All the sector CCAPs can be found here.

The Nationally Determined Contribution (NDC) refers back to the CCCSP as the means of implementation of Cambodia's goals. The NDC identifies that national vulnerability to climate change is caused not only by geography and high reliance on agriculture sector but also by lack of financial, technical, and human capacities. Infrastructure and coastal zones are recognized as one of most vulnerable sectors by climate change. The NDC also raises the

[50] MoWRAM (2014) Climate Change Action Plan for Water Resources and Meteorology, pp3-4

profile of increased adaptive capacity to address climate change as a priority.[51] Cambodia has therefore selected a number of 'priority actions', giving prominence to ones with climate change impact mitigation co-benefits. The project address the following priorities through its components as follows:

Table 9

Aligning NDC Priorities with Proposed Project Components

NDC – Priority Actions	Project Component/Output
Promoting and improving the adaptive capacity of communities, especially through community-based adaptation actions.	Component 1, Outputs 1.1, 1.2 and 1.3 and Output 3.5 will lead to strengthened community capacity. All investments implemented by the project under Component 3 will be locally-driven.
Restoring the natural ecology system to respond to climate change.	Component 3, Output 3.1 will restore 134 hectares of mangrove along Kep's coastline that will strengthen the ability of the coastal ecological system to respond to climate change, as well as provide co-benefits such as defending agricultural land near the coast and increasing fish and crab populations. 3.6 will plant or restore 257 hectares. In total, the project will plant or strengthen 391 hectares of mangrove
Implementing management measures for protected areas to adapt to climate change.	Component 2, Output 2.3 will strengthen the institutional capacity to manage the investments, including the green investment in mangrove described above and in Output 3.1.
Strengthening early warning systems and climate information dissemination.	Component 3, Output 3.8, the weather station and tide gauge with early warning system broadcast capabilities to be installed will contribute towards enhanced early warning capabilities.
Developing and rehabilitating the flood protection dykes for agricultural and urban development.	Component 3, Outputs 3.3 will improve embankments that will benefit 3,500 people.

In addition to its comprehensive development and climate change policy framework, the Cambodian government has placed significant emphasis on decentralization and deconcentration (D&D) reform, which promotes transformation of responsibilities and functions of government from national level to sub-national level. In Cambodia's NSDP, the government aims at the "[p]rovision of power and duties to manage and perform all respective functions in line with the principles of local autonomy and local accountability to the maximum level". In accordance with this focus on D&D, the project will be executed through an Agreement of Cooperation with the NCSD, who will work with the Provincial Halls of Kep and Preah Sihanouk Provinces. Further details are provided in Part III, Section A.

In terms of plans at the sub-national level, 6 cities, including Kep and Sihanoukville, are starting to work with the Global Green Growth Institute (GGGI) to develop green city strategic plans, under the framework of the emerging national strategic plan for green secondary cities. The project will coordinate with GGGI to ensure the alignment of this initiative with the proposed project.

The table below summarises how the project aligns with policies, strategies and plans of the Cambodian government. The main objective of the project is to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.

51 Cambodia's NDC to the UNFCCC, p.4

Table 10

Project alignment with government priorities

	NSDP 2019-2023)	CCCSP (2014-2023)	NDC	CCAP	THE ORGANIC LAW	IP3-III (2018-2020)	The National Strategic Plan For Green Secondary
Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments		X	X	X			X
Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits	X		X		X	X	
Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	X		X	X			

E. COMPLIANCE WITH RELEVANT NATIONAL TECHNICAL STANDARDS AND THE ENVIRONMENTAL AND SOCIAL POLICY OF THE ADAPTATION FUND

Table 11

Compliance with National Technical Standards

Expected Concrete Output/Intervention	Relevant Rules, Regulations, Standards and Procedures	Compliance, Procedure and Authorizing Offices	AF ESP risks and Mitigation
Output 1.1 Community capacity built to collect and manage solid waste	Sub-decree on Urban Solid Waste Management (2015) Sub-decree on Plastics bags Management (2017)	As there is no national technical standard defining capacity building at the community level	All principles will be taken into account when developing vulnerability assessment and action planning
Output 1.2. Communities in target areas have been trained on resilient house construction techniques	National housing policy (2014) Anukret # 86 on Construction Permit	The Provincial Halls of Kep ad Preah Sihanouk Provinces will work with the respective Provincial Departments of Provincial and Municipal Administration	
Output 1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component	The Organic Law (2001) Commune planning and investment project guidelines for infrastructure projects Guidelines for Commune Development Plans and Investment Plans (NCDD)	The Provincial Halls of each province will be responsible for overseeing alignment with commune development planning. Both the Provincial Halls and the National Committee for Sub-National Democratic Development are under the Ministry of Interior	
Output 2.1. Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	Guidelines for Integrating Climate Change into Commune Development Planning (MoE/CCCA)	NCSD will take a lead to ensure that the guidelines are followed	
Output 2.2 Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	Guidelines on provincial/district/commune project operations Other relevant guidelines are identified in Outputs 3.1 to 3.8, below	NCSDand the Provincial Halls will work together to ensure compliance	

Output 2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits	Commune planning and investment project guidelines for infrastructure projects Guidelines for Integrating Climate Change into Commune Development Planning (MoE/CCCA) Close alignment with IP3-III	NCSDand the Provincial Halls will work together to ensure compliance	
Output 2.4 Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement.	There are no relevant laws or guidelines or knowledge management, but at the national level, knowledge management aims to influence the future development or revision of the Cambodia Climate Change Strategy and the NDC	NCSD Will ensure compliance, as it works with MoE on the development of climate policy.	
Output 3.1. 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	Law on environmental protection and natural resources management (1996) National Strategic Plan on Green Development 2013-2030	For all outputs 3.1 – 3.8, the Provincial Halls of the two respective provinces will be responsible for ensuring the construction/maintenance is implemented in accordance with national laws and technical standards. The respective provincial departments that will engage in the investments are listed below - Kep Province	AF Principles 6, 8, 9, 10, 15
Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	Law on Water Resource Management Article 5-11 (also applies to outputs 3.2b, 3.3, 3.4, 3.6)	Department of Water Resources and Meteorology - Kep Province	AF Principles 6, 8, 9, 12, 13
Output 3.3 Prevention of salt water ingress through improved channels	Technical Guidelines for Commune/Sangkat (2009). Fund's projects which consist of 3 parts (Part 1: Assessment and designs; Part 2: Technical designed standard, construction, equipment /materials and works; Part 3: Monitoring and Evaluation) (2009) Law on Water Resource Management Article 5-11	Department of Water Resources and Meteorology - Kep Province	AF Principles 4, 6, 8, 9, 12, 13, 15
Output 3.4b Bank strengthening work at Roness Reservoir to provide additional water retention and safety.	Law on Water Resource Management Article 5-11 Drinking Water Quality Standards (Ministry of Industry, Mines and Energy) Law on environmental protection and natural resources management (1996) National Strategic Plan on Green Development 2013-2030	Department of Water Resources and Meteorology - Kep Province Department of Water Resources and Meteorology - Kep Province	AF Principles; 2, 5, 6, 10, 12, 15

Output 3.5 Resilient Housing designs developed and demonstrations constructed (both provinces	National Housing Policy (to provide general people, especially low and medium income households and vulnerable groups with access to decent housing or improving a house to ensure the right to adequate housing)	Department of Land Management, Urban Planning and Construction - Preah Sihanouk Province and Kep Province	AF Principle 2, 3, 5, 6, 11, 12, 13
Output 3.6 Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province	Law on Water Resource Management Article 5-11 See 3.1 for mangrove-related legal considerations	Department of Water Resources and Meteorology - Preah Sihanouk Province	AF Principles 2, 3, 4, 6, 8, 9, 10, 12, 13, 14, 15
Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	Anukret # 86 on Construction Permit	Department of Land Management, Urban Planning and Construction - Preah Sihanouk Province	AF Principles 2, 3, 4, 5 6, 8, 12, 13
Output 3.8 Weather station and tide gauge with early warning system broadcast capabilities installed (Tide Gauge in Ou Okhna Heng Commune, Prey Nob District	Not relevant	Department of Water Resources and Meteorology – Preah Sihanouk Province	AF Principle 9, 10, 11, 14

Ensuring effective and successful compliance with National Technical Standards is a vital component of ensuring effective implementation of environmental and social safeguard measures. National technical standards do not give the project all the tools to comply with the Adaptation Fund's Environmental and Social Policy, or UN-Habitat's Environmental and Social Safeguard system. As such, additional safeguarding measures are outlined in Section K, below. These safeguarding measures, outlined in Section K, will complement the national technical standards, where they exist, and augment them where they do not.

Please note that the hierarchy of laws from national to local level in Cambodia is as follows: The Constitution of the Kingdom of Cambodia (the "Constitution") is the supreme law in Cambodia. All laws, legal documents and state body decisions must adhere to it. Laws are adopted by the National Assembly, the Senate and promulgated by the King. A sub-decree ('Anukret') is used to clarify provisions within existing laws, set out the functions and duties of Royal Government of Cambodia bodies and appoint senior government officials. It is drafted by relevant ministries, approved by the Council of Ministers and endorsed by the Prime Minister. It is the most common governmental decision and is applicable in the above table. Ministerial Orders or Proclamations (Prakas) are executive regulations made at the ministerial level to implement and clarify specific provisions within higher-level legislative documents and give instructions. Their scope is limited to the focus and subject matter of the ministry that enacted them.

At the sub-national level, local Regulations or by-laws ('Decas') are approved by Commune Councils at sub-national level. They have force of law within the territorial authority of the Commune Councils, thereby cannot conflict with other regulations at the national level.

F. DUPLICATION WITH OTHER FUNDING SOURCES

The sites selected for this project were chosen because of their high vulnerability and inability to adapt to climate change, as well as because the Royal Government of Cambodia has identified the coastal zone as a priority area. However, the target sites are also characterised by minimal other work by development partners in climate change (other donor initiatives were discussed during national and local consultations and are summarised in Part II Section H, below).

Nevertheless, projects have been identified through the consultation mission and through institutional knowledge of UN-Habitat, thanks to its long history of operations in Cambodia. Table 12 below summarises other relevant projects that are either ongoing, recently completed, or about to start in Cambodia. Historical projects are not included.

Table 12

Relevant Projects/Programmes in the Target Area

Relevant Projects/ Programme	Lessons Learned	Complimentary Potential	Project Timeline and Budget
Vulnerability Assessment and Adaptation Programme for Climate Change in the Coastal Zone of Cambodia Considering Livelihood Improvement and Ecosystems, implemented by UNEP, executed by Ministry of Environment, funded by GEF-LDCF.	There is a feeling from a number of stakeholders that this VA is insufficient for planning of local investments for adaptation.	The current project has utilised findings of the vulnerability assessment carried out by the UNEP project in Prey Nob district (this is the only overlapping target district) in its formulation	$1.6 million, 2012-2015

Building climate resilience of urban systems through Ecosystem-based Adaptation (EbA) in the Asia-Pacific region, implemented by UNEP, executed by Ministry of Environment, funded by LDCF.	The UNEP EbA project has not yet started, and will likely begin implementation sometime in 2018. It is proposed to keep a 'green/brown complementarity' between these two projects.	UN-Habitat is an implementing partner on the UNEP project, which enables it to ensure complementarily potential.	To begin in 2018. $1.5 million (Cambodia component).
"Strengthening Climate Information and Early Warning Systems to Support Climate-Resilient Development in Cambodia", implemented by UNDP, executed by Ministry of Water Resources and Meteorology, funded by GEF-LDCF.	The UNDP project does not work in the same target areas as this project. The UN-Habitat concept note formulation mission met UNDP to discuss this project (section H).	While MoWRAM is the main stakeholder at the national level the project works with NCDD at the national level. NCDD and MoWRAM will sit on this project's Management Committee	$4.9 million, 2014-2017.
Reducing the Vulnerability of Cambodian Rural Livelihoods through Enhanced sub-national Climate Change Planning and Execution of Priority Actions, implemented by UNDP, executed by Ministry of Environment/NCSD, funded by GEF-LDCF	As above.	The project works with NCDD at the national level. NCDD will sit on this project's Management Committee	$4.5 million, 2017-2019.
Pilot Programme for Climate Resilience (PPCR), Implemented and funded by ADB, executed by Ministries of Environment, Rural Development and Planning.	The implementation/infrastructure component of PPCR doesn't overlap target areas with the proposed project.	UN-Habitat is a partner in a small component of PPCR, so is well placed to coordinate lessons learned at the national level.	$85 million, 2009-2019.
Cambodia Climate Change Alliance, implemented by UNDP, executed by Ministry of Environment and funded by the EU, SIDA and DANIDA. Green Secondary City Planning, implemented by GGGI.	The UN-Habitat concept note formulation mission met with the CCCA programme and agreed full information sharing (see Section H, below). This project will be implemented in Kep and Sihanoukville. GGGI will be a non-resource partner in this project, and will also take an observer position on the board, to ensure coordination.	Under the NCSD supervision and management, the proposed project will invite a representative of the CCCA programme to be on the management board, as CCCA is the largest project at the MoE. The actions taken in this project will be shared with GGGI, who will incorporate their lessons learned in the overall city plans for Kep and Sihanoukville.	$>20 million, 2010-2019 Unknown, 2015-2019
Fishery Conservation and Mangrove Protection in Preah	IUCN is currently working with MoE to establish a protected	IUCN partners with the Ministry of Environment	2016 to

Sihanouk and Kep Provinces, implemented by the International Union for the Conservation of Nature (IUCN).	karst landscape in Kampot Province and its first marine protected area around the Koh Rong Archipelago.	in May 2017, through a memorandum of understanding, providing complementarity potential.	
Partnerships for Environmental Management in the Seas of Southeast Asia, an intergovernmental organization operating in East Asia to foster and sustain healthy and resilient oceans, coasts, communities and economies across the region.	The activities have focused on a different area of Preah Sihanouk city than this project, as well as water use and supply management in Stung Hav District, which neighbours the target district of this project. PEMSEA has also established protection and management of 1,060 hectares of mangrove areas, including in Prey Nob District. This area is in Kampong Smach and doesn't overlap with the proposed project	UN-Habitat has worked with PEMSEA previously, including during the Sihanoukville climate change vulnerability assessment work undertaken in 2011, and has good relationships with the organisation and its work.	2006 to ongoing
Mangrove planting in Fishery Communities – implemented by the Fisheries Action Coalition Team (FACT).	FACT is implementing small-scale mangrove works in Prey Nob district. This is not in the target area of 3.6	The work is small scale and limited to mangrove, however, FACT has lengthy experience which the project can draw upon.	2016 to Ongoing
Marine Protected Area related activities on Koh Rong island (Implemented by a coalition of NGOs, including Fauna and Flora International, CARE, SONGSA Foundation and IUCN.	The Marine Protected Area was established by Government Declaration No. 364 dated 16 June 2016.	The experience of implementing these projects will inform activities implemented in Koh Rong. However, this project does not directly work on strengthening the marine protected area around Koh Rong, and therefore there is no direct overlap.	2016 to Ongoing
Small scale NGO Actions in the Tumnup Rolok area.	Three small NGOs: Peur un Sourire d'Enfant (PSE), Operation Enfant du Cambodia (OEC) and M'lob Tapang have small scale education programmes in the area.	These projects are small scale and primarily relate to education, thus no direct linkage exists.	Ongoing

G. LEARNING AND KNOWLEDGE MANAGEMENT

Components 1&2 of the project address knowledge management and sustainability. Activities under this component are designed to increase community and local government capabilities to manage solid waste, resilient housing (at the community scale) and planning and maintenance capacity at the institutional level.

The participatory approach to implementation will promote building knowledge at the local level, including on planning (at local government level) and on technical/vocational skills for constructing and maintaining small-scale resilient infrastructure (both at local government and community level). There will be direct and ongoing sharing of lessons from the project implementation sites, while the project will also use a participatory monitoring process, which will enable the beneficiary communities under Component 3 to work directly with the project's monitoring and evaluation officer, to highlight issues in delivery and to strengthen adaptation benefits, including in replication and sustaining the project's gains.

At the national level, other vulnerable districts and communes will be able to derive lessons learned from the project. Information will be consolidated in reports and the project investment will support the development or refinement of tools and guidelines will be for developing resilient infrastructure[52]. The project will be executed through the Ministry of Environment/National Committee for Sustainable Development and the two Provincial Halls, however, this structure will be supported by forging links with other relevant government bodies, particularly the NCDD at the national level and the Provincial Departments of Water Resources and Meteorology and Land Management, Urban Planning and Construction in both provinces.

As part of the sustainability/exit strategy, the project will develop participatory monitoring processes, which will trigger institutional learning processes, participation, knowledge exchange and replication and scale-up of good practices.

UN-Habitat is part of a number of international dissemination mechanisms. The Knowledge Centre on Cities and Climate Change (in short: K4C) provides a knowledge management platform for Climate Change and Human Settlements interventions. It is proposed to use this platform (as well as the UN-Habitat website) to disseminate the lessons learned from this project. UN-Habitat will also work to integrate knowledge generated from the project with the knowledge management component of the CCCA programme, and through the 'camclimate' website[53]. The agency is also coordinating the UN System representation on human settlements at the Conference of the Parties (CoPs).

To ensure lessons and experiences of the project can reach target audiences at the local, national and international levels, a communication plan will be established in the inception phase of the project. This will create a larger vision of which stakeholders the project will reach and how and through which channel(s) to reach them. For example, local people can be effectively reached through leaflets and local radio, which is popular in Cambodia, while social media can reach more broadly citizens all over Cambodia, in addition to printed media (articles in national and local newspapers), non-printed medias (television, national radio). The use of social media would be particularly relevant to reach the youth population (aged 15-24), which represents 20.6% of the total population of Cambodia.[54]

Table 13

Learning and knowledge management

Expected Concrete Outputs	Learning Objectives (Lo) & Indicators (I)	Knowledge Products
Output 1.1. Community capacity built to collect and manage solid waste **Output 1.2.** Communities in target areas have been trained on resilient house construction techniques	LO – Community members trained to have the knowledge on organising community scale solid waste collection, resilient house construction and on the organisation required to manage the assets	Community level training materials

[52] See for example the Climate Resilient Irrigation Guidance Paper, 2013 - http://webcache.googleusercontent.com/search?q=cache:WOyCVifS69IJ:www.unepdhi.org/-/media/microsite_unepdhi/publications/documents/unep_dhi/carp-resilient%2520irrigation-final%2520ud.pdf%3Fla%3Den+&cd=1&hl=en&ct=clnk&gl=th

53 http://www.camclimate.org.kh

54http://cambodia.unfpa.org/sites/default/files/pub-pdf/Flyer_Cambodia_Youth_Factsheet_final_draft_%28approved%29.pdf

Output 1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3	constructed under the outputs of Component 3. i Number of community level management committees/structures established and no. of community members trained	
Output 2.1. Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits **Output 2.2.** Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure **Output 2.3.** Institutional systems strengthened to monitor adaptation investments and replicate their benefits **Output 2.4** Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement	LO – provincial governments, commune officials and communities themselves gain knowledge of how to plan for, construct, manage and maintain infrastructure, resilient houses and natural assets that will make them more resilient to climate change i – Number of officials trained	A set of guidelines produced that covers step-by-step the process of designing, planning, monitoring and managing small scale infrastructure and protective natural assets for resilience. Training materials under each output (books, slides etc).
Output 3.1. 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province **Output 3.2** (a) Water gates repaired in 3 locations in Pong Teuk and Angkaol (b) 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province **Output 3.3** Prevention of saltwater ingress through improved channels **Output 3.4** (a) (b) Bank strengthening work at Roness Reservoir to provide additional water retention and safety. (c) **Output 3.5** Resilient Housing designs developed and demonstrations constructed (both provinces) **Output 3.6** Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province. **Output 3.7** Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province **Output 3.8** Weather station and tide gauge with early warning system broadcast capabilities installed. Tide Gauge in Ou Okhna Heng Commune, Prey Nob District.	Lo – Provincial and commune officials and communities will have enhanced knowledge of operating infrastructure and protective natural and social assets to enhance resilience. i – Number and types of infrastructure constructed and protective natural/social assets built/rehabilitated.	Documentation of good practices, effective designs and lessons learned.

H. CONSULTATIVE PROCESS

In development of this project, UN-Habitat undertook several joint missions by the country office representatives of the Regional Office for Asia and the Pacific to consult national and local stakeholders from 8th to 12th of May 3rd to 7th July and 11th to 16th of December 2017. UN-Habitat also mobilised seven engineers and associated experts from Arcadis, under the auspices of the Shelter Programme, to undertake further technical design work on the investments outlined in Component 3 between 15th and 26th of October, 2018.

The meetings at the national level between **8th to 12th of May 2017** focused primarily on alignment with national priorities (as identified in Section D), coordination (and avoiding duplication) with other development partner initiatives (outlined in Section F), the implementation modality and the target districts and communes. There was also discussion of the climate hazards and underlying vulnerabilities, and the types of vulnerabilities the project should address. Further consultations with the national government took place on **16th and 25th of October 2018**.

At the local level in both provinces, discussions with local officials went into greater detail on the priority areas, the development challenges/underlying vulnerabilities they face and the climate hazards. The local level meetings also discussed various adaptation options and investments that are required in the target areas. The meetings with officials of Preah Sihanouk and Kep Provinces identified the proposed climate change projects reflected in the Commune Investment Plan (CIP) that is the official priority investments at the commune level. The Commune Investment Plans offer 'pre-packaged' actions that could enhance alignment between the project and government priorities. Finally, the meetings helped the project design team understand the priorities of the different line departments at provincial level.

The consultation mission also met with other key actors in climate change adaptation and mitigation, including UNDP, the Global Green Growth Institute (GGGI) and UN Environment (in Bangkok).

The second consultation mission took place from the **3rd to the 7th of July 2017,** and discussed in more detail possible actions and identified the target number of beneficiaries. The objective was to understand the local climate change impacts/effects per commune, (the lack of) community coping mechanism/barriers to building resilience, specific resilience building needs and interest and concerns regarding the proposed project in general. The results are displayed in Annex 1 and inform the background and context section.

Further in-depth discussions with the proposed executing entities[55], provincial and commune stakeholders were held during a mission from **11th to 15th of December 2017** to develop the full proposal through a robust stakeholder engagement process, to complete the rapid vulnerability assessment, outline preliminary action plans and develop further the environmental and social safeguards screening and management plan.

The purpose of this mission on national level was to reach agreement with the Executing Entities about the project modality, which is outlined in detail in Part III. Section A.

The mission also held in-depth discussions with Provincial stakeholders in both target Provinces. These meetings contributed in several ways to reiterate the support of provincial officials for the project and highlighted several adaptation concerns and underlying vulnerability issues. The meeting revealed potential adaptation actions listed in the Commune Investment Plan, reflecting the priority investments at the commune level and the line departments at provincial level.

Through consultation with the target commune councils and vulnerable groups, the mission reconfirmed the issues discussed with provincial level stakeholders and also understood the local issues and smaller scale interventions not covered by the Commune Investment Plan. These meetings also reconfirmed acceptance by the communes, outlined alternative options for increasing resilience and potential environmental and social risks and impacts of the interventions.

Based on comments from the Adaptation Fund Secretariat, a final set of consultations, primarily around providing more detail on the investment programme outlined in Component 3, was undertaken between **October 15th and 26th, 2018.** The outputs of these consultations are displayed in the investment programme highlighted in Part II, Section A and on UN-Habitat's ROAP website. These consultations met the national and sub-national governments, as well as communities, but focused primarily on-site visits and assessments to inform the investment programme and Environmental and Social Safeguards to ensure compliance with the Environmental and Social Policy of the Adaptation Fund.

Based on the feedback from the Adaptation Fund Secretariat and Board in February-March 2019, a further mission and set of consultations took place between 4th – 8th November 2019. This meeting met officials of the Provincial Government and Fisheries Administration in Kep, the Provincial Government of Preah Sihanouk Province, the Global Green Growth Institute and the Ministry of Environment. The primary purpose was to address the latest comments from the Adaptation Fund. This includes revisiting all field sites, discussing with the aforementioned stakeholders, and reallocating the budget – removing the O Thmar investment (previously investments 3.4a&c), which didn't meet the requirements of Environmental and Social Policy of the Adaptation Fund - and reallocating funds across

[55] Note that since these consultations the number of executing entities has been reduced to one – the NCSD

the other investments. This led to scaling up the mangrove investments in Investment 3.1 and introducing a new element of mangroves in Investment 3.6. Investment 3.7 has been made more ambitious in its scope and several other investments have been re-costed based on updated assumptions, information and available costs

Table 14

Stakeholder Consultations Held

Stakeholder, Incl. Role/Function	Consultation Objective	Outcome	Conclusion
Ministry of Environment/National Council for Sustainable Development (NCSD)	• Re-confirm focal point support • Establish preferred target areas • Ensure coordination with other, ongoing adaptation activities and policy alignment • Agree on project modality and responsibility of implementation	• MoE/NCSD has agreed to support the project formulation • The target areas named in this concept note were agreed • Information was exchanged on existing and planned initiatives in the target area, as highlighted in Part II, Section F • Arrangement modalities can be found in Part III. Section A; Project Arrangements	MoE/NCSD as the designated authority will approve the project
National Committee for sub-national Democratic Development	• Establish NCDD interest in being an executing entity • Agree in principle the modality for channelling funds to the local level • Gain understanding on integrating climate change adaptation into commune and district level plans • Understanding existing technical standard, rules, and regulations • Agree on project modality and responsibility of implementation	• NCDD agrees to be an executing partner • Funding for local investments would be channelled through the NCDD mechanism • The project contains provisions to mainstream climate change into commune/district planning • The project follows NCDD's Technical Guidelines for Commune/Sangkat (2009) • Arrangement modalities can be found in Part III. Section A, project arrangements	NCDD will also provide written agreement to be an executing partner
Local officials in Preah Sihanouk Province	• Agree target sites • Understand climate change vulnerability and highlight possible adaptation investments • Agree on role in organigram • Identify climate change adaptation projects of the Commune Investment Plans (CIP) of the target Province • Collect missing data for rapid vulnerability assessment	• Target sites agreed • A clear picture of vulnerability and investments established • An updated and agreed organigram was provided • Climate change adaptation projects of each commune received • Missing data for rapid vulnerability assessment collected	The long-list of target communities is listed in Part I – summary of the project
Communes councils and vulnerable groups in Preah Sihanouk Province	• Understand the local climate change impacts/ effects per commune and (the lack of) community coping mechanisms/barriers to building resilience • Understand specific resilience building needs and interest as well as concerns • Understand trend and impacts of tourism on the communities • Understand the main climate change issues, the impacts of vulnerable groups and climate actions prioritized by the commune council and vulnerable groups that are not reflected by the CIP	• Insufficient data and relevant documents were collected Developed the programme of investments under Component 3	The collected data of target communities is listed in Annex 1 – summary of the community consultation
Local officials in Kep Province	• Agree target sites • Discuss climate change vulnerability and highlight possible	• Target sites agreed • A clear picture of vulnerability and investment actions	The long-list of target communities is listed in

	adaptation investments • Understand provincial priorities of climate change adaptation projects based on the Commune Investment Plan	established • A list of climate change adaptation projects of the Commune Investment Plan received	Part I – summary of the project
Commune council and vulnerable groups in Kep Province	• Understand the local climate change impacts/ effects per community and (the lack of) community coping mechanisms/barriers to building resilience • Understand specific resilience building needs and interest as well as concerns • Understand trend and impacts of tourism on the communities • Understand the main climate change issues, the impacts of vulnerable groups and climate actions prioritized by the commune council and vulnerable groups that are not reflected by the CIP.	• Insufficient data and relevant documents were collected • Developed the programme of investments under Component 3	The collected data of target communities is listed in Annex 1 – summary of the community consultation
UNDP	• Gain experience from UNDP on the implementing modality for multi-lateral climate finance projects • Improve alignment with the Cambodia Climate Change Alliance, and other climate change projects	• Agreement that national execution with funds for local investment channelled through NCDD is effective • Confirmation that UNDP has no ongoing activities in the target area, and that the proposed project complements ongoing UNDP initiatives	No formal further action, but ongoing dialogue to continue
UNCDF	• Ensure alignment with support provided to NCDD and commune/district planning	• Agreement that the commune/ district planning component does not duplicate	No formal further action, but ongoing dialogue to continue
GGGI	• Increase alignment with GGGI/MoE's green secondary cities planning work, which will take place in Sihanoukville and Kep	• Agreement that GGGI will be a partner, and that there will be information flow to ensure that investments made under this project will be part of the planning work undertaken by GGGI	GGGI will be a non-financial partner in the project (i.e. no funding from this project)
UNEP	• Ensure synchronicity with the UNEP coastal adaptation project, which also worked in Prey Nob, and the forthcoming urban Ecosystem Based Adaptation project, which will also work in Kep	• The UNEP project has been concluded. All relevant reports regarding this project have been passed to UN-Habitat (and MoE/NCSD). • The urban EbA project is yet to start. The proposed project will only work on small-scale infrastructure in Kep	No formal further action, but ongoing dialogue to continue

In Cambodia, UN-Habitat has been implementing projects that support and strengthen policy interventions, institutional capacity building and community empowerment related to water and sanitation, climate change adaptation, disaster risk management, gender mainstreaming and youth development, housing and urban planning both national and subnational level. The following section elaborates Table 14, detailing further the consultations that took place with government agencies at the national and sub-national level and development partners during the three consultation missions that supported the formulation of the project.

Consecutive meetings during each mission were held with the proposed executing entities, NCSD, MoE and the Provincial Halls of both provinces to discuss target areas, appropriate small-scale infrastructure interventions, the overall policy environment and the implementation modality. MoE and NCSD both recommended Prey Nob in Preah Sihanouk province and both the municipality and district in Kep province[56]. The discussions confirmed that the Ministry of Environment will be the executing partner for Components 1&2 and The Provincial Halls of the respective provinces will be the implementing entities for Component 3 (Outputs 3.1 to 3.4 in Kep, Output 3.5 in both Kep and Preah Sihanouk Province, Outputs 3.6-3.8 In Preah Sihanouk).

Climate change resilience and environment is the largest portfolio of UNDP in Cambodia. UNDP also recommended that the project should have a strong linkage with the NCDD. The meeting also discussed the technicalities of capacity building at the local level, with UNDP recommending that local officials take a place on the project board.

The mission met with the Global Green Growth Institute (GGGI), which is implementing activities under the framework of the Green Urban Development Programme. This programme produced the green city strategic plan, which is now officially adopted and has been incorporated into the environmental law and code. GGGI is also developing a national strategic plan for green secondary cities, and develop green strategic plans for 6 cities, likely including Kep and Sihanoukville. GGGI is also developing an overall framework at the national level and planning at the city level. These combined works provide scope for alignment with the proposed project.

UN-Habitat met with officials from Preah Sihanouk province, including representatives from the Department of Environment, the Fisheries Administration, NCDD and the Provincial Hall Administrative Department. There is limited donor footprint in these areas with no donors currently investing in resilient housing, protective infrastructure or water supply. The participants agreed with the proposed mechanism of project implementation, which partners with MoE for national policy development and trainings while partnering with the respective Provincial Halls for fund-flows to the investment. This mechanism is also identified to match with the national strategic plan and the IP3-III.

The meeting with provincial officials in Kep included representation from the Department of Environment, Department of Tourism, Fisheries Administration, Department of Water Resources and Meteorology, Department of Public Works and Transport, the Provincial NCDD Advisor and the Department of Administration under Provincial Hall. The meetings discussed the priority actions which contributed to the selection of actions highlighted in Outputs 3.1 to 3.5.

UN-Habitat conducted community consultation in the communities of Preah Sihanouk and Kep Province. Based on the guide on community-level vulnerability assessments and action planning, requisite data including community profiles and tourism were collected through interviews and relevant documents. All of collected data were summarized in Annex 1. Further in-depth consultations were held with the commune councils of 14 target communes[57], including vulnerable groups. These consultations identified the climate change hazards per commune and helped to understand the necessary and prioritized adaptation action planning in each commune, beyond and independent from the small-scale interventions addressed in the Commune Investment Plans. These consultations heavily influenced the investment programme of the project outlined in Outputs 3.1 – 3.8.

56 Kep Province is made up of 1 municipality and 1 district

57 Because the project will not implement the concrete component in Koh Rong and logistical constrains, the mission from 11th to 16th of December 2017 did not visit the Koh Rong commune, an island about 27 km from the mainland

I. JUSTIFICATION

The proposed project components, outcomes and outputs fully align with national and local government/institutional priorities, with identified community and vulnerable groups needs and with five of the Adaptation Fund's seven outcomes (See Part II, Section A) as stated in the Adaptation Fund results framework. This alignment has resulted in the design of a comprehensive approach in which the different components strengthen each other and in which outputs and activities are expected to fill identified gaps in Cambodia's climate change response.

The project maximises the funding amount for the investments programmed under Component 3. It allocates 86 per cent of the project budget (excluding executing costs and project cycle management) to investments in Component 3. The funding for soft activities under Components 1&2 is required for complementarity/support for Component 3 and sustainability and quality assurance of the project. The table below provides a justification for the funding requested, focusing on the full cost of adaptation reasoning by showing the impact of AF funding compared to no funding (baseline) related to expected project outcomes.

Table 15

Project justification table

Outcomes/ Planned Activities	Baseline (Without AF)	Additional (With AF)	Comment and Alternative Adaptation Scenarios
Output 1.1. Community capacity built to collect and manage solid waste	Solid waste is problematic in the target areas with little capacity to manage it or recognise the problems to causes to water management infrastructure and the environment	People will have the capacity to organise their waste so that it does not block critical infrastructure and can be collected from collection points on the main road	The alternative would be to replace solid waste affected infrastructure with new infrastructure, a vastly more expensive option that would not guarantee positive adaptation benefits and would carry more environmental and social safeguarding risks
Output 1.2. Communities in target areas have been trained on resilient house construction techniques	Up to 200 households per commune are damaged every year due to storms and people lack the capacity to build more resilient houses	9,720 people will benefit from training	The alternative would be to replace the existing housing stock with externally build houses, but in a way that does not build the capacity of local people
Output 1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3,	Communities don't have the capacity to manage basic infrastructure	Basic maintenance of infrastructure is conducted by communities	External contractors conduct maintenance which is costly and potentially less reliable
Output 2.1 Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	Capacity building is still in an early stage at present, meaning additional capacity is required to plan for the impacts of climate change.	Capacity is enhanced, enabling the implementation of adaptation actions identified as a result of work undertaken in Component 1. 100 government officials from the provincial and district levels have also been trained.	Capacity building, ongoing under the support of NCDD, is currently slowing. This means urgent action required to adapt to climate change will not be forthcoming.

Output 2.2 Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	Capacity on technical management is limited to the national level and 1-2 engineers at the provincial level	A core team of 40 engineers, architects and ecosystem experts trained across the whole project area	There is currently no other capacity building effort of this nature, meaning that technical maintenance beyond the capacity of the community would not be conducted, or would rely on external contractors
Output 2.3: Institutional systems strengthened to monitor adaptation investments and replicate their benefits	Institutional systems are limited, especially considering the recent withdrawal of NCDD advisors at the provincial level	Strengthened capacity of target provinces to respond climate change through the Cambodian government planning and budgeting system	There is no adaptation alternative – without support the provincial level would not have the capacity to respond through the sub-national planning system to climate change.
Output 2.4 Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement	There is minimal feedback from communities about successful autonomous adaptation efforts. At the national level, policy responses will continue to be formulated, but may not benefit from the latest innovative practices	Communities and local government will have greater information and knowledge about 'what works', while national government will be more informed in the policy and strategy formulation process.	There is no alternative adaptation scenario other than effective knowledge management
Output 3.1. 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	**Vulnerability Baseline** Saltwater incursion, coast flooding and coastal erosion	**Adaptation Benefit resulting from the project** Improved agriculture, access to drinking water and coastal defence	**Alternative scenario** Building sea walls would be the alternative action to achieve the same result, but would be much less cost effective and create substantial additional ESS risks
Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	Water is mismanaged, causing both draughts and floods, in an area of declining rainfall	Improved access to water for agriculture, leading to greater yield. Increased water availability for drinking/domestic use	The alternative would be to build a water treatment plant or similar infrastructure, which would be prohibitively expensive
Output 3.3 Prevention of salt water ingress through improved channels	As above	As above	As above
Output 3.4 Bank strengthening work at Roness Reservoir to provide additional water retention and safety.	Roness is incapable of storing sufficient water and its southern bank is in an unsafe condition.	As above	The alternative would be (a) new reservoir(s) at different sites. However, this is difficult for cost and environmental and social safeguard reasons

Output 3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)	Strong winds damage up to 200HH per commune every year	Poor households will be damaged as a result of strong winds and therefore will not have to invest their minimal savings in repairs	The alternative would be relocation of the affected households, either to other, less vulnerable areas, or into social housing. However, this carries substantial Environmental and Social Risk
Output 3.6 Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province.	Sea water affects land and ground water in three communes, affecting agricultural yield and drinking water	People in the three target communes will be protected from seawater and coastal flooding	The alternative would be to build a seawall. However, this is a highly costly activity and it would carry substantial environmental and social risks
Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	Heavy rains lead to flooding which temporarily closes the market, resulting in lost income	People will be protected from flooding and earn a year-round income. Moreover, water will be supplied from rainwater	The alternative action would be to re-locate or reconstruct the market, which would be highly costly, requiring new land and not guaranteed to bring adaptation benefits
Output 3.8 Weather station and tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Okhna Heng Commune, Prey Nob	Floods and storms damage households, agricultural lands, and jeopardise coastal fisheries partly because people don't have access to reliable information	People will have improved information, allowing them to make more informed decisions and take additional measures to safeguard themselves during the rainy season.	There is no viable alternative to this action, other than to continue business as usual, which is causing damage to houses, land and jeopardising coastal fisheries

J. SUSTAINABILITY

The project aligns with the Cambodian government's planning and implementation mechanism and strengthens it. This is because NCSD, the executing partner will work directly with MoE, line ministries and the local government in each province, promoting alignment with sub-national planning at the commune and district level. Through the activities under Component 2 of the project, the target districts and provinces will be enabled to plan for small-scale resilient investments, and to programme their maintenance more effectively. UN-Habitat will further design an exit strategy addressing all institutional levels to ensure the long-term and sustainable benefits of this project

INVESTMENT	MAINTENANCE ARRANGEMENT
Output 3.1 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	Develop a Mangrove Planting and Monitoring Plan as the first activity in the implementation. After the project, the Fisheries Administration of Kep Province would be responsible for care for the mangrove areas, in conjunction with the communities living adjacent to them.
Output 3.2 a) Water gates repaired in 3 locations in Pong Teuk and Angkaol b) 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	Communities will be organised under Output 1.3 to perform basic management and maintenance of both the water gates and the canals. Output 1.1 will also enhance sustainability because it will prevent damage and reduced functionality through solid waste clogging. Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Kep Province.
Output 3.3 Prevention of salt water ingress through improved channels	Communities will be organised under Output 1.3 to perform basic management and maintenance of the channels and supporting infrastructure. Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Kep Province.
Output 3.4	Communities will be organised under Output 1.3 to perform basic management and maintenance of the reservoirs.

Bank strengthening work at Roness Reservoir to provide additional water retention and safety.	Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Kep Province.
Output 3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)	The communities will be trained to manage their own houses and replicate the activity under Output 1.2 The Provincial Departments of Urban Planning, Land Management and Construction in both provinces will be responsible for management and maintenance of the demonstration houses (with active collaboration from the target Communes).
Output 3.6 Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province.	Communities will be organised under Output 1.3 to perform basic management and maintenance of the water gates and to Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Preah Sihanouk Province. A separate Mangrove Planting and Monitoring Plan will be developed prior to planting. Communities will be organised and engaged to care for the mangroves. After the project the Fisheries Administration of Preah Sihanouk Province would be responsible for care for the mangrove areas, in conjunction with the communities living adjacent to them.
Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	Communities will be organised under 1.1 to improve solid waste management, which will support continued functionality of the market's drainage infrastructure. Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Preah Sihanouk Province.
Output 3.8 Weather station and tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Okhna Heng Commune, Prey Nob District	Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Preah Sihanouk Province.

The social, economic, financial and environmental sustainability of the investments described below.

Social

By implementing the project through the People's Process methodology, whereby people take ownership for the design and construction of the infrastructure that they will ultimately be beneficiaries of, there will be greater social sustainability because people will take ownership of their adaptation infrastructure. In implementing the investments under Component 3, communities will gain greater awareness of climate change and adaptation, and vocational skills to build, operate and maintain infrastructure.

Economic

Adaptation is a highly important economic activity in the target areas. The activities to improve resilient housing, for example, under Outcomes 1.2 and 3.5, will bring sustainable economic benefits because people will not be forced to invest their minimal savings or get into debt to afford house repairs. The activities under outputs 3.2, 3.3, 3.4 and 3.6 will enhance people's access to water, making their land more productive and carrying health benefits for them. The mangrove plantations under Output 3.1 and 3.6 will also defend people's land and also bring additional economic benefits in terms of improved fish and crab catch. The activities under Output 3.7 to improve flood resilience at Veal Rinh market will also bring economic benefits because people will no longer lose at least 30 days of income per year due to floods. The economic benefits of the actions – especially the investment programme under Component 3 – are quantified in Part II Section C of this proposal.

Financial

Financial sustainability of the project's benefits is ensured by executing the project through the NCSD, working with the Provincial Halls of the two target provinces. Provincial halls have a coordinating function at the sub-national level. Provincial halls are best placed to do the following at the sub-national level:

- Partner with the Department of Planning and the NCDD to ensure that investment planning includes maintenance of the infrastructure, as well as replicating its successes in other areas.
- Mobilize national finance to support future upscaling as the Provincial Halls sit under the Ministry of Interior and have a powerful voice to demand further sub-national action.
- At the national level, NCDD, which is also under the Ministry of Interior, is applying to become a Green Climate Fund direct access entity. If this happens during the lifespan of the project, the target areas will be well-positioned to advocate for leveraging further finance through this modality.

These steps are being taken to mitigate the risk that infrastructure may not be properly maintained in the future. This has been in the case on some projects in the past that have not been implemented with sufficient government support or buy-in. The sea wall targeted under Output 3.6, for example, was constructed in 2002-3 with support from a bilateral donor, and has since fallen into disrepair.

The NCSD is the executing agency for this project. The project's governance structure combines the Ministry of Environment, the two target provinces and a variety of other important stakeholders at the national level. Further information on the management structure is presented in Part III, Section A. The need for further and sustained finance will be a key consideration for all the executing partners as the project is under implementation.

K. ENVIRONMENTAL AND SOCIAL IMPACTS AND RISKS

Table 16

Overview of the environmental and social impacts and risks identified as being relevant to the project.

Checklist of Environmental and Social Principles	No Further Assessment Required for Compliance	Potential Impacts and Risks – Further Assessment and Management Required for Compliance
Compliance with the Law	X	
Access and Equity		X
Marginalized and Vulnerable Groups		X
Human Rights		X
Gender Equity and Women's Empowerment		X
Core Labour Rights		X
Indigenous Peoples	X	
Involuntary Resettlement		X
Protection of Natural Habitats		X
Conservation of Biological Diversity		X
Climate Change	X	
Pollution Prevention and Resource Efficiency		X
Public Health		X
Physical and Cultural Heritage	X	
Lands and Soil Conservation		X

As shown in Table 16, the project seeks full alignment with Adaptation Fund's Environmental and Social Policy (ESP) and will also be compliant with to UN-Habitat's Environmental and Social Safeguards System. This section briefly describes the initial analysis of environmental and social impacts of the project based on the ESP.

Components 1 & 2 consist entirely of soft activities. The Adaptation Fund's ESP says, "Those projects/programmes with no adverse environmental or social impacts should be categorized as Category C.[58] However, they have been subjected to a comprehensive screening, as presented in Annex2. It has been determined that these activities will not cause direct, indirect transboundary and cumulative impacts to environment and society.

All physical works activities in the project will be undertaken under Component 3. These activities carry the risk of causing environmental and social

58 Adaptation Fund Environmental and Social Policy, paragraph 28, Page 8

impacts. As the activities implemented under the project will be local and small scale, it is deemed that they are not 'Category A' risks. All activities implemented under Component 3 are, therefore, Category B or C. Capacity building under Component 1 (at the community level) and Component 2 (at the level of the sub-national government) will emphasise environmental and social safeguards and minimizing environmental and social, as well as project implementation risks, and the integration of gender and youth issues.

Moreover, the using the People's Process as a means to implement means that communities will manage the planning and construction of infrastructure, be trained on environmental and social risks and therefore will be incentivized to minimize environmental and social impact. This is because, under the People's Process, communities themselves are the planners, constructors and beneficiaries of the small-scale infrastructure, rather than contractors. Contractors have less incentive to minimise environmental and social risks, because they are not the end users of the infrastructure in question.

The checklist shown in Table 16 has been prepared based on the extensive consultations that took place in formulating the proposal, which were conducted with the Adaptation Fund Environmental and Social Policy and UN-Habitat's Environmental and Social Safeguard System, as well as the AF Gender Policy, in mind This is further elaborated in the risk assessment overview table, which is part of the Environmental and Social Risk Analysis in Annex 2. and the Environmental and Social Management plan in Part III, Section C.

PART III: IMPLEMENTATION ARRANGEMENTS

A. ARRANGEMENTS FOR PROJECT MANAGEMENT

The following mechanisms for project execution, coordination and oversight have been agreed in close consultation with the Ministry of Environment (MoE), as the national designated authority to the Adaptation Fund, the National Council for Sustainable Development (NCSD), the inter-ministerial body chaired by H.E. Minister of Environment and the sub-national government in the two target provinces.

The project will be executed at two levels; 1) national, 2) sub-national (which consists of the provincial and commune levels) At the national level, the overall coordination of the project's execution will be led by the NCSD, who will be the signatory of the project MoU and AoC with UN-Habitat. The NCSD will also ensure that the project is executed in a timely manner, chair the Project Management Committee and coordinate its activities and results across the Cambodia government system. The NCSD will work directly with the Ministry of Environment for the execution of Components 1&2, and the Provincial Halls of Kep and Preah Sihanouk Provinces to execute Component 3.

The NCSD will then work with **Provincial Halls of Kep and Preah Sihanouk Provinces** at the Provincial Level to execute Component 3 of the project. NCSD will work with the Provincial Hall of Kep Province to execute activities under Outputs 3.1 – 3.5 of the project, while NCSD will work with the Provincial Hall of Preah Sihanouk Province to execute the activities under Outputs 3.6 – 3.8 of the project.

In the Cambodian government system, Provincial Halls are the main provincial level administration unit, headed by a governor, they coordinate the other line departments at the provincial level, and are accountable to the Ministry of Interior. The Provincial Governors of the two respective target provinces will be signatories to the agreement with UN-Habitat to execute the project, while the day-to-day oversight of the project will be the responsibility of the Provincial Administration Unit. The structure of the Provincial Halls is shown below in Figure 14.

The Provincial Halls will then coordinate with other provincial departments to deliver the physical works. The table below shows the execution responsibility. Note that in this table, the executing entity is characterized by fund flow – they will receive funding from UN-Habitat. The executing partner is a key agency involved in delivering the activities, who will organize and facilitate accordingly.

Thirdly, the commune councils, elected bodies that work in each commune, will support the project's implementation at the local level. While there will be no fund flow to the commune level, the councils will each

chair a local commune committee (described below) that will, *inter alia,* support the organization of communities, facilitate the construction works, and act as a first point of contact for community members to engage with the project (including offering a possible channel to discuss potential grievances).

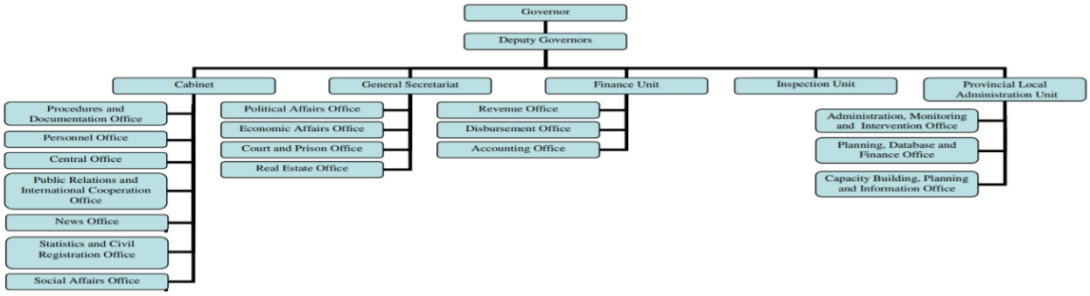


Figure 14 - Structure of the Provincial Halls
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Table 18

Project Execution Responsibilities

Output	Executing Entity	Executing Partner
Output 1.1. Community capacity built to collect and manage solid waste	NCSD	Provincial Department of Environment, Kep and Preah Sihanouk Provinces
Output 1.2. Communities in target areas have been trained on resilient house construction techniques	NCSD	Provincial Department of Land Management, Urban Planning and Construction, Kep and Preah Sihanouk Provinces
Output 1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3	NCSD	Provincial Halls of both provinces, NCDD, Department of Planning
Output 2.1. Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	NCSD	Provincial Halls of both Provinces, Department of Environment, Department of Planning, NCDD (both provinces)
Output 2.2. Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	NCSD	Provincial Halls, Department of Water Resources and Meteorology, Department of Land Management, Urban Planning and Construction, Department of Environment, Fisheries Administration (both provinces for all departments)
Output 2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits	NCSD	Provincial Halls, NCDD, Department of Planning (both provinces)
Output 2.4 Knowledge from the project implementation is captured and disseminated to local and national	NCSD	Communities, Provincial Halls, MoE

59 Ministry of Interior (2008), Situational Analysis of Provincial/Municipal and District/Khan Administration in Cambodia, p8
60 Note that this is a generic structure. While the Provincial Administration Unit/Office is present in every provinces, some of the other offices may differ from province to province

stakeholders, focusing on sustainable adaptation actions and policy enhancement		
Output 3.1. 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	NCSD	Fisheries Administration, Provincial Department of Environment
Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	NCSD	Department of Water Resources and Meteorology, Kep Province
Output 3.3 Prevention of salt water ingress through improved channels	NCSD	Department of Water Resources and Meteorology, Kep Province
Output 3.4 3.4b Roness reservoir rehabilitated for enhanced safety and storage	NCSD	Department of Water Resources and Meteorology, Kep Province
Output 3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)	NCSD	Department of Land Management, Urban Planning and Construction, Kep and Preah Sihanouk Provinces
Output 3.6 Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province.	NCSD	Department of Water Resources and Meteorology, Department of Environment, Fisheries Administration Preah Sihanouk Province
Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	NCSD	Department of Land Management, Urban Planning and Construction, Preah Sihanouk Provinces
Output 3.8 Weather station and tide gauge with early warning system broadcast capabilities installed (Tide Gauge in Ou Okhna Heng Commune, Prey Nob District	NCSD	Department of Water Resources and Meteorology, Preah Sihanouk Province

UN-Habitat is the multilateral implementing entity (MIE) and will provide project management support, oversight and will act as the secretariat of the Project Management Committee. It will also be part of the team that implements the project, where it will provide technical knowledge and expertise based on its experience implementing other climate change projects in Cambodia and the Asia-Pacific region. The agency will further oversee compliance with its Environmental and Social Safeguard System and the Environmental and Social Safeguard Policy of the Adaptation Fund.

Legal and Financial Arrangements

UN-Habitat and the National Council for Sustainable Development (NCSD) will sign a joint Memorandum of Understanding (MoU) as a legal commitment to implement the project.

UN-Habitat will the enter into an Agreement of Cooperation with NCSD. This is the legal basis to transfer funds to be invested under the project. This agreement will be reviewed by the PMC and will specify in significant detail the activities to be implemented by the project, the timeframe and the deliverables required.

The Permanent Secretary, NCSD, will authorize the payments against the contractual agreements, upon recommendations from the project manager. The Director of the Climate Change Department, as well as the UN-Habitat Programme Manager for Cambodia will provide an advisory function.

Project Governance

At the national level, the Project will be supported by a **Project Management Committee** (PMC). The PMC will be formed to oversee and keep abreast of project progress and facilitate the implementation of the project, including overseeing and cooperating with the project team, the technical advisory group, the local steering committees and the project oversight group.

The PMC will be chaired by the Secretary General, NCSD, and vice-chaired by Governors of Kep and Preah Sihanouk Provinces, or their appointed deputies. UN-Habitat will provide the secretariat function of the PMC. A representative of the UN-Habitat Regional Office for Asia and the Pacific will also be a member of the PMC. Other members of the PMC will be representatives of the following; the NCDD the Climate Change Department, MoE, working-level representatives of the Provincial Governments of Preah Sihanouk Province and Kep Province, the Ministry of Water Resources and Meteorology, the Fisheries Administration, the Ministry of Women's Affairs and Ministry of Land Management, Urban Planning and Construction. Observer members of the committee will representatives of the UN Capital Development Fund and the Global Green Growth Institute.

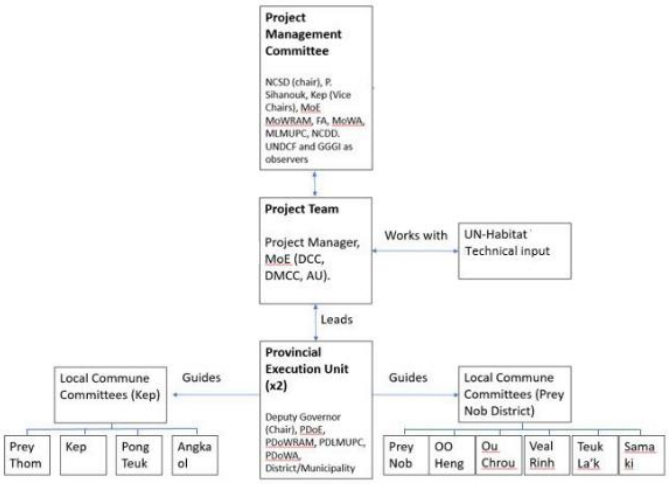
The PMC will: (1) approve annual work plans and review key project periodical reports; (2) will review and approve the contractual agreements, including workplans, with a particular emphasis on environmental and social safeguards, budgets and payment schedules; (3) review any deviations and consider amendments to workplans and contractual arrangements.

The PMC will meet at least once per year throughout the project implementation and whenever needed to fulfil the above functions. The PMC will also convene *adhoc* meetings to address serious Environmental and Social safeguard risks, if these arise. At least 30% of committee members will be women, and the Ministry of Women's Affairs will be a member of the PMC. This is designed to ensure female representation at the decision-making heart of the project.

Project Oversight, will be incorporated into the core function of the PMC (rather than being a separate oversight body), is led by the responsible officer in UN-Habitat's Regional Office for Asia and the Pacific (ROAP) under the guidance of the Regional Director and supported by Project Management Officers (financial management and administration) and UN-Habitat's Headquarters (HQ) Monitoring and Evaluation Unit, the Programme Division including the Climate Change Planning Unit, and the External Relations Division, in particular the Advocacy, Outreach and Communications will ensure project management compliance in accordance with UN-Habitat and AF standards and requirements.

The national level **Project Team** will be comprised of the Project Manager (who will be recruited by the NCSDt), the Director of the Department of Climate Change, the Director of Marine and Coastal Conservation, and the Administration Unit, MoE. The Project Team will be responsible for managing project activities and ensuring compliance with all commitments contained in this project document, such as the 15 Environmental and Social Safeguards Principles of the Adaptation Fund, the Environmental and Social Management Plan (see Part III. Section E for the results framework, Annex 2 for the ESMP), as well as providing day-to-day support to the executing entity. The Project Team will also take the lead in monitoring through periodic visits to the intervention sites, and generating learning from the project. The Project Team will develop a Monitoring and Evaluation Plan during the project's inception phase, which will be distributed to targeted stakeholders, and reported to the PMC.

There will then be a **Project Execution Unit** in each province (2x PEUs in total), which will be located in Provincial Hall. The Provincial Execution Unit will be chaired by the Deputy Governor of Kep and Preah Sihanouk Provinces This unit will include a provincial level coordinator who will oversee the day-to-day running of each activities underway in each respective province. The project execution will also count on representation from the following offices at the subnational level; Provincial Hall, the Provincial Departments of Environment; Water Resources and Meteorology; Land Management, Urban Planning and Construction, the Fisheries Administration, Women's Affairs and representatives from each of the municipalities and districts in the project (there is 1 target municipality and 1 target district in Kep, and 1 target district in Preah Sihanouk Province). The provincial execution unit will target 30% female representation, and include representation from the Provincial Department of Women's Affairs.



At the community Level, representatives of each elected commune council will form a **Local Commune Committee** with district officials and community representatives themselves. The local commune committee will be guide the investment activities in the target areas, as well as take a role in oversight, especially with regard to emerging environmental and social risks. As people on this committee are the closest to the beneficiaries and the field sites, they will be best-placed to review any breaches of the project's environmental and social safeguard system, and to flag any risks.

Figure 15 - Project Organigram

B. MEASURES FOR FINANCIAL AND PROJECT RISK MANAGEMENT

The status of financial and project risks, including those measures required to avoid, minimize, or mitigate these risks, will be monitored throughout the project (as discussed in Section D: arrangements for monitoring, reporting and evaluation).

Table 19

Financial and project management risks, significance of risks and measures to manage/mitigate risks.

	Category and Risk	Rating: Impact/ Probability 1: Low 5: High	Management/Mitigation Measure
1.	Environmental/ social: Current climate and seasonal variability and/or hazard events result in infrastructure construction delays or undermine confidence in adaptation measures by local communities	Impact: 3 Prob: 2	• Current climatic variability has been taken into account in the planning and design of project activities and especially into Component 3: The detailed project sheets (click here) identify where physical works need to take place during the dry season, for example • All selected investments under Component 3 have been extensively consulted with communities, local elected officials, government staff at the sub-national and national level and with other organisations working in the target area.
2.	Institutional: Loss of government support (at all levels) for the project (activities and outputs) may result in lack of prioritization of AF project activities.	Impact: 4 Prob: 1	• Establishment of a project management committee and the overall participatory and inclusive project design will improve national, municipal and beneficiary level ownership throughout and thus enhance government support for project implementation. • UN-Habitat will enter into legal agreements (MoUs and AoCs) with the NCSD to ensure that the executing partners will deliver project activities and outputs. • Government staff working on climate change, environment, disaster management, land use and housing will be strongly integrated into the project's structure (see Part III, Section A) • In the fallout from the 2018 election, the position of the NCDD has been weakened in Cambodia, which is why the organisation plays a diminished role compared to the previous version of the proposal. The project design, and particularly its management arrangements now have a robust structure, as there will not be a national election until 2023. However, there will be a commune election in 2021, which could affect some locally elected representatives. However, the structure of the local committees is such that they also include both government staff and community members, which is partly designed to ensure continuity, in the event of a change of personnel at the commune level.
3.	Institutional: Capacity constraints of local institutions may limit the effective implementation of interventions	Impact: 2 Prob: 1	• The project has a strong capacity building and training component, designed to promote effectiveness and sustainability at the community, district and provincial government levels as part of Components 1&2
4.	Institutional/social Lack of commitment/buy-in from local communities may result in delay at intervention sites.	Impact: 2 Prob: 1	• Community stakeholders have been consulted during the full project development phase to ensure their buy-in into the AF project. • A bottom-up approach integrating the community into the AF project's implementation phases – including community contracting - will be followed.

			• Where possible, the community will have an active role through the 'People's Process' that ensures ownership of the project particularly through community participation in project implementation and monitoring
5.	Institutional/social: Disagreement amongst stakeholders with regards to adaptation measures (infrastructure) and site selection.	Impact: 3 Prob: 2	• Adaptation measures and locations have been selected using extensive and detailed criteria, and through several rounds of in-depth consultation • There will be a participatory approach to the construction of the infrastructure to be built under Component 3, through the People's Process
6.	Institutional: Communities may not adopt activities during or after the AF project, including infrastructure maintenance	Impact: 2 Prob: 2	• The interventions will be institutionalized within the ministries, local government and communities to ensure sustainable delivery of (post-) project implementation, including formal agreements for infrastructure maintenance (at national level) and O&M structures at the sub-national level. Given the commitment of the national government and the policy alignment of this project, and the direct reporting mechanisms of local government to national government, it can be assumed that such agreements will be honoured. • Officials of sub-national (provincial, district/municipality and commune/sangkat) level will support the participating communities beyond the project implementation ensuring community level governance support as well as support for maintenance. • Capacity building and training of communities will be undertaken to improve their awareness and understanding of the benefits of the activities, including infrastructure maintenance (Component 1). • Communities will be involved in project implementation/decision making throughout the project. Communities will have a stake in the construction, operation and maintenance of the infrastructure (Capacity building under Component 1, construction under Comp 3)
7.	Financial: Complexity of financial management and procurement. Certain administrative processes could delay the project execution or could lack integrity	Impact: 3 Prob: 2	• Financial management arrangements have been defined during project preparation. • UN-Habitat's control framework, under the financial rules and regulations of the UN secretariat, will ensure documentation of clearly defined roles and responsibilities for management, internal auditors, the governing body, other personnel and demonstrates prove of payment / disbursement. • Procurement will be done by the NCSD as agreed in the Agreement of Cooperation. The project manager and the project team have a certifying role (for key procurements / expenditures). All expenditures/costs/payments will be paid in USD. In Cambodia, US$ is used for the procurement of goods and services (including salaries). Hence, there is no risk of exchange rate fluctuation.
8.	Institutional: Delays in project implementation, and particularly in the development of infrastructure interventions	Impact: 1 Prob: 2	• The ownership by the Government has been high during the project preparation phase which will reduce this risk. • Partnerships with key government agencies and infrastructure and community resilience project planning will start early on – in tandem with the community action planning. Institutional arrangements will be put in place well before the finalization of community action plans. • Lessons learned from other relevant projects (see Part II, Section F), done by MoE and NCDD are incorporated in the project design.

9.	Institutional: A lack of coordination between and within national government Ministries and Departments.	Impact: 1, Prob:2	• The Project Management Committee under the leadership of NCSD is to ensure coordination. Should UN-Habitat observe coordination problems, the agency will try to resolve issues directly with concerned parties and or the PMC.
10.	Legal Delays or barriers in gaining approval for infrastructure and housing due to delays in the development process or due to land tenure issues.	Impact 4 Prob 1	• During the project preparation phase the proposed infrastructure identified is located on state public land. This means that conflicts over land tenure are not envisaged. • The PMC and the LCC are tasked to ensure close collaboration with the provincial line departments of Environment, Water Resources and Meteorology, Land Management, Urban Planning and Construction and the Fisheries Administration

C. MEASURES FOR THE MANAGEMENT OF ENVIRONMENTAL AND SOCIAL RISKS

The proposed project seeks to fully align with the Adaptation Fund's Environmental and Social Policy (ESP). For that purpose, environmental and social risks and impacts of the project and related activities need to be identified and addressed (so that the project does not unnecessarily harm the environment, public health or vulnerable communities). As described in Part II. Sections E and K, systematic screening and assessment has been done based on broad consultation with national and local government stakeholders, a wide range of other concerned stakeholders and the target communities. The project design has benefitted from this process.

To ensure that remaining risks are well managed the project management and governance (Part III. Section A), Monitoring and Evaluation (Part III. Section D) fully take the management of environmental and social risks into account. In addition, and Environmental and Social Management Plan (ESMP) has been developed to ensure full compliance with the Adaptation Fund's Environmental and Social and Gender Policies.

The ESMP for this project, detailed in Annex 2 identifies measures and actions that reduce potentially adverse environmental and social impacts to acceptable levels. The plan includes compensatory measures, if applicable. Specifically, the ESMP".

(i) Identifies and summarizes all anticipated adverse environmental and social impacts in line with the Adaptation Fund's ESP principles;
(ii) Describes mitigation measures, both from the perspective of mitigating risks at each activity and from the perspective of upholding all ESP principles;
(iii) Describes a process which supports the screening and assessment of all project activities and the conditions under which screening and mitigation action is required;
(iv) Clearly assigns responsibilities for screening, assessment, mitigation actions and, approval and monitoring;
(v) Takes into account, and is consistent with, other technical standards required for the project in particular those that relate to national law.

It should also be noted that each investment that forms a part of Component 3 has been designed to provide environmental and social benefits, based on the Environmental and Social Policy of the Adaptation Fund. A summary of the benefits, and how ESP principles has been incorporated into the design of the investments is included in each investment sheet, which can be found here.

For the activities under the three components of the project, the ESP will be upheld by ensuring that:

(i) All MoUs and Agreements of Cooperation with the Executing Entity will include detailed reference to the ESMP and in particular the 15 ESP Principles.
(ii) The ToR of Committees and Advisory Groups, project personnel and focal points will include detailed reference to the ESMP and in particular the 15 ESP Principles.
(iii) The Executing Entity and other relevant government agencies will receive training / capacity development to understand the 15 Principles, the ESMP and in particular their responsibilities. This will include members of the Project Management Committee, the Local Commune Committees and the Communities.
(iv) A Monitoring and Evaluation Framework will be developed by the project management team and presented for approval to the Project Management Committee.
(v) All project monitoring will have the 15 environmental and social principles, and the ESMP Strategy mainstreamed into it. In addition to upholding the ESP of the Adaptation Fund and to familiarize all project stakeholders with the 15 ESP principles, this will also ensure that all stakeholders fully take ownership of the environmental and social safeguards procedures of the project and that any activity that may have been altered or not yet assessed in detail are captured.
(vi) A grievance mechanism is also part of the plan. This will allow any affected stakeholder to raise concerns, anonymously if they wish, to the community leaders on the local coordinating committee, the project team or the PMC. The primary alternative means for affected beneficiaries and/or community members

to raise grievances confidential telephone number[61]. In addition to the grievance mechanism, local staff will be trained to have an 'open-door' policy with communities, so that communities can discuss any aspect of the project at any time. This less formal mechanism will also enable project staff to listen to communities' concerns or ideas and promote them in the implementation of the project. More formal consultations and workshops held at local and national levels throughout the project implementation will also serve as a means for stakeholders to raise concerns or suggests with the project's implementation.

D. ARRANGEMENTS FOR MONITORING, REPORTING AND EVALUATION

The AF project will comply with formal guidelines, protocols and toolkits issued by the AF, UN-Habitat and the Royal Government of Cambodia. Table 20, below, defines a more detailed Monitoring and Evaluation Framework, in which the Monitoring and Evaluation (M&E) of progress in achieving project results will be based on targets and indicators established in the Project Results Framework (see also below). Besides that, the status of identified environmental and social risks, UN-Habitat's Environmental and Social Safeguard System and the ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks, will be monitored throughout the project (at the activity level and through annual project performance, mid-term and terminal reports). The same applies to financial and project management risks and mitigation measures. Annex 4 further reflects the AoC-partner in charge monitoring activities and ensuring milestones.

Monitoring and Evaluation Framework

UN-Habitat will ensure the timeliness and quality of project implementation. The oversight and general guidance of the project will be provided by the Project Management Committee. UN-Habitat will ensure that the project team and the key national executing partners are fully briefed on the M&E requirements.

Audit of the project's financial management will follow UN finance regulations and rules and applicable audit policies. The M&E plan will be implemented as proposed in the Table 20 below.

Table 20

Monitoring and Evaluation Plan

Type of M&E Activities	Responsible Parties	Time Frame	Reporting
Inception Workshop and Report	National Project Manager Project Management Committee UN-Habitat ROAP	Workshop: within first two months of start Report: within first quarter	Inception Report
Periodic status/ progress reports	National Project Manager	Quarterly	Quarterly Report
Final Evaluation	National Project Manager UN-Habitat ROAP Project Management Committee External Consultants	Final: At least three months before the end of project implementation	Final Evaluation Report
Project Terminal Report	National Project Manager UN-Habitat ROAP Local consultant	At least three months before the end of the project	Terminal Report
Audit	UN-Habitat ROAP National Project Manager	As per UN-Habitat regulations	Audit Reports

61 Note that an address was considered. However, Cambodia does not have a reliably functional postal service and literacy rates are far from 100% across the beneficiary communities. Given that telephone penetration is significantly higher, and a far more frequently used and reliable means of communication, it was decided that this is the best confidential and private means to address grievances.

Community consultations / workshops / training	National Project Manager	Within one week after each event	Documentation
Visits to field sites	UN-Habitat ROAP Project Management Committee Government representatives	Every six months	Field Report

For the M&E budget and a breakdown of how implementing entity fees will be utilized in the supervision of the M&E function, please see the detailed budget (Part III, Section G). For related data, targets and indicators, please see the project proposal results framework (Part III, Section E).

Participatory monitoring mechanisms (involving different levels of government and communes) will be put in place for the collection and recording of data to support the M&E of indicators. The project formulation has gathered demographic data (some of which is in this public domain) and generated maps through Google Maps and Google Earth, which will be handed over to the PMC for use in the project, including in monitoring.

The communes will be involved in further data collection and in community consultations in data analysis. This will allow beneficiary communes to work directly with the project's M&E mechanism, to highlight issues in project delivery and to strengthen adaptation benefits, including in replication and sustaining the project's gains. Data collected will include marginalized groups (e.g. women) aggregated (if possible). Project site visits will be jointly conducted based on an agreed schedule to assess project progress first hand.

The Project Manager will develop an **M&E Plan** during the project's inception phase, which will be distributed and presented to all stakeholders during the initial workshop. The emphasis of the M&E plan will be on (participatory) outcome/result monitoring, project risks (financial & project management risks and environmental social safeguard risks) and learning and sustainability of the project. Periodic monitoring will be conducted through visits to the intervention sites.

UN-Habitat will ensure that all executing partners are fully briefed on the M&E requirements to ensure that baseline and progress data is fully collected and that a connection between the Knowledge Management component and M&E is established. The Agreement of Cooperation will also reflect these.

An Annual Project Performance Review (PPR) will be prepared to monitor progress made since the project's start and in particular for the previous reporting period. The PPR includes, but is not limited to, reporting on the following:

- Progress on the project's objective and outcomes – each with indicators, baseline data and end of project targets (cumulative);
- Project outputs delivered per project outcome (annual);
- Lessons learned/good practice;
- Annual Work Plan and expenditure;
- Annual management;
- Environmental and social risks (i.e. status of implementation of ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks. The reports shall also include, if necessary, a description of any corrective actions that are deemed necessary;
- Project financial and management risks (same as per above).

The **reports** that will be prepared specifically in the context of the M&E plan are:

(i) the M&E plan,
(ii) the project inception report,
(iii) the Annual-, and terminal project performance reports and
(iv) the technical reports.

For the M&E budget and a breakdown of how implementing entity fees will be utilized in the supervision of the M&E function, please see the detailed budget (Part III. Section G). For related data, targets and indicators, please see the project proposal results framework (Part III, Section E).

E. PROJECT PROPOSAL RESULTS FRAMEWORK

Table 21

Project Results Framework

Expected Result	Indicators	Baseline Data	Targets	Risks & Assumptions	Data Collection Method	Frequency	Responsibility
Project objective: enhance the climate and disaster resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.							
Project component 1: community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments							
Outcome 1 Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments	Level of knowledge capacity at the community increased, measured by the number of community groups performing basic maintenance, clean-ups or house maintenance	Communities in the target area are not organised to manage or maintain infrastructure, collect solid waste or repair houses	At least one community group per investment and one group per commune formed and functional, performing these tasks. Each group should include 50% women	R Migration and/or rapid development makes it difficult to sustain these community groups A People will continue to be willing to take responsibility for management, maintenance and clean-up	Commune-level data gathering	Baseline, mid-term and end	UN-Habitat and executing entity, with support from target commune councils
Output 1.1. Community capacity built to collect and manage solid waste	No. and type of trainings conducted to strengthen capacity on solid waste management No. of female training beneficiaries	No training has been conducted on solid waste management, and solid waste is a critical factor in preventing the functionality of critical infrastructure	2x trainings per commune completed. 50% of trainees are women	R – Communities ignore the training they have been given A – Improved solid waste management will play a critical role	Training reports	Baseline, mid-term and end	UN-Habitat and Executing entity

				in the continued functionality of infrastructure			
Output 1.2. Communities in target areas have been trained on resilient house construction techniques	No. of people trained on resilient house construction techniques No. of female beneficiaries	There are few if any local carpenters that have sufficient capacity to build resilient houses.	200 people 50% of whom women) trained	R Carpenters take their new skills elsewhere, seeking greater economic opportunities A People will actually utilise the skills they gain in house construction (Rather than reverting to traditional practices)	Training reports	Baseline, mid-term and end	UN-Habitat and Executing entity
Output 1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3	No. of trainings provided to communities on managing, monitoring and maintaining infrastructure investments No. of women trained	Communities have not received training of infrastructure management, monitoring and maintenance and are unaware of the need and approaches	8 Training clusters implemented with 50% participation from women	R – Limited technical capability to maintain infrastructure A – Sufficient maintenance can be undertaken without specialist equipment or knowledge	Training reports	Baseline, mid-term and end	UN-Habitat and Executing entity

Activities	Milestones
1.1.1 Define trainee group 1.1.2 Baseline knowledge/training needs assessment 1.1.3 Define/prepare training materials 1.1.4 Give trainings 1.1.5 Monitor	▪ All trainees defined by month 6 ▪ All baseline knowledge/training needs assessments completed by month 12 ▪ All training materials prepared by month 15 ▪ All trainings complete between months 15-36 ▪ All monitoring of training complete by month 42

1.2.1 Define trainee group (note that these will be different from Output 1.1) 1.2.2 Baseline knowledge/training needs assessment 1.2.3 Define/prepare training materials 1.2.4 Give trainings 1.2.5 Monitor 1.3.1 Define community members who will lead 1.3.2 Baseline knowledge/training needs assessment 1.3.3 Develop training materials on infrastructure maintenance and mangrove planting and management 1.3.4 Organize community-scale committees 1.3.5 Monitor							
Project Component 2: Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits							
Outcome 2 Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits and knowledge captured and disseminated	Level of capacity at the sub-national level increased, measured by the number of adaptation actions planned in the target area	Capacity is limited, especially outside the national level. It is unclear if any adaptation projects have been planned	5 projects prepared and planned for through the government system that enhance this project's adaptation benefits, and extend climate change adaptation to a greater number of people in the target area. These projects should include the particular, differentiated adaptation needs of women	R. Political issues change the nature of the planning system A. There is continued broad support for climate change adaptation, politically	Review of planning	Baseline, mid-term and end	Executing entity
Output 2.1. Government officers at the	No. of government staff trained disaggregated by sex	There is constrained capacity (both in terms of manpower and technical know-how) to plan for the	60 government officers trained, at least 20 of whom are women	R. Changing priorities in the planning system result in	Training reports	Baseline, mid-term and end	Executing entity and UN-Habitat

provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits		replication and upscaling of climate change actions		adaptation getting lower priority A. Continued willingness exists to plan for and implement climate change adaptation			
Output 2.2. Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	No. of government staff trained No. of female government staff trained	There is constrained capacity (both in terms of manpower and technical know-how) to manage, operate and maintain infrastructure	25 government officers trained, at least 10 of whom women	R. Staff move on to new posts, once trained A. Staff will remain in place to be able to implement the training	Training reports	Baseline, mid-term and end	UN-Habitat and Executing entity
Output 2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits	No. of monitoring systems in place	There is currently no systematic way to review 'what works' in terms of climate change adaptation and to upscale its benefits	A system in place to systematically monitor adaptation investments and plan and advocate for replication, upscaling and further funding	R. Changing priorities in the planning system result in adaptation getting lower priority A. Continued willingness exists to plan for and implement climate change adaptation	Institutional review report	Baseline, mid-term and end	UN-Habitat and Executing entity

Output 2.4 Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement	No of knowledge products produced and estimated number of people reached	There is currently no systematic approach to capturing successful or autonomous adaptation practices, and no 'anchoring' of urban adaptation issues within either MoE or NCSD	At least 20 local good practice documents (which could include local language articles, radio broadcasts or brochures) and 3 major policy recommendations. At least 3 of the knowledge products will focus specifically on the adaptation priorities and actions of women At least 100,000 people reached with knowledge products	R Local people are unwilling to change their practices or sceptical of adaptation actions A Autonomous adaptation actions are still possible in the coastal area, and that coastal adaptation continues to be a high priority for the government	The physical knowledge products. Workshop reports (at the national level)	Baseline and end	

Activities

2.1.1 Define trainee group
2.1.2 Baseline knowledge/training needs assessment
2.1.3 Define/prepare training materials
2.1.4 Give trainings
2.1.5 Monitor

2.2.1 Define trainee group (note that these are different from Output 2.1)
2.2.2 Baseline knowledge/training needs assessment
2.2.3 Define/prepare training materials
2.2.4 Give trainings
2.2.5 Monitor

2.3.1 Perform institutional review
2.3.2 Make recommendations
2.3.3 Train appropriate range of officers
2.3.4 Highlight best practices and integrate into plans

2.4.1 Write case studies

Milestones

- All trainees defined by month 6
- All baseline knowledge/training needs assessments completed by month 12
- All training materials prepared by month 15
- All trainings complete between months 15-36
- All monitoring of training complete by month 42

- Institutional review complete by month 12
- Training conducted by month 18
- Plans updated by month 36
- Case studies complete before month 48

2.4.2 Develop stories for radio broadcasts (note that radio is still a very common means of receiving information in rural Cambodia) 2.4.3 Develop high level policy recommendations 2.4.4 Conduct national level policy alignment workshops							
Project component 3: Resilience built through investment in small-scale protective and basic service infrastructure and natural assets							
Outcome 3 Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	No of people that benefit from climate change resilient infrastructure, access to natural assets and improved livelihood options to withstand conditions resulting from climate variability and change	62,521 people, at least 50% of whom women, have been assessed as vulnerable to climate change impacts	100% of the vulnerable population (62,521 people) of which at least 50 percent women have access to resilient infrastructure and/or protective natural assets	R – Delay in implementing infrastructure A – Agreement of Cooperation will stipulate timeframe for implementing infrastructure	Field site inspections photo documentation and data base and geo-tacked community monitoring report	Baseline, mid-term and end	UN-Habitat
Output 3.1. 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province and Prey Nob Commne, Prey Nob District	No. of people who benefit from the restored mangrove, disaggregated by sex	Approximately 1140ha of land is vulnerable to coastal flooding, erosion, and salt-water incursion	This land and 17,754 people, at least 50% of whom are women have greater protection from coastal flooding, erosion and salt-water incursion. There will be $600 benefit to fishermen per hectare of mangrove planted	R – Plantation Failure, illegal cutting A – Full buy-in from local communities who understand the long-term benefits of mangroves	MPMP and monitoring reports	Baseline, mid-term and end	UN-Habitat
Activities 3.1.1 Site reconfirmation and finalisation 3.1.2 Develop and finalise the Mangrove Planting and Management Plan (MPMP) 3.1.3 Approve the MPMP 3.1.4 Plant the mangroves				Milestones • MPMP complete and approved (month 9) • Plantation underway (Month 12) • Plantation complete (Month 24)			

3.1.5 Monitor the progress of the mangrove areas and highlight any problems For a more detailed description of the activities, see Project sheet 3.1, here							
Output 3.2a Water gates repaired in 3 locations in Pong Teuk and Angkaol **Output 3.2b** Canals Rehabilitated in Pong Teuk and Angkaol Communes	No. of people who benefit from the repaired water gates and rehabilitated canals, disaggregated by sex	Water shortages arising from inadequate water management	1960ha of paddy with greater water access. Increased rice yield for agricultural families, and water access for non-agri families A total of 19,553 people, at least 50% are women, benefit	R – Solid waste decreases the effectiveness of the gates A – The training under Output 1.1 will be effective	Monitoring reports	Baseline, mid-term and end	UN-Habitat
Activities 3.2.1 a&b Reconfirm and design in further detail, based on technical drawings provided 3.2.2 Procure the necessary construction materials 3.2.3 Undertake the construction work during the dry season For a more detailed description of the activities, see Project sheets 3.2a and 3.2b here				Milestones • Construction complete by month 18. Physical work on 3.2b to take place during the dry season			
Output 3.3 Prevention of saltwater ingress through improved channels	No. of people who benefit from the rehabilitated canals	3,500 people in the target area lack basic water management infrastructure and suffer from saltwater incursion	3,500 people, at least 50% of whom are women will benefit	R. Inability to access the site A. Sea-level rise will be within worst-case scenario projections. Continued cooperation to allow site access	Monitoring reports	Baseline, mid-term and end	UN-Habitat
Activities 3.3.1 Final re-confirmation on ESS, considering the need for an access road 3.3.2 Procurement of hardware 3.3.3 Site clearance and access road construction 3.3.4 Install gates and embankments				Milestones • ESS reconfirmation complete by month 9 • Access road constructed by Month 18 • Activity complete by month 36 • Site restored to original state by month 42			

For a more detailed description of the activities, see Project sheet 3.3 here							
Output 3.4 Roness reservoir rehabilitated for enhanced safety and storage	No. of people who have improved access to water No. of ha land protected	24,470 people have unreliable access to water, are vulnerable to poor conditions or the reservoir, and rely on rainfed agriculture. The same number of people are threatened by the unsafe embankment People in the coastal area are highly vulnerable to coastal flooding	24,470 people, of whom 50% are women, will have year-round access to water even during especially dry years, 600ha of rice paddy will be irrigated. People will be protected from the unsafe embankment The same number of people will benefit from increased protection from flooding	R. A contractor with sufficient technical capability cannot be found A. Sufficient technical equipment and competence can be found in Cambodia	Monitoring reports	Baseline, mid-term and end	UN-Habitat
Activities 3.4.1 Clear the site 3.4.2 Confirm (through survey if necessary) that the site is clear on UXO 3.4.3 Procure the necessary hardware 3.4.4 Undertake bank stabilisation work 3.4.5 For a more detailed description of the activities, see Project sheet 3.4				Milestones • UXO clearance report complete by month 6) • Excavation complete by month 18 • Material removal complete by month 21 • Complete by month 36			
Output 3.5 Resilient Housing designs developed and	No. of locally appropriate housing designs developed	Up to 200 houses per commune are destroyed or severely	9,720 people, of whom, 50% are women, benefit from	R. people don't utilise the training in their own houses/future	Monitoring reports	Baseline, mid-term and end	UN-Habitat

demonstrations constructed (both provinces)	No. of demo houses constructed	damaged by strong winds every year. Women are more likely to be injured or affected from or by damaged houses Houses are not well constructed and use poor materials	design, training and 4 demo houses built	construction/repairs A. People will use their skills productively, will remain in the area and will reconstruct their houses			
Activities 3.5.1 Develop in greater detail demo house drawings 3.5.2 Select training beneficiaries considering age, gender and location 3.5.3 Run educational programmes/courses for trainees 3.5.4 Construct demo houses with trainees For a more detailed description of the activities, see Project sheet 3.5, here				Milestones • Detailed designs complete by month 12 • Courses and demo houses complete in all communes by month 36			
Output 3.6 Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province.	No of people whose land is protected from saltwater incursion, disaggregated by sex No. of ha of land protected	The landside of the embankment and water gates is severely affected by salt water, meaning that rice paddies are unproductive and surface water used for drinking is unusable	20,000 people, of whom 50% women, in the area (of a total population of 27,667) and 2,000ha of rice fields protected	R. Access to the site will not be possible in the rainy season, due to the existing quality of the access road and the nature of the equipment that needs to travel down it A. Sea-level rise will be within worst-case scenario projections.	Monitoring reports	Baseline, mid-term and end	UN-Habitat
Activities 3.6.1 Design new gates and site visits				Milestones • Topographic and geotechnical surveys complete by month 18			

3.6.2 Install new gates 3.6.3 Develop mangrove plantation and management plan 3.6.4 Plant mangroves For a more detailed description of the activities, see Project sheet 3.6, here				• New gates installed by month 24 • Areas filled and works complete by month 36			
Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	The number of days' income lost to flooding events	The market floods every time there is heavy rain. Sellers lost around 30 days' income per year as a result. The vast majority of sellers (up to 90%) are women	The market retains 365 day per year functionality, not losing any days to heavy rainfall. The market has access to harvested rainwater 4,500 people, up to 90% of whom are women, have improved year-round income	R. Sellers will be impacted while the works are ongoing A. The market can continue its functionality throughout the adaptation works, and that the incomes of those who derive their livelihood there will not be affected	Monitoring reports	Baseline, mid-term and end	UN-Habitat
Activities 3.7.1 Re-consult the sellers and the owner with a view to minimising risks and disruption arising from the works 3.7.2 Procure all necessary materials 3.7.3 Undertake works 3.7.4 Specific training for market vendors and residents 3.7.5 Develop a best-practice case study For a more detailed description of the activities, see Project sheet 3.7, here				**Milestones** • Re-consultations complete by month 9 • Works underway by month 12 • Works Complete by month 36 • Final training and best-practice case study complete by month 42			
Output 3.8 Weather station and tide gauge with early warning system broadcast capabilities installed (Tide	No. of people who have improved access to tidal information and early warning, disaggregated by sex	There is no accurate or local tidal information provided to people, and no early warning system	An estimated 30,000 people, of whom, 50% are women have access to early warnings. Tidal information is also available to the local government and	R. People will have adapted to not having weather information, and may not heed warnings provided	Monitoring reports	Baseline, mid-term and end	UN-Habitat

Gauge in Ou Okhna Heng Commune, Prey Nib District			beneficiaries in the coastal area.	A. Information can be provided to people in a timely manner			

Activities 3.8.1 – Import the tide gauge and weather station 3.8.2 – installation of tide gauge and weather station and integration with other PoWRAM systems 3.8.3 – Training for PoWRAM and other related officials. For a more detailed description of the activities, see Project sheet 3.8, here	Milestones Tide Gauge in-country by month 18 Training complete by month 24 Fully operational by month 30

Table 22

Activities and Milestones

OUTPUT	YEAR 1				YEAR 2				YEAR 3				YEAR 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Output 1.1. Community capacity built to collect and manage solid waste		X		X	X							X		X		
Output 1.2. Communities in target areas have been trained on resilient house construction techniques		X		X	X							X		X		
Output 1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3		X		X	X							X		X		
Output 2.1. Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits		X		X	X							X		X		

Output 2.2. Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	X		X	X					X		X			
Output 2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits			X		X				X				X	
Output 2.4 Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement					X		X			X				
Output 3.1. 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province		X	X			X								
Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol (a) Canals Rehabilitated in Pong Teuk and Angkaol Communes (b)					X									
Output 3.3 Prevention of salt water ingress through improved channels		X			X				X		X			
Output 3.4 Roness reservoir rehabilitated for enhanced safety and storage			X		X		X		X				X	
Output 3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)			X						X					
Output 3.6 Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province.					X	X			X					

Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	X	X							X		X	
Output 3.8 Weather station and tide gauge with early warning system broadcast capabilities installed (Tide Gauge in Ou Okhna Heng Commune, Prey Nob District			X		X		X					

F. PROJECT ALIGNMENT WITH THE ADAPTATION FUND RESULTS FRAMEWORK

Table 23

Project alignment with the Adaptation Fund results framework

Project Outcome	Project Outcome Indicator	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Outcome 1 Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments	Level of knowledge capacity at the community increased, measured by the number of community groups performing basic maintenance, clean-ups or house maintenance	**Outcome 3:** Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	**$ 274,659**
Outcome 2 Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits	Level of capacity at the sub-national level increased, measured by the number of adaptation actions planned in the target area	**Outcome 2:** Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks	**$ 361,541**

Outcome 3 Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	No of people that benefit from climate change resilient infrastructure, access to natural assets and improved livelihood options to withstand conditions resulting from climate variability and change	**Outcome 4:** Increased adaptive capacity within relevant development and natural resource sectors **Outcome 5**: Increased ecosystem resilience in response to climate change and variability-induced stress **Outcome 6:** Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	4.2. Physical infrastructure improved to withstand climate change and variability-induced stress 5. Ecosystem services and natural assets maintained or improved under climate change and variability-induced stress 6.1 Percentage of households and communities having more secure (increased) access to livelihood assets	**$** 3,517,307

Project Output	Project Output Indicator	Fund Output	Fund Output Indicator	Grant Amount (USD)
Output 1.1. Community capacity built to collect and manage solid waste	No. and type of trainings conducted to strengthen capacity on solid waste management	***Output 3***: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level	$ 101,395
Output 1.2. Communities in target areas have been trained on resilient house construction techniques	No. of people trained on resilient house construction techniques	***Output 3***: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level	$82,995

Output 1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3	No. of trainings provided to communities on managing, monitoring and maintaining infrastructure investments	***Output 2.2:*** *Targeted population groups covered by adequate risk reduction systems*	2.2.1. Percentage of population covered by adequate risk-reduction systems	$ 90,269
Output 2.1. Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	No. of government staff trained	***Output 2.1***: Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	$ 75,684
Output 2.2. Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	No. of government staff trained	***Output 2.1***: Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	$ 121,695
Output 2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits	No. of monitoring systems in place	***Output 2.2:*** *Targeted population groups covered by adequate risk reduction systems*	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	$ 88,856
Output 2.4 Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement	No of knowledge products produced and estimated number of people reached	***Output 7*** *Improved integration of climate-resilience strategies into country development plans*	7.1. No., type, and sector of policies introduced or adjusted to address climate change risks	$ 75,306
Output 3.1. 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	No. of people who benefit from the restored mangrove	***Output 5:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and	$ 294,470

			change (by type of assets)	
Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol (a) Canals Rehabilitated in Pong Teuk and Angkaol Communes (b)	No. of people who benefit from the repaired water gates and rehabilitated canals	***Output 6:*** Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	**$** 5,341 **(a)** **$76,050 (b)**
Output 3.3 Prevention of salt water ingress through improved channels	No. of people who benefit from the rehabilitated canals	***Output 6:*** Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	$197,841
Output 3.4 Bank strengthening work at Roness Reservoir to provide additional water retention and safety. \	No. of people who have improved access to water No. of people protected from the at-risk southern embankment	***Output 5:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	**$** 1,384,000
Output 3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)	No. of locally appropriate housing designs developed No. of demo houses constructed	***Output 6:*** Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	**$** 171,800
Output 3.6 Green-grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province.	No of people whose land is protected from salt	***Output 6:*** Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	$ 303,280

Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	The number of days' income lost to flooding events	***Output 6:*** Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.2. Type of income sources for households generated under climate change scenario	**$** 814,655
Output 3.8 Weather station and tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Okhna Heng Commune, Prey Nob District	No. of people who have improved access to weather information and early warning	***Output 6:*** Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	**$** 102,380

Adaptation Fund Core Indicators	Indicative Targets	Comments
1 Number of Beneficiaries	62,521 (50% women)	This only measures the beneficiaries of physical investments. It does not count the government officers trained by the project under Component 2
2. Early Warning Systems	1	There is no local early warning system in place, but local people receive warming of hazards from Ministry of Water Resources and Meteorology through TV, media and local authorities.
3. Assets Produced, Developed, Improved, or Strengthened	11 infrastructures	The investment sheets (Part II, Section A, and online)
4. Increased income, or avoided decrease in income	4500 people will directly increase their income, 57,113 will indirectly increase their income	The 4500 people will benefit from the adaptation activities at Veal Rinh Market (output 3.7) The 57,113 beneficiaries are the combined total of outputs 3.2 (a&b), 3.3, 3.4 and 3.6. The adaptation actions under these outputs will enable to increase their incomes through improved water management
5. Natural Assets Protected or Rehabilitated	391ha	The adaptation activities under output 3.1 will lead to the planting/replanting of 134ha of mangrove, protecting 1143ha of land and benefitting 17,754 people. Activities under 3.6 will plant 257ha of mangrove and protect up to 20,000 people

G. DETAILED BUDGET

Programme Component	Outputs	Activities	Total Budget	Year 1	Year 2	Year 3	Year 4
Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments	1.1. Community capacity built to collect and manage solid waste	1.1.1 Define trainee group 1.1.2 Baseline knowledge/training needs assessment 1.1.3 Define/prepare training materials 1.1.4 Give trainings 1.1.5 Monitor	$ 101,395	$ 48,928	$ 52,467		
	1.2. Communities in target areas have been trained on resilient house construction techniques	1.2.1 Define trainee group 1.2.2 Baseline knowledge/training needs assessment 1.2.3 Define/prepare training materials 1.2.4 Give trainings 1.2.5 Monitor	$82,995	$36,378	$46,617		
	1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3	1.3.1 Define community members who will lead 1.3.2Baseline knowledge/training needs assessment 1.3.3 Develop training materials 1.3.4Organise community-scale committees 1.3.5 Monitor	$ 90,269	$ 39,102	$ 51,167		
		COMPONENT 1 TOTAL	**$ 274,659**	**$124,408**	**$ 150,251**		
Government planning and technical capacity enhanced to sustain and enhance the	2.1. Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	2.1.1 Define trainee group 2.1.2Baseline knowledge/training needs assessment 2.1.3 Define/prepare training materials 2.1.4 Give trainings 2.1.5 Monitor	$ 75,684	$ 35,967	$ 39,717		

project's adaptation benefits	2.2. Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	2.2.1 Define trainee group 2.2.2 Baseline knowledge/training needs assessment 2.2.3 Define/prepare training materials 2.2.4 Give trainings 2.2.5 Monitor	$121,695	$35,809	$50,048	$35,839	
	2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits	2.3.1 Perform institutional review 2.3.2 Make recommendations 2.3.3 Train appropriate range of officers 2.3.4 Highlight best practices and integrate into plans	$88,856	$24,639	$38,278	$25,939	
	2.4 Knowledge from the project implementation is captured and disseminated to local and national stakeholders, focusing on sustainable adaptation actions and policy enhancement	2.4.1 Write case studies 2.4.2 Develop stories for radio broadcasts (note that radio is still a very common means of receiving information in rural Cambodia) 2.4.3 Develop high level policy recommendations 2.4.4 Conduct national level policy alignment workshops	$75,306	$9,320	$17,089	$22,989	$25,909
		COMPONENT 2 TOTAL	**$361,541**	**$105,734**	**$145,132**	**$84,767**	**$25,909**
Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	3.1. 134ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	3.1.1 Site reconfirmation and finalisation 3.1.2 Develop and finalise the Mangrove Planting and Management Plan (MPMP) 3.1.3 Approve the MPMP 3.1.4 Plant the mangroves 3.1.5 Monitor the progress of the mangrove areas and highlight any problems	$294,470	$80,000	$160,000	$30,000	$24,470
	3.2a Water gates repaired in 3 locations in Pong Teuk and Angkaol	3.2.1 a&b Reconfirm and design in further detail, based on technical drawings provided 3.2.2 Procure the necessary construction materials	$5,341		$ 5,341		

	3.2b Canals Rehabilitated in Pong Teuk and Angkaol Communes	3.2.3 Undertake the construction work during the dry season	$76,050		$25,000	$40,000	$11,050
	Output 3.3 Prevention of salt water ingress through improved channels	3.3.1 Final re-confirmation on ESS, considering the need for an access road 3.3.2 Procurement of hardware 3.3.3 Site clearance and access road construction 3.3.4 Install gates and embankments	$197,841	$30,000	$150,000	$17,841	
	Output 3.4b Bank strengthening work at Roness Reservoir to provide additional water retention and safety.	3.4.1 Clear the site 3.4.2 Confirm (through survey if necessary) that the site is clear on UXO 3.4.3 Procure the necessary hardware 3.4.4 Undertake bank stabilisation work	$1,384,000	$350,000	$550,000	$430,000	$54,000
	Output 3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)	3.5.1 Develop in greater detail demo house drawings 3.5.2 Select training beneficiaries considering age, gender and location 3.5.3 Run educational programmes/courses for trainees 3.5.4 Construct demo houses with trainees	$171,800	$50,000	$50,000	$50,000	$21,800
	Output 3.6 Green-grey protective infrastructure in Ou	3.6.1 Design new gates and site visits 3.6.2 Install new gates 3.6.3 Develop mangrove plantation and management plan	$303,280	$100,000	$100,000	$75,000	$28,280

	Ohkna Heng Commune, P. Sihanouk Province.	3.6.4 Plant mangrove					
	Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	3.7.1 Re-consult the sellers and the owner with a view to minimising risks and disruption arising from the works 3.7.2 Procure all necessary materials 3.7.3 Undertake works	$814,655	$100,000	$250,000	$420,000	$44,655
	Output 3.8 Tide gauge with early warning system broadcast capabilities installed. Tide Gauge in Ou Okhna Heng Commune, Prey Nob District.	3.8.1 – Import the tide gauge and weather station 3.8.2 – installation of tide gauge and weather station and integration with other PoWRAM systems 3.8.3 – Training for PoWRAM and other related officials.	$102,380			$102,380	
	ESP Compliance		$167,940	$20,000	$60,000	$60,000	$27,490
		Component 3 TOTAL	**$3,517,308**	$730,000	$1,350,341	$1,225,221	$211,745
		PROJECT ACTIVITIES TOTAL	$4,153,507	$960,142	$1,645,724	$1,309,988	$237,654
Programme execution		Project Team Leader (part-time)	$17,000	$4,250	$4,250	$4,250	$4,250
		Programme Manager	$256,200	$36,600	$73,200	$73,200	$73,200
		Office staff and technical support	$63,000	$9,000	$18,000	$18,000	$18,000
		Office facilities	$42,000	$6,000	$12,000	$12,000	$12,000
		Travel related to execution	$54,600	$7,800	$15,600	$15,600	$15,600

	Final Evaluation	$21,813	$	$	$	$21,813
	PROJECT EXECUTION TOTAL	$454,788	$63,650	$123,050	$123,050	$145,038
	TOTAL PROGRAMME COST	**$4,608,295**	$1,023,792	$1,768,774	$1,433,038	$382,692
Programme cycle management	PSC 7 Percent (on total operational budget including components below) approx. 7.1 percent	$325,010	$32,511	$65,023	$178,813	$48,663
	Evaluation support cost (HQ)	$10,000	$1,500	$2,800	$3,900	$1,800
	Project Support Costs (ROAP) - Project Management Committee Meetings - IE staff salary / supervision of reports etc. - Project supervision missions	$56,695	$7,195	$11,500	$30,000	$8,000
	PROJECT CYCLE MANAGEMENT TOTAL	**$391,705**	**$41,206**	**$79,323**	**$212,713**	**$58,463**
	AMOUNT OF FINANCING REQUESTED	**$5,000,000**	$1,064,998	$1,848,097	$1,645,751	$441,155

Detailed Budget for Components 1&2

Output		Cost	Year 1	Year 2	Year 3	Year 4
	Output 1.1					
	Main Partners MoE/ NCSD, local governments					
	trainings on provincial and commune level	**6,800**	3,200	3,600	0	0
	Climate Change Assessment Specialist (Int)	**33,695**	13,478	20,217	0	0
	Community Mobilizer, GIS support, enumerators	**23,100**	10,500	12,600	0	0
	Communication (data for tablets/GIS etc.)	**5,400**	1,800	3,600	0	0
	Laptops (2), printer	**5,000**	5,000	-	0	0
	Production of maps, printing of assessments etc	**6,250**	3,500	2,750	0	0
	City consultations	**8,750**	5,250	3,500	0	0
	Tranport/Travel /mission	**12,400**	6,200	6,200	0	0
	Sub total 1	**101,395**	**48,928**	**52,467**	**0**	0
	Output 1.2					
	Main Partners MoE/ NCSD					
	Urban Planner/DRR expert (int)	**33,695**	13,478	20,217	0	0
	Training (evidence base action palnning)	**8,250**	3,850	4,400	0	0
	Planners	**19,250**	8,250	11,000	0	0
	Transport (travel/per diem)	**18,600**	9,300	9,300	0	0
	Reports	**3,200**	1,500	1,700	0	0
	Sub total 2	**82,995**	**36,378**	**46,617**	0	0
	Output 1.3					
	Main Partners MoE/ NCSD, local governments					
	Climate Change Planner	**33,695**	13,478	20,217	0	0
	Local Planners, GIS support, enumerators	**16,800**	6,300	10,500	0	0
	Training	**5,600**	2,400	3,200	0	0
	Transport (travel/per diem)	**18,600**	9,300	9,300	0	0
	City consultations	**10,500**	5,250	5,250	0	0
	Production of maps, printing of plans etc	**5,074**	2,374	2,700	0	0
	Sub total 3	90,269	39,102	51,167	0	0
	Outcome 1 total	**274,659**	**124,408**	**150,251**	**0**	**0**

Output 2.1					
Main partner NCDD					
Climate Change Planning/Assessment Expert	**40,434**	20,217	20,217	0	0
Capacity Development Expert	**24,750**	11,000	13,750	0	0
Initial Training	**5,500**	2,750	2,750	0	0
Layout and printing	**5,000**	2,000	3,000		
Sub total 4	**75,684**	**35,967**	**39,717**	0	0
Output 2.2					
Main partner MoE					
Climate Change Assessment Expert:	**33,695**	10,109	16,848	6,739	0
Community Mobilizer, GIS support, enumerators	**33,600**	10,500	14,700	8,400	0
Training	**5,500**	1,100	2,200	2,200	0
Rental of drone, tablets	**4,200**	1,500	1,700	1,000	0
Communication (data for tablets/GIS etc.)	**9,000**	1,800	3,600	3,600	0
Transport (travel/per diem)	**31,000**	9,300	9,300	12,400	0
Production of maps and documents	**4,700**	1,500	1,700	1,500	
Sub total 5	**121,695**	**35,809**	**50,048**	**35,839**	**0**
Output 2.3					
Main partner MoE					
Climate Change Planner	**26,956**	6,739	13,478	6,739	0
Local Planners, Community Mobilizers, Facilitators	**29,400**	8,400	12,600	8,400	0
Transport (travel/per diem)	**18,600**	6,200	6,200	6,200	0
Community consultations	**9,000**	1,800	3,600	3,600	0
Production of maps, printing of plans etc.	**4,900**	1,500	2,400	1,000	0
Sub Total 6	**88,856**	**24,639**	**38,278**	**25,939**	**0**
Output 2.4					
Main Partners MoE/ NCSD, local governments					
Knowledge Management Expert	**26,956**	3,370	6,739	6,739	10,109
Knowledge Management workshops	**3,300**	550	550	550	1,650
Transport (travel/per diem)	**34,850**	4,100	8,200	12,300	10,250
Production of reprots documents e-stories	**7,500**	1,000	1,000	2,500	3,000
Communication	**2,700**	300	600	900	900
Sub total 7	**75,306**	**9,320**	**17,089**	**22,989**	**25,909**
Outcome 2 total	**361,541**	**105,734**	**145,132**	**84,767**	**25,909**

Output 3.1

ITEM	ZONE	LAND SIZE (Ha)	ALLOCATED BUDGET ($USD)(3)
Mangrove Plantation Asessments	All districts		$50,000
Kep District Mangrove Reforestation	Mangrove Plantations within High to Medium Intertidal Zones	37.19	$39,979
	Mangrove Densification (plantation spacing at 50% relative to new plantation zones)	0	$0
Angkoal District Mangrove Reforestation	Mangrove Plantations within High to Medium Intertidal Zones	97.2	$104,490
	Mangrove Densification (Plantation spacing at 50% of new plantation zones)	0	$0
Nursery Establishment Costs	Mangrove Nursery ($25,000)	NA	$25,000
Comminity Awareness Training	NA	NA	$50,000
Pilot Studies for Phase 2 Works	NA		$25,000
			$294,469

Output 3.2a

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Concrete gate 1	4.2 m^3	$104	$440
Gate with plate and spindle including frame	1	$3,500	$3,500
Filling material gate 1	6 m^3	$8.00	$48
Concrete gate 2	1 m^3	$104	$104
Filling material gate 2	3 m^3	$8.00	$24.00
Concrete gate 3	3 m^3	$104	$310
Sandbags needed for construction all gates	15 m^3	$13	$195
Labour (unskilled)	20 days	$15	$300
Labour skilled	10 days	$30	$300
Pump to drain work space	1	$120	$120
		TOTAL	$5,341.00

Output 3.2b

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Removal of debris	8600m³	$6	$51,000
Labour (unskilled)	250 days	15	$3,750
Labour (skilled)	60 days	30	$1,800
Equipment	500hr	39	$19,500
		TOTAL	$76,050

Output 3.3

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Topographic survey along proposed line of embankment, 370 m – (2 x skilled surveyor for 4 days each)	8	$300	$ 2,400
Site clearance	3.000 m2	$20	$ 60,000
Embankment fill	5,500 m3	$8	$ 44,000
Water gate - culverts	6	$900	$ 5,400
Water gate – transport for culverts	1	$1,000	$ 1,000
Water gate – concrete	160 m3	$145	$ 23,200
Water gate - steelwork	Lump Sum		$ 15,000
Water gate – duck bill valves	4	$400	$ 1,600
Water gate – other (mesh etc.)			$ 2,000
Temporary access track			$ 16,241
Design support team - engineer (2 engineers for 3 weeks)	42 days	$300	$ 12,600
Labour – skilled (3 labourers for 8 weeks)	120 days	$30	$ 3,600
Labour – unskilled (18 labourers for 8 weeks)	720 days	$15	$ 10,800
		TOTAL	$197,841

Output 3.4

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Vegetation clearance / management on embankment (1.4 km x 5m)	7,000 m2	$ 9	$ 63,000.00
Ground Investigation (20 boreholes to 15m depth, 5 boreholes to 25m depth, 30 boreholes to 10m depth and conversion of 8 boreholes to monitoring wells to 10m depth), including field engineer supervision	725m	$ 120.00	$ 87,000.00
Ground investigation – testing and analysis of samples (as detailed in implementation section below)			$ 45,000.00
Monitoring wells – recording of data on a weekly basis (done by existing reservoir maintenance staff on site)			$ -
International consultancy support / supervision	160 individual work hours	$ 250.00	$ 40,000.00
Dams Supervising Engineer – supervision and review of inspection, design (assume 4 weeks)	100 individual work days	$ 500.00	$ 50,000.00
Design support team – hydrology, hydraulic engineer, geologist, structural engineer (average unit rate, national engineer)	600 individual work days	$ 300.00	$ 180,000.00
QA	4 individual work days	$ 300.00	$ 1,200.00
Additional material required to widen and improve safety of the dam (estimated – based on additional average dam cross-section of 35m2 over 1.4km length)	60,000 m3	$ 8.00	$ 480,000.00
Polythene liner embedded in dam upstream face and keyed into bed of reservoir (1.4 km x 18m)	25,200 m2	$ 4.00	$ 100,800.00
Additional concrete works (spillway, apron, gate housings)	250 m3	$ 145.00	$ 36,250.00
Spillway surface reinforcement			$ 150,000.00
Labour (skilled) (15 skilled operatives for 5 months)	2,500 individual work days	$ 30.00	$ 75,000.00
Labour (unskilled) (workforce of 50 working 8 hour days for 5 months)	5,050 individual work days	$ 15.00	$ 75,750.00
		TOTAL	$1,384,000.00

Output 3.5

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Project Preparation Phases			
Material & sustaintability survey (2 staff for 28 days)	56 days	$300 per day	$ 16,800
Development of 'demo' building drawings	20 days	$300 per day	$ 6,000
Development of building manuals	30 days	$300 per day	$ 9,000
Construction of Demo Houses (In Kep and Prey Nob Provinces)			
Construction of Traditional Style Demo Houses with Latrine and Storm-water Tanks (1 per commune, 4 total)	4	$15,000	$ 60,000
Construction of Masonry Style Demo Houses with Latrine and Storm-water Tanks (1 per commune, 4 total)	4	$15,000	$ 60,000
Engineering Input	10 days	$300 per day	$ 3,000
Training Seminars			
- 2 highly skilled tradesmen to run educational programs (50 sessions in total at 3 hours per session) – Assume 20 attendees each class, with at least 5 women, and preferably 10.	100 x 4 hours sessions	$20 per hour	$ 8,000
- Engineer to train tradesmen and women and run preliminary courses.	10 days	$300 per day	$ 3,000
- Training Materials	-	-	$ 1,000
- Miscellaneous Costs	-	-	$ 5,000
		TOTAL	$ 171,800

Output 3.6

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Provision of stop boards to enable access (approx..2.5m x 1m, 2 per gate)			$500
New steel gates and mechanism and refurbish runners	4 sets	$5,000	$20,000
Remove rusted rungs and install new steel ladder access	10 locations		$5,000
Labour – skilled (1 team leader for 10 days)	10	$30	$300
Labour – unskilled (5 operatives for up to 10 days each)	46.5	$15	$700
Mangrove Plantations within High to Medium Intertidal Zones		208.97	$224,643
Mangrove Densification (Plantation spacing at 50% of new plantation zones)		48.5	$52,138
		Total	$303,280

Output 3.7

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Culvert 1500 x 1500 mm	1060 m	300$/m	$ 318,000
Traffic culvert 1500 x 1500 mm	100 m	2,500$/m	$ 250,000
Labour	375 days	$15 per day	$ 5,625
Labour skilled	125 days	$30 per day	$ 3,750
Connection with existing drainage system of surrounding	20 points	250$/point	$ 5,000
Trees	244 unit	20$/unit	$ 4,880
Excavation	1360 m	2.5$/m	$ 3,400
Lighting (Existing)			
Asphalt	2160 m2	75$/m2	$ 150,000
Rainwater tank	100 unit	130$/unit	$ 13,000
Excavator	1000 hr	39$/unit	$ 39,000
Garbage trap	4 unit	3,000$/unit	$ 12,000
Eco-Treatment	2 unit	5,000$/unit	$ 10,000
		TOTAL	$ 814,655

Output 3.8

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Provision of wave and tide gauge for remote, shallow location – type 'FSI Remote Coastal Reporter'			$23,250
Shipping, customs clearance, local shipping taxes, transhipment to shallow draught vessel for access to site and delivery			$23,760
Automated Weather Station			$50,000
Installation of SAME			$5,370
		TOTAL	$102,380

Budget Explanatory Notes

Project Execution Cost

A. Project Support Costs (ROAP) - Project Management Committee Meetings - IE staff salary / supervision of reports etc. - Project supervision missions: The Human Settlement Officer at the Regional Office of UN-Habitat will provide oversight support and regular field mission for which $7,195; $11,500; $30,000: $8,000 are budgeted for respective year with a total budget of $56,695 for the project period.

B. Following national staff are budgeted:
- Program Manager for 42 person-months at $6,100 per month with a total allocation of $256,200. The Programme Manager will be contracted through UNON.
- Office staff and technical support for 42 person-months at $1,250 per month with a total allocation of $52,500.

C. Following Operations costs are budgeted:
- Office operations at $1,000 per month. Total budget $42,000.
- Travel related to execution at $1,200 per month. Total budget $54,600.

D. $21,988 has been budgeted for project evaluation including support from UN-Habitat HQ.

Project Cycle Management Fee

a. Project Support Cost by the UN-Habitat Regional Office is budgeted at 1.134% of total cost.
b. UN-Habitat HQ Project Support Cost is budgeted at 7% of total cost.
c. $10,000 has been budget for UN-Habitat HQ Evaluation Unit support to the project

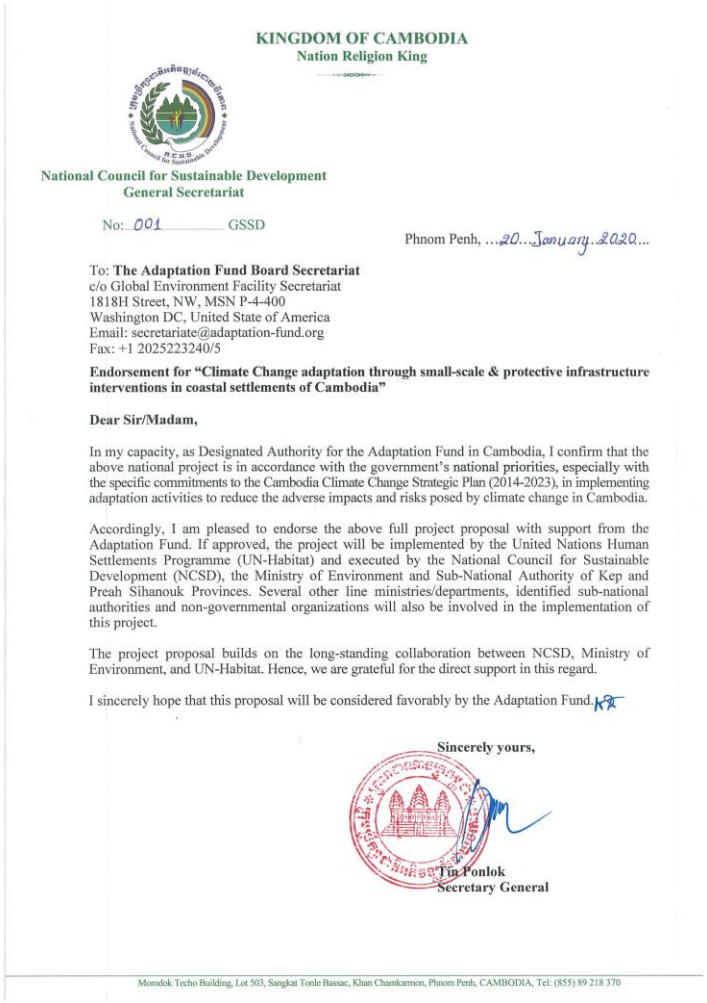
H. DISBURSEMENT SCHEDULE

	Year 1	Year 2	Year 3	Year 4	Total
Schedule date	1st disbursement – upon agreement signature **October 2019 Or Upon Signing**	2nd disbursement – One Year after project start **October 2020**	3rd disbursement - Two years after project start **October 2021**	4th disbursement – Third Year after Project Start **October 2022**	**TOTAL**
A. Project Funds (US$)	$960,142	▪ Upon First Annual Report ▪ Upon financial report indicating disbursement of at least 70% of funds $1,645,724	▪ Upon Second Annual Report ▪ Upon financial report indicating disbursement of at least 70% of funds $1,309,988	▪ Upon Third Annual Report ▪ Upon financial report indicating disbursement of at least 70% of funds $237,654	$4,153,507
B. Programme Execution	$63,650 Milestones (by end of year) - Full list of trainees decided with background info developed (for Outputs 1&2)	$123,050 Milestones (by end of year) - All training materials finalised - 50% of training complete (for Components 1&2) - Mangrove planting (physical works) complete - Output 3.2a+b construction complete	$123,050 Milestones (by end of year) - All training complete (Components 1&2) - Local level plans updated - Output 3.3 physical works complete - Output 3.4 (a,b and c) physical works complete - Output 3.5 all demo houses and training complete - Output 3.6 All physical works complete - Output 3.7 All physical works complete - Output 3.8 Weather station and Tide gauge fully operational	$145,038 Milestones (by end of year) - All monitoring complete - Case studies complete - Output 3.3 – Site restored to original state **if** communities don't want to keep the access road - Output 3.7 Best practice case study and replication designs complete	$454,788
C. Programme Cycle Mgt	$41,206	$79,323	$212,713	$58,463	$391,705
TOTAL	$1,064,998 - Baseline knowledge/TNA complete (for outputs 1&2)	$1,848,097 - Output 3.3 access road complete - Output 3.4 Construction underway - Demo house construction underway - Output 3.6 Design work and MPMP complete - Output 3.6 Gates installed - Output 3.7 physical works underway - Output 3.8 Procurement and import complete	$1,645,751	$441,155	**$5,000,000**
Milestone	- Training materials drafted - MPMP Complete - UXO clearance report (where necessary) - Detailed house designs completed - Further market consultations complete and works underway (output 3.7)				

Part IV – Endorsement by Government and Certification by the Implementing Entity

A. Record of endorsement on behalf of the government[62]

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:



KINGDOM OF CAMBODIA
Nation Religion King

National Council for Sustainable Development
General Secretariat

No: 001 GSSD

Phnom Penh, ...20...January..2020...

To: **The Adaptation Fund Board Secretariat**
c/o Global Environment Facility Secretariat
1818H Street, NW, MSN P-4-400
Washington DC, United State of America
Email: secretariate@adaptation-fund.org
Fax: +1 2025223240/5

Endorsement for "Climate Change adaptation through small-scale & protective infrastructure interventions in coastal settlements of Cambodia"

Dear Sir/Madam,

In my capacity, as Designated Authority for the Adaptation Fund in Cambodia, I confirm that the above national project is in accordance with the government's national priorities, especially with the specific commitments to the Cambodia Climate Change Strategic Plan (2014-2023), in implementing adaptation activities to reduce the adverse impacts and risks posed by climate change in Cambodia.

Accordingly, I am pleased to endorse the above full project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the United Nations Human Settlements Programme (UN-Habitat) and executed by the National Council for Sustainable Development (NCSD), the Ministry of Environment and Sub-National Authority of Kep and Preah Sihanouk Provinces. Several other line ministries/departments, identified sub-national authorities and non-governmental organizations will also be involved in the implementation of this project.

The project proposal builds on the long-standing collaboration between NCSD, Ministry of Environment, and UN-Habitat. Hence, we are grateful for the direct support in this regard.

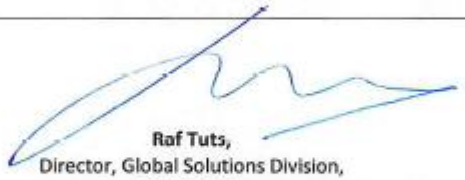
I sincerely hope that this proposal will be considered favorably by the Adaptation Fund.

Sincerely yours,

Tin Ponlok
Secretary General

Morodok Techo Building, Lot 503, Sangkat Tonle Bassac, Khan Chamkarmon, Phnom Penh, CAMBODIA, Tel: (855) 89 218 370

1. 6. Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

I certify that this proposal has been prepared in accordance with the guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans, including Cambodia's National Strategic Development Plan, its National Climate Change Strategy and Sector Action Plans, its Second National Communication to the UNFCCC. Subject to approval by the Adaptation Fund Board, I commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the implementing entity will be fully (legally and financially) responsible for the implementation of the project/programme.
 **Raf Tuts,** Director, Global Solutions Division, UN-Habitat
Date: 17th January 2020 — Tel.: +254-20-762-3736; E-Mail: raf.tuts@un.org
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Annex 1 – Community Consultations and Vulnerability Assessment

A. Summary of Results from Community Consultation in Kep and Preah Sihanouk Provinces

I. Kep Province

Kep province is located on low land close to the sea. Storm surge, flood and sea water intrusion were the main concerns raised during the field mission. Rice production has been affected by floods, groundwater has been contaminated by see water, poor houses have been destroyed by storms, and the coastline has been eroded by sea level rise and strong waves.

Kep province is highly vulnerable to climate change, especially in Angkaol commune. Storms are predominant concerns, while floods, saline intrusion (as influenced by sea level rise) and coastline erosion are as additional concerns. The highest vulnerabilities relates to agriculture (rice fields and salt farms). The vulnerability affects social welfare (and public health, economic growth and livelihoods), and unique habitats and ecosystems. Cultivated land is known to be vulnerable to saline intrusion in low land areas. The production of rice and crops are reduced due to poor soil quality and salinity. Storm surge causes disturbance to daily living and destruct agriculture production.

There are five target communes/ sangkat in Kep province as below information:

1. Beneficiaries

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	Number of villages/Communities	4	7	3	2
2	Total population	8,566	10,987	8,521	4,917
3	Number of Female	4,280	5,574	3,994	2,358
4	# of age 0-17	3,288	4,579	2,969	2,111
5	# of age 18-60	4,729	5,668	5,112	2,262
6	# of > age 60	549	740	440	544
7	# of indigenous people	0	0	0	0
8	# of disabled population	108	169	78	98
9	# of informal settlements	20	25	260	13
10	# of households	1,835	2,481	1,917	1,074
11	Poverty rate (%)	18,04	11,66	11,41	9,30
12	How many people (percent) will benefit from the following interventions in the community: Main climate change impacts and risks need are: Storm, flood, Saline intrusion, drought				
	Physical/structural interventions (roads, bridges, agriculture irrigation, water supply facilities, drainage system, houses)	80%	80%	50%	50%
	Trainings	50%	50%	50%	30%
	Communication	100%	100%	100%	100%
	Information	100%	100%	100%	100%
14	Early warning systems in place covering different types of hazards (e.g. floods, cyclones, storms, droughts, etc.)				
15	Existence of drainage and sewage system	No system in place			
16	Existence of different groups (ethnic, women, elderly, disabled, youth) who are treated differently. If so, how?				
17	Participation of women in decision-making process. If no, why?				
18	Responsible person to take elderly, disabled people and children				
19	Main livelihoods / sources of income in community?				

2. Climate change – impacts, barriers for adaptation and possible interventions analysis

No.	Name of Sangkat/commune	Most problematic climatic hazard	Effects	Factors stopping your community from coping with current impacts	Prioritized activities/ infrastructure to enhance adaptive capacity
1	Angkaol				

2	Pong Tuek	• Storm surge • Flood and sea water intrusion • Sea level rise and strong waves • Drought • Beach erosion • Water pollution	• Low rice production • Contaminated ground water • Destroyed houses • Slow down fishing activities • Damaged roads and dikes • Coastline erosion • Lack of water supply • Poor sanitation and health issues	• Bad infrastructure • Limited irrigation • Insufficient clean water supply • Limited of education and skills • Lack of sanitation • Health issues • Poor management of natural resources like forests • Poor houses	• Improve road condition and drainage system • Agriculture irrigation • Trees plantation on coastline • Water supply by digging new ponds and wells • Conserve and protect natural resources and biodiversity • Resilient houses models • Environmental management activities, e.g. planting trees, improve sanitation • Provide vocational training on various topics
3	Prey Thom				
5	Kep				

Note: Climate hazards, effects, coping barriers and priority interventions have been consolidated because they are similar in each Sangkat/commune.

3. Strengthened institutional capacity

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	Having a structured plan for hazard risk reduction/ climate change adaptation	Yes, the structured plan in place but there is no facilities and financial assistance as well as limited capacity on climate change adaptation and resilience.			
2	Experience of the municipality on specialist training (for risk reduction and resilience)	There is no/limited capacity/experience at municipality or provincial level on specialist training. Usually, national specialists provide these such trainings.			
3	Having a CC and resilience plan incorporated into planning schemes	Yes, commune development plan has been elaborated climate change but limited implementation due to no fund and capacity.			
4	Reporting awareness of exposure to at least one key hazard	No, local community could not make a report on this matter due to lack of capacity. National and provincial officials have assisted on this report.			

4. Assets produced, developed or strengthened (Health issues related to climate change)

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	# of households to report an occupant with diarrhoea in last 3 months in this settlement	0	0	0	0
2	# of households to report an occupant with malaria/ dengue last year	0	0	0	0
3	Existence of drainage issues that may give rise to mosquito borne diseases	Yes	Yes	Yes	Yes
4	Main health problems/ issues	No major health issues but lack of sanitation and hygiene cause of health problem to children and women. Blood pressure and liver function are main health issue for older people.			

5. Urban development and housing

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	# of dwellings with 'average' or 'poor' quality walls	1,363	1,423	1,282	660
2	# of overcrowded dwellings	43	17	28	8
3	# of dwellings, which have been trained on enhancing dwelling resilience	0	0	0	0

Physical Infrastructure

No	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	Are the streets and roads in this settlement planned and paved?	y	y	y	y
2	How many schools are there in this settlement? Are they built in a resilient manner?	7	7	5	2
3	How many hospitals/health posts are there in this settlement? Are they built in a resilient manner?	1	2	1	0
4	Are the necessary protective infrastructures in place (e.g. dams and walls) to reduce impact of flooding, storms, etc. in this community?	0; small canal to receive water from Pong Tuek 2 dams to avoid salt water intrusion into rain fields	1	Shared with Ou Krasar, only 20% has been used by Prey Thom; 1 reservoir.	0
5	Does this settlement have an operational drainage system? Is it sufficient to drain precipitation and avoid flooding?	n	n	n	n
6	How many pagodas/mosques	3	5	3	3

6. Water resources and infrastructure

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	# of households with toilet	1,618	1,627	1,125	605
2	% of households using following types of toilets: 1) Shared community toilet 2) Share neighbours 3) Connected to septic tank 4) Straight pipe 5) Connected to town sewerage system	90% - Straight pipe 10% - Septic tanks	90% - Straight pipe 10% - Septic tanks	80% - Straight pipe 20% - Septic tanks	70% - Straight pipe 30% - Septic tanks
3	Average type of toilet: 1) Water seal 2) Flush 3) Pit	90% - Pit 10% - Flush	90% - Pit 10% - Flush	60% - Pit 40% - Flush	60% - Pit 40% - Flush
4	% of households with toilet discharging directly into the environment (unimproved pit toilet or straight pipe to sea/river/etc,)	100%	100%	100%	100%
5	Main water resource for livelihood	Surface water (ponds), ground water (wells), and rain water			
6	# of households that own (not shared) formal water connection with meter	162	1,658	459	439

7. Waste and waste infrastructure

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	Existence of regular waste collection by council or private organization	No	No	No	Yes
2	% of households to dispose waste in river, creek, or sea	10%	15%	15%	5%
3	% of households to burn or bury waste	90%	85%	85%	20%

8. Natural assets protected or rehabilitated

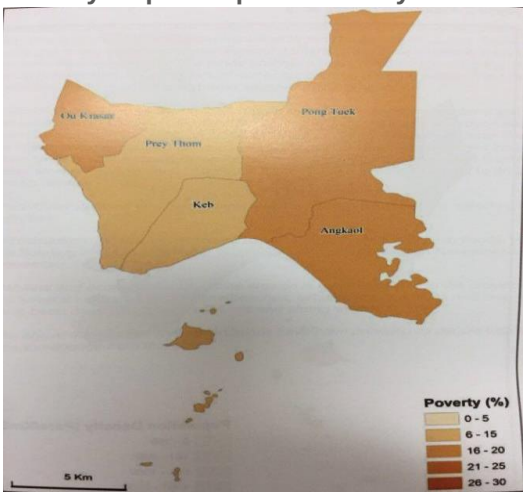
No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep	
1	Does this settlement report issues with pollution/ environmental degradation (e.g. coral or mangroves)? And how many people affected - livelihoods	Yes, local settlement report issues with pollution and environment degradation that affected to majority of people in the city, particularly fisherman.				
2	Has any steps been taken in this settlement to improve/ maintain/reduce impacts on natural assets? And how many people affected - livelihoods	Due to no financial assistance, there is no major action taken place. Individual people have taken care for themselves. There is around 20-30% of population affected their livelihood.				
	Main environmental problems **(Choose Top 3)** 1) River flooding 2) Coastal Flooding (saltwater intrusion) 3) Surface Flooding (rainwater) 4) River Bank Erosion (soil disappearing) 5) Inland erosion 6) Coastal Erosion (beach disappearing) 7) Pollution (dirty air, dirty water, dirty soil) 8) Rubbish (waste management) 9) Drainage (e.g., blocked drains) 10) Sanitation (problems with toilet) 11) Decline in Mangrove areas 12) Plant Disease 13) Insects or bugs (flies, mosquitoes)	1. Coastal Flooding (saltwater intrusion) 2. Decline in Mangrove areas 3. Surface Flooding (rainwater) 4. Freshwater for drinking and usage		1. Drainage (e.g. blocked drains) 2. Sanitation (problems with toilet) 3. Decline in Mangrove areas 4. Surface flood		

10. Improved policies & regulations

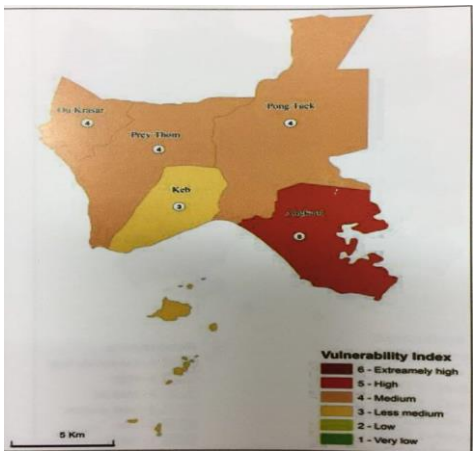
No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep	
1	Does the sangkat/commune has the necessary building regulations for resilient development? Are they enforced properly in this community?	There are building regulations from national that has applied for nationwide usage. They are enforced by technical line department of land management, urban planning and construction. However, there is very limited information on the resilient development in those regulations.				
2	Have any policies been introduced or adjusted in your municipality to address climate change?	There is no local policy to address climate change but they implement the national climate change action plan and NAPA. Commune development plan and investment programme have also addressed climate change and disaster risk reduction.				

11. Community vulnerability and risk map

Poverty Map of Kep Province by Commune



Overall Vulnerability of Kep Province by Commune



II. Preah Sihanouk Province

Several climate change issues were discussed during the field consultation. Concerns included erratic rainfall, sea water intrusion on rice fields and ground water, storms and storm surge destroying rice and crop production, and waste management.

Households: Poor households living in homes built with zinc and thatched roofs, located on low lands along the coastline, are sensitive to storm surge and sea level rise. These CC exposures also affect drinking water, sanitation, health and livelihoods. Drought or erratic rainfall is also main issues that can affect water supplies and drinking water when the dry season lasts longer than usual. The capacity of these people to recover from extreme weather is still limited. Additionally, the management of solid water is also an issue, as it was found that the waste was floated during the floods.

The assessment studied 10 communes in Preah Sihanouk Province. Note, only 7 of these are included in the final project proposal.

1. Beneficiaries

No.	Municipality/ District	Prey Nob								Sihanoukville	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	Number of Villages/communities	4	4	3	3	5	5	5	6	2	3
2	Total population	5,455	4,413	3,641	10,717	6,683	7,944	9,006	7,917	1,693	18,613
3	Number of Female	2,720	2,198	1,919	5,636	3,334	3,976	4,559	4,025	791	9,308
4	# of age 0 - 17	2,133	1,728	1,620	3,850	2,474	2,909	3,696	2,170	611	7,316
5	# of age 18 - 60	2,930	2,182	1,724	6,007	3,795	4,163	4,834	4,847	985	10,324
6	# of > age 60	392	503	297	860	414	872	476	900	97	973
7	# of indigenous people	0	0	0	0	127	0	0	0	0	0
8	# of disabled population	25	25	19	80	37	42	115	83	7	46
9	# of immigrants	551	178	101	628	223	340	139	464	526	5,582
10	# of informal settlements	45	13	0	40	17	42	21	5	330	160
11	# of households	1,169	963	1,044	1,967	1,352	1,608	1,688	1,503	427	4,094
12	Poverty rate (%)	20.2	20.1	19.2	26.3	19.8	18.8	18.0	12.6	23.7	11.7
13	How many people will benefit from the following interventions in the community: The main climate change impacts and risks need to be focused are: storm surge, strong waves, sea water intrusion, ground water, pollution, drinking water, waste and flood.										
	Physical/structural interventions (roads, dikes, water supply facilities, market, irrigation, drainage system, houses)	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
	Trainings	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
	Communication	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%

	Information	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
14	Early warning systems in place covering different types of hazards (e.g. floods, storms, drought etc.)	There is no local early warning system in place but they receive warming system from Ministry of Water Resources and Meteorology through TV, media and local authorities.									
15	Existence of drainage/sewage system	There is limited drainage system available only in the downtown									
16	Existence of different groups (ethnic, women, elderly, disabled, youth) who are treated differently. If so, how?	There are no different groups established. They are under the supervision and management of Commune's children and women committee									
17	Participation of women in decision-making process. If no, why?	Yes, women have involved all level of decision-making but they have limited knowledge and experience.									
18	Responsible person to take elderly, disabled people and children	There are provincial, district and commune disaster committees and red-cross committee's responsibilities.									
19	Main livelihoods / sources of income in community?	Fishery, agriculture, industry, poultry/animal raising, building construction and tourism									

2. Climate change - Trend analysis

No	Municipality / District	Name of Sangkat/commune	Most problematic climatic hazard	Effects	Factors stopping your community from coping with current impacts	Prioritized activities/ infrastructure to enhance adaptive capacity
1	Prey Nob	Tuek Thla	• Storm surge • Strong waves • Sea water intrusion • Ground water • Pollution • Drinking water • Waste management • Flood, and • Sea level rise,	• No tourists to visit • Destroyed houses • Damaged roads and dikes • Low fish production • Low rice production • Contaminated ground water • Coastline erosion • Lack of water supply • Poor sanitation and health issues	• Low income that affect to livelihood due to no tourists • Bad infrastructure • Insufficient clean water supply • Poor house conditions • Lack of sanitation • Health issues • Poor management of natural resources like forests • Limited irrigation • Limited of education and skills	• Improve road condition • Provide clean water supply • Provide proper drainage system • Conserve and protect natural resources and biodiversity • Provide resilient house models • Environmental management activities, e.g. planting trees, improve sanitation • Provide vocational training on various topics • Agriculture irrigation
2		Tuek L'ak				
3		Sameakki				
4		Veal Renh				
5		Samrong				
6		Prey Nob				
7		Ou Oknha Heng				
8		Boeng Taprom				
9	Sihanoukville	Koh Rong				
10		Sangkat Muoy				

3. Strengthened institutional capacity

No.	Municipality/ District	Prey Nob								Sihanoukville	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	Having a structured plan for hazard risk reduction/ climate change adaptation	Yes, there is a structured plan in place but very limited operation/function due to no capacity and fund.									
2	Experience of the municipality on specialist training (for risk reduction and resilience)	No specialist training from the municipality/district level to support the communities. They are from provincial and national level with limited supported.									
3	Having a CC and resilience plan incorporated into planning schemes	Yes, all plans such as commune, district/municipality, and provincial development plans have addressed climate change adaptation and resilience. However, the implementation is limited due to low capacity and financial support.									
4	Reporting awareness of exposure to at least one key hazard	Yes, there is a report on disaster happened in the areas such as storms and flood.									

4. Assets produced, developed or strengthened (Health issues related to climate change)

	Municipality/ District	Prey Nob	Sihanoukville

No.	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	# of households to report an occupant with diarrhoea in last 3 months in this settlement	0	0	0	0	0	0	0	0	0	0
2	# of households to report an occupant with malaria/ dengue last year	0	0	0	0	0	0	0	0	0	0
3	Existence of drainage issues that may give rise to mosquito borne diseases	Yes, there is drainage issues such as bad smell, pollution, mosquito and bad living environment									
4	Main health problems/ issues	There are skin diseases, mosquito borne diseases and high blood pressure									

5. Urban development and housing

No.	Municipality/ District	Prey Nob								Sihanoukville	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	# of dwellings with 'average' or 'poor' quality walls	973	879	854	1,399	1,187	1,392	1,438	1,342	373	3,157
2	# of overcrowded dwellings	30	23	47	50	11	7	30	10	29	46
3	# of dwellings, which have been trained on enhancing dwelling resilience	0	0	0	0	0	0	0	0	0	0

6. Physical Infrastructure

No	Municipality/ District	Prey Nob								Sihanoukville	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	Are the streets and roads in this settlement planned and paved?	y	y	y	y	y	y	y	y	n	20%
2	How many schools are there in this settlement? Are they built in a resilient manner?	4	3	3	2	3	3	3	5	2	3
3	How many hospitals/health posts are there in this settlement? Are they built in a resilient manner?	0	3	1	1	0	1	0	1	1	1
4	Are the necessary protective infrastructures in place (e.g. dams, walls) to reduce impact of flooding, storms, etc. in this community?	0	1	0	1	2	3	0	1	0	0

5	Does this settlement have an operational drainage system? Is it sufficient to drain precipitation and avoid flooding?	n	n	n	n	n	n	n	n	n	n
6	How many Pagodas/Mosques exist?	2 Mosques	1 Pagoda	2 Pagodas	2 Pagodas	5 Pagodas	2 Pagodas and 2 Mosques	2 Pagodas and 3 Mosques	2 Pagodas and 3 Mosques; 50 % are Cham Muslim	1 Pagoda	1 Pagodas

7. Water resources and infrastructure

No	**Municipality/ District**	**Prey Nob**								**Sihanoukville**	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	# of households with toilet	455	702	724	1,433	794	1,254	777	760	318	3,757
2	% of households using following types of toilets: 1) Shared community toilet 2) Share neighbours 3) Connected to septic tank 4) Straight pipe 5) Connected to sewerage system	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100 %	Straight pipe – 70% Septic tank – 30%
3	Average type of toilet: 1) Water seal 2) Flush 3) Pit	Flush	Flush	Flush	Flush	Flush	Flush	Flush	Flush	Flush	Flush
3	% of households with toilet discharging directly into the environment (unimproved pit toilet or straight pipe to sea/river/etc.)	100%	100%	100%	100%	100%	100%	100%	100%	100 %	100%
3	Main water resource for livelihood	Surface water, underground water, ponds, wells, and rainwater									
4	# of households that own (not shared) formal water connection with meter	872	598	905	1,955	877	965	698	1,225	95	3,043

8. Waste and waste infrastructure

No.	**Municipality/ District**	**Prey Nob**								**Sihanoukville**	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	Existence of regular waste collection by council or private organization	No	No	No	No	No	No	No	No	No	No

2	% of households to dispose waste in river, creek, or sea	20%	20%	20%	10%	20%	20%	20%	20%	10%	15%
3	% of households to burn or bury waste	80%	80%	80%	90%	80%	80%	80%		90%	85%

9. Natural assets protected or rehabilitated

No.	Municipality/ District	Prey Nob								Sihanoukville	
	Name of Sangkat/ commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	Does this settlement report issues with pollution/ environmental degradation (e.g. coral or mangroves)?	Yes, local settlement report issues with pollution and environment degradation that affected to majority of people in the communities.									
2	Has any steps been taken in this settlement to improve/ maintain/reduce impacts on natural assets?	There is very limited implementation because no fund support. Community people have taken care for themselves. There is around 50% of population affected their livelihood.									
	Main environmental problems **(Choose Top 3)** 1) River flooding 2) Coastal Flooding (saltwater intrusion) 3) Surface Flooding (rainwater) 4) River Bank Erosion (soil disappearing) 5) Inland erosion 6) Coastal Erosion (beach disappearing) 7) Pollution (dirty air, dirty water, dirty soil) 8) Rubbish (waste management) 9) Drainage (e.g. blocked drains) 10) Sanitation (problems with toilet) 11) Decline in Mangrove areas 12) Plant Disease 13) Insects or bugs (flies, mosquitoes)	• Decline in Mangrove areas • Drainage (e.g., blocked drains) • River flooding, coastal flooding (saltwater intrusion), surface flooding (rainwater)								• Deforestation • Pollution/ Rubbish/ Drainage/ Sanitation • Coastal Erosion	

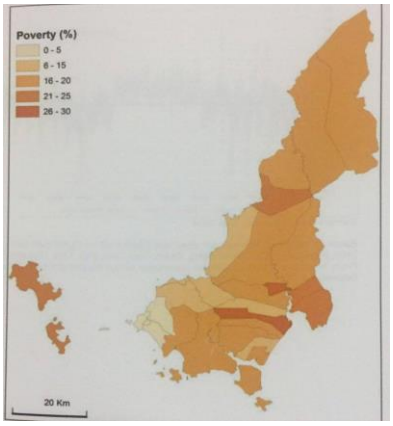
10. Improved policies & regulations

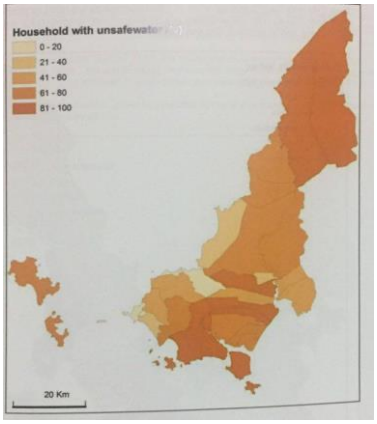
No.	Municipality/ District	Prey Nob								Sihanoukville	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy
1	Does the sangkat/commune has the necessary building regulations for resilient development? Are they enforced properly in this community?	No, they don't have a local building regulation. So people in the community to build their houses based on their experience and practice. However, the Ministry of Land Management, Urban Planning and Construction has issued all necessary building regulations that applied for nationwide implementation. But those regulations may not include the resilient development.									
2	Have any policies been introduced or adjusted in your municipality to address climate change?	There is no local policy to address climate change, but they implement the national climate change action plan and NAPA. Commune development plan and investment programme have also addressed climate change and disaster risk reduction.									

11. Community vulnerability and risk map

Poverty Map of Preah Sihanouk Province by Commune

Household with unsafe water of Preah Sihanouk Province by Commune





B. Action Planning

Prognoses of interventions based on in-depth community consultation in target provinces. Information in below tables established the basis to identify the catalogue of intended sub-projects.

I. In Kep Province

Commune/ Sangkat of Kep Province	Main Climate Change Impact	Activities		
Angkaol	1. Strong winds (more than 100 HH in 2013 and 20-30 per year)	1.1. Advocacy on planting more trees	1.2. Demonstration of resilient housing design	
	2. Sea water floods	2.1. Protective infrastructure (road or dam)		
	3. SLR and beach erosion	3.1. Erosion vulnerability assessment and hazard map	3.2. Protective infrastructure (road)	
Pong Tuek	1. Strong winds (20-30 HH per year)	1.1. Advocacy on planting more trees	1.2. Demonstration of resilient housing design	
	2. SLR and salinization	2.1. Advocacy on reforestation of the coast-line	2.2. Protective infrastructure (canal, fresh water reservoir)	2.3. Salt-resilient crops for agriculture
	3. Beach erosion	3.1. Erosion vulnerability assessment and hazard map	3.2. Protective infrastructure (road)	
Prey Thom	1. Drought	1.1. Fresh water reservoir		
	2. Lack of water supply	2.1. Rain water harvesting	2.2. Piped water supply	2.3. Advocacy esp. to children and women about health issues of unsafe water
	3. Strong wind (60 HH destroyed per year)	3.1. Advocacy on planting more trees	3.2. Demonstration of resilient housing design	
Kep	1. Flood	1.1. Improvement of flood-protective 3-4 km long canal (shared with Ou Krasar commune)		
	2. Drought	2.1. Water supply from Kampot is a goal of the CIP for 2022, but water shortage is an urgent issue of today		

	3. Strong wind (20 HH destroyed per year)	3.1. Advocacy on planting more trees	3.2. Demonstration of resilient housing design	
Ou Krasar	1. Strong wind	1.1. Advocacy on planting more trees	1.2. Demonstration of resilient housing design	
	2. Unsafe water	2.1. Awareness on health issues to unsafe water and how to avoid		
	3. Drought	3.1. Rehabilitation of irrigation and capacity to harvest water during dry season	3.2. Drought-resilient crop for agriculture	

II. In Preah Sihanouk Province[63]

Commune/Sangkat of Preah Sihanouk Province	Main Climate Change issue	Activities		
Tuek Thla	1. Drought	1.1. Rehabilitate reservoir located in one village to improve the water supply for the whole year		
	2. Flood	2.1. Build water gate for existing reservoir		
	3. Strong wind	3.1. Advocacy on planting more trees	3.2. Weather station, broadcasting extreme weather events and EWS	3.3. Demonstration of resilient housing design and training of local craftsmen
Tuek L'ak[64]	1. Drought	1.1. Build a reservoir or dam with water gate to keep water		
	2. Flood	2.1. Assess possible infrastructure like canals to channel rain water		
	3. Strong wind	3.1. Advocacy on planting more trees	3.2. Weather station, broadcasting extreme weather events and EWS	3.3. Demonstration of resilient housing design and training of local craftsmen
	4. Decline of mangroves	4.1. Make eco-tourism areas accessible	4.2. Demarcation of areas for eco-tourism	
Samakki	1. Flood	1.1. Repair the water gate		
	2. Strong wind (100 HH per year destroyed in Tuek Thla, Tuek L'ak and Samakki)	2.1. Advocacy on planting more trees	2.2. Weather station, broadcasting extreme weather events and EWS	2.3. Demonstration of resilient housing design and training of local craftsmen
	3. Drought (Jan-May no drinking water. It needs to be bought costly from neighbouring communes)	3.1. Build dam and water gate that keeps water for 100 ha of land during the dry season		
	4. Decline of mangroves	4.1. Make eco-tourism areas accessible	4.2. Demarcation of areas for eco-tourism	

[63] Because the project will not implement the concrete component in Koh Rong and logistical constrains, the mission from 11th to 16th of December 2017,where actions were identified, did not visit the Koh Rong commune, an island about 27 km from the mainland

[64] Natural protected area of Kampong Smach involving 6 communes of Prey Nob District (Tuek Lak, Samakki, Veal Renh, Ou Oknha Heng, Samrong and Boeng Taprom).

Veal Rinh	1. Strong wind	1.1. Advocacy on planting more trees	1.2. Weather station, broadcasting extreme weather events and EWS	1.3. Demonstration of resilient housing design and training of local craftsmen
	2. Drought (Jan-May no drinking water. It needs to be bought costly from neighbouring communes)	2.1. Improve access to drinking water by building dam or channel water through canals		
	3. Flood	3.1. Channel floods through canals and water gates		
	4. Decline of mangroves	4.1. Make eco-tourism areas accessible	4.2. Demarcation of areas for eco-tourism	
Samrong	1. Drought	1.1. Build water gate to channel and harvest rain water		
	2. Flood	2.1. Repair roads that were damaged by floods	2.2. Build water gate to channel rain water during heavy rainfalls	
	3. Strong winds	3.1. Advocacy on planting more trees	3.2. Weather station, broadcasting extreme weather events and EWS	3.3. Demonstration of resilient housing design and training of local craftsmen
	4. Decline of mangroves	4.1. Make eco-tourism areas accessible	4.2. Demarcation of areas for eco-tourism	
Prey Nob	1. Drought	1.1. Rehabilitation of canals in Oknha Heng could keep the water channelled in Prey Nob		
	2. Flood (affects esp. the market, the source of regular income of the people)	2.1. Rehabilitation of canals in Oknha Heng can avoid floods in Prey Nob	2.2. Build drainage system and sanitation system esp. around the market	
	3. SLR	3.1. Improve 8km of road to protect the road to the garment factory from SLR		
Ou Oknha Heng	1. Salinization	1.1. Rehabilitation of protected dam along 3 villages in order to avoid sea-water intrusion of the rice fields	1.2. Improvement of canals across the communes	
	2. Drought	2.1. Rehabilitation of canal to provide fresh water during dry season	2.2. Build barriers for animals to avoid contamination of fresh water reservoirs	
	3. Decline of mangroves	3.1. Make eco-tourism areas accessible	3.2. Demarcation of areas for eco-tourism	
Boeng Taprom	1. Flood	1.1 Rehabilitate the canal to channel floods and harvest fresh-water in the dry season		
	2. Salinization	2.1. Rehabilitate the canal to protect fresh-water from sea-water intrusion	2.2. Build dam (or protective infrastructure) to mitigate SLR	
	3. Decline of mangroves	3.1. Make eco-tourism areas accessible	3.2. Demarcation of areas for eco-tourism	

Sangkat Muoy	1. Drought	1.1. Build water pipelines. Esp. people living on the hill-side cannot access water during the dry season. Approx. 500 HH have no access to safe drinking water.	1.2. Wastewater sewage system can also avoid contamination of rain water, which otherwise goes straight into the sea. But difficult to implement due to land ownership issues.	
	2. Strong wind	2.1. Advocacy on planting more trees	2.2. Demonstration of resilient housing design and training of local craftsmen	
	3. Lack of drainage system and wastewater management system	3.1. Build wastewater treatment plant	3.2. Channel drainage to redirect the water flow	

Annex 2 – Environmental and Social Risk Screening, Impact Assessment and Environmental and Social Management Plan

The purpose of this Annex is to demonstrate the project's compliance with the Environmental and Social and Gender Policies of the Adaptation Fund. It provides an analysis of the potential environmental and social risks of the project's physical activities and highlights opportunities, concluding in an Environmental and Social and Gender Policy Compliance Plan. The contents of this plan will be made available to the PSC before the project commences, and it will be used as a basis to brief beneficiary communities before the project commences. Its contents will be translated into Khmer prior to the start of the project, and its key findings and messages will be simplified to enable beneficiary communities to understand them.

Compliance with environmental and social safeguards

Environmental and social safeguards are essential tools to prevent and mitigate the potential for undue and unintended harm that could arise from project activities. In line with the Adaptation Fund's ESP and GP and UN-Habitat's Environmental and Social Safeguard Policy (ESSP), UN-Habitat and its partners are required to conduct risk screenings and impact assessments of all activities that have even a negligible risk of causing unintended harm.

To ensure compliance with the Environmental and Social Policy of the Adaptation Fund, all project activities are screened in this Annex against the 15 environmental and social principles, as defined in the Environmental and Social Policy of the Adaptation Fund. Where risks have been identified, this annex analyses the potential for impact and describes the measures that have been built into the project to avoid or mitigate risks and their impacts. Throughout the project, investments have been designed. This Annex supersedes any previous environmental and social safeguards related annex that has been submitted in previous versions of this proposal.

To ensure compliance with the Adaptation Fund Gender Policy, extensive information has been provided in Part 1 of the proposal.

The analysis presented in this Annex is based on data from the census, numerous government sources, other secondary sources and where this is not available, primary data gathered by the project formulation team. All investments identified in the project have been developed in regular consultation with local and national government and target beneficiary communities. The proposed measures to avoid, mitigate and manage environmental and social safeguards risks have also been discussed extensively with local and national government stakeholders and communities. Please note that all technical information relating to all technical designs and related information are presented in Annex 3.

2.2 Screening and Categorization

Table 2.1, below, screens the project's activities against the 15 Adaptation Fund Environmental and Social Safeguard principles (hereafter, the 15 principles) and provides a summary of why the principle has been triggered or not. Further details and analysis are provided throughout this annex. Further detailed project design sheets are provided in Annex 3. Due to space constraints in the proposal, these are summaries, and full versions can be provided upon request. Where appropriate, this annex also contains information gathered through the community consultation process, which is described further in Part II, Section H.

It should be noted at this point that only activities under Component 3 involve physical works (construction, installation of facilities, maintenance) and so on. All other activities in the other outputs proposed by the project are 'soft' activities that involve training, reports and publications. As such, the investments under Component 3 are considered category B risk and require further screening. The remaining activities under Components 1 and 2 are considered Category C and, as no risks arise, impact assessments are not required. In the analysis below, there are occasional references to mitigation

measures that are to be factored into soft activities where these support a hard activity to reduce environmental and social risks – i.e. where training will emphasize gender equality and women's empowerment. This notwithstanding, it should be assumed that soft activities have been considered to have no risk or such minimal risk that mitigation measures are not required and, for reasons of space, are not discussed further here.

Table 2.1 – Environmental and Social Risk Screening for the whole project

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment required for compliance	Explanation why principle has been triggered (or not)
1. Compliance with the law	X		All issues relating to compliance with the law have been checked in Part II, Section E and are described extensively there
2. Access and equity		**X**	This primarily relates to the demonstration houses and training under investment 3.5, and the market adaptation activity under 3.7. Without effective management and mitigation measures, these two activities ***could*** lead to preferential access to training (3.5) or denial of services (3.7) for some people ***if*** management and/or mitigation measures are not taken.
3. Marginalized and vulnerable groups		**X**	There is some risk in terms of access and equity in investments 3.5 and 3.7 (see above) and management and mitigation measures are required. This particularly relates to people living below the poverty line.
4. Human rights		**X**	Human rights risks relate primarily to land rights, and are discussed in involuntary resettlement, below. Further analysis of Cambodia's domestic human rights framework and its relationship with key international treaties is provided below
5. Gender equality and women's empowerment		**X**	Compared with some other least developed countries, women in Cambodia face comparatively little discrimination. However, many indicators of socio-economic development, such as literacy, remain lower for women. There is therefore a risk across the project that women are not included in the project, and as such their potential to benefit is reduced. Women are the primary beneficiaries in investment 3.7.
6. Core labour rights		**X**	The project will use unskilled and semi-skilled labour sourced from the communities for the planting and construction works that will take place in investments 3.1, 3.2, 3.3, 3.4, 3.6, and 3.7. Without management and mitigation measures, discussed later in this annex, there is a risk that these labourers could be mistreated. This includes low salaries below minimum wage or market rate, hiring school-age workers, discrimination against women, poor facilities, lack of safety equipment and informality.
7. Indigenous people	X		There are no indigenous people in the target area
8. Involuntary resettlement		**X**	This risk has been identified for all physical components of the project, with the exception of 3.8. While ***all*** target sites have been evaluated, most recently in November 2019 and it has been concluded that no one is living at the site or making a livelihood from it. Moreover, all investments are being made entirely on public land, and all site access is possible by public road, with the exception of investment 3.3. Investment 3.3 includes the provision to build a temporary access track, which will be cited entirely on public land. At present, this land is not occupied, but the situation can change rapidly in Cambodia. However, this risk has been triggered acknowledging that Cambodia has experienced involuntary resettlement in the past throughout the country, and the rapid nature of development in the country, including investment in nearby Sihanoukville, means that UN-

			Habitat can't be certain at this moment that there won't be informal settlers on the sites between now and project commencement.
9. Protection of natural habitats		**X**	Investments 3.1, 3.2, 3.3, 3.4, 3.6 and 3.8 take place in or near critical habitats. Investments under 3.1 inherently involve mangrove areas. Investments 3.2, 3.3 and 3.4 are in peri-urban or rural areas at the edge of Kep. 3.6 and 3.8 are located close of the Kampong Smach protected area. With this proximity in mind, there is potential for disruption of habitats through construction activities, transporting materials to and from the sites and the presence of casual labour. Investment 3.1 also carries risks – while the investment is intended to benefit the natural habitat, there is a risk, without management or mitigation measures that the investment could be counterproductive and damage the mangrove it is designed to help. For example, without a mangrove planting and management plan, there is a risk that invasive or incompatible species could be introduced to the area, risking both project failure and existing mangroves.
10. Conservation of biodiversity		**X**	See above. In particular, 3.1, 3.6 and 3.8 are in areas that are important for biodiversity (though note that none of the project is implemented in an officially designated biodiversity conservation area). Investments 3.1, 3.6 and 3.8 are implemented in or close to mangrove areas, and as such this ecosystem is critical to support marine biology as well as coastal human livelihoods (particularly crab fishing, which is a common form of livelihood, especially in Kep)
11. Climate change		**X**	All investments under Component 3 carry some limited climate change related risks, without management or mitigation measures. In all cases, materials need to be transported to the sites. Almost all this transportation is local (i.e. moving materials from builder's merchants to the sites). Investment 3.5 will use sustainable materials that will have to be transported from Phnom Penh, about 180km away by road. These activities involve small emissions relating to transportation. The weather station/tide gauge activity in 3.8 will involve importing equipment from a neighbouring country (likely Thailand). Aside from this, no other materials will be imported from abroad. The project will not implement any other emitting activities – none of the investments consume fuel or generate emissions from, for example, waste. The project is an adaptation project and as such is designed to bring adaptation benefits. However, there is a risk that if any of the investments were to be unsuccessful, they could be maladaptive – either by failing to bring benefits or by shifting climate change related risks and vulnerabilities to other areas. Mitigation and management measures are required to minimise this risk.
12. Pollution prevention and resource efficiency		**X**	There are some small risks arising from the construction. With the exception of 3.1, all investments under Component 3 involve construction using common building materials, such as concrete and building sand/fill material. Without management and mitigation measures, there is a risk of small-scale, localized pollution in and around the construction sites. This risk is exacerbated by the solid waste management system in Cambodia being imperfect in its coverage. No construction will involve hazardous materials such as chemicals other than basic paints (for painting water gates, for example).
13. Public health		**X**	There are some localised to risks to public health arising from the project. In all investments, except 3.1 and 3.8 involve creating a temporary construction site during implementation. This carries typical construction site risks (i.e. risks from vehicles entering and leaving the site, risk to children, etc).

			Sites that involve embankments – investments 3.3 and 3.4 – and the retention of water carry a risk throughout the lifespan of the infrastructure (i.e. during the project and beyond). If the embankment were to fail, there could be outflow of substantial amounts of water (especially Investment 3.4). Management and mitigation measures are required. Sites that involve water gates (3.2a&b, 3.6) also carry small health and safety risks throughout the lifespan of the infrastructure, particularly relating to broken parts or accidental misuse. Investment 3.7 involves construction works in a large market that is busy (at any point in the day there are hundreds of people working or shopping in it) and sells food products including meat, fish and vegetables. Without management and mitigation measures, there is a risk that construction works would pose a health hazard to people shopping or working in the market, and of food contamination.
14. Physical and cultural heritage		**X**	There are no UNESCO World Heritage sites in any of the target areas. There are also no sites of national heritage interest in the target area. Investments 3.6 and 3.8 are close to the Kampong Smach protected area (see Protection of natural habitats), though not in it, and access to the sites doesn't require that vehicles go through Kampong Smach. There are a few Buddhist temples throughout the area and most houses in Cambodia have a spirit house (usually at the front of the house), which are both sites of significance to local people. For this reason, this risk has been triggered and is analysed further below.
15. Lands and soil conservation		**X**	There is some negligible risk to land and soil conservation. Investments 3.1 and 3.6 involve mangroves, the planting of which involves disturbing soil. Investments 3.3 and 3.4 involve using embankment fill material, which will be procured on the open market. Investment 3.3 involves creating a temporary access track on public land, which nevertheless will disturb soils. For those reasons, this risk has been triggered.

Project Components	Expected Concrete Outputs and Target Communes	Expected Concrete Outcomes	Expected Beneficiaries	AF Environmental and Social Principle/s potentially triggered
Component 3 Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	**Output 3.1.** 134ha of Mangroves restored in Kep and Angkaol Communes, Kep Province	**Outcome 3.** At least 62,521 people have access to protective natural and social assets and/or benefit from physical infrastructure to reduce the climate vulnerability. (AF outcome 4 and 5)	17,754	AF Principles 6, 8, 9, 10, 15
	Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province		19,533	AF Principles 6, 8, 9, 12, 13
	Output 3.3 Prevention of saltwater incursion through improved channels and embankments		3,500	AF Principles 4, 6, 8, 9, 12, 13, 15
	Output 3.4 Bank strengthening work at Roness Reservoir to provide additional water retention and safety.		14,060	AF Principles 4, 6 8, 9, 10, 12, 13, 15
	Output 3.5 Resilient Housing designs developed and demonstrations constructed (Both provinces		9,720	AF Principle 2, 3, 5, 6, 11, 12, 13
	Output 3.6 Green-Grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province		20,000	AF Principles 6, 8, 9, 10, 12, 13, 14, 15
	Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province		4,500	AF Principles 2, 3, 4, 5 6, 8, 12, 13
	Output 3.8 Weather station and tide gauge with early warning system broadcast capabilities installed (weather station in Teuk La'k Commune, Tide Gauge in Ou Okhna Heng Commune, P. Sihanouk Province		30,000	AF Principles 9, 10, 11, 14

Table 2.2 Risks against the Project's Outputs

Details and results of the risk screening process; Principle 1: Compliance with the law

Explanation: All issues relating to compliance with the law have been checked in Part II Section E of the proposal and described thoroughly there. Where risks occur under Principle 4, Human Rights, Principle 8, Involuntary Resettlement and Principle 12, Pollution Prevention and Resource Efficiency, there could be potential for breaches of the law (an involuntary resettlement would clearly be a breach of the law, for example). However, these risks are discussed in those respective sections. As far as the project not being in compliance with local or national laws, this has been checked (Part II, Section E) and no further risks and thus actions are identified). Compliance with Labour Laws is analysed under the Core Labour Rights Principle.

Principle 2: Access and equity

Screening result: Potential risk resulting from activities under Component 3.

To understand risks relating to access and equity (and marginalized and vulnerable groups), we must identify that the investments under Component 3 provide two different types of adaptation services/benefits; general benefits and targeted benefits. Mangroves, for example, provide general benefits – they benefit the communities (and infrastructure) in the coastal area and as such there is no possibility for discrimination in the benefits they provide. Moreover, the relative benefits of different people in relation to these investments is determined by their proximity to them or their geographical location. The housing investment, on the other hand, provides targeted benefits, to a pre-defined group of people. In this type of investment, the risk to access and equity (and marginalized and vulnerable groups) is greater.

In this project, Investments 3.1, 3.2, 3.3, 3.4, 3.6 and 3.8 provide general benefits. Investments 3.5 and 3.7 provide targeted benefits. The beneficiaries of the general benefits of investments have been determined by the number of people living nearby, in the catchment area of the activity. The process to determine the beneficiaries of these investments was described in Part 1 and Annex 1 of the proposal. Because an extensive process has been followed to determine these beneficiaries and because these investments provide general benefits, it has been determined that there are no risks in terms of access or equity under these investments.

However, risk has been identified under investments 3.5 and 3.7, which provide targeted benefits. Without effective management and mitigation measures, these two activities ***could*** lead to preferential access to training (3.5) or denial of services (3.7) for some people ***if*** management and/or mitigation measures are not taken. In investment 3.5, the risk lies in the selection of beneficiaries, which could be preferential or unequal without management measures (i.e. effective procedures to fairly select benefits). Activity 3.7 provides primary benefits to the traders who work in and around the market, and secondary benefits to people who live in the area and who depend on it to buy goods. There is a risk during construction that people will not have complete access to the market. This would have a knock-on impact on the incomes of the traders who work there. Moreover, construction works may prevent traders from accessing the market to sell their produce. Risk management and mitigation measures are required to ensure that traders and consumers have continued, equitable access to the site during the construction phase. After construction, the improved conditions at the market should enable people improved access to the market, especially during heavy rain periods.

Principle 3: Marginalized and vulnerable groups

Screening result: Potential risk arising from investments 3.5 and 3.7. No other risks arising from other activities.

Explanation: Women and people living below the poverty line are the main marginalized groups in the area. These two issues can be interrelated – In 2014, ADB noted "female-headed households with more than two children and no adult males are much more likely to be poor and the girls more likely to be working. Households headed by women are likely to be more vulnerable; they are also likely to experience shocks differently than male-headed households, largely due to social norms and more limited economic opportunities and income[65]." According to the ID poor programme, 18 per cent of people in Kep Province and 23 per cent in Preah Sihanouk Province live below the poverty line[66].

Considering the high poverty rate, the proposal considers the poor to be a marginalised and vulnerable group. If we assumed that people are marginalised and vulnerable because they are discriminated against or excluded, then risk arises in investments 3.5 and 3.7. In 3.5 especially, poverty could be a source of discrimination (either explicit or tacit) without management or mitigation measures, while in 3.7, poverty (even relative to other traders) could be a cause of discrimination of benefits or disruption caused by the works.

Some older statistics indicate that there are a very small number undocumented migrants in the target area. However, consultations with local government have repeatedly indicated that these people have been naturalized and there are no

[65] ADB (2014) Cambodia Country Poverty Analysis, p.xi
[66] ID Poor Atlas, 2012

longer undocumented migrants in the area. All target areas have a high poverty rate, and those below the poverty line can be considered a marginalised and vulnerable group. There is a small population of Cham Muslims in the target area (especially in Prey Nob). However, they are not considered a 'minority' by the Cambodian government, and during consultations Muslim community representatives insisted that they be treated the same as the remainder of the population (i.e. they prefer not to be considered a marginalised or minority group).

Risks to women are analysed below under gender equality and women's empowerment, in Table 2.3

Output / activity	Location	Stakeholders (disaggregated marginalized or vulnerable groups)	Possible risk / adverse impacts (Identified specific needs, limitations, constraints, concerns) + identified rivals, disputants (see principle 2)
Investment 3.5	10 target communes	People below the poverty line, women	The poor and/or women are excluded from the training related to the activity, or access to the demonstration houses.
Investment 3.7	Veal Rinh Market, Veal Rinh Commune, Prey Nob District	People below the poverty line, women	The poor are excluded from the market. Women (who make up up to 90% of the market traders) are disproportionately negatively affected.

Principle 4: Human rights

Screening result: Potential risk to human rights concerning land rights and resettlement

Explanation: Please see the table below for a summary of the ratification of various human rights treaties in Cambodia. This shows that Cambodia has ratified the major rights treaties, such as CEDAW and the International Covenant on Civil and Political Rights. Cambodia has had a Special Rapporteur on Human Rights since 1998 and records show extensive visits and reports by the Special Rapporteur since 1998[67].

The human rights considerations relating to land and involuntary resettlement are analysed under the involuntary resettlement area. Potential risks to women's rights are addressed in the gender equality and women's empowerment safeguard area. Aside from this, the proposal development team is satisfied that the laws of Cambodia, its commitment to major international human rights treaties and extensive engagement with the Special Rapporteur demonstrate that the country is committed to upholding and promoting human rights principles.

Of the 6 treaties that Cambodia hasn't ratified, 5 are optional protocols, where the corresponding main convention has been ratified. The only convention that Cambodia hasn't ratified is the International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families. The proposal development team has assessed the area and ascertained that there are no undocumented migrants in the project's target area, and nothing to indicate that there will be an influx of migrants in the near future.

However, because there is a possibility for a lack of protection, precautionary mitigation and management measures are identified, below.

Table 2.4 Human Rights Treaties Ratified by Cambodia

Organisation consulted	Possible human rights issue (cited, non-ratification)

[67] https://spinternet.ohchr.org/_layouts/15/SpecialProceduresInternet/ViewCountryVisits.aspx?Lang=en&country=KHM

OHCHR	Of the 18 'core' human rights treaties, Cambodia has ratified 12 of them[68]. These are as follows:	
	Ratified • International Convention on the Elimination of All Forms of Racial Discrimination (1969) • International Covenant on Civil and Political Rights (1976) • International Covenant on Economic, Social and Cultural Rights (1976) • Convention on the Elimination of All Forms of Discrimination against Women (1981) • Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (1987) • Convention on the Rights of the Child (1990) • Optional Protocol to the Convention on the Elimination of All Forms of Discrimination against Women (2000) • Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict (2002) • Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography (2002) • Optional Protocol to the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (2006) • Convention on the Rights of Persons with Disabilities (2008) • International Convention for the Protection of all Persons from Enforced Disappearance (2010)	***Not ratified*** • Optional Protocol to the International Covenant on Civil and Political Rights (1976, signed but not ratified) • Second Optional Protocol to the International Covenant on Civil and Political Rights, aiming at the abolition of the death penalty (1991) • Optional Protocol to the International Covenant on Economic, Social and Cultural Rights (2013) • Optional Protocol to the Convention on the Rights of the Child on a communications procedure (2014) • International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families (2003, signed but not ratified) • Optional Protocol to the Convention on the Rights of Persons with Disabilities (2008)

Principle 5: Gender equality and women's empowerment

Screening result: Potential risk resulting from investments 3.5 and 3.7. No risk arising from any other activities as the project has built-in targets and indicators for the inclusion of women in its results framework.

Explanation: As highlighted in Section 1 of the proposal, while women don't face as extensive barriers and challenges in Cambodia as in some other Least Developed Countries – they have the same rights to work as men, for example – there is evidence that women are more vulnerable to climate change and have generally worse socio-economic development outcomes. In the 2013 floods, for example, women were disproportionately affected, being more likely to be at home when floods hit, having greater responsibility for caring for children and the elderly and less capacity to migrate. Women's literacy nationwide is approximately 70%, compared to 84% for men.

As stated above, only Investments 3.5 and 3.7 provide targeted benefits to people, where there is a process of selecting beneficiaries beyond people who live in a vulnerable area. There are risks of discrimination against women in these two investments. In Investment 3.5, there is a risk that architecture and construction may be perceived as 'men's jobs' and thus women won't be selected as beneficiaries, or will be, explicitly or tacitly discouraged or prevented from engaging with the investment.

Women are the primary beneficiaries of Investment 3.7. The primary beneficiaries of this investment are women, who comprise up to 90 per cent of the market traders[69]. The secondary beneficiaries of the project are people who live in the

[68] https://indicators.ohchr.org/

[69] Note that consultations indicate that there is a high turnover of traders in the market. Getting reliable, gender-disaggregated data on the number of traders is impossible. However, three rounds of consultations and site visits have repeatedly indicated that a very high number of the traders are women

target area and use the market to buy goods. While no data is available, typically women are responsible for preparing food in Cambodia, and as such are more likely to buy goods at the market.

Investment 3.7 is therefore primarily for the benefit of women, their safety and their livelihoods. However, there are two main risks arising from this investment, despite its intended benefits. Firstly, during the construction period, there is a risk that construction activities could hinder access to the market or create health and safety risks. Installing the drainage system, for example, will involve digging holes/trenches around the entrance to the market to install the new infrastructure, while the rainwater harvesting element of the design will involve upgrading the guttering and other activities on the roof. Without management and mitigation, these activities would pose risks that would disproportionately affect women. The second risk is project failure, i.e. the project is completed but proves mal-adaptive. In this case, the people who use the market would be left no better off than before the project, unable to adapt to climate change impacts. Because the project disproportionately benefits women, project failure in this case would disproportionately negatively affect women.

Principle 6: Core labour rights

Screening result: Potential risk resulting from investments under Component 3. No risk arising from any other activities.

Explanation: The project will use some community labour to do unskilled construction related tasks, in accordance with UN-Habitat's proven People's Process approach and some specialist hired (i.e. non-community) labour. The project will hire approximately 225 people in total under Component 3. Of this number, approximately 200 will be unskilled labourers (hired from the community) and 25 will be skilled workers (such as engineers or site supervisors). All investments under Component 3 require some form of labour, and 3.4 and 3.7 in particular will require relatively large teams of workers for several weeks or more.

Risks can arise in this process through the potential for exploitative practices, such as hiring school-age children, hiring people on insecure contracts, paying below the minimum wage, discrimination against women or unsafe working conditions (the latter of which is addressed in the Public Health safeguard area). Cambodia's Labour Law prescribes a maximum 48-hour working week. However, data indicates that 51-53 hour working weeks are more typical in the construction sector, creating a clear risk to legal compliance and over-work[70].

As analyzed in the next section, the risk is small, however. UN-Habitat will legally oblige (through Agreements of Cooperation) its executing partners to uphold international labour standards, and Cambodia has ratified and transposed into law all eight fundamental conventions of the International Labour Organisation (See below).

Table 2.5, Ratification of key ILO Treaties

Organisation consulted	Possible ILO core labour standards compliance issue (non-ratification)
ILO	Cambodia has ratified all eight fundamental conventions of the ILO: • Freedom of Association and Protection of the Right to Organise Convention, 1999 • Right to Organise and Collective Bargaining Convention, 1999 • Forced Labour Convention, 1999 • Abolition of Forced Labour Convention, 1999 • Minimum Age Convention, 1999 • Worst Forms of Child Labour Convention, 2006 • Equal Remuneration Convention, 1999 • Discrimination (Employment and Occupation) Convention, 1999

[70] ILO (2013) Cambodia Labour Force and Child Labour Survey 2012 Labour Force Report, p.62.

Principle 7: Indigenous people

Screening result: No risk

There are no indigenous people in the project area, as evidenced by the census and reinforced through numerous consultations with provincial government officials and commune-level officers (who are responsible for registering births, deaths and local population counts).

Principle 8: Involuntary resettlement

Screening result: Potential risk resulting from Investments 3.1-3.7. No risk arising from any other activities.

The table below provides a description of the risks at the sites of investments 3.1-3.7. Note that the project team has repeatedly visited all target sites, most recently in November 2019 (see Part II, Section H).

A cautious approach of involuntary resettlement has been taken in the preparation of this risk assessment, and in the impact analysis and management and mitigation measures presented later in this Annex. This is because Cambodia has had problems regarding resettlement in the past, including a number of high profile cases, including cases in urban areas[71][72]. A search of Open Development Cambodia's database, plus local consultations with communities and the provincial level government could not find evidence of resettlement in Kep or Prey Nob District, though there have been resettlements in Sihanoukville City (approximately 40km from the target sites in Prey Nob district). Moreover, Cambodia's rapid economic growth creates the potential for further involuntary resettlement in the future as land will inevitably be re-purposed for infrastructure or sold off to private developers – though note that there is no evidence of this at the present time at the target sites, which have been repeatedly visited and their status checked with local government, including the Provincial Department of Land Management, Urban Planning and Construction.

Table 2.6 – Involuntary Resettlement Risks

Output / activity	Location[73]	Private or public land and land use	Possible risk of resettlement (+ explanation)
3.1 – Mangrove rehabilitation	Angkaol, Pong Teuk, Prey Thom and Kep Communes, Kep Province	All land is state public land. The sites can be accessed by public road	Based on satellite imagery, there is evidence of previous, failed attempts at agriculture at the target sites (which would have been from settlers illegally occupying the land). There are also salt farms in the vicinity of the sites, especially in Angkaol, though these are not directly on the existing sites or the planned expansion areas. There is no one currently living on or occupying the site, which has been verified by site visits and consultations with, *inter alia,* the Provincial Department of Land Management and the Fisheries Administration. Nevertheless, this risk has been triggered due to historical evidence of mangrove cutting and people having attempted agriculture at the target site.
3.2a Water gate repair	Angkaol and Pong Teuk Communes, Kep Province	All land is state public land and accessed by public roads and tracks	There is no one living on or immediately adjacent to any of these target sites, all of which are accessed by public road, track or path. There are agricultural sites adjacent to the water gates that are privately owned. The construction period of the gates will take 1-2 weeks and involve some equipment (such as a concrete mixer) and there is a risk of some minimal disruption to people living near the sites or working in the fields while the works are underway.

[71] https://opendevelopmentcambodia.net/tag/forced-evictions/
[72] https://www.phnompenhpost.com/national-post-depth-politics/boeung-kak-disastrous-decade
[73] In all cases, a full map with locations is provided in Part II, Section A

3.2b Canal rehabilitation	Angkaol and Pong Teuk Communes, Kep Province	All land is state public land and accessed by public roads and tracks	As shown in the map provided in Part II, Section A, most of the canal rehabilitation sites are the same as the water gate repair in 3.2a (i.e. the water gates are located on the canals that need to be rehabilitated). As with 3.2a, there is no one living on or immediately adjacent to any of these target sites, all of which are accessed by public road, track or path. There are agricultural/rice paddy fields next to the canals that are privately owned. There is a risk of some temporary disruption for people living on or working in the adjacent fields. The clearing works will take approximately 1 month. The clearing works will involve a digger/excavator machine (which can access the sites using the public road). The debris cleared will be removed from the site by vehicle. As such, there is no risk of resettlement from this activity, but there is a potential risk of temporary disruption (noise, blocked access, equipment entering and leaving the site) during the construction period
3.3 Embankments	Angkaol and Pong Teuk Communes, Kep Province	All land is state public land	This activity is physically close investments 3.2a&b but closer to the coast and beyond the Roness Reservoir canal and water gate water system. There is no one living on the target sites, and the sites themselves are not being used for agriculture. The locations of the investments are all on public land. However, there are people living nearby and there are rice paddy fields in the area. The works will take approximately 8 weeks to complete and during this time there is a risk of disruption to people living, working or growing crops adjacent to the area. Also, risk arises from the short (200-300m) access track that would need to be constructed to bring equipment and workers to the site (presently on accessible on foot). This track can be constructed on public land (and land that is presently not being used for anything) but there is a risk that this may be disruptive for local people.
3.4 – Roness reservoir	Pong Teuk Commune (with beneficiaries in Kep and Angkaol Communes)	State public land	Roness reservoir is state public land. The southern side of the reservoir is the most heavily populated area. However, this is demarcated and separated from it by the railway line and a small access road. The east, west and north sides of the reservoir are very sparsely populated, with no houses within at least 500 metres of the embankments and a few agricultural fields. No one lives at the side, and it is not being used for anything other than water storage. This has been confirmed through site visits, satellite imagery and consultations with local government, including the Departments of Water Resources and Meteorology (Responsible for the reservoir) and the Department of Land Management, Urban Planning and Construction (responsible for land use) The site can be accessed from a public road that leads to the main National Road 2. Works at the site will take about 6 months to complete, and during this time there will be heavy vehicle traffic using the access road and parking, loading and unloading in the area. Once the construction work is complete, the reservoir will still be an open area, with public access to the access road and embankments. It will not be fenced off or enclosed. Considering this and the lack of evidence for anyone living at the site, a minor risk has been triggered and management and mitigation measures identified. It is important to note, however, that satellite imagery shows that there has been some previous attempt at agriculture at the site (see the satellite image below, under Protection of Natural Habitats). Site visits and consultations suggest that no one is currently practising agriculture at the site, so the proposal development team believes this is a historical, failed attempt at agriculture. The evidence of re-growth of trees in these areas adds further evidence that any attempts at agriculture occurred at least several years ago. No evidence was uncovered of anyone using the site at present. Any attempt at agriculture would have been informal and illegal, as the area remains state public land.

3.5 – Housing	Ten Communes	All sites on state public land	All sites for the demonstration houses are on state public land, next to the commune office. No private land will be used for this activity and construction activities will be brief and small-scale (i.e. involving one house)
3.6 – Green-Grey protection	Ou Okhna Heng Commune, Prey nob District	State public land	The entire investment – the water gates and the mangroves, are located on state-public land. There are people living without land titles close to 2 of the water gates to be repaired, and at the southern end of the mangrove plantation. However, they are not living on the sites, and they **will not** need to move as a result of the investment. The entire site is accessible by a public road. The water gate repair will need some equipment (such as a concrete mixer), but nothing that can't be transported on a small truck. There is some evidence of prior failed attempts at (illegal) agriculture in the mangrove area, but it appears that this has not been practiced for a number of years. There is also a new agro-industrial concession along the access road to the site – however this is located 1-1.5km away from the southwestern-most end of the investment. Because of this, risks are identified for this investment and management and mitigation measures are identified, below.
3.7 – Market upgrading	Veal Rinh Commune, Prey Nob District	State public land	There is some risk identified in this activity, primarily during the construction phase. The site is on public land and located next to Highway 4 (the main Phnom Penh – Sihanoukville road). The construction phase will involve installing new drainage infrastructure around the main entrance to the market, which will temporarily hinder access. However, there are numerous entrances to the market (both from the main Highway 4 and a small access road that runs perpendicular to Highway 4) which means that works can be managed in such a way that continued access will be guaranteed. Some stall-holders (especially those in the portion of the road close to the Highway 4 entrances) may be disrupted during the works, and it is possible that they will be temporarily unable to trade for short periods during the construction works, as some construction activities would risk their safety and the safety of shoppers at the market. The market is located on the west side of highway 4. See map below and in Annex 3. The new drainage will remove wastewater through a culvert under the road to the east side of the highway. There are houses and small businesses on the east side, but behind them is a mix of private rice paddy land and public open space. The water will drain to the eco-treatment facilities on this public land, behind the residential/commercial units on the east side of the highway. These sites are on public land, accessed by public roads and there is no risk of resettlement arising from this part of the activity. Once construction works are complete, there is no risk of involuntary resettlement. The works are designed to ensure continued access to the market and continued ability to trade for local people. This is a positive change on the baseline situation, where heavy rains make the market inaccessible and thus people's livelihoods are affected.
3.8 – Weather station and tide gauge	Ou Okhna Hneg Commune, Prey Nob District	State Public Land	No risk arises as a result of this activity. It is on state public land, only requires a very small amount of that land, and the locations are accessed by public roads and not currently used for any other purpose. There are no construction activities required except for the installation of equipment, which is expected to be completed in no more than 1 day.

Principle 9: Protection of Natural Habitats

Screening result: Potential risk arising from investments 3.1-3.4, 3.6 and 3.8.

Explanation: The investments are reviewed in-turn below. For background, Cambodia has eight categories of 'natural protected areas', as follows[74]:

- National Park
- Wildlife sanctuary
- Protected landscape
- Multi-purpose management area
- Biosphere reserve
- Natural heritage site
- Marine park
- Ramsar site (this is defined area(s) recognized for the importance of their wetlands and surrounding environment, including wildlife, habitats and ecosystems).

41 per cent of Cambodia's land area is under one or more forms of the above categories of protected area[75]. Kep has one national park (considered IUCN Category II), which is approximately 67km² in size[76]. None of the Kep investment sites are in the national park, though they are all only at most 10km by road from the entrance to the park. Note however that all sites can be accessed by public roads that **do not** pass through the national park area.

It should also be noted that the area highlighted in green below forms part of the Kien Giang UNESCO Man and the Biosphere reserve, and is part of Vietnam's territory. The mangrove intervention is 12km away from the boundary of Kien Giang, at its nearest point, straight line distance[77].

Investment 3.1:

Investment 3.1 concerns the proposed mangrove areas on several stretches of Kep's coastline. At present, none of this mangrove area has any protected status. However, as with any coastline it is a sensitive environment and an important natural habitat for birds, shellfish and crabs. This activity is designed to benefit both the people living in the area and the

[74] https://opendevelopmentcambodia.net/topics/protected-areas/
[75] https://www.khmertimeskh.com/87603/six-sanctuaries-proposed/
[76] https://www.protectedplanet.net/68857
[77] https://www.protectedplanet.net/478284 - distance calculated through googlemaps

natural environment. However, the risk in this activity arises from project failure; i.e. that the mangrove species planted don't succeed, or that an invasive species is used that is detrimental to the existing mangrove in the area.

No risks to either Kep National Park or Kien Giang are identified, as the activity is local, involves only planting and will not involve any chemicals or other materials that have potential for long-distance or transboundary risks. Any failure of the project would be contained to the intervention site.

Investment 3.2 and Investment 3.3

These two investments are analyzed together due to their close proximity and sharing the same ecosystem. Both investments are around 8-10km away from Kep National Park by road, and at between 3-7km away from the coastline (straight line distance). Investment 3.2a and b can be accessed by public road that does not pass through the park while investment 3.3 would need to create a short access track on public land. While both sites are away from the urban area, they are both in areas with a number of people living close by, and where people practice agriculture and access water.

In both cases, construction works are small scale, use a combination of natural materials (embankment fill) and a small amount of concrete and metal and do not produce any waste product or other externalities that could endanger the surrounding natural habitat. Nevertheless, risk has been triggered understanding that this is a peri-urban area used for agriculture and any physical works in such an area carries some small risk to the surrounding natural habitat.

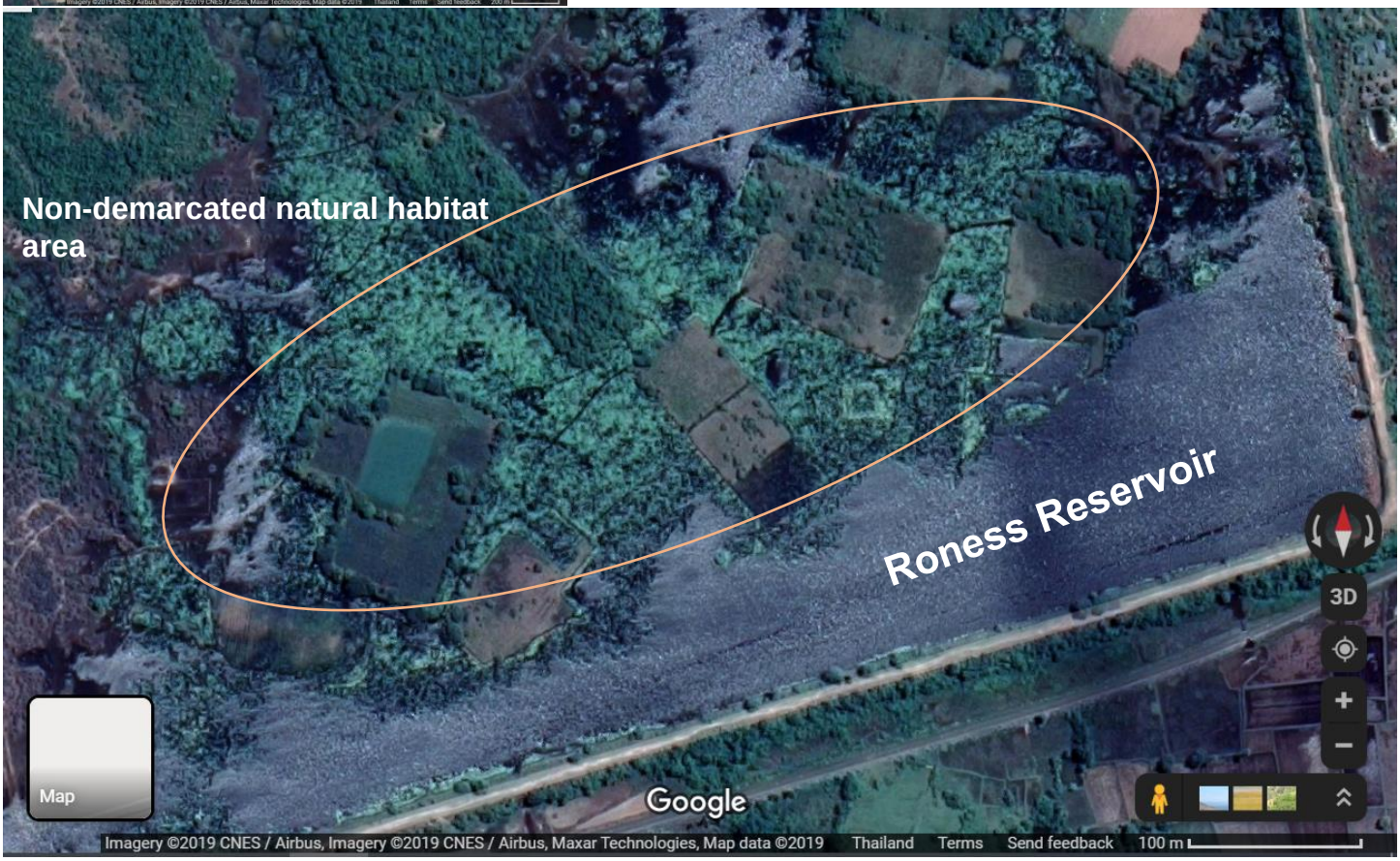
Investment 3.4

Roness reservoir is further from the coast, but around 5km from the closest point of the Kep National Park, straight line distance. While Roness is a human-made reservoir (constructed in the late 1970s), it has since become partly overgrown on its northern edge and this has become a green space with bird and possibly other wildlife.

This is demonstrated in the satellite images shown below.

However, the risk to this unplanned natural area is minimal. Primarily, the strengthening works relate to the south, east and west banks of Roness. While there is some vegetation clearance, this will primarily relate to weeds and small trees that grow along the south bank.

It should also be noted that the surrounding ground generally slopes north to south in this area, which explains the need to protect the south bank in the first instance, as this is necessary as a protective measure for the land infrastructure and people sited to the south of the reservoir.



Investments 3.6 and 3.8

Note; these investments are also being analyzed together as they are in the same area.

Investments 3.6 and 3.8 are physically close to Ream National Park, another (along with Kep) of Cambodia's seven national parks. The southwestern most extent of the mangrove activity in investment 3.6 is about 14km, straight line distance, from the closest point of Ream National Park. However, the site can be accessed without passing through Ream National Park.

The mangrove planting part of this investment shares the same risks and risk analysis as Investment 3.1, and is not repeated here. The water gate repair part of the investment involved localized construction and repair activities on the existing (but broken) water gates. The construction works are localized, only involving basic construction materials, which will be transported away from the site once construction is completed. The site (including the mangrove areas) can be accessed by an existing (not paved) public road.

The site is also physically close to the proposed Kampong Smach eco-tourism area. While Kampong Smach doesn't have protected area status, for the purpose of this project and assessment it can be considered an important natural Habitat, as it contains an estimated 1,961 hectares of mangrove and 643 hectares of muddy creeks[78].

The boundaries of Kampong Smach are not precisely defined. However, using the ICM Ecotourism Management Plan's map as a guide, the mangrove area proposed under this project would directly border Kampong Smach, and the water gate repairs would be around 4km away from its southern-most extension. Entering and leaving the construction site would not require vehicles to pass through Kampong Smach.

The tide gauge part of investment 3.8 would be located close to the water gate repairs and thus similarly close to Ream and Kampong Smach. However, this is only an installation, not a construction activity.

Principle 10: Conservation of biological diversity

Cambodia has very substantial biodiversity, with 212 species of mammals, 536 bird species, 176 reptile species, at least 850 freshwater fish species and 435 marine fish species. Among these, Cambodia has 16 endangered and 2 critically endangered species[79]. Such species include the Irrawaddy Dolphin, the Giant Ibis and the Siamese Crocodile[80].

For the purpose of assessing risks under the Conservation of biological diversity Principle, the proposal development team assumes that areas with biodiversity in the project's target area are the same as under the Protected natural habitats Principle, outlined above. There are no additional biodiversity areas (formally defined or otherwise) in the project's target area that are not mentioned under Protection of Natural Habitats). There is no evidence that any of the endangered species mentioned above can be found in the project's target area; they are mostly found in the upper Mekong, Tonle Sap or Cardamom Mountains areas, far from the project's target site.

The general risks are the same as outlined above under Protection of Natural Habitats. However, additional, biodiversity specific risks are as follows:

3.1 – Project failure and/or introduction of unsuitable mangrove species carries the risk of damaging biodiversity, including birds, crabs and shellfish that depend on the mangrove for feeding and breeding areas.

3.4 – The natural area to the north of Roness Reservoir could be host to biodiversity, particularly freshwater fish and bird species (though this has not been studied). Numerous large birds have been spotted in the area during the project formulation. Construction activities (despite being focused on the south, east and west banks of the reservoir) could therefore be disruptive to this wildlife.

3.6 – Carries the same risks as 3.1, under its mangrove component.

3.8 – Takes place in the same area as 3.6 and thus carries some risk because the tide gauge would be installed in close to a mangrove area that is important for birds, crabs and shellfish.

Principle 11: Climate change

Screening result: Potential risk resulting from activities under Investments under Component 3. No risk arising from any other activities.

[78] Preah Sihanouk Integrated Coastal Management Programme (2019) Kampong Smach Ecotourism Management Plan, p.9 (unpublished)
[79] https://en.wikipedia.org/wiki/Wildlife_of_Cambodia
[80] https://opendevelopmentcambodia.net/topics/animals/

Explanation: See table 2.1, above.

Principle 12: Pollution prevention and resource efficiency

Screening result: Potential risk resulting from activities under Investments under Component 3. No risk arising from any other activities. Particular risks emerging under investments 3.2-3.7. Investments 3.1 and 3.8 are not expected to generate any waste products or pollutants resulting from the planting, installation, maintenance or operation of the investments.

Explanation: The construction activities under investments 3.2-3.7 will use construction materials, including naturally sourced fill material, concrete, a small amount of metals (for the water gates) and paint/weather sealant. No investment under the project will use any hazardous materials in its construction, so there are no realistic risks of pollution arising from hazardous materials such as asbestos. None of the investments generate waste or bi-products resulting from their day-to-day operation, so risk emerges primarily from the construction phase. Routine maintenance may generate very small amounts of localised waste.

It should be noted that there are numerous relevant laws in the area of pollution prevention. These include the Sub-Decree on Solid Waste Management (1999), Sub-Decree on the Control on Air and Noise Pollution (2000) and Sub-Decree on Water Pollution Control (1999)[81]. More recently, a new regime of fines has been introduced for people who violate pollution related laws[82].

Table 2.7 Pollution and resource inefficiency risks arising

Output / activity	Possible inefficiencies in energy and material resource use and waste and pollution due to project activity	Possible risk
3.2a Water gate repair and Canal Rehabilitation	**Waste:** Improper disposal of waste/surplus construction materials **Procurement:** Without guidance, materials could be sourced from non-local sources, requiring unnecessary transportation **Design:** All designs are based on the use of locally available materials (or where materials are not available locally, in-country), no use of electricity and to operate without emissions or waste products	There is a risk that the activities generate waste in the construction and that this would be disposed of incorrectly. There is also risk that there could be inefficient sourcing, leading to unnecessary emissions. Because of the small-scale nature of the construction works, such waste would be small in scale. No waste products are generated from the operation of the infrastructure
3.3 - Embankments	**Waste:** Improper disposal of waste/surplus construction materials **Procurement:** Without guidance, materials could be sourced from non-local sources, requiring unnecessary transportation **Design:** All designs are based on the use of locally available materials (or where materials are not available locally, in-country), no use of electricity and to operate without emissions or waste products	There is a risk that the activities generate waste in the construction and that this would be disposed of incorrectly. There is also risk that there could be inefficient sourcing, leading to unnecessary emissions. No waste products are generated from the operation of the infrastructure
3.4 – Roness Reservoir	**Waste:** Improper disposal of waste/surplus construction materials **Procurement:** Without guidance, materials could be sourced from non-local sources, requiring unnecessary transportation **Design:** All designs are based on the use of locally available materials (or where materials are not available locally, in-country),	There is a risk that the activities generate waste in the construction and that this would be disposed of incorrectly. There is also risk that there could be inefficient sourcing, leading to unnecessary emissions.

[81] https://opendevelopmentcambodia.net/topics/pollution-and-waste/
[82] https://www.phnompenhpost.com/national/new-fines-announced-trash-code-violators

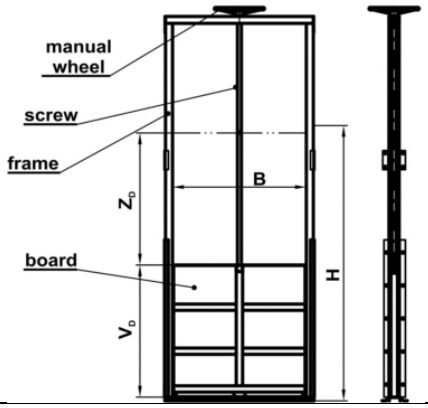
	no use of electricity and to operate without emissions or waste products	Due to the substantial size of the embankment and the scale of the investment, management and mitigation measures are required and outlined below. No waste products are generated from the operation of the infrastructure
3.5 - Housing	**Waste:** Improper disposal of waste/surplus construction materials **Procurement:** Without guidance, materials could be sourced from non-local sources, requiring unnecessary transportation **Design:** All designs are based on the use of locally available materials (or where materials are not available locally, in-country), to make the most of natural light and ventilation and to minimise waste products	There is a risk that the activities generate waste in the construction and that this would be disposed of incorrectly. There is also risk that there could be inefficient sourcing, leading to unnecessary emissions. As the houses will use wood and bamboo in their construction, risks emerge in terms of sustainable sourcing. Without management or mitigation measures, wood or bamboo could be sourced unsustainably, risking deforestation either in the local area or other parts of Cambodia. No waste products are generated from the operation of the infrastructure
3.6 – Green-Grey Protection	**Waste:** Improper disposal of waste/surplus construction materials **Procurement:** Without guidance, materials could be sourced from non-local sources, requiring unnecessary transportation **Design:** All designs are based on the use of locally available materials (or where materials are not available locally, in-country), no use of electricity and to operate without emissions or waste products	There is a risk that the activities generate waste in the construction and that this would be disposed of incorrectly. There is also risk that there could be inefficient sourcing, leading to unnecessary emissions. Because of the small-scale nature of the construction works, such waste would be small in scale. No waste products are generated from the operation of the infrastructure. No waste products are envisaged during the mangrove planting activities.
3.7 – Market Upgrading	**Waste:** Improper disposal of waste/surplus construction materials **Procurement:** Without guidance, materials could be sourced from non-local sources, requiring unnecessary transportation **Design:** All designs are based on the use of locally available materials (or where materials are not available locally, in-country), no use of electricity and to operate without emissions or waste products	There is a risk that the activities generate waste in the construction and that this would be disposed of incorrectly. There is also risk that there could be inefficient sourcing, leading to unnecessary emissions. No waste products are generated from the operation of the infrastructure. The drainage canals will have trash screens that prevent solid waste clogging the system. This is an improvement on the baseline situation, where the current, limited drainage system is entirely clogged with waste. However, the waste will still need to be removed from the screens, and as such management and mitigation measures are required.

Principle 13: Public Health

Screening result: Potential Risk resulting from some activities under Component 3. No risk arising from any other activities.

Explanation: The table below provides a detailed, investment-by investment description of where risks to public health occur. Risks have been triggered wherever there is a construction site, because improperly managed construction sites cause health and safety risks to local people if improperly managed. More generally, however, most of the investments provide protective rather than provisioning services, meaning that there are few public health type risks emerging from their operation after the construction period. Where these exist, they are highlighted in the table below.

Table 2.8 – Health Risks Arising

Output / activity	Possible health risks	Description possible health risks / impacts
3.2 – Water gate repair and Canal rehabilitation	Construction site risks Broken parts and misuse	There will be a short construction period of around 6 weeks (i.e. 1-2 weeks on 3.2a and 1 month for 3.2b) during which there will be typical construction site public health risks to local people. This includes vehicles entering and leaving the site, a team of workers, some physical equipment (such as concrete mixing on 3.2a). Without risk management and mitigation measures, there are public health risks to local people, particularly children, living in the area, as they may not understand the risk arising from construction activities. 3.2a involves manually operated water gates, per the design in the picture below. There is a risk that, over time, the metallic moving parts of the gates may break and cause injury to the gate operator. Management and mitigation measures are required and outlined below 
3.3 - Embankments	Construction site risk Project failure/embankment instability	There will be a short construction period of around 8 weeks. This includes vehicles entering and leaving the site, a team of workers, some physical equipment including compacting equipment. Without risk management and mitigation measures, there are public health risks to local people, particularly children, living in the area, as they may not understand the risk arising from construction activities. As the embankment is protective, a project failure (i.e. failure of the embankment) would cause public health risks to people living within its protective zone. Design, management and mitigation measures are therefore required to prevent this.
3.4 – Roness Reservoir	Construction site risk Project failure/embankment instability	There will be a construction period of approximately 6 months. This includes vehicles entering and leaving the site, a team of workers, some physical equipment including compacting and general construction equipment. Without risk management and mitigation measures, there are public health risks to local people, particularly children, living in the area, as they may not understand the risk arising from construction activities. There is also a specific risk as the site is adjacent to the main Sihanoukville to Phnom Penh railway which was re-opened in 2016 and now has a few freight and passenger trains every day. The road that connects Highway 33 (the main Kep – Phnom Penh highway) and Roness Reservoir crosses the railway but without any lights, barrier or other safety equipment. Construction vehicles entering the site will have to use this road and thus cross the railway. The baseline situation is that Roness Reservoir's embankments (and especially the embankment on the south side) are in an unsafe condition. This is a substantial risk to the homes, agricultural lands and railway immediately to the south of the site at

		present. The project is designed to eliminate this risk (as a co-benefit to its adaptation purpose). However, project failure (i.e. failure during or after construction of the southern embankment) would lead to substantial public health risks from flooding. Considering the above, risk avoidance, design, management and mitigation measure are proposed.
3.5 - Housing	Construction site risk	The construction sites in this investment are specifically for the purpose of training local carpenters. Nevertheless, these sites carry specific risks to the trainees, including from construction equipment, working on roofs, etc. There is also a risk that the construction sites pose a risk to the general public if they are improperly signposted and separated. Risk management and mitigation measures are proposed below.
3.6 – Green-grey protection	Construction site risk	For the risk arising from the water gate repair part of this investment, see 3.2, above. No risks are foreseen from the mangrove part of the investment.
3.7 – Market Upgrading	Construction site risk	There will be a construction period of 3-4 months under this activity. This will include vehicles entering and leaving the site (though considering that the site is at the side of the main Phnom Penh-Sihanoukville highway, this brings negligible additional risk) team(s) of workers and general construction equipment. Without management and mitigation measures, and safety conscious design features, there are public health risks to traders and shoppers using the market. There are specific risks in place at the market. Aside from the business of the area which receives substantial pedestrian traffic and its proximity to the road, the market sells fresh food produce, including meat, fish, fruits and vegetables, as well as cooked foods (there are several food stalls in the market). There are specific risks arising from the construction relating to food contamination. As the drainage part of the works will take place next to Highway 4, there are risks to both people working at the site (From passing traffic, which includes buses and heavy trucks) and risks to passing traffic from the construction activities. Considering the above, comprehensive risk management, mitigation and design features are required.

Principle 14: Physical and cultural heritage

Screening result: Potential Risk resulting from some activities under Component 3. No risk arising from any other activities.

Explanation: There are three UNESCO World Heritage sites in Cambodia; The Angkor Temple Complex in Siem Reap Province, the Preah Vihear Temple in Preah Vihear Province and the Ancient Inshapura site in Kampong Thom Province[83]. All of these sites are at least 300km by road from the areas targeted by this project and as such there is no risk to these sites. There are a further 8 sites on Cambodia's tentative heritage list, none of which are in either of the target provinces. The closest of the tentative Word Heritage sites is Phnom Da/Angkor Borei in Takeo Province, around 100km from Kep by road. This site will not be affected by the proposed project.

Most of the investments are in peri-urban areas. However, there are a few temples in the vicinity. Both target areas have mosques too, but none were found within a 10km radius of the investments (with the exception of Investment 3.7). Consultations with communities, undertaken several times in the formulation screened for sites of tangible or intangible

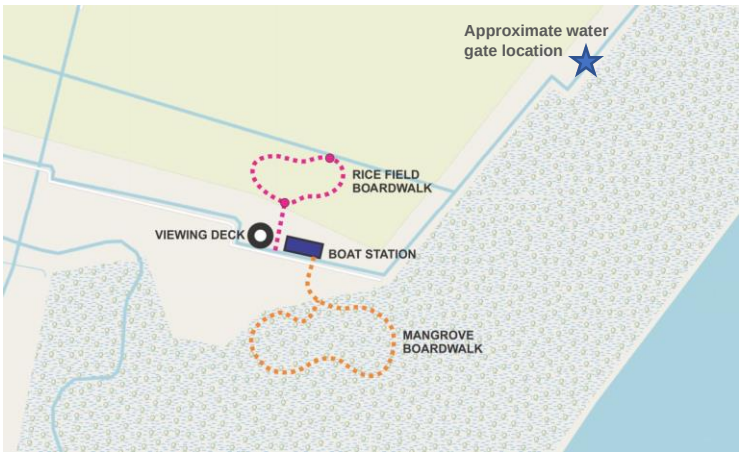
[83] http://whc.unesco.org/en/statesparties/kh

cultural heritage, but none were found. In fact, risks to physical and cultural heritage were only found at the sites of Investments 3.6 and 3.8.

Investment 3.6 and 3.8

The risk to physical and cultural heritage has been triggered specifically for these two investments because of the emergence of the proposed Kampong Smach Ecotourism Management Plan which was released as a draft for consultation in February 2019 (and was therefore not considered extensively in previous versions of this proposal).

While the Kampong Smach mangrove area is outside of (though bordering with) the proposed area of these two investments, some of the proposed ecotourism developments proposed in the plan are in the target site. While this is not *per se* physical or cultural heritage, it is considered here as it has the potential (and is intended) to become a site of cultural (and economic importance). The Plan proposes four sites for eco-tourism development. Of these, two sites are very close to the proposed investments under 3.6 and 3.8. The picture below (left) shows a computer-generated image of the proposed watch tower/visitor center development that would take place at the first site (in the target area).



The picture on the right[84] shows a picture of activities that are proposed at site 1. As the picture shows, one of the mal-functioning water gates is close to the proposed development (about 300-500 meters away).

The proposed activities in the Kampong Smach plan are at this stage only at the planning phase, and as of November 2019 they are not funded. However, risk management measures are identified on the assumption that they are built some time in conjunction with the proposed programme.

Principle 15: Land and soil conservation

Screening result: Potential Risk resulting from some activities under Component 3. No risk arising from any other activities.

Explanation: Risks have been identified under investments 3.1, 3.3, 3.4 and 3.6. No risks under the other investments. First, turning briefly to the investments where no risk has been identified. 3.2(a&b) are upgrades/repairs to existing infrastructure that will not change the siting of the infrastructure, and will not conduct any digging, dredging or other activities that would disturb the soil. 3.5 Also doesn't require any digging or disturbance of the soil beyond the installation of house foundations. Considering that the land is not currently used for any agricultural purpose this is not considered a risk. 3.7 is in a highly urbanized area and will do any digging or disturb the soil as the necessary infrastructure is mostly already in place, but just needs to be improved. 3.8 is an installation, rather than construction activity, and thus will not

[84] Picture source: Preah Sihanouk Integrated Coastal Management Programme (2019) Kampong Smach Ecotourism Management Plan, p.23 (unpublished). Approximate location of the water gate added by the author

disturb the soil. The water gate repair part of investment 3.6 doesn't involve any soil disturbance either, as the gates are already existing *in situ*.

Mangrove Investments (3.1 and 3.6) – Risk has been identified in these investments because planting activities inherently involve digging and changing the exact nature of the soil. As identified under Principle 9, project failure (i.e. introduction of unsuitable species or death of mangroves) is the main risk, and this would be a risk to land and soil conservation in the same way that it is a risk to the natural habitat. With this in mind, risk management measures are proposed later in this Annex.

Embankments (Investments 3.3 and 3.4) – While neither of these activities involve digging or dredging, they do require embankment fill material (i.e. natural soil/earth type material). Without risk management or mitigation measures, there is a risk that this material will be unsustainably sourced and thus create land and soil conservation issues at source (whether inside or outside the project's target area). Risk management and mitigation measures are proposed as a result.

2.3 Environmental and Social Impact Assessment

The table below provides an overview of the project's proposed activities and their potential risks and impact assessment against the 15 principles. Due to space constraints, the information presented below is summary in nature. More detailed project design sheets with more detailed information have been prepared and can be shared with the Adaptation Fund upon request. The project development team has included what it believes to be all the pertinent information here.

The below tables describe potential impact that could be reasonably expected **if no risk management or mitigation measures were put in place.**

Table 2.9 Environmental and Social Impact Assessment – Investments 3.1-3.8

Project activities Activities	Potential risk / impact	Impact assessment
All investments (see right-hand column where impacts relate to specific investments)	Risks identified all under ESP Principles, except Principles 1 and 7	**Access and Equity** As highlighted in the risk assessment, above, this project has two types of investments. Investments 3.1-3.4, 3.6 and 3.8 provide general benefits to all people in a specified geographic location and there is no discrimination in the benefits they provide. Mangroves, for example provide the same adaptation benefits to all people living within the geographic range of the defences they provide. In the proposed project, only Investments 3.5 and 3.7 provide targeted benefits. With this in mind, the risk assessment only identified access and equity risks under Investments 3.5 and 3.7. This specifically relates to access to training services (3.5) and denial of services (3.7). Taking 3.5 first, as highlighted below under Gender Equality and Women's Empowerment, taking agricultural extension services as a proxy example, only 10% of such services reach women. Women in Cambodia tend to work less and earn less, so if services discriminate against women (whether intentionally or not) they have the effect of perpetuating the cycle (i.e. where women have fewer educational opportunities, thus earn less). Specific data relating to architecture in Cambodia are difficult to come by. However, the ILO data cited below (See Core Labour Rights) indicate that men outnumber women in construction 9:1. There is no national association of architects in Cambodia, for example. However, prominent Cambodian female architects have identified a lack of mentorship[85], the challenges of balancing work and family life (with women expected to invest more hours in the home – see below) and the perception that architecture and construction are 'man's jobs'[86]. The above points to implicit or explicit exclusion of women. In that case, the impact of this risk in investment 3.5 would be to perpetuate a cycle where women are excluded from education and training opportunities and then earn less as a consequence. With this in mind, management and mitigation measures are proposed, below. Without such measures, we can reasonably assume that women in the area would be insufficiently included. A risk of loss of income was highlighted under Investment 3.7. This is an access and equity issue as some market traders may lose more income than others effectively because of where they are located in the market. Consultations with traders showed they can make up to US$10 per day on a good day. Data from the ADB shows that people who work in 'trade and wholesale' make between US$152 (women) and US$164 (men) per month (just over $5 per day, assuming all days are worked)[87]. Considering this data is five years old, we consider it to be broadly in line with experiences shared during consultations with traders. The construction period is envisaged to be up to four months. If we assume that a trader earns an average of US$10 per day and works all 120 days they could earn US$1200. There are approximately 4,500 people who depend directly on the market for some portion of their livelihood. If we assume

[85] https://www.khmertimeskh.com/50651859/muygech-building-a-name-for-women-in-architecture/
[86] https://www.realestate.com.kh/news/architecture-sector-women-in-Cambodia/
[87] ADB (2015) Promoting Women's Economic Empowerment in Cambodia, p.12

all of them would be affected and lost all their income during the construction period, that means the loss to the local economy would be US$5,400,000. While this is a clear over-estimate, it shows that construction works have the potential to have a substantial impact. Even if only 20% of sellers were affected (assuming total loss for the full construction period) the local economy would lose over US$1 million.

With this substantial potential for loss of livelihood during the construction period, management and mitigation measures are required and proposed below.

Marginalised and Vulnerable Groups

The risk assessment highlights the poor as a marginalised and vulnerable group. The impact assessment for Access and Equity, above, highlights that even construction works that affect 20 per cent of the market traders would have a substantial impact on the local economy and the incomes of local, low-income people.

There is a possibility that people could be excluded from the housing investment activity in Investment 3.5 based on poverty. While not exactly analogous, there is evidence that poverty has been a factor in the exclusion of people from systematic land registration, for example[88]. UNDP has identified vocational training as an essential component of the 'graduation package' as Cambodia seeks to 'graduate' from LDC status. In other words, the extreme poor have been unable to access technical and vocational training and this, in turn, is a contributing factor in the cycle of poverty[89]. Thus, if the extreme poor were missed (or, indeed, not targeted) by this investment, their omission could contribute to the continued cycle of poverty, preventing people making socio-economic progress and thus contributing to hinder Cambodia's graduation to middle income country status.

The potential impacts on women are highlighted in Gender Equality and Women's Empowerment. Regarding the above, management and mitigation measures are therefore proposed in the next section.

Human Rights

As highlighted in the risk assessment, human rights issues mainly present themselves in terms of involuntary resettlement, core labour rights and gender equality. As such, these concerns are addressed under these respective principles. No additional human rights risks were identified, and the proposal development team was satisfied that Cambodia's commitments on human rights mean no additional risks, beyond the aforementioned, present themselves. As such, no further impacts identified, but general management and mitigation measures are presented, below.

Gender Equality and Women's Empowerment (investments 3.5 and 3.7)

As shown below, there are important differences between men and women in terms of opportunities in education and work. Women in Cambodia are more likely to leave school early, have lower levels of literacy and earn less. However, where there are sex-related differences in employment opportunities and outcomes, this is analysed below under Core Labour Rights, below.

[88] NGO Forum/World Vision (2015) The Exclusion of Urban Poor Communities from Systematic Land Registration in Phnom Penh
[89] UNDP (2017) Graduation-Based Social Protection for Cambodia's Extreme Poor, p.16

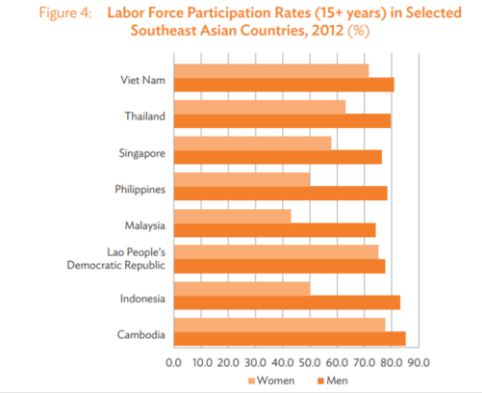
		On average, women in Cambodia provide 3.5 hours' per day more unpaid domestic work (such as cooking and caring for children) than men. As the ADB notes, "Women face a double burden in that they are expected to keep the house and family while working and bringing in an income at the same time[90]." Consequently, this means that any loss of income for women is magnified because women face greater burdens of responsibility. This is a potential impact from investment 3.7, which could cause a loss of income to market traders, who are primarily women. Indeed, women run 65% of all businesses nationally, but female-run businesses are less likely to be profitable, and are more likely to be unregistered and thus informal. Protections for such business are therefore less, and as such we can approximate a greater likelihood of impact. Relating to investment 3.5, no detailed statistics are available for architecture. However, a comparable example from agriculture is telling; despite the fact that half of all agricultural workers are women, only 10 per cent of agricultural extension services offered reach women. Moreover, there are significant gender disparities in access to agricultural equipment[91]. This suggests that without proactive measures to include and ensure women's participation, services will tend to be oriented towards men and benefit them disproportionately (if we assume agricultural extension services are comparable with architectural training). Core Labour Rights (Investments 3.1-3.7) As highlighted above, there is a risk to people working on construction and planting activities under the project. This risk must be seen in the context of fairly high rates of informality in unskilled and semi-skilled work in Cambodia. Despite signing all eight fundamental conventions of the ILO into law, enforcement can be patchy, and compliance limited. The labour force participation rate in Cambodia is 75.8 per cent for men and 62.4 for women**. Considering very low unemployment rates (<1%), this tends to indicate high levels of informality. Indeed, the construction sector has especially high rates of informality, with 99 per cent of those working in the sector informally employed. It is worth noting that men outnumber women in the construction sector 9:1[92] Moreover, 1/8th of the working population has no formal education. This appears to correlate with illiteracy rates, which are 13.7 and 25.7 per cent for men and women respectively[93]. More than 90 per cent of workers in Cambodia are paid per hour (or day) worked. Low salaries are still a very serious issue in the country. Minimum wages work on a sector-by-sector basis and there is no minimum wage in the construction sector. The average monthly wage is US130 for men and US$105 for women. Long working hours are also problematic with a typical working week being 48 hours for men and 45 for women[94]. Hours in the construction sector are longer, at 53 and 51 hours for men and women respectively[95] The ILO survey found that health and safety at work is not concerningly problematic in Cambodia, with about 2.5 per cent of employers reporting some sort of accident or injury, mostly superficial injuries, sprains or, at worst, dislocations.

[90] Ibid, p.19
[91] Ibid, p.23
[92] ILO (2013) Cambodia Labour Force and Child Labour Survey 2012 Labour Force Report, p.47
[93] ILO (2013) Cambodia Labour Force and Child Labour Survey 2012 Labour Force Report, pp. ix-x
[94] Ibid, pp. xi-xii
[95] P.62

The above evidence suggests that without management and mitigation measures, impact of exploitative labour risks in all areas of Cambodia would be informal working arrangements, long hours, low wages and differential (and mostly worse) conditions for women. The proposal also acknowledges that low levels of education and persistent illiteracy make it more difficult to employ basic labour protections when illiteracy rates are high (meaning people are unable to read or understand contracts and other written information) the norm to which they are accustomed is informal work. It should be noted that (Despite the name of the ILO survey cited in this section), the last survey of child labour in Cambodia was in 2000 and as such is no longer reliable[96]. Some, limited evidence suggests that Child Labour is prevalent, and that the impact of this would be failure to comply with the law and would contribute to denying children the opportunity to attend school (for the short-term cash benefits of work)[97]. It should be noted, however, that the latest ILO statistics indicate that no youth are outside education or training[98]

Understanding the above, it is clear that there is potential for the risks to lead to impacts based on existing data from the ILO's authoritative Labour Force Survey. However, extensive legal and contractual means exist to ensure executing entities and any sub-contractors comply with Cambodia's laws and international labour related norms and standards. Beyond this, there will be regular monitoring to ensure compliance. These measures are detailed further in the next section of this Annex.

**Using different sources, the ADB reckons that Cambodia has the highest rate of female labour force participation in ASEAN, which, while lower than the labour force participation rate for men, shows less of a gender gap than in many other Asian countries[99].



Involuntary Resettlement

[96] Ibid, p.3
[97] USAID (2013) Findings on the Worst Forms of Child Labour
[98] https://www.ilo.org/gateway/faces/home/ctryHome?locale=EN&countryCode=KHM&regionId=4&_adf.ctrl-state=1bggcroro_4
[99] ADB (2015) Promoting Women's Economic Empowerment in Cambodia, p.6

There have been notable, high-profile involuntary resettlement cases in Cambodia, which are alluded to in the risk assessment section. However, there is no evidence of involuntary resettlement or land conflicts in the target area. Moreover, a key factor in the selection of the activities is their citing on state public land. The sites have been checked repeatedly by the proposal development team and no evidence has been found of anyone living at the sites, or using them (legally or illegally) for cultivation or other livelihood activities. As noted in the risk assessment, there is some evidence for historical (illegal, and failed) attempts at agriculture at the mangrove (3.1, 3.6) and Roness (3.4) sites.

The impacts of involuntary resettlement in Cambodia have been well documented and the issue is highly politicized. Among the impacts highlighted in involuntary resettlement cases are; i) ***Livelihood and employment –*** "Relocation sites, usually located on the outskirts of the city, generally offer few opportunities for gainful employment. It has also been difficult for families to continue or seek employment in the city centre given transport costs and other obstacles", ii) ***Food (in)security –*** This is linked to livelihood and employment. Resettled families who lose their livelihoods, or whose incomes decrease tend to experience a corresponding decrease in calorie intake. Iii) ***Physical and mental health –*** Resettled families often lose access to health services that they previously got for free (or heavily subsidized) in urban areas. There is also some evidence for psycho-social issues, including domestic violence being more prevalent among resettled communities. People living with HIV are also more likely to suffer. Iv) ***Education –*** Evidence suggests that upon relocation children dropped out of school or families had to separate to keep children in the city centre to finish the school year. Families also have had to pay informal fees to transfer their children between schools, and the daily informal fees requested by teachers have put an extra-burden on families' limited income. V) ***Civil and administrative issues –*** It is often difficult for evicted families to transfer their voter registrations, identification papers and 'family books' (a form of domestic registration) to the new area[100].

Because of the aforementioned impacts in other resettlement cases in Cambodia, the proposal has been careful to select project sites where the team assesses the risk of involuntary resettlement is very low.

Specific impacts occurring under Investment 3.7 are highlighted in the Access and Equity section of this impact assessment. Temporary eviction or inability to access the market to trade could lead to serious economic, loss of income impacts for local people without management or mitigation measures. More general management and mitigation measures are proposed in the next section.

Protection of Natural Habitats

The risk assessment notes risks arising under investments 3.1-3.4, 3.6 and 3.8. Regarding 3.1 and mangrove investments under 3.6, Mangrove forests have been in alarming decline in Cambodia in recent years. The country lost 42 per cent of its mangroves in the period 1989-2017. Mangrove loss has been especially high in Preah Sihanouk Province, where 52 per cent of forests have been lost. 34 per cent have been lost in Kep in the same period. The primary cause of this has been salt farming, commercial development and shrimp farming. Reforestation efforts have had some success in arresting deforestation rates[101]. This evidences the need for reforestation as a means to reverse other, negative consequences.

Studies indicate up to 74 different species of Mangroves in Cambodia from 35 families. The dominant species belong to the genera *Rhizophora* (*R. mucronata, R. apiculata*) *Avicennia, Lumnitzera, Bruguiera, Ceriops* and *Xylocarpus*. In addition to mangrove trees, other associated species include

[100] United Nations High Commissioner for Human Rights (OHCHR) (2012) Eviction And Resettlement in Cambodia: Human Costs, Impacts and Solutions, p.6
[101] Veettil and Quang (2019) Mangrove forests of Cambodia: Recent changes and future threats, Ocean and Coastal Management: 181, 104895

		the mangrove palm, *Nypa fruticans*[102]. The mangrove species throughout Cambodia's coastal zone have been mapped, and as such the risk and impact of planting incorrect or incompatible species are minimal. Ministry of Environment, Ministry and Agriculture, Foresty and Fisheries and the UN Food and Agriculture Organisation have collaborated to produce detailed surveys[103] With this in mind, management and mitigation measures are proposed. Investments 3.2 and 3.3. The risk of the works causing damage to natural habitats was found to be minimal. Impacts to the natural environment from potential pollution are discussed in Pollution Prevention and Resource Efficiency, below. No evidence was found that small-scale investments such as these have caused major habitat loss or damage to the environment in Cambodia. UN Environment Programme has noted that "Excessive logging, conversion of forest lands for agriculture, and hunting wildlife for trade and local consumption have contributed to the increasing rate of wildlife habitat loss and biodiversity destruction in Cambodia"[104]. The same report goes on to note, however, that "The absence of a strong land use policy framework, inadequate coordination among ministries and department dealing with natural resources and land use development as well as a lack of accurate information to guide land use allocation are other important factors that have contributed to continuing pressure on the forest and hence, constraints on appropriate land use management of the country"[105]. This provides further evidence from risks arising from ineffective oversigh of development activities and thus local impacts arising from damage to or loss of local habitats, and with this in mind general management and mitigation measures are proposed. The above also applies to investment 3.4, which is physically close to investments 3.2 and 3.3. The non-demarcated area of natural habitat immediately to the north of the reservoir is a particular area of potential impact to the reservoir. This is discussed in management and mitigation measures. Conservation of Biodiversity Climate Change The primary climate change related risks arising are from project failures; i.e. where the infrastructure fails and thus creates vulnerabilities (or 'maladaptation'. The impacts of this (i.e. total project failure) would be as follows: 3.1 – The target beneficiaries would be at greater risk from coastal storms, sea-level rise and salination as a result of mangrove loss 3.2a&b – People will have continued difficulties win water access and management, especially for agriculture, affecting crop production (primarily) and incomes and food security (secondarily) 3.3 – Provides protection for people living just inland from the coast. If the embankment were to fail people would be impacted by flooding 3.4 – The most at risk part of the investment is the southern embankment. If this were to fail it would cause serious impacts to people living to its south (with up to 20,000 people living in its catchment area), either in terms of flood damage or lack of water supply (because their water comes from

[102] Vongwattana, K (undated) National Report on Mangroves in the South China Sea, p.4
[103] See, for example, FAO (2005) Global Forest Resources Assessment, Thematic Study on Mangroves
[104] UNEP/MoE (2009) Cambodia Environment Outlook, p.35
[105] ibid

the reservoir. The main Sihanoukville to Phnom Penh railway line is immediately south of the reservoir and would be impacted by any failure of the embankment. Depending on the scale of damage this would have the potential to cost millions of dollars (in terms of repair costs and opportunity costs). It should be noted again, however, that according to two separate engineer's inspections, the southern bank of Roness is presently unsafe

3.5 Doesn't construct major infrastructure and as such no project failure risks occur. However, without careful selection of materials there is a risk that this activity could contribute to deforestation, which could impact people in communities where this would take place, and would make a small contribution to increasing Cambodia's greenhouse gas emissions.

3.6 Failure of the Watergates would expose the nearby communities to greater flood risks, which would likely impact agriculture and housing. For failure of the mangrove part of this investment, see 3.1

3.7. Failure of this investment would impact people's incomes. This is discussed above under access and equity.

3.8 Failure would result in a continuation of the status quo.

Pollution Prevention and Resource Efficiency

Cambodia has substantial waste problems. As Open Development Cambodia notes; "The rapid economic and population growth in Cambodia is leading to significant environmental pollution. Economic development activities have generated major environmental consequences, including air pollution, water pollution, noise pollution and solid wastes (sic)". Four main industrial drivers of waste and pollution have been identified; garment factories, brick kilns, rice milling and rubber processing[106]. When solid and liquid waste enters ponds, stream and rivers, it impacts the ability of people – especially the poorest – to access water.

According to IGES and the UN Environment Programme, Construction and Demolition waste includes "most commonly includes paper/cardboard, garden/ vegetation, wood/timber, carpets, other textiles, rubber, glass, plastics, metals, hazardous waste, ceramics, soil/rubble, cobbles/boulders, clean soil, concrete, plasterboards, bricks, asphalt/bitumen, cement sheet, insulation and others"[107]. The types of waste likely to be generated from this project (the investments under Component 3) fit into this category (however, no hazardous materials are to be used).

In many cases in Cambodia, construction related waste is not disposed of correctly, sustainably or in accordance with the law. Situations like the ones depicted below are commonplace in Cambodia. There are numerous potential impacts of this. 1) It leads to increased local pollution problems such as vermin or unsafe/hazardous conditions in nearby water bodies, 2) It is unsightly (problematic in an area like Kep that depends on income from tourism), 3) Solid waste blocks drainage facilities,

[106] https://opendevelopmentcambodia.net/topics/pollution-and-waste/

[107] Kumar Singh, R. Yagasa, R. and Dickella, P (2018) State of Waste Management in Phnom Penh, Cambodia, p.21

		contributing to flooding in flood prone areas (photographic evidence of this can be found in the main proposal and 4) Open solid waste emits methane, a greenhouse gas up to 20 times more potent than carbon monoxide[108]. Considering these issues, management and mitigation measures are proposed in the following section **Public Health** Investments 3.2-3.7 involve construction sites. As highlighted above (in Core Labour Rights), construction sites carry risks to workers and the public alike. 2.5 per cent of workers report experiencing some type of accident of accident in the workplace. The impacts of such actions were usually minor (i.e. superficial injuries), but this nevertheless highlights the need for management and mitigation measures. However, unsafe construction practices can have more serious consequences for workers and communities. There was a high-profile case in Sihanoukville City in early 2019 where an under-construction building collapsed and 28 workers were killed[109]. This highlights the serious impacts of unsafe construction site practices. Recently, a link has been highlighted between unregistered construction companies, construction without permits and poor safety practices, with Sihanoukville City being an area where such practices have been prevalent[110]. Evidence has also emerged recently that health impacts to construction workers have occurred at construction sites managed by illegal, informal or small construction companies, whose procedures and policies are non-existent or less well developed. Specific risks and impacts from the embankment at Roness are described above in Protection of Natural Habitats. Public health risks arising from project failures are addressed above in Climate Change and Protection of Natural Habitats. Considering the construction site risks and impacts, noted above, management and mitigation measures are proposed in the next section. **Physical and Cultural Heritage** While risks were identified in the previous section to investments 3.6 and 3.8, no impacts could be identified at this time as the proposed ecotourism sites (which the proposal development team classes as physical and cultural heritage for the purpose of this assessment) have not been built yet, and the plan shared by Provincial Government of Preah Sihanouk Province has not been given approval at the time of writing (November 2019). **Land and Soil Conservation** Impacts from project failures under investments 3.1, 3.3, 3.4 and 3.6, for which risks occur to land and soil conservation, are highlighted above under protection of natural habitats and climate change. No additional impacts arise that are not discussed there.

[108] Photo, ibid, p.22
[109] https://www.france24.com/en/20190626-collapsed-dreams-cambodia-construction-workers-risk-lives-riches
[110] https://theaseanpost.com/article/construction-cambodia-lacks-safety

2.4 - *Environmental and Social and Gender Policy Compliance Plan, Grievance Mechanism and Budget*

This Environmental and Social and Gender Policy Compliance Plan describes the management process that will be put in place to ensure that the project is managed in a way that is consistent with the Environmental and Social and Gender Policies of the Adaptation Fund. It also summarizes the risk mitigation measures that have been built into the project to ensure compliance with AF policies and the laws and regulations applicable to it in Cambodia.

For an overview of project activities' potential risks, impact assessment against the 15 AF principles, including measures to avoid or mitigate risks and impacts see below table. Besides specific measures per project output, the project has put in place general management arrangements and measures to avoid or reduce potential environmental and social risks, which are described below the Table.

Table 2.10 Environmental and Social Risk Management and Mitigation

Component	Environmental and Social Policy Area	Impact Assessment	Measures put in Place to avoid, manage or mitigate risks
	Access and Equity	See here	Risks and impacts have been identified under Investments 3.5 and 3.7 Investment 3.5 will put in place a direct quota for the inclusion of women. 40% of the trainees engaged in the training under investment 3.5 will be women. The target has been set at 40% to reflect the difficulty in finding women to work in the sector, and the dominance of men in physical trades in Cambodia. Nevertheless, this target has been set to avoid perpetuating the cycle where women are excluded from education and training opportunities and then earn less as a consequence. Measures will be taken to ensure that women feel comfortable and supported at the training, including sensitisation to all trainees that women have the equal right and potential to work in architecture and physical trades such as carpentry. Investment 3.7 could lead to loss of income arising from disruption due to the construction works. To mitigate this, the market will be kept open throughout the construction. Fortunately, the market has multiple entrances. During construction period numerous entrances will be kept open to ensure that people can still move themselves and products in and out. The small road at the side of the market will also be kept open if and when vehicle access is required. The picture at the end of this section demonstrates this. The green arrows represent access roads that will be kept open – including to vehicles[111] - throughout the construction period. Much of the construction will take place near the drainage culverts that run along the front (east) side of the market, indicated by the orange line. This entrance will be temporarily closed to ensure the safety of people using and working in the market.

[111] Note that only the northern access road is wide enough to be accessed by a car or small truck. The other two roads are only accessible to motorbikes.

			By ensuring continued access, traders at the market will be able to continue largely unaffected. Signs and other public information will inform people that the market is open for business during the construction period. There will be some localized disruption while pipes and other infrastructure are installed around the rainwater harvesting part of the investment. However, this will be minimal, and works will be undertaken in continued discussion with sellers. General safety measures are described under Public Health, below. 
	Marginalized and Vulnerable Groups	See here	The extreme poor are at risk of exclusion under the training activities under investment 3.5. To address this, the project will use 'I.D. Poor' programme data to ensure that the poorest are targeted and are the most likely to benefit. In doing this, UN-Habitat understands that 100 per cent literacy can't be guaranteed, and as such training materials will be prepared in a visual and easy to use format to aid those who are illiterate or less literate.

			The trainees will be organized into a network to encourage sustainability of the action and so that those who have been trained are enabled to collective advocate for improved housing resilience, greater inclusion of the poor and on other issues relating to housing as they emerge. These measures are in addition to those highlighted under Access and Equity above, and Gender Equality and Women's Empowerment, below.
	Human Rights	See here	As highlighted in the risk assessment, human rights issues mainly present themselves in terms of involuntary resettlement, core labour rights and gender equality. As such, measures to mitigate and manage risks to human rights issues are presented in the respective sections.
	Gender Equality and Women's Empowerment	See here	As highlighted above in Access and Equity, there will be a target of 40% participation of women in Investment 3.5. In investment 3.7, continued access to the market will be ensured, allowing traders to continue trading, which is a safeguarding measure that will overwhelmingly benefit women. Beyond this, other measures will be put in place for the benefit of women. All trainings will ensure that clean, segregated sanitation facilities are provided. Women will be allowed to bring infants and small children under their care to trainings under investment 3.5 if they don't have any other options (assuming that one potential barrier for women is the unavailability of child care). As mentioned above, 3.5 will have a 40% participation target for women. Training facilitators will encourage all group members to speak up and be active participants during training (to avoid a dynamic where a few more assertive men dominate the group). As the Economic and Social Impact section, above, notes; "Indeed, women run 65% of all businesses nationally, but female-run businesses are less likely to be profitable, and are more likely to be unregistered and thus informal. Protections for such business are therefore less, and as such we can approximate a greater likelihood of impact.". The continued opening of the market during the construction works is designed to minimize the impact of the construction to women. Beyond the construction period, the aim of this investment is to adapt to the changing climate in a way that avoids losses currently (and increasingly likely in the future) endured by the predominantly female traders. If this investment is successful, it will mitigate the risk of bankruptcy and indebtedness experienced by women in the market by enabling them to continue trading despite weather and climate conditions.
	Core Labour Rights		Risks and potential impacts are noted for all investments from 3.1-3.7. All workers employed under the project and by its contractors will be formalized, with proper, legally binding contracts that workers understand. As low levels of education and illiteracy remain problematic, all construction contract workers will have the right to have their contracts explained to them, and will be empowered to report anonymously to UN-Habitat's National Project Manager or through the grievance mechanism if they feel they are being unfairly treated in any way. Targets for female

			employment will be set in conjunction with contractors. Considering men outnumber women by 9:1 in Cambodia's construction industry, a 50% female participation target is probably not realistic. While the minimum wage works on a sector by sector basis in Cambodia and there is no minimum wage in the construction sector, the project has budgeted US$15 per day for unskilled construction workers. If we assume a 22 working day month, this equates to a monthly gross salary of $330 per month – well above the currently monthly averages of $130 for men and $105 for women. All women and men will be paid equally. Construction workers will not be asked to work more than 9 hours per day and will be given rest and meal breaks per International Labour Organization guidance. All construction workers employed by the project will be over the age of 18 and under the age of 65. Understanding that occupational health and safety is problematic in Cambodia – particularly in the construction sector, all workers will be given basic safety equipment, including hard hats and high visibility jackets. Construction will only take place during the daylight hours and where construction works take place outside during the rainy season, workers will be given shelter from storms and heavy rains. In the case of Investment 3.7, fencing and barriers will separate workers from the busy National Highway 4, which is next to the market. Other construction site related measures are outlined in the Public Health Principle, below. All of the above risk mitigation and management measures will be enforced through Agreements of Cooperation that Habitat will sign with its executing partners, which will contractually oblige them to conform to the measures outlined here.
	Involuntary Resettlement		As the risk and impact sections of this Annex demonstrate, there have been high profile involuntary resettlement cases in Cambodia in the past. However, the nature of the sites selected under this project show low risk of resettlement. However, Investments 3.1, 3.4 and 3.6 show some prior, failed attempts at agriculture while 3.7 risks hindering access or disrupting people's ability to earn income. Management measures for this are presented under Access and Equity, above. In Investments 3.1, 3.4 and 3.6, numerous visits to the field sites have been made, and visual inspections of the site, plus consultation with local government officials (at the commune and provincial level) indicate that no one is presently living there or deriving income from the land (legally or otherwise). However, a further re-inspection of the sites will take place prior to the start of planting or construction works. If no evidence of dwelling or livelihood activity at the sites is found at the point (through visits to the sites, photographs, and meetings with local people, commune officials and the Provincial Department of Land Management, Urban Planning and Construction), construction can commence. If evidence is found that people have recently moved to the site (either dwelling or for livelihood), the project will enter into a consultation period with the affected people to reach a negotiated and agreed solution. It should also be noted that upon approval of the project by the AF Board, the respective Provincial Governments and Commune Councils will be informed, who in turn can informally inform any new incumbents of the land that it is earmarked for development. It should be reiterated at this point that **all** land where the investments will take place under this project is state public land.

	Protection of Natural Habitats		The risk and impact assessment notes risks and potential impacts arising under investments 3.1-3.4, 3.6 and 3.8. Investments 3.1 and 3.6 will develop a mangrove planting and management plan. A budget of US$50,000 has been allocated to this study (Across both target sites) to allow for a very detailed assessment. One of the main purposes of this study is to re-confirm that the species identification conducted jointly between the UN Food and Agriculture Organisation and the Ministry of Agriculture, Forestry and Fisheries is accurate. It will also identify general management practices necessary to ensure that the mangroves planted make a continued contribution to enhancing natural habitats and biodiversity, as well as providing adaptation benefits. 3.2 and 3.3 are relatively small localised constructions. 3.2(a&b) don't involve clearing or altering any natural habitat. For 3.2(a&b) it was determined that effective construction site management practices and removal and disposal of waste will be sufficient to ensure that the surrounding natural environment is protected. Investment 3.4 borders a non-demarcated, unofficial natural habitat area (the area to the north of the reservoir). Preservation of this area is made easier because the (only) access road to the site is from the south, meaning no trucks, equipment or workers will pass through the habitat area. Indeed, to access the habitat one would have to walk around the perimeter of the reservoir – a distance of at least 500 metres. During the construction, temporary fencing will be erected to separate the construction site (on the south side of the reservoir) from the habitat area (on the north side) to prevent trespassing, waste dumping and any other unintended damage to this area. To reiterate, the construction works are primarily focused on the south bank of the reservoir.
	Conservation of Biodiversity		The risk and impact assessment notes risks and potential impacts arising under investments 3.1-3.4, 3.6 and 3.8. All measures under Protection of Natural Habitats, above, are designed to also conserve biodiversity in the target area.
	Climate Change		Maladaptation risks occur throughout the project. In all cases, local materials will be used. Only in 3.8 does material or equipment need to be imported from overseas. Throughout all project minor emissions will be generated through construction (i.e. through vehicles bringing materials and workers to the project sites), but none of the investments will generate emissions in their operations. 3:1 – As highlighted above, the Mangrove Planting and Management Plan will ensure that appropriate mangrove species will be chosen, planted correctly and management and maintained in a way that ensures they have a long lifespan. This is critical as mangrove is only effective as a coastal adaptation measure.

			3.2 – Both parts of this investment (i.e. 3.2a and 3.2b) are existing infrastructures that were designed to provide effective water management that have fallen into disrepair. In both cases, the designs put the infrastructures back to working order and improve them to cope with greater volumes of water that are likely as a result of climate change. 3.3 – The embankment is a new piece of infrastructure and has been designed to ensure that the community isn't affected by climate change risks from coastal flooding. The design specifications are such that worst case future climate change impacts have been considered. Further information is provided in Annex 3. 3.4 – The works will enhance the ability of the reservoir to store and distribute water, improving water access in the dry season (which is projected to be longer and warmer). Moreover, as the southern embankment has been classified as unsafe by two international engineers who inspected, the works proposed under this project also have a safety benefit as full or partial failure of the southern embankment would – at minimum – flood surrounding farmland, damage houses and damage the nearby railway line. 3.5 – Sustainably sourced materials will be used to construct demonstration houses 3.6 – The mangroves will also be planted in accordance with a to-be developed mangrove planting and management plan (see 3.1 – though a separate, location specific plan will be developed). The water gate repairs will restore water management to original design standards (together with mangroves they will enhance adaptation). 3.7 – Aside from emissions generated in construction, no climate change impacts foreseen. The project will bring adaptation benefits through improved drainage and rainwater harvesting 3.8 – The weather station and tide gauge will be imported, but no emissions are generated from their operation. Regional suppliers for the equipment will be sought, but it may not be possible to avoid importing equipment from North America or Europe.
	Pollution Prevention and Resource Efficiency		All investments, particularly 3.2-3.4, 3.6 and 3.7 will generate waste materials resulting from the construction. None of the investments will generate significant waste products or pollutants from their ongoing use/operation. Disposal of solid waste in Kep is through a controlled, covered Landfill site within the province's boundaries (to the north of National Road 33). There are modern waste collection trucks operated by a private company[112]. Waste collection is on a subscription model (i.e. the disposer pays a small fee to the company). Where materials used are safe to go to landfill, they will be disposed of in this manner. Recycling facilities (for plastics like PVC pipe) are not available in-province. However, old concrete

[112] https://issuu.com/undpkh/docs/final_provincial_

			can be re-cycled locally at small, artisan foundries. The situation is similar in Prey Nob District, where the Prey Chhor landfill site is available, with collection service provided by a private contractor. Recycling exists in theory though reliable data on recycling rates is not widely available.
	Public Health		Investments 3.2 to 3.7 involve construction site activity (Investments 3.1 and 3.8 only involve planting or installation). Risks and impacts have been highlighted above. To manage and mitigate this, effective construction site management practices are required. Investments 3.2 and 3.6 involve relatively small construction sites with no heavy equipment beyond cement mixers and basic construction tools, investments 3.3, 3.4 and 3.7 involve larger sites with larger, more complex equipment. As such, more stringent standards are required at these sites, where risks and potential for impact are greater. This is especially true for Investment 3.7 as the market is in a busy area frequented by thousands of people per day. Achieving this means following various internationally recognized good practices. Among these are Good Practices in Safety, Health and Working Conditions, an ILO Guidebook that uses Cambodia as a case study country. This guidance is particularly relevant for the smaller construction sites as the guidelines focus on smaller infrastructure. Among the measures outlined are basic safety training for all workers, masks and scarves to protect against the sun, safety belts for workers working above 2 metres, barriers to prevent falls into dug areas, temporary shaded storage to store paints and weather sealant, all heavy materials carried by cart/wheelbarrow, mandatory use of hard hats and demarcation of construction sites with signs and barriers[113]. For the larger, more complex construction sites, more sophisticated standards, such as the Zero Accident Technique of the Construction Institute will apply. These standards incorporate many of the basic steps, listed above, but require construction firms/site managers to develop, for example, strategies and action plans to ensure that standards are met consistently throughout construction. This will be particularly important in Investment 3.7, where the market will remain open throughout the construction period. Measures to be put in place will include (but are not limited to) alternative access arrangements, no-go zones for members of the public that are fenced off an inaccessible and training for all workers on the site.
	Physical and Cultural Heritage		No impacts have been identified. However, there are risks (or potential risks) due to the proposed construction of eco-tourism facilities in and around the Kampong Smach area, which would overlap (if built as proposed) with the construction area in 3.6 and 3.8. Because of this, continued dialogue will be maintained with the Provincial Hall of Preah Sihanouk Province regarding the potential future development of the eco-tourism site in Prey Nob District
	Land and Soil		For management and mitigation measures, please see Protection of Natural Habitats and Climate Change

[113] Based on ILO (2006) Good Practices in Safety, Health and Working Conditions,

	Conservation		

General management arrangements in place to avoid or reduce potential environmental and social risks

Both the management arrangements below and the general measures, beneath, are based on a combination of secondary research and information about typical risks and risk avoidance, management and mitigation in Cambodia, the community, local and national government consultations that have been undertaken in the preparation of this proposal and the length experience of UN-Habitat and its partners in Cambodia and the Asia-Pacific region. It also reflects the best practice learned from other projects UN-Habitat has implemented for the Adaptation Fund in, *inter alia,* Laos and Mongolia. It also reflects good practices from other agencies working in Cambodia, including UNDP and the Asian Development Bank, who implement projects in accordance with strict and internationally recognized Environmental and Social Safeguard Standards.

i) ***Responsibilities:*** Direct responsibility for this implementation of the project in accordance with this plan lies with the Project Manager, who has oversight and compliance responsibility. Any changes or additional activities that arise during the project implementation that add value to or complement proposed sub-projects (within allowable limits set by the Adaptation Fund) will need to be cleared by the Project Manager and approved by the Project Management Committee.

ii) ***Management and Implementation of Risk Mitigation Measures:*** Mitigation measures, including awareness raising and capacity building related to compliance with the Environmental and Social and Gender Policies are part of the project activities and are budgeted under these.

iii) ***Gender:*** The situation of women is presented in Part I of the proposal and measures are highlighted under Gender Equality and Women's Empowerment

iv) ***A budget*** has been prepared and is presented below. 5% of the overall Component 3 budget is allocated to compliance with the Environmental and Social and Gender Policies of the Adaptation Fund.

General measures to be put in place to reduce environmental and social risks

The following general actions will be put in place to ensure compliance with the Environmental and Social Policy.

i) All memorandums of understand, agreements of cooperation with executing entities will include reference to and compliance with the 15 principles of the AF ESP and the Gender Policy.

ii) That UN-Habitat staff specialized in human rights issues will check for compliance with the ESP during the project's implementation. The gender focal point will also check compliance against principle 5 and the Gender Policy during implementation. The project will need to pass the UN-Habitat PAG with agency requirements for human rights, gender, youth and climate change.

iii) Continued coordination with focal points within the national and local governments, responsible for compliance with national and local standards will take place throughout the project.

iv) Capacity building and awareness raising: The project manager and his or her team will provide capacity building and awareness raising on compliance with the environmental and social and gender policies to executing entities and target communities so that they are aware of potential risks and are better placed to avoid or mitigate them, or recognized the potential for them and raise them through the appropriate channels, including the grievance mechanism (described below). This capacity building and awareness raising will be done in the inception phase of the project, prior to the commencement of construction.

Grievance Mechanism

i) The grievance mechanism will apply to all the project's target areas and will be open to beneficiaries and non-beneficiaries alike. It will allow them accessible, transparent, fair and effective means to communicate with the project management (and Project Management Committee) if there are any concerns regarding the project design and implementation. All employees, executing entities and contractors and people in the target areas will be made aware of the grievance mechanism to lodge any complaint, criticism, concern or query regarding the project's implementation.

ii) The mechanism considers the particular needs of different groups in the target communities. It combines anonymous mailboxes at community level, a trained local facilitator in each community who can listen to grievances while assuring anonymity and a telephone number that enables people to call anonymously. These options allow people to make their grievance in Khmer language, with options for illiterate people or people with low levels of literacy, and recognize that internet and smart phone penetration is not universal in the target area. Moreover, any stakeholder involved with the project can use any workshop, training or any other event organized by the project, either in public (i.e. through open floor discussion) or in private (i.e. discretely with UN-Habitat or executing entity staff involved with the workshop) can raise a grievance verbally.

iii) Project staff, including those from the executing entities will also be trained to recognize grievances from community members and how to deal with grievance reports. The local facilitators in each community will also be trained on to recognize dissatisfaction and on how to report grievances. In addition, monitoring activities will also provide an opportunity for beneficiary communities to voice their opinions as they wish. This recognizes that in Southeast Asian countries, some people don't feel confident in directly confronting grievances and don't like to be seen to complain. It allows people to raise issues in a subtle and anonymous way.

iv) All grievances will be anonymized and presented to the Project Management Committee. All grievances will be treated will equal and urgent importance, regardless of who raised them, or the mode by which they did so.

v) All stakeholders, including beneficiaries will be made aware of the grievance mechanism, their options for reporting, what constitutes a grievance and their right in anonymity at the start of the project, and/or whenever the project first makes contact with them (i.e. during the inception phase, whether in training, or whichever activities come first). Stakeholders will be reminded of the grievance mechanism periodically throughout the project.

vi) The address and email address of the Adaptation Fund will be made public (i.e. project website, Facebook and mailbox) for anyone to raise concerns regarding the project:

Adaptation Fund Board secretariat
Mail stop: MSN P-4-400

1818 H Street NW
Washington DC

Monitoring and Evaluation Arrangements, including budget

Risk monitoring arrangements

i) This monitoring programme, as outlined in Table 2.11 and 2.12 below will be used to measure the effectiveness of actions and collate results which will be reported to the Adaptation Fund in annual, mid-term and final (terminal) reports. Monitoring will be done to ensure that actions are taken in a timely manner and to determine if actions are appropriately mitigating the risk / impact or if they need to be modified in order to achieve the intended outcome.

ii) Annual reporting will include information about the status of implementation of this compliance plan. The reports shall also include, if necessary and required, a description of any corrective actions that are deemed necessary.

iii) Direct monitoring responsibilities will be under the Project Manager, who will also have oversight and compliance responsibility. If changes or additional activities are required, monitoring indicators will be modified or added as well, as required.

iv) Gender specific and/or disaggregated indicators and targets have been developed as shown in the results framework and summarized below.

v) The budget required is shown below

Table 2.11 – Environmental and Social Safeguard Monitoring Overview

Action	Indicator and method	Responsibility and frequency
Implementation of grievance mechanism	- Grievance mechanism information is shown in target areas (e.g. Commune and District offices) - Grievance mechanism information is shown on UN-Habitat project website	Project manager Within half a year from inception
Consent process (communities)	- Consent sheets are signed by community members/market stall holders (inv 3.7) **before** the project begins any physical works	Project manager, Executing Entity Before inception of physical works
Permission (government)	- Full written permission from each government agency obtained before construction begins[114]	Project manager, UN-Habitat, relevant local government agency

Table 2.12, Monitoring Environmental and Social Policy Compliance

Activity and ESS Policy Area where risk/impacts occur		Measures to avoid or mitigate risks / impacts (full details in Table 2.??, above)	M & E arrangements	
Activities			Indicator and method	Responsibility and frequency
Output 3.1. 134ha of Mangroves restored in Kep and Angkaol Communes, Kep Province	Core Labour Rights	Formal contracts. Fair wages well above the minimum wage, good working conditions. Occupational health and safety	Example contracts (personal details redacted) made available and comments invited from ILO representatives and the Ministry of Labour. Worker testimony gained through informal discussions.	NCSD[115], PDoE[116] Kep, M&E Officer, Project Manager. Annual and upon major recruitment
	Involuntary resettlement	Continued site visits, site inspections and (if it becomes the case that people settle on the site) negotiated settlement (note that no evidence could be found of people living at the site or using it for their livelihood).	Regular (at least quarterly) site visits documented by photographs and, where necessary, informal discussions. At least 6-monthly meeting between the project (represented by the M&E officer), PDoE and PDLMUPC	NCSD, PDoE Kep, M&E Officer, Project Manager. Annual, before planting and ad hoc inspections of the site
	Protection of Natural Habitats	Mangrove Planting and Management Plan	Mangrove Planting and Management Plan in place before planting starts. The Plan has been approved by the Project Management Committee and is subject to annual technical review.	NCSD, PDoE Kep, M&E Officer, Project Manager. Annual, upon drafting terms of reference for the MPMP
	Conservation of Biodiversity	Mangrove Planting and Management Plan	See above	See above
	Land and Soil Conservation	Mangrove Planting and Management Plan	See above	See above

[115] National Council on Sustainable Development
[116] Provincial Department of Environment

Output 3.2(a&b) Water gates repaired in 3 locations in Pong Teuk and Angkaol 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	Core Labour Rights[117]	Formal contracts. Fair wages well above the minimum wage, good working conditions. Occupational health and safety	Example contracts (personal details redacted) made available and comments invited from ILO representatives and the Ministry of Labour. Worker testimony gained through informal discussions.	NCSD, PDoWRAM[118], M&E Officer, Project Manager. Annual and upon recruitment
	Involuntary Resettlement	Continued site monitoring (only general risks found)	Regular (at least quarterly) site visits documented by photographs and, where necessary, informal discussions. At least 6-monthly meeting between the project (represented by the M&E officer), PDoWRAM and PDLMUPC.	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual
	Protection of Natural Habitats	Construction site management, disposal of waste	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during construction
	Public Health	Following ILO guidance on construction site safety. Training for all workers on occupational health and safety	Training complete prior to construction starting. All signs, fences and other safety equipment in place, as signed off by the site manager and M&E Officer. Weekly site reports by the site manager and inspection by the M&E Officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during construction
	Pollution prevention and resource efficiency	Effective disposal of waste	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer (merged with Protection of Natural Habitats)	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during construction
Output 3.3 Prevention of saltwater incursion through improved channels and embankments	Human Rights	See Involuntary resettlement	See Involuntary resettlement	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual before and during construction
	Core Labour Rights	Formal contracts. Fair wages well above the minimum wage, good working conditions. Occupational health and safety	Example contracts (personal details redacted) made available and comments invited from ILO representatives and the Ministry of Labour. Worker testimony gained through informal discussions.	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and at the time of recruitment
	Involuntary Resettlement	Continued site monitoring (only general risks found)	Regular (at least quarterly) site visits documented by photographs and, where necessary, informal discussions. At	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual, before and during construction

[117] Note that while the Measures, Indicator and Method are the same, each investment is at a different site with different groups of workers
[118] Provincial Department of Water Resources and Meteorology

			least 6-monthly meeting between the project (represented by the M&E officer), PDoWRAM and PDLMUPC.	
	Protection of Natural Habitats	Construction site management, disposal of waste	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual, during construction
	Public Health	Following ILO guidance on construction site safety. Zero accident construction technique	Training complete prior to construction starting. All signs, fences and other safety equipment in place, as signed off by the site manager and M&E Officer. Weekly site reports by the site manager and inspection by the M&E Officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual, during construction
	Pollution Prevention and Resource Efficiency	Effective disposal of waste	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer (merged with Protection of Natural Habitats)	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual, during construction
	Land and Soil Conservation	See Protection of Natural Habitats	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual, during construction
Output 3.4 Bank strengthening work at Roness Reservoir to provide additional water retention and safety.	Human Rights	See Involuntary Resettlement and Core Labour Rights	See Involuntary Resettlement and Core Labour Rights	NCSD, PDoWRAM, M&E Officer, Project Manager.
	Core Labour Rights	Formal contracts. Fair wages well above the minimum wage, good working conditions. Occupational health and safety	Example contracts (personal details redacted) made available and comments invited from ILO representatives and the Ministry of Labour. Worker testimony gained through informal discussions.	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during recruitment
	Involuntary Resettlement	Continued site visits, site inspections and (if it becomes the case that people settle on the site) negotiated settlement (note that no evidence could be found of people living at the site or using it for their livelihood).	Regular (at least quarterly) site visits documented by photographs and, where necessary, informal discussions. At least 6-monthly meeting between the project (represented by the M&E officer), PDoWRAM and PDLMUPC. If evidence of encroachment is found during the construction period, additional monitoring measures will be proposed to the PSC.	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual, during and before construction.

	Protection of Natural Habitats	Temporary fencing to prevent trespassing	Site manager's weekly report and periodic inspection by the Project M&E Officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during construction
	Conservation of Biological Diversity	See Protection of Natural Habitats	Site manager's weekly report and periodic inspection by the Project M&E Officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during construction
	Public Health	Following ILO guidance on construction site safety. Zero accident construction technique	Training complete prior to construction starting. All signs, fences and other safety equipment in place, as signed off by the site manager and M&E Officer. Weekly site reports by the site manager and inspection by the M&E Officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during construction
	Pollution Prevention and Resource Efficiency	Effective disposal of waste	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer (merged with Protection of Natural Habitats)	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during construction
	Soil Conservation and Land Use	See Protection of Natural Habitats	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer	NCSD, PDoWRAM, M&E Officer, Project Manager. Annual and during construction
Output 3.5 Resilient Housing designs developed and demonstrations constructed (Both provinces	Access and Equity	Minimum 40% of trainees will be women	Register/list of trainees. Training needs assessment/trainee identification exercise complete.	NCSD, PDLMUPC[119], M&E Officer, Project Manager. Annual and upon identifying trainees
	Marginalised and Vulnerable Groups	Targeting the poorest	Using the ID Poor programme to identify the poorest, most vulnerable and most in-need people. Also captured through the training needs assessment/trainee identification exercise, as above.	NCSD, PDLMUPC, M&E Officer, Project Manager. Annual and upon identifying trainees
	Gender Equality and Women's Empowerment	Minimum 40% of trainees will be women. Women made to feel comfortable participating in the activities	See above, Access and Equity	NCSD, PDLMUPC, M&E Officer, Project Manager. Annual and upon identifying trainees

[119] Provincial Department of Land Management , Urban Planning and Construction

	Core Labour Rights	Formal contracts. Fair wages well above the minimum wage, good working conditions. Occupational health and safety	Example contracts (personal details redacted) made available and comments invited from ILO representatives and the Ministry of Labour. Worker testimony gained through informal discussions.	NCSD, PDLMUPC, M&E Officer, Project Manager. Annual and upon identifying trainees
	Climate Change	Sustainably sourced materials will be used to construct demonstration houses	Bidding/tender documents must explicitly identify sources of wood and other construction materials and explain why such materials are sustainable	NCSD, PDLMUPC, M&E Officer, Project Manager. Annual and at procurement
	Public Health	Following ILO guidance on construction site safety. Zero accident construction technique	Training complete prior to construction starting. All signs, fences and other safety equipment in place, as signed off by the site manager and M&E Officer. Weekly site reports by the site manager and inspection by the M&E Officer	NCSD, PDLMUPC, M&E Officer, Project Manager. Annual and during training/construction
	Pollution Prevention and Resource Efficiency	Effective disposal of waste	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer (merged with Protection of Natural Habitats)	NCSD, PDLMUPC, M&E Officer, Project Manager. Annual and during training/construction
Output 3.6 Green-Grey protective infrastructure in Ou Ohkna Heng Commune, P. Sihanouk Province	Core Labour Rights	Formal contracts. Fair wages well above the minimum wage, good working conditions. Occupational health and safety	Example contracts (personal details redacted) made available and comments invited from ILO representatives and the Ministry of Labour. Worker testimony gained through informal discussions.	NCSD, PDoE Preah Sihanouk, M&E Officer, Project Manager. Annual and upon major recruitment
	Involuntary Resettlement	Continued site visits, site inspections and (if it becomes the case that people settle on the site) negotiated settlement (note that no evidence could be found of people living at the site or using it for their livelihood.	Regular (at least quarterly) site visits documented by photographs and, where necessary, informal discussions. At least 6-monthly meeting between the project (represented by the M&E officer), PDoE and PDLMUPC	NCSD, PDoE Preah Sihanouk, M&E Officer, Project Manager. Annual, before planting and ad hoc inspections of the site
	Protection of Natural Habitats	Mangrove Planting and Management Plan. Construction site management, disposal of waste	Mangrove Planting and Management Plan in place before planting starts. The Plan has been approved by the Project Management Committee and is subject to annual technical review.	NCSD, PDoE Preah Sihanouk, M&E Officer, Project Manager. Annual, before planting and ad hoc inspections of the site

	Conservation of Biodiversity	See Protection of Natural Habitats	See above	See above
	Public Health	Following ILO guidance on construction site safety. Zero accident construction technique	Training complete prior to construction starting. All signs, fences and other safety equipment in place, as signed off by the site manager and M&E Officer. Weekly site reports by the site manager and inspection by the M&E Officer	NCSD, PDoE Preah Sihanouk, M&E Officer, Project Manager. Annual, before planting and ad hoc inspections of the construction site
	Pollution Prevention and Resource Efficiency	Effective disposal of waste	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer (merged with Protection of Natural Habitats)	NCSD, PDoE Preah Sihanouk, M&E Officer, Project Manager. Annual, before planting and ad hoc inspections of the construction site
	Physical and Cultural Heritage	Continued dialogue with the Provincial Hall of Preah Sihanouk Province	There are no physical sites to inspect at present. However, there will be ad hoc discussions with the Provincial Hall of Preah Sihanouk Province to discuss developments in this area. Provincial Hall will be fully informed of the project's progress and two way dialogue will be created.	NCSD, PDoE Preah Sihanouk, M&E Officer, Project Manager. Annual, and ad hoc based on discussions with the Provincial Hall[120] of Preah Sihanouk Province
	Land and Soil Conservation	See Protection of Natural Habitats	See Protection of Natural Habitats.	NCSD, PDoE Preah Sihanouk, M&E Officer, Project Manager. Annual, before planting and ad hoc inspections of the site
Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P.	Access and Equity	Continued safe market access and a 100% continued trading approach	Surveys with market traders before and after construction. This will include discussing the construction plans (i.e. specific procedures to ensure continued trading) with the traders for their suggestion and agreement	NCSD, DLMUPC Preah Sihanouk, M&E Officer, Project Manager. Annual and ad hoc during construction
	Marginalised and Vulnerable Groups	See Access and Equity (understanding that most of the traders are women)	Surveys with market traders before and after construction. This will include discussing the construction plans (i.e. specific	NCSD, DLMUPC Preah Sihanouk, M&E Officer, Project

[120] The Provincial Hall has (*inter alia)* a coordinating function at the provincial level.

Sihanouk Province			procedures to ensure continued trading) with the traders for their suggestion and agreement	Manager. Annual and ad hoc during construction
	Human Rights	See Involuntary Resettlement	See Involuntary Resettlement	NCSD, DLMUPC Preah Sihanouk, M&E Officer, Project Manager. Annual
	Gender Equality and Women's Empowerment	See Access and Equity	See Access and Equity	NCSD, DLMUPC Preah Sihanouk, M&E Officer, Project Manager. Annual and ad hoc during construction
	Core Labour Rights	Formal contracts. Fair wages well above the minimum wage, good working conditions. Occupational health and safety	Example contracts (personal details redacted) made available and comments invited from ILO representatives and the Ministry of Labour. Worker testimony gained through informal discussions.	NCSD, DLMUPC Preah Sihanouk, M&E Officer, Project Manager. Annual and ad hoc during construction. Annual and during the recruitment phase
	Involuntary Resettlement	See Access and Equity – continued ability to trade unaffected	As Access and Equity plus a survey of foot traffic into the market to ensure that there has not been a decline in the number of people using it (a proxy for ensuring that there has been no loss of income).	NCSD, DLMUPC Preah Sihanouk, M&E Officer, Project Manager. Annual and ad hoc during construction
	Public Health	Following ILO guidance on construction site safety. Zero accident construction technique	Training complete prior to construction starting. All signs, fences and other safety equipment in place, as signed off by the site manager and M&E Officer. Weekly site reports by the site manager and inspection by the M&E Officer	NCSD, DLMUPC Preah Sihanouk, M&E Officer, Project Manager. Annual and ad hoc during construction
	Pollution Prevention and Resource Efficiency	Formal waste disposal through the waste management contractor	Weekly report by the site manager. Pre and post construction site inspection by the M&E officer (merged with Protection of Natural Habitats)	NCSD, DLMUPC Preah Sihanouk, M&E Officer, Project Manager. Annual, during and after construction
Output 3.8 Weather station and tide gauge	Protection of Natural Habitats	Ensure zero disruption of the local environment in installing equipment	Pre and post installation inspection by the Project M&E Officer.	NCSD, DoWRAM Preah Sihanouk, M&E Officer, Project Manager. Annual and during/after installation

with early warning system broadcast capabilities installed (weather station in Teuk La'k Commune, Tide Gauge in Ou Okhna Heng Commune, P. Sihanouk Province	Conservation of Biodiversity	See Protection of Natural Habitats	See Protection of Natural Habitats	NCSD, DoWRAM Preah Sihanouk, M&E Officer, Project Manager. Annual and during/after installation
	Climate Change	Seek regional suppliers for equipment	Bidding/tender documents must explicitly identify the source/supply route of the equipment and explain why the most sustainable options are being chosen.	NCSD, DoWRAM Preah Sihanouk, M&E Officer, Project Manager. Annual and during procurement
	Physical and Cultural Heritage	Continued dialogue with the Provincial Hall of Preah Sihanouk Province	There are no physical sites to inspect at present. However, there will be ad hoc discussions with the Provincial Hall of Preah Sihanouk Province to discuss developments in this area. Provincial Hall will be fully informed of the project's progress and two way dialogue will be created.	NCSD, DoWRAM Preah Sihanouk, M&E Officer, Project Manager. Annual and during/after installation. Ad hoc based on discussions with the Provincial Hall of Preah Sihanouk Province

Budget

The overall budget contains a provision of US$167,490 for ensuring compliance with the Environmental and Social and Gender Policies of the Adaptation Fund. This is 5% of the total budget for the investments under Component 3 of the project, and is shown in the Detailed Budget section in Part III, Section G. The budget is distributed across the four years of the project, with $20,000 in the first year, $60,000 in years 2 and 3 and the balance in the final year. The detail of the ESS budget is per the specific presented below.

Item	Total	Year 1	Year 2	Year 3	Year 4
M&E Officer salary	69,000	9,000	24,000	24,000	12,000
Travel relating specifically to ESS	29,000	3,500	11,000	11,000	3,500
Training on ESS compliance	42,500	5,000	15,000	15,000	7,500
Consultations and field level workshops	26,990	2,500	10,000	10,000	4,490
Environmental and social safeguards	167,490	20,000	60,000	60,000	27,490
	167,490	20,000	60,000	60,000	27,490

The $167,490 allocated for compliance with the Environmental and Social Policy is comparatively high relating to other projects submitted to the Adaptation Fund. However, it has been set at this level in recognition that Cambodia is a Least Developed Country and that the project is relatively complex in nature.

Annex 3 – Project Investment Sheets under Component 3

Please note that further information about all of the investments presented below can be provided upon request. Only key information has been presented here due to space constraints. A full engineer's design concept is available for each investment.

3.1. MANGROVE PLANTATIONS FOR IMPROVED COASTAL RESILIENCE

INTRODUCTION

Problem statement

Mangrove ecosystems are rapidly declining in many parts of the world. This has resulted in the loss of important environmental and economic products and services including agricultural products, flood mitigation and nursery grounds for fish.

Deliverables	Delivery of mangrove plantation for coastal resilience
Beneficiaries	17,754
Budget	$294,490
Location	Kep Province, Ou Okhna Heng, P. Sihanouk

Consultations with local communes in Kep Province and Prey Nob District have identified that coastal communities are being impacted by climate change and its effects on the coastal environment, leading to the serious consequences for local people. The identified environmental impacts listed below can be attributed to a combination of declining mangrove ecosystems and/or insufficient coverage by existing mangrove reserves and the impacts of climate change:

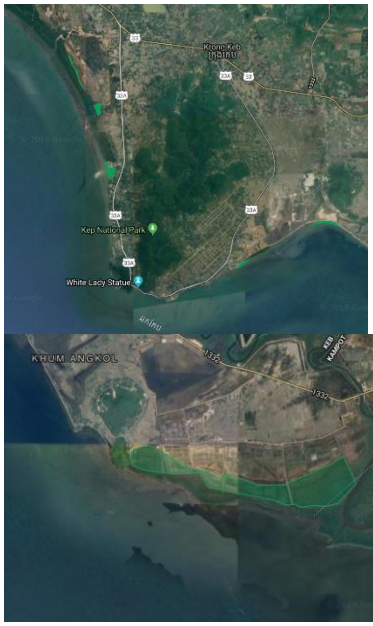
- Significant reduction in fish levels for local fishermen and women;
- Coastal erosion leading to loss in coastal agricultural land and damage to coastal infrastructure;
- Storm surges resulting in salt water ingress into the local agricultural land and surface water, resulting in decreasing agricultural productivity and surface water availability;
- Reduced resilience of houses in the coastal area to flooding and high winds, contributing to potential loss of life and property damage.

This investment will plant mangroves along the coast in Prey Thom, Kep Pong Teuk and Angkaol Communes in Kep Province and Prey Nob Commune in Prey Nob District and establish or restore mangrove protected areas in these locations.

The case of environmental and socio-economic benefits for this investment are strong: as per the International Federation of Red Cross and Red Crescent Societies (IFRC) study dated 2011 *Mangrove plantation in Viet Nam: measuring impact and cost benefit* the plantation of mangroves over a 30-year period is estimated to provide benefits per hectare of mangrove plantation 28 to 104 times the initial establishment costs.

Location

The selected locations for mangrove plantation in this investment are all in area classified as 'state public land', and thus do not impact private land, but provide protection to land behind the plantations as well as preventing coastal erosion, and supporting marine biodiversity through increased fish and crab spawning areas.



Top left: Proposed site for strengthening mangrove in Ou Krassar Commune, Kep. Top right: Proposed site in Prey Nob District. Bottom left, Proposed site in Angkaol Commune, Bottom right, total area of mangrove in Kep

Beneficiaries

Key beneficiaries include:

BENEFICIARIES	REASON	QUANTITY	COST/ BENEFICIARY
Local Fishermen	Improved fishing yields resulting from the improved marine ecosystem. As per the International Federation of Red Cross and Red Crescent Societies (IFRC) study dated 2011 *Mangrove plantation in Viet Nam: Measuring impact and cost benefit* mangroves have also had a positive impact on the provision of additional income for coastal communities through an increase in per hectare yield of aqua culture products such as shellfish and oyster by 209-789 per cent.	1000	$11.52
Protection of Local Infrastructure, Property and Residents	Mangrove plantations provide protection against coastal erosion, salt water ingress to rice fields and protection of residents, infrastructure property against storm surges and other environmental impacts. As per the International Federation of Red Cross and Red Crescent Societies (IFRC) study dated 2011 *Mangrove plantation in Viet Nam: Measuring impact and cost benefit* mangroves can provide direct protective benefits between $800 and $3287 per Ha subject to site specific constraints.	16, 754	$11.61

BUDGET

Mangrove Plantation

ITEM	ZONE	LAND SIZE (Ha)	ALLOCATED BUDGET ($USD)(3)
Mangrove Plantation Asessments	All districts		$50,000
Kep District Mangrove Reforestation	Mangrove Plantations within High to Medium Intertidal Zones	37.19	$39,979
	Mangrove Densification (plantation spacing at 50% relative to new plantation zones)	0	$0
Angkoal District Mangrove Reforestation	Mangrove Plantations within High to Medium Intertidal Zones	97.2	$104,490
	Mangrove Densification (Plantation spacing at 50% of new plantation zones)	0	$0
Nursery Establishment Costs	Mangrove Nursery ($25,000)	NA	$25,000
Comminity Awareness Training	NA	NA	$50,000
Pilot Studies for Phase 2 Works	NA		$25,000
			$294,469

Notes:

1. Assumed plantation cost is $1075 per hectare ($850 with a 26% augmentation due to inflation) in accordance with IFRC (International Federation of Red Cross and Red Crescent Societies) paper 'Mangrove plantation in Viet Nam: Measuring impact and cost benefit' (2011)
2. Mangrove Nursery Costs based on paper entitled Sinohin, V., & Baconguis, S. (2000). Establishing a mangrove nursery. SEAFDEC Asian Aquaculture, 22(1), 7-8, 28-30 and with 1998 costs inflated at 3% per year.

3.2a WATER GATE REPAIR ANGKAOL AND PONG TEUK COMMUNES

INTRODUCTION

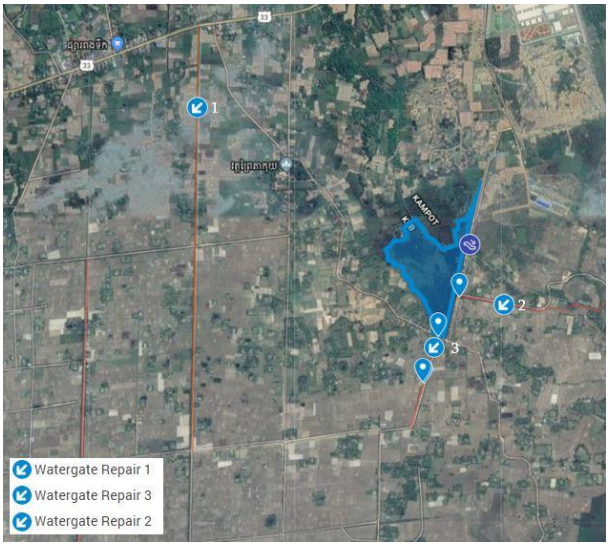
Three irrigation canals from the main reservoirs O Thmar and Roness are not functioning as per their design. The community is therefore unable to divide the water and get the right water levels and amounts of water to agricultural areas or use it for drinking purposes.

Problem statement

The state of the current infrastructure means that the communities don't benefit from the existing water gates. Increasing periods of water shortage due decreased rainfall as a result of climate change enhance the problem of a non-functional irrigation system. Rice farmers depending on this water source for irrigation and all those dependent on it for domestic water use are likely to face increasing problems with water shortages in the dry season in the near future, particularly considering rapidly declining rainfall in the dry season.

Resilience to natural hazards refers to the ability to protect lives, livelihoods and infrastructure from destruction or damage, and to the capability to restore normalcy after natural hazard has occurred. This investment seeks to improve the resilience of the affected communes to the vulnerability of increasingly intense rainfall events and longer periods of draughts causing water shortage for cropping by repairing three water gates.

Location



Beneficiaries

The beneficiaries of this investment are the communities living in the area relying on water supply from the canals and dividing water by the water gates to water the rice paddies and other crops in the area.

- Commune
- Paddy field area

The community living and relying on this water source is 8,566 in Angkaol Commune and 10,987 in Pong Teuk Commune. The area of paddy field benefiting repair of these gates is approximately 600 hectares for water gate 1,130 hectares for water gate 2 and 230 hectares for water gate 3. The locations of the gates are indicated on the map above.

BUDGET

Gate repair Angkaol and Pong Teuk

The estimated costs of the gate repairs are presented below.

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Concrete gate 1	4.2 m^3	$104	$440
Gate with plate and spindle including frame	1	$3500	$3500
Filling material gate 1	6 m^3	$8	$48
Concrete gate 2	1 m^3	$104	$104
Filling material gate 2	3 m^3	$8	$24
Concrete gate 3	3 m^3	$104	$310
Sandbags needed for construction all gates	15 m^3	$13	$195
Labour (unskilled)	20 days	$15	$300
Labour skilled	10 days	$30	$300
Pump to drain work space	1	$120	$120
		TOTAL	$5,341

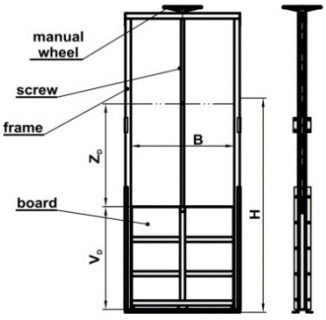


Left – Watergate 1. Centre – Watergate 2. Right, Watergate 3.

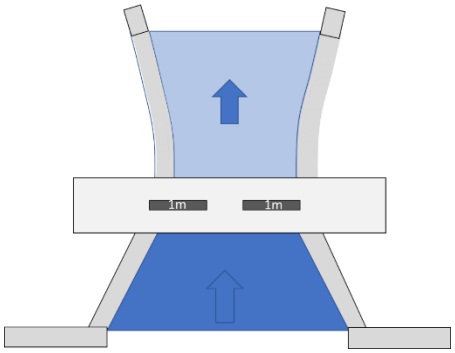
Details on water gates:
Watergate 1 is missing the spindles and gate and the surrounding embankment is eroded
Watergate 2 is suffering from erosion at the embankment both upstream and downstream
Watergate 3 is having trouble due to scour on the gate bottom

Design

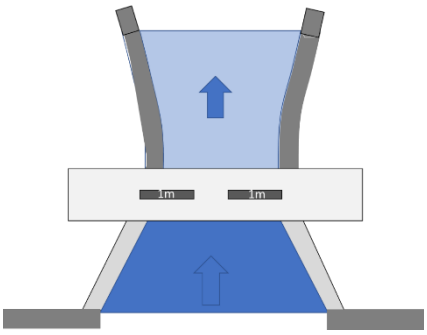
The gates designs are standard for the area and seen throughout the province. The repair works are detailed per water gate. Mostly focusing on concrete works and precautions to prevent erosion.
Gate 1
Repair works on water gate one are slightly more comprehensive than the other gates. Water gate 1 needs a proper structure provided before two new spindles can be installed. To do so, the upper structure needs to be built with concrete and the also the lining around the gate, guiding the water, requires reconstruction.



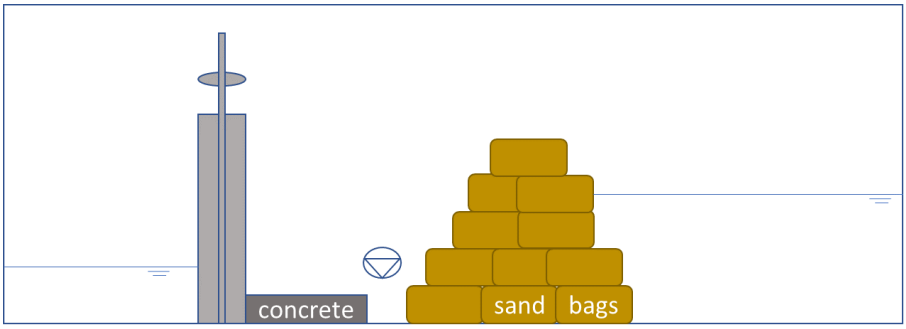
The design of the gate is shown to the left.



The works required for Gate 2 are shown below



The scour on gate 3 will be repaired using the method depicted below:



3.2b PONG TEUK AND ANGKAOL CANALS REHABILITATION

INTRODUCTION

Pong Teuk and Angkaol Communes both have been affected by fluvial flooding due a lack of drainage capacity. Reservoirs in the communities are not well operated and the canals are silted up, which causes the capacity shortage. Besides draining during wet conditions, the canals provide an irrigation function for the rice paddy fields in the area. These canals therefore have the potential to provide year-round functionality – drainage in the rainy season and water for irrigation and domestic use in the dry season.

The canal downstream from Roness Reservoir is silted up and needs re-lining to prevent flooding in wet periods. The canals downstream from O Thmar reservoir are overgrown by vegetation as seen in the picture above.

Problem statement

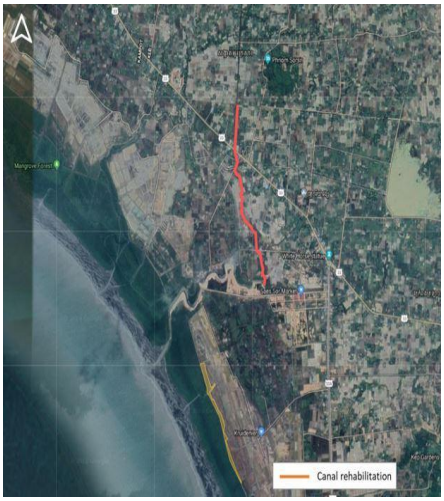
Poorly maintained canals have limitations in discharge capacity therefore cause flooding in the wet season. On the other end in the dry season water designated to an area is vital for its rice production. Losses due to bad water canal management causes water shortages and crop failures in periods of drought, which are likely to become more common as a result of declining rainfall due to climate change. The communities need a more resilient approach to water management allowing them to:

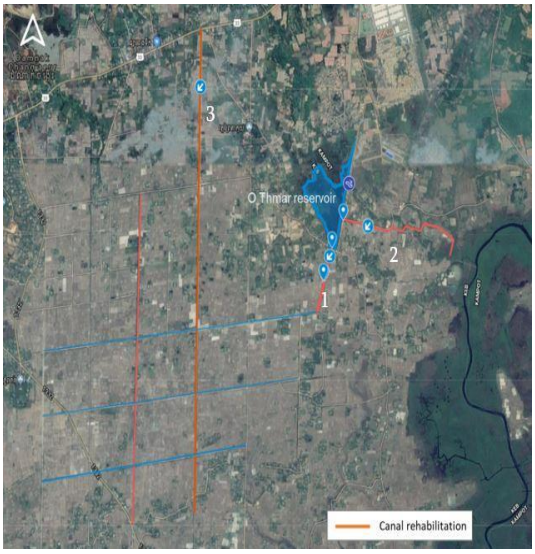
Resilience to natural hazards refers to the ability to protect lives, livelihoods and infrastructure from destruction and damage, and to the capability to restore areas after natural hazard has occurred. This project seeks to improve the resilience of the affected communes to the vulnerability low discharge capacity due to silted canals by the provision of:

- Canal maintenance and re-lining of the most silted up canals
- Capacity building on canal maintenance.

Location

The location of the irrigation channels is situated in Kep Province for both Angkaol and Pong Teuk Communes. The maps below show the locations of the canals. Shown in the maps below





Beneficiaries

The group benefiting from these infrastructures is combined farmers and villagers who depend on the water as a source and the upstream living communes who rely on the canals to function as drains which discharge the excess of rainwater. The group of beneficiaries is described in detail in section 3.2a – the same people will benefit from activities under output 3.2a and 3.2b

BUDGET

Canal Rehabilitation

The cost of the canal rehabilitation is based on the total length of the three canals combined. The total length is 8,600 meters. Taking out debris with an excavator counts for the largest cost in rehabilitation of the canals. Taking out the debris can also be done by hand, using a large amount of unskilled labour. This will take more time. It is recommended in this investment to get the debris out with an excavator and start an education programme on canal maintenance. Training on canal maintenance will be undertaken as part of Output 1.3.

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Removal of debris	8600m^3	$6	$51,000
Labour (unskilled)	250 days	15	$3,750
Labour (skilled)	60 days	30	$1,800
Equipment	500hr	39	$19,500
		TOTAL	**$76,050**

DATA COLLECTION

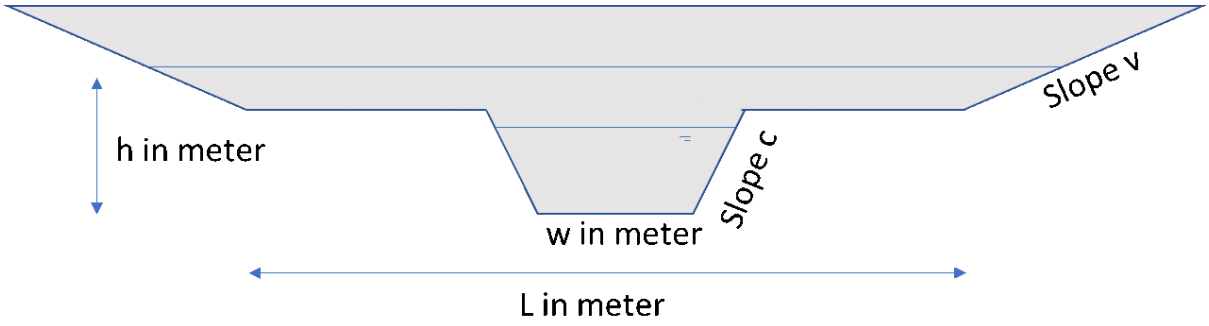
Inputs

Rehabilitation of the canals is based on the information collected during the field visit. Visual inspections showed a lack of maintenance of the canals, causing blockages of major structures such as culverts and gates. The canals should be designed based on the discharge capacity set by the orifices and sluice in the irrigation system. Visual inspection shows the following dimensions for the orifices and sluices in the O Thmar and Roness Reservoir. The canals therefore need to be designed on the maximum discharge capacity of the sluices.

	SLUICE GATE 1 SOUTH O THMAR RESERVOIR	SLUICE GATE 2 EAST O THMAR RESERVOIR	SLUICE GATE RONESS RESERVOIR
Head loss [H1]	3 m	3 m	1 m
Width	1 m	2 m	2 x 1.5 m
Height [W]	1.5 m	1.5m	1 m
Maximum discharge wet season[Q]	6.7 m3/s	12.5 m3/s	3.4 m3/s

Rainfall data is essential in understanding the behaviour of the water system. the graph below shows the averages rainfall per month for the last 34 years in nearby Sihanoukville. Over 85% of annual rainfall occurs in the rainy season from June to October.

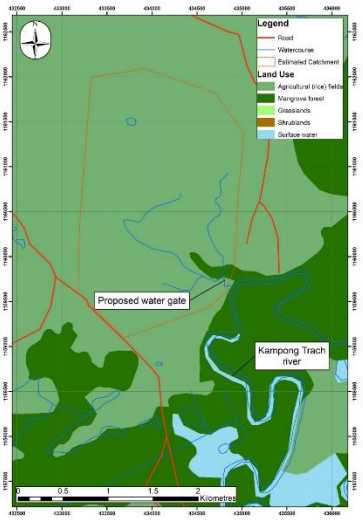
The canal after dredging will be according to the design below.

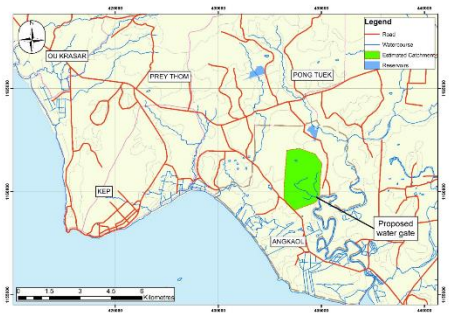


	CANAL 1 O THMAR SOUTH SLUICE	CANAL 2 OTHMAR EAST SLUICE	CANAL 3 A,B RONESS DOWNSTREAM
Wet season discharge Q [m^3/s]	6.7	12.5	13.4
Wet season bottom width L [m]	4	6	6
Bottom width w [m]	0.5	0.5	1
Slope c [m/m]	1/3	1/3	1/3
Slope v [m/m]	1/5	1/5	1/3
Water level h [m]	1.2	1.40	1.4

3.3 PREVENTION OF SALT WATER INGRESS THROUGH RIVER CHANNELS

INTRODUCTION





Deliverables	• Embankment • Water gate with one-way valves
Beneficiaries	3,500
Budget	US$ 197, 841
Location	Protects Angkaol and Pong Teuk Communes

Problem statement

Communities relying on agriculture, (in Cambodia largely rice production), living near to the sea and on low-lying land, are at risk of saline intrusion from the sea and tidal rivers washing inland and causing salinization of their crops in extreme tidal events. This is exacerbated by the seasonal nature of Cambodia's climate, where for six months in the dry season there is very little runoff from the land.

Consultation and site investigations have indicated that, while some areas now have a tidal flooding embankment, others are still exposed to flooding from the open sea, which not only affects crop production but reduces the fertility of the soil for future cropping.

Any structure preventing inland flow of salt water must also allow outflow of surface flood waters during the rainy season, so a gate or sluice with a one-way non-return valve is necessary to enable the outflow.

Location

A flood embankment has been proposed across an un-named tributary of the Kampong Trach river in Angkaol Commune. The location is shown on the maps below.

Beneficiaries

Angkaol Commune has benefitted in recent years from a new flood embankment protecting the commune and the adjacent inland commune of Pong Teuk from flooding directly from the sea. However, tidal flooding from the Kampong Trach Estuary is still a reality and this directly affects farms across a 4.5 km2 area. There are 19,553 people currently reported as living in Angkaol and Pong Teuk Communes, with approximately 3,500 living within and wholly reliant on the area protected. If the risk of salinization is removed the entire community and the surrounding district will benefit from increased crop yields and improved soil structure.

BUDGET

Embankment and Water Gate

These costings are based on cost estimates for the National Road no. 3 upgrade works in 2012 adjusted for inflation and on a quote from the Phnom Penh Precast concrete company for the culverts and transport.

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Topographic survey along proposed line of embankment, 370 m – (2 x skilled surveyor for 4 days each)	8	$300	$2,400
Site clearance	3.000 m2	$20	$60,000
Embankment fill	5,500 m3	$0	$0
Water gate - culverts	6	$900	$5,400
Water gate – transport for culverts	1	$1,000	$1,000
Water gate – concrete	160 m3	$145	$23,200
Water gate - steelwork	Lump Sum		$15,000
Water gate – duck bill valves	4	$400	$1,600
Water gate – other (mesh etc.)			$2,000
Temporary access track			$16,241
Design support team - engineer (2 engineers for 3 weeks)	42 days	$300	$12,600
Labour – skilled (3 labourers for 8 weeks)	120 days	$30	$3,600
Labour – unskilled (18 labourers for 8 weeks)	720 days	$15	$10,800
		TOTAL	**$ 197,841**

DATA COLLECTION

Inputs

This study has been informed by data provided by the Ministry of the Environment, Kep Provinicial Department of Water Resources and Meteorology, Preah Sihanouk Provincial Department of Water Resources and Meteorology, Kep Provincial Department of the Environment and Angkaol Commune. Data for cost estimates has been provided by Arcadis and the Phnom Penh Precast concrete company. Mapping has used Google Earth satellite imagery and openly available GIS data including geology, land use and watercourses.

Consultations

Consultation has been carried out with the National Ministry of the Environment, Kep Provincial Department of Water Resources and Meteorology, Kep Provincial Department of the Environment and Angkaol and Pong Teuk Communes.

Further information on consultations undertaken in the formulation of the proposal can be found in Part II, Section H.

Site Records

A site visit took place and identified a location where an existing footpath crosses a stream on a wooden bridge (see Map 1 and cover picture). Either side of this bridge there is an elevated path which can be used as the foundation for a higher embankment. The path delineates the boundary between mangrove downstream (which requires a saline environment) and rice fields upstream (which require a fresh water environment). See Photos 1 and 2 in the Photos section below. It is proposed to create a more formal boundary with a flood embankment and water gate at this location (see maps 1 and 2 for location details).

IMPLEMENTATION

Design

The design comprises two elements, an embankment and a water gate. The flood embankment is 370m long. This has been checked using GIS mapping and confirmed by the community but a full topographic survey along the line of the embankment is necessary to confirm the required length of the embankment before works are commenced. Upon completion of construction the crest level should be surveyed throughout to ensure a consistent flood defence level.

The embankment should be sufficient to prevent overtopping from the sea in extreme events up to 2100, in accordance with worst-case scenario projections of 1-metre sea level rise. In the Shoreline Assessment carried out for the Ministry of the Environment in 2014 it was estimated that an average sea level rise of 0.8m could occur by 2100. The community advised that the existing footpath is overtopped by up to 0.5m on extreme tides every 2-3 years. Therefore the new flood embankment will need to be a minimum of 1.3m above the existing footpath level, providing continued functionality under worst-case scenarios of future climate change. We have allowed a further 200mm freeboard in the estimations for this work.

It is proposed to construct a flood embankment 1.5m in height above the existing path, grading out to higher ground level on each side of the stream. The embankment should be a minimum of 2m in width at the crest and have 1 in 3 side slopes. The embankment is not required to withstand high tidal water levels for long periods and so compacted local alluvial soil with sufficient clay content to provide cohesion will be appropriate. The cross-section sketch (Drawing 1 in the Drawings section below) indicates the highest part of the embankment near to the water gate. The fill required to raise the embankment may be less as the ground rises to either side, but this can only be confirmed by the topographic survey. For the purposes of costing we have assumed that an average 1.85m depth of fill is required along the 370m length. Therefore the average cross-section of the extra embankment fill is 1.85m height x 8m width, giving a total fill requirement of 5,500m3.

It should be noted that the embankment fill will be sourced from the excavation works at the nearby O Thmar reservoir (See investment 3.4a). This is an alteration to the original proposal, based on comments from the Adaptation Fund. Recycled material from O Thmar will substantially reduce the cost of this intervention, and reduces the overall environmental and social safeguard risks of the project by reducing the amount of material that needs to be disposed of.

The water gate will be located where the embankment meets the stream, on the approximate alignment of the existing wooden bridge, and is required to pass a peak flood flow off the inland catchment to avoid drowning the rice fields and causing property flooding. No rainfall intensity data is available, but records of monthly total rainfall covering the period January 1983 to December 2017 as recorded in Sihanoukville 100km to the west of Angkaol are available, and have been used to estimate rainfall intensity. It is worth noting that the maximum monthly rainfall value was recorded in July 1991, and although the trend in average rainfall is increasing for the dry season months of January to March during the 34-year period of data collection, the trend for the rest of the year, including the wet season, is in steep decline with average monthly rainfall overall down by nearly 25% over this period (see graph below). Therefore it is likely that the peak runoff rate calculated here will not be exceeded.

The calculation is as follows:

Maximum rainfall per month = 1,319.7 mm = 1.3197 m = 0.043 m/day. Assume rain actually fell only 15% of the time, in intense bursts rather than continuously. This gives a peak rainfall rate of: 0.043 m/day divided by 15% = 0.284 m/day = 11.83 mm/hr

Using the Rational Method hydrology calculation, the Time of Concentration is: Tc = (0.87 L3/H)0.385

Where L = length of catchment – 2.7 km
H = difference in ground level across catchment = 2 m

Therefore Tc = 2.29 hrs

The maximum flow to be discharged is given by: Q = 0.278 C i A

Where C = Runoff coefficient (= 0.4)
i = Rainfall intensity (= the peak rainfall rate x the time of concentration) = 27 mm/hr
A = catchment area = 4.47 km2

Therefore, the maximum runoff at the proposed water gate location is 13.44 m3/s

A single 1m diameter concrete pipe culvert will pass approximately 2.4 m3/s flow so six 1m diameter culverts placed in parallel will address this volume of flow. It is proposed that four of these will be simple culverts with one-way valves to allow fresh water flows out but retain sufficient upstream water for cultivation, and prevent salt water ingress. The other two, in the deepest part of the channel (this is assumed to be the centre but this should be checked before construction starts) would be fitted with conventional sluice gates so these can be opened to allow flood flows to be passed through the structure in extreme conditions, but they should then be closed to prevent salt water from flowing into the rice fields once the flooding has passed.

An indicative sketch design is shown as Drawing 2 in the Drawings section below.

The gate structure including wing walls and head walls should be cast in concrete around the six pipes and the valves fitted to the seaward side of the structure. The vertical sluice gates fitted on the landward side can be of the same standard design as used elsewhere in Angkaol (see Photo 3 in the Photos section below).

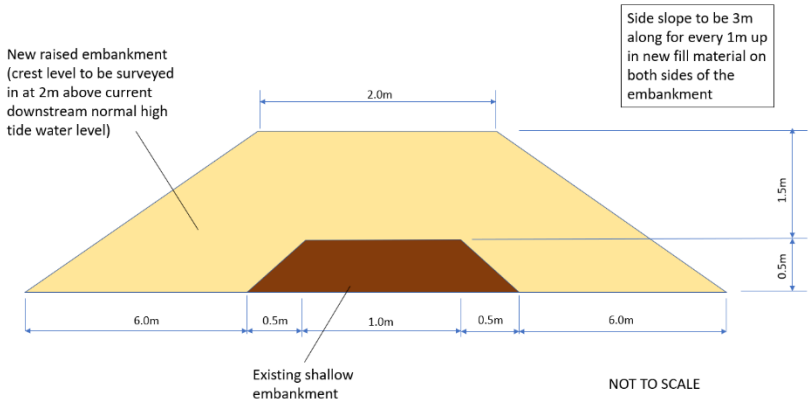
It is proposed to use 'duck-bill' type non-return valves instead of the more conventional vertically-hung steel flap valves (see Photo 4 in the Photos section below). Flap valves are liable to failure through siltation and debris clogging them up, thereby preventing either opening or closure.

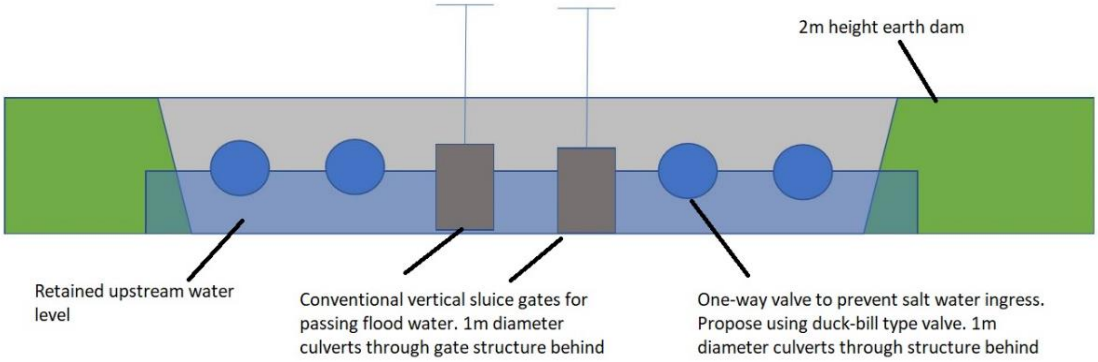
To provide further protection against failure from debris, given the likelihood of solid plastic waste being flushed down the stream in a flood, it is recommended that a galvanised wire 60mm x 60mm mesh debris screen is attached to the upstream side of the gate structure to cover over the culverts which have duck-bill valves on them.

Construction
In order to bring in construction components (e.g. culvert pipes and steelwork) and machinery to the site, a temporary roadway will need to be constructed. This will need to be designed and constructed to minimise disruption to the local community using state land as far as possible. The road should be removed on completion of the project.

Contractor Requirements
The contractor must ensure that construction work minimises disruption to the local community. Local labour should be used as far as possible.

TECHNICAL DRAWINGS





3.4 FACILITATING THE REFURBISHMENT OF RONESS RESERVOIR

INTRODUCTION

Deliverables	• Remove vegetation • Ground investigation and engineer's inspection to inform refurbishment design • Full redesign of dam • Construction of fully refurbished dam to engineer's design
Beneficiaries	24,470
Budget	US$1,384,000
Location	Protects Kep, Angkaol and Pong Teuk Communes

Problem statement

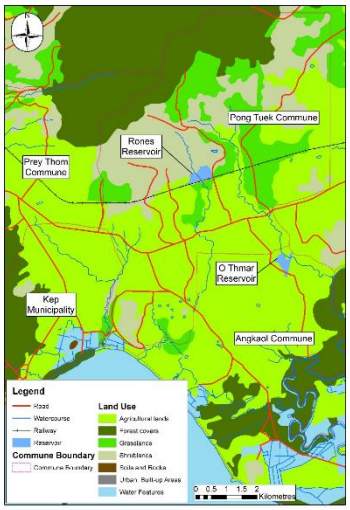
Of the ten reservoirs in Kep Province Roness is one of the highest and largest. As such, it is easier for downstream communities to obtain water from Roness and the area reliant on the reservoir for water is approximately 22 km2. It can also provide additional water supply to downstream reservoirs such as O Thmar through connecting channels in the low-lying agricultural area of Pong Teuk commune. Unfortunately, the dam is dilapidated and, as it was constructed during the Khmer Rouge regime (1975-1979) it was not built to modern engineering standards. Therefore, the reservoir is currently maintained with a very low water level and impounds at most 1m depth of water rather than the theoretical maximum 3.5m. If it is possible to refurbish the reservoir to retain closer to the original intended capacity this would provide much greater water security for the entire province and improve crop yields during the dry season.

This investment provides sufficient budget for a complete investigation, detailed design and refurbishment of the dam, based on the information gathered across three extensive consultations and field visits. The construction costs presented are based on these consultations and site visits. The detailed inspection and design may uncover the need for further works as a 'phase 2' beyond the life of the present project. These will not, however, compromise the effectiveness or safety of the works proposed here, but will propose further enhancements to the dam in the future.

Given that the western area of the Roness dam impounds a small body of water relative to the length of dam wall there may be opportunities during the detail design phase to realign the dam wall to reduce construction costs with minimal impacts to water storage capacity.

Location

The existing Roness Dam is located approximately in the centre of Pong Teuk Commune, immediately upstream of the Phnom Penh to Sihanoukville railway line. The location is shown on the map below.



Beneficiaries

Roness reservoir provides a water supply for Pong Teuk and Angkaol Communes and Kep Province. The collective population of these three settlements is 24,470. While Roness is not the only supply reservoir for these communes the availability of additional water supply through the dry season would certainly be of benefit to the entire neighbourhood as it would provide additional water security and improve the prospects for double or even triple cropping. It would also improve the prospects for increased local tourism, both through improved water supply and through the potential for recreational activity such as boating, water sports and freshwater fishing.

A complication does exist at Roness as, since the impounded water has been maintained at its current low level due to the state of the embankment, some local villagers have begun to cultivate areas within the footprint of the reservoir. If the embankment is upgraded and the reservoir restored to hold more water than at present this will cause detriment to those people farming within the reservoir extent. However, there is the potential for these people to adapt to alternative livelihoods supporting the additional economic activities that a restored reservoir could attract (e.g. farming goats to graze the embankment to keep it clear of large vegetation; freshwater fishing; providing boating for visitors). There would not be any requirement for resettlement as the local villagers live in a small community just to the east of the reservoir, outside the embankment. The full refurbishment of the reservoir would improve safety for the community by reducing the risk of dam failure.

BUDGET

Investigation, development of design and estimate of construction for Dam Embankment

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Vegetation clearance / management on embankment (1.4 km x 5m)	7,000 m2	$9	$63,000
Ground Investigation (20 boreholes to 15m depth, 5 boreholes to 25m depth, 30 boreholes to 10m depth and conversion of 8 boreholes to monitoring wells to 10m depth), including field engineer supervision	725m	$120	$87,000
Ground investigation – testing and analysis of samples (as detailed in implementation section below)			$45,000
Monitoring wells – recording of data on a weekly basis (done by existing reservoir maintenance staff on site)			$0
International consultancy support / supervision	160 individual work hours	$250	$40,000
Dams Supervising Engineer – supervision and review of inspection, design (assume 4 weeks)	100 individual work days	$500	$50,000
Design support team – hydrology, hydraulic engineer, geologist, structural engineer (average unit rate, national engineer)	600 individual work days	$300	$180,000
QA	4 individual work days	$300	$1,200
Additional material required to widen and improve safety of the dam (estimated – based on additional average dam cross-section of 35m2 over 1.4km length)	60,000 m3	$8	$480,000
Polythene liner embedded in dam upstream face and keyed into bed of reservoir (1.4 km x 18m)	25,200 m2	$4	$100,800
Additional concrete works (spillway, apron, gate housings)	250 m3	$145	$36,250
Spillway surface reinforcement			$150,000

Labour (skilled) (15 skilled operatives for 5 months)	2,500 individual work days	$30	$75,000
Labour (unskilled) (workforce of 50 working 8 hour days for 5 months)	5,050 individual work days	$15	$75,750
		TOTAL	**$1,384,000**

DATA COLLECTION

Inputs

This study has been informed by data provided by the Ministry of the Environment, Kep Provincial Department of Water Resources and Meteorology, Kep Provincial Department of the Environment and Pong Teuk Commune. Costings data has been provided by Arcadis and by the UN Habitat Programme Manager for Cambodia. Mapping has used Google Earth satellite imagery and openly available GIS data including geology, land use and watercourses. Advice on the necessary site investigations and hydrological / hydraulic studies has been provided by dams and geotechnical specialists within Arcadis and a site visit has informed the understanding of the dam condition and situation.

Consultations

Consultation has been carried out with the Ministry of the Environment, Kep Provincial Department of Meteorology and Water Resources, Kep Provincial Department of the Environment and Pong Teuk Commune.

Site Records

The site visits to Roness Reservoir included a site visit to the main south-facing dam that runs parallel to and 30m north of the railway line. The embankment has approximately 1:1 side slopes of a fairly sandy material although seemingly containing cohesive material and well-compacted. The downslope side is mostly heavily vegetated with a number of large holes where root boles have been pulled out with fallen trees. There are sporadic trees on the upstream face of the dam as well, and during the visit a branch fell from one of these trees into the water. A small mechanical excavator was present for undertaking some limited vegetation clearance from and repairs to the dam crest, but the angle of slope limited the ability to clear a lot of the vegetation. There was no spillway. We observed two manual sluice water gates (one had a damaged spindle but appeared to be still operable), and noted that there is a maintenance engineer retained on site to operate these in the event of a flood to prevent water building up behind the dam. The crest was approx. 4m wide, which enabled vehicle access along the top. According to GIS data and Google Maps the crest along the east-facing section of the embankment forms a public road, although like many rural roads here this is unsurfaced. Outflow channels to the south passed under the railway line in culverts and then ran through the adjacent agricultural land serving irrigation channels. The culverts under the railway did not appear adequate to accommodate a significant outflow from the reservoir if all the sluice gates were fully opened in a flood event. We were advised that the railway had only recently been renovated and the track appeared in a very good condition. Water marks on the concrete of the sluice gate housings showed the level water had formerly been maintained at, which is approx. 3.5m from assumed bed level (assuming the bed of the reservoir is at the same level as ground on the downstream side of the embankment). On the same assumption current water level was maintained at no more than 1m from bed. There were observed to be established woodlands within the footprint of the reservoir and appeared also to be some cultivated areas, which are more apparent from Google Earth satellite imagery dated 07/02/2018. We observed several people within the wooded areas.

IMPLEMENTATION

Design

To safely and effectively complete the refurbishment of the dam at Roness Reservoir, a full investigation and redesign of the dam to include a spillway and other modern safety features which are not currently present is required.

While the consultations and site visits conducted initial investigations and allowed for a concept design to be developed. The detailed site investigation inclusive of geotechnical testing and the detailed design of the dam are to occur in the next phase of works - cost and time implications precluded these works from taking place prior to the submission of the proposal. Any additional construction activities identified during the detailed design phase will be put forward in a proposal for phase 2 works to be implemented in the future to guarantee enhanced functionality in the context of reducing rainfall and a growing population.

An assessment of the Roness dam western wall alignment is to be investigated during the detailed design phase. As the western wall impounds a small body of water relative to its length there are opportunities to reduce construction costs with minimal impacts to overall water storage capacity.

Vegetation Clearance

Firstly, the extent of vegetation along the embankment is both a source of weakness (there is a risk of piping along tree roots, and the root boles of fallen trees cause large-scale physical damage to the embankment) and inhibits the ability to inspect the dam for leaks and other damage. The dam should be inspected by a qualified dams engineer who can instruct on the removal or management of vegetation to minimise disruption to the embankment (felling of established trees may cause more problems with leakage pathways as the roots rot). Any damage from trees that have already fallen, or where tree boles need to be removed, should be repaired before proceeding to the second stage of work. Subject to instructions by the qualified dams engineer, the ground surface on the downstream slope should then be maintained as far as possible as simply grass cover – to enable this it is recommended the area is fenced in and grazed by goats (cattle would be too heavy and could over-graze and damage the slope).

Geotechnical Investigation

The second element of work will be to undertake geotechnical investigation to establish the quality of the material the dam is built from and the material it is built on. It is not believed that there are any design drawings or specifications dating from the dam construction, and so it is proposed that a series of boreholes are advanced along the dam crest, the upstream and downstream toes, and at the locations of the proposed outlet works and spillway(s) to sample and test existing embankment and foundation soils. If, during the drilling of the boreholes, it is apparent that the material in or under the dam changes between two boreholes, additional ones should be drilled between the two that show differences to determine where an underlying change occurs.

The purpose of the geotechnical investigation is to determine the quality of the soil in the dam and the sub-soil conditions including ground water levels. The Length of the dam is approximately 1400 m.

Site investigation:

- Approximately 25 borings along the dam crest spaced approximately every 70 m including continuous Standard Penetration Tests (SPTs), and (un)disturbed sampling. Five borings would be advanced to top of rock or a maximum depth of 25 m. The remaining 20 would be advanced to a depth of approximately 15 m from the crest of the dam (up to at least 10 m into the original sub-soil).
- Approximately 30 borings along the dam's upstream and downstream toes and at the location of the spillway(s) and outlet works advanced to an average depth of 10 m into natural ground
- Convert 8 borings along 4 cross-sections, spaced at approximately 500m into monitoring wells (approximately 10 m deep) to determine the piezometric level.

At the discretion of the qualified dams engineer, some borings could be replaced by Cone Penetration Testing (CPT's). It is assumed that drilling through the dam material and sub-soil can be executed by percussion boring or an equal system. In case hard soil (rock) is encountered then drilling using the rotary coring technique will be necessary.

Laboratory testing (it is assumed no rock material will be encountered) to be conducted on existing embankment soils and foundation soils.

Non-cohesive soils

The following tests are required on non-cohesive soil samples:

- Particle size analysis (classes/sieve dimensions);
- Hydrometer tests on selected samples;
- Triaxial tests (consolidated drained, minimum/maximum density).

Cohesive soils

The following tests are required on cohesive soil samples:

- Atterberg limits;
- Moisture content;
- In situ density (by undisturbed samples);
- Un-drained shear strength (pocket penetrometer and/or torvane in field);
- Triaxial tests (consolidated undrained with pore pressure measurements);
- Particle size analysis (classes/sieve dimensions);
- Hydrometer tests on selected samples;
- Consolidation test.
- Dispersion tests

For the Roness dam this will to the following amount of site investigation and laboratory testing:

- 20 borings including SPT's and (un)disturbed sampling up to depth of 15 m;
- 5 borings including SPT's and (un)disturbed sampling up to depth of 25 m;
- 30 borings to a depth of 10 m
- 8 monitoring wells including monitoring every week (to be done by existing on-site maintenance operatives following training);
- Continuous SPTs
- 15 determination of undrained shear strength (pocket penetrometer and/or torvane in field).
- 15 disturbed samples (short borings)
- 30 disturbed samples (long borings: dam material and sub-soil)
- 15 undisturbed samples (sub soil)

Approximate amount of tests (non-cohesive

- 20 Particle size analysis (5 including hydrometer tests);
- 10 Triaxial tests of 9 samples each (each with 3 confining pressures) for all soils – existing embankment and foundation soils

Approximate amount of tests (cohesive):

- 25 Atterberg limits;
- 15 organic content;
- 250 water content;
- 10 particle size analysis incl. hydrometer tests;
- 15 in-situ density;
- 5 triaxial tests of 9 samples each (each with 3 confining pressures) for all soils – existing embankment, foundation soils;
- 5 consolidation tests.

Detailed Inspection and Design Report

Third, the qualified dams engineer should carry out a thorough inspection of the dam and the reservoir. Then, with support from specialist hydrological and hydraulic engineers, and including analysis of the geotechnical investigation, the dams engineer should produce a report detailing the works required to bring the dam up to modern safety standards. This report should include:

- A study of the local geological and hydrological conditions;
- A site visit;
- Determine and collect basic assumptions for the design of the dam, e.g. earthquake loads, spillway requirements and ancillary objects etc.;
- Planning, execution and supervision of the site investigation specified above;
- Design of the dam: determination of dam height or maximum water level, dam dimensions, spillway, channel design incl. revetments, design culverts including foundation of these objects;

- Design drawings and contract, bill of quantities etc.

- This report will involve input from specialist teams in the following areas:

- Hydrologic & hydraulic analysis and hydraulic design of outlet works and spillway(s)
- Geotechnical analysis and design for embankment design, seepage controls, foundation treatment
- Structural design of outlet works and spillway(s)
- Civil design and preparation of drawings and technical specifications

The following assumptions have been made in determining the extent of work on the Roness Dam.

1) Numbers and depths of borings are estimates required to facilitate design of a fully refurbished embankment. If the intent of this document is to only provide the program and cost for a preliminary geotechnical investigation, then the program can be cut back. See comments in the text.
2) Dam foundation consists of alluvial sediments with unknown depth to rock (but assumed at no more than 25 m).
3) Dam is 1400 m long and up to 4 m high
4) Outlet work to be designed consists of tower and conduit
5) Spillway(s) to be designed consist of open channel structure(s) on one of the abutments.
6) Assumptions for foundation conditions:
    a. Rock is deep and will not factor into the foundation analysis or require special evaluation or treatment.
    b. There will be suitable low-permeability soil stratum within 10-12 m of the natural ground surface.
7) Terrain is relatively flat.
8) There are no property or other restrictions for locating spillway(s) and outlet works.
9) Assumes no time for environmental assessments or permitting
10) Does not include any bidding or procurement assistance or construction phase services.
11) Assumes 8 to 12-month design period following the geotechnical investigation.

The above reconstruction procedure at this stage assumes:

1) Suitability of the existing material from the dam for the refurbish the dam wall with minimal need to augment this material by mixing in externally sourced soils. Additional material outside the site boundaries can be sourced if necessary.
2) If there are limitations to the availability of locally sourced clay, as an alternative to a clay blanket and clay key, the dam's impermeable lining will be constructed using embedded HDPE sheeting. The HDPE sheet would be tied into the bed at the upstream toe of the embankment and provided with a suitable protective cover. The HDPE sheeting is to be safely treated to ensure that sheet degradation from rodents is mitigated.
3) Construction of a new spillway and the refurbishment of the existing outfall structures
4) Use of locally sourced materials to widen and strengthen the dam

Community Engagement

Roness reservoir is well-positioned to provide a water supply to much of Pong Teuk, Kep, Angkaol and Prey Thom Communes and as such most of the communities will have a stake in its refurbishment and will be supportive of any works. As identified above, there is a small community of approximately 50 people living in a village immediately to the east of Roness Dam, some of whom currently cultivate land within the reservoir footprint. It will be necessary to engage with these people to ensure they are able to effectively adapt to any change in the reservoir water level that occurs later following completion of the investigation and design proposed in this investment.

Construction

The existing dam material will be re-used and strengthened as much as possible. Other details of the physical works are as above.

Contractor Requirements

The geotechnical investigation should be carried out under the instruction of a qualified dams engineer to advise on the specific placing of boreholes and monitoring wells.

3.5 HOUSING RESILIENCE

INTRODUCTION

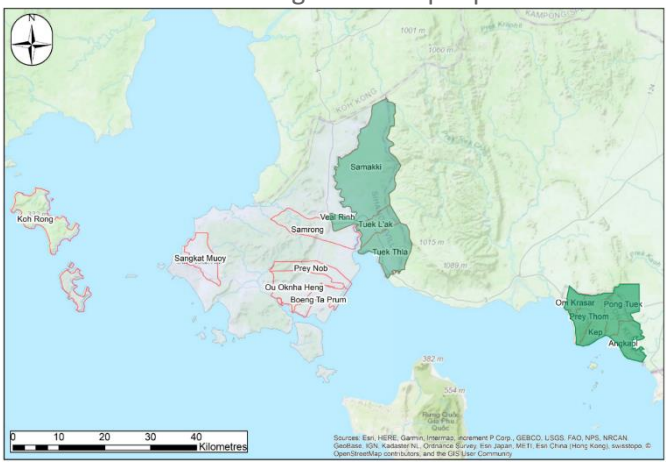
Deliverables	Resilient Housing
Beneficiaries	9,720
Budget	$171,800
Location	All Communes

Problem statement

Poor and marginalised households tend to be less resilient and face greater difficulties in absorbing and recovering from the impacts of natural disasters. Recurrent disasters also compound losses for many households, forcing them to organize their livelihood such that overall risks can be reduced in the face of uncertainty, even if it means a reduction in their income and increased poverty (UNISDR 2009b).

Consultation with local communities and site investigations have corroborated that housing in the local communities are vulnerable to strong winds - in some communes up to 80% of housing is damaged by strong winds on an annual basis.

Resilience to natural hazards refers to the ability to protect lives, livelihood and infrastructure from destruction and damage, and to the capability of communities to rebuild following a natural disaster. This project seeks to improve the resilience of the affected communes and reduce their vulnerability to environmental hazards through the provision of education and training for local people to create local capacity to facilitate the construction of safe and resilient housing, provide new economic and livelihood options.



The poor are already resilient, by both nature as well as necessity. However, further funding, information, and support are needed to empower them to escape poverty traps and better cope with climate change-related disasters.

Location

Resilient Housing

The housing resilience program will be focused on communes identified to be susceptible to weather related disasters. The locations are shown in the map to the left

In Prey Nob District, the investment will focus on the following communes (being those that were deemed particularly susceptible to strong winds following consultation with the local community and associated site visits):

- Teuk Thla
- Teuk L'ak
- Samaki
- Veal Rinh

In Kep Province, the investment will focus on the following communes (being those that were deemed susceptible to strong winds following consultation with the local community and associated site visits):

- Angkaol
- Pong Teuk
- Prey Thom

- Kep
- Ou Krasa

Beneficiaries

	BENEFICIARIES	QUANTITY	COST PER PRIMARY BENEFICIARY
Housing Resilience	Training workshop attendees	2000 Families (or 10,000 People Approx., with 50% representation of women.)	$171,800/10,000 = $17.18 per beneficiary

BUDGET

Budget for Resilient Housing

DESCRIPTION	QANTITY	UNIT PRICE	COST
Project Preparation Phases			
Material & sustainability survey (2 staff for 28 days)	56 days	$300 per day	$16,800
Development of 'demo' building drawings	20 days	$300 per day	$6,000
Development of building manuals	30 days	$300 per day	$9,000
Construction of Demo Houses (In Kep and Prey Nob Provinces)			
Construction of Traditional Style Demo Houses with Latrine and Storm-water Tanks (1 per commune, 4 total)	4	$15,000	$60,000
Construction of Masonry Style Demo Houses with Latrine and Storm-water Tanks (1 per commune, 4 total)	4	$15,000	$60,000
Engineering Input	10 days	$300 per day	$3,000
Training Seminars			
- 2 highly skilled tradesmen to run educational programs (50 sessions in total at 3 hours per session) – Assume 20 attendees each class, with at least 5 women, and preferably 10.	100 x 4 hours sessions	$20 per hour	$8,000
- Engineer to train tradesmen and women and run preliminary courses.	10 days	$300 per day	$3,000
- Training Materials	-	-	$1,000
- Miscellaneous Costs	-	-	$5,000
		TOTAL	**$171,800**

DATA COLLECTION

Inputs

The following inputs were used for the development of this investment:

- Community Consultations (Refer to the proposal Part II, Section H)
- Site Records and Observations

Site Records

Coastal Cambodia Building Style Observations

In poor communities along the southern coast of Cambodia, traditional building styles are prevalent. Construction of housing stock is often mixed with both modern and traditional materials and building techniques.

Building Arrangement: The traditional Khmer house is typically a rectangular home with dimensions generally between 4x6m to 6x10m. Homes either sit directly on the ground, or more typically, on stilts (typically 3m above the ground). This is to avoid annual flooding, protect against petty theft, provide natural cooling and allow for the storage of animals and equipment under the house. Access provided by concrete or wooden stairs. Elevation above ground level facilitates the provision of shade for daily life activities at ground level during the day.

Roofs: Whilst the roofs of traditional housing are typically of gable thatch roof construction it was noted that most of the existing housing stock in the region including new homes were typically constructed with corrugated steel gable roofs.

Room Arrangements: The simplest houses consist of only one room on the upper floor, partitioned off to provide a storage place for rice, a bedroom for the parents, and further space for unmarried daughters.

Foundations: Foundations typically consist of timber or concrete load-bearing piles nested on concrete foundations. For very loamy soils, wooden piles are driven up to 2m in depth to stabilize the foundation.

Wall cladding: Houses of the most marginalized are generally cladded with palm leaf matting which is directly fixed to the structural framework. Fine bamboo struts are often used to anchor the matting. In more sophisticated houses wooden boards are used to clad the walls, aligned either horizontally or vertically. Walls for new homes are typically of masonry construction.

Ventilation: Housing stock is typically absent of electric or mechanical air conditioning. A draught-free environment is obtained through natural ventilation. In more modern masonry houses, natural ventilation is often provided through the inclusion of 'air bricks' along the façade of the building.

To maximise effectiveness and adoption from beneficiaries, proposed resilient housing designs are to consider the aforementioned local cultural sensibilities and borrow heavily from local building styles (Audefroy, 2010).

Issues with Existing Housing Construction

The following is a brief summary of issues identified within the existing housing stock during initial site visits to the local communes. Identified issues are typically associated with construction defects, poor workmanship, unsuitability of construction with local site context and/or poor local building techniques:

- Corrugated roof sheeting of inadequate thickness when subject to corrosion and absent of washers at fixing locations are highly susceptible to tears at fixings during high wind events;
- Roofing projecting too far beyond the external wall edge and are therefore at higher risk of high uplift loads during wind events;
- Roof beam spacing too large and at risk of failure under loading;
- Corrugated roof sheeting reliant on nails in lieu of more robust fixings such as screws for connection into roof beams;
- Poorly constructed building joints with no steel straps or tie downs to mitigate high tension and compression forces at joints;
- Poor material quality of insufficient thickness or strength;
- Foundations are sufficiently imbedded within the soil and subject to pull-out;
- Timber posts are not adequately attached to the concrete foundation;
- No use of diagonal bracing to stabilise the timber structure from lateral loads induced by wind and flood water;
- Housing stock insufficiently elevated from ground level in flood prone areas;

- Housing stock have larger exposure to wind forces due insufficient planting of protective vegetation to form a natural wind buffer against prevailing winds;

Increased Adoption of Masonry Construction

Cambodian people are finding it more difficult to acquire the raw timber materials needed and are resorting to more modern materials such as brick, cement and corrugated sheeting.

Distribution of masonry houses appeared to be more prevalent along main roads, with more traditional timber housing styles evident along rural roads. This is an indication that those with better means are opting for newer construction styles and materials. However, this doesn't necessarily make them less likely to be impacted by strong winds.

New housing stock and housing under construction typically appeared to be of a masonry style construction.

Whilst the primary residences appeared increasingly built from masonry and concrete elements, secondary residences, storage, animal pens, and sanitation structures were typically of timber construction and of substantially poorer quality.

Increased adoption of masonry and concrete elements for housing construction is consistent with information received during consultation sessions with the local communes. The Chief of Pong Teuk Commune informed the design team that homes built from masonry and concrete are favoured due to their greater resilience to extreme weather and competitive costing due to limited availability of timber materials. The Pong Teuk Commune leader also informed us that well-built traditional homes were, as of recent times, potentially costing more than concrete and masonry house construction.

Based on the team's post-strong wind event site investigation on the 18th of October 2018, damage to residences were typically to roofing elements. On that date, over 175 residences were reportedly damaged according to the Chief of Pong Teuk Commune. Damage also extended to properties of masonry construction where (following a site inspection) it was evident that roof construction was not adequate. Specifically:

- Masonry to beam connections;
- Roof beam to roof beam connection; and
- Corrugated sheet to roof beam connections

Based on the increased adoption of concrete and masonry house construction and evidence that masonry houses are affected by environmental factors, it is proposed that any training on building practices provided to communes (in addition to the repair and construction of traditional timber houses) include training on construction methodology for masonry houses to address key construction shortcomings.

Quality of Building Materials

One of the key issues of housing construction within these provinces is the availability of suitable materials., where the use of poor-quality building materials (i.e. insufficient material strength and thickness and poor fixings) is evident.

With the reduced availability of quality timber due to historic deforestation, and the consequential use of inferior timber material in housing construction, for the poor there is an increased susceptibility to environmental impacts due to poor housing infrastructure.

The proposed training and workshops to be provided as part of this investment is to emphasize the importance of quality building materials, and to provide guidance on which materials/techniques allow for quality, low cost construction. Locally-available precast construction elements for incorporation into housing construction in lieu of other materials is to be evaluated as part of these workshops.

Assessment of Environmental Impacts to Housing

Based on consultation sessions with the communes, susceptibility of housing to wind events is a recurrent issue for the community, with hundreds of houses being damaged on an annual basis. There is a clear need to improve housing resilience in the region for wind-based events, particularly with respect to wall bracing and roof construction.

Despite identifying water marks clear above floor level for many housing structures, flooding was perceived as lesser of an issue for the community. It was noted that most traditional houses were built elevated from the ground and therefore protected from low level flood waters. Masonry houses on the other hand, were observed to be of sufficient strength to weather minor flood events.

With rising sea levels and houses being increasingly built of masonry construction flush with the ground level, there is an increasing risk of housing infrastructure susceptibility to larger flood events. To reduce the risk, communes should carry out hazard mapping to identify areas at higher flood risk. Furthermore, flood protection requirements for 1 in 100-year flood events should be articulated in educational programmes associated with housing resilience.

Protective Vegetation

Housing, where protected by a shelterbelt of vegetation, were reported by local residents as more resilient against strong winds. It is recommended that housing resilience educational programmes include information on the introduction of vegetation shelterbelts as cost effective wind protection.

Stormwater Retention

With water of increasingly greater scarcity in the area, safe drinking water harder to access, existing housing stock and new housing stock should incorporate storm water storage from roof runoff. Poor access to quality drinking water is reiterated by the local residents who reportedly at relative high cost and effort purchase water from distant reservoirs.

Rainwater is considered to be of very high quality by both recipients and non-recipients and was thus used extensively where available. The annual rainfall in the regions, which is in excess of 1400mm per year, can facilitate rain water harvesting efforts in the region. Costs for domestic rainwater tank reportedly range from US$160 for a jumbo jar to US$250 a concrete ringed tank.

Sanitation

Poor sanitation facilities have been identified as an issue during by both community consultations and on-site visits. Sanitation and hygiene awareness workshops should be carried out which emphasise the importance of latrines uses with activities and visual representations to connect open defecation to river water, which people might drink. Poor sanitation is a particular concern for women. Participants should understand the importance of latrines and be motivated to build one in their home.

Research by the World Bank's Water and Sanitation Programme published in 2012 argued that more than half of the Cambodian households that lack a latrine could, in fact, afford one.

Sustainability Issues

Long-term use of demo housing infrastructure:
Following completion of all learning programs, community infrastructure used to accommodate the housing resiliency seminars is to be repurposed:

- Demo housing (8 houses total) is to be augmented to a fit for purpose state for permanent settlement.
- Learning centre (1 learning centre total) to be augmented for use as a community centre. Ongoing management of the community centre to be under the purview of the commune.

Sustainable use of local materials
With respect to the types and quantities of local materials used in housing construction, the programme is expected to have a net benefit outcome:

- Successful implementation of housing resiliency principals within local construction would have a net benefit and result in reduced requirement for reconstruction and therefore requirements for new materials following wind and flooding events.
- Program to identify newer construction styles that incorporate the use of materials that mitigate risks of deforestation.

A material and sustainability survey are to occur alongside project preparation works to maximise use of sustainable materials. Proposed works include:

- Survey of local materials available to each commune
- Assessment of material sustainability
- Evaluation of opportunities to maximise material use sustainability

Long-term sustainability of the training programme:
To maximise the continuance key learnings of the program within the targeted communities:

- Best practises to be documented in paper and digital formats and distributed to public facilities including local government offices and schools. Discussion sessions will also be held to support less literate people in the community who may not be able to benefit from written information:
- Best practises to be documented in both written and video format in Khmer, using accessible language
- Videos to be uploaded online to Youtube and shared to people who have access to smartphones (increasingly common in the target area)
- Prior to completion of the training programme, local municipality to be offered the opportunity to fund extensions to the programme.
- Otherwise, it is expected that the housing resiliency learnings will be informally conveyed through the broader community and their families

Housing Resilience Design

Stage 1 - Project Preparation Works

Project preparation works are to take consideration of the following key consideration to ensure that the housing resilience works are adequately implement with appropriate consideration of the local context:

- Housing Resilience Literature: Mobilised project team to undertake a literature review on disaster resilient shelter construction and leading practices.
- Local Construction Practices: Undertake an assessment of local building practices and architectural styles, based on previous work conducted by UN-Habitat in Cambodia. The programme will be tailored to suit the local context and local culture. The assessment will analyse cultural requirements regarding functional spaces, housing styles, typology, materials and local construction techniques. Local availability of housing precast construction elements to be evaluated. Note that the assessment will take place under Output 1.2 of the project, and its findings implemented here.
- Sustainability and Materials Survey: A material and sustainability survey are to occur alongside project preparation works to maximise use of sustainable materials. Proposed works includes, survey of local materials available to each commune, assessment of material sustainability and the evaluation of opportunities to maximise material use sustainability.

Note: Design without adequate local representation and cultural sensibility are very likely to create conflict or even rejection from beneficiaries (Audefroy, 2010) and subsequently result in the ineffectiveness and unsuitability of rebuilt houses for future disasters.

- Hazard Mapping: Undertake housing and community multiple hazard assessment and ranking to produce community-based climate and disaster mapping and planning. Hazard mapping to take into account sea level rise, projected flood levels for 1 in100 year flood, local accounts of flood and wind prone areas.

Note: Evaluation tool detailed within Section 4.1 of paper Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region by Humanitarian Architecture Research Bureau (HARB) wherein an evaluation framework when undertaking this exercise with local communities is provided.

- Demo Housing Locations: In coordination with local commune leaders identify sites within Kep province and the affected Prey Nob communes wherein construction of demonstration houses are ideal. Location to be located near to transportation routes and suitable for training workshops to be held.
- Implementation Documentation: Produce implementation documentation including detailed construction documentation (taking into consideration local context, commune specific hazards and commune consultation), a training curriculum and an implementation plan.
- Development of Monitoring Procedures: To ensure effective coordination and management of housing resilience projects, monitoring procedures and checklists to be development for the respective stages of the project to facilitate tracking of project progress against the success criteria and compliance with the established standards. Plan to include report project success vis-à-vis success criteria and reporting on lessons learned from both successes and failures.

Stage 2 - Approvals

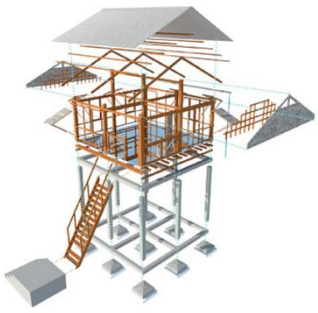
Submit Housing Resilience Documentation and attain formal approval from the Provincial Department of Land Management, Urban Planning and Construction, and Provincial Hall of Preah Sihanouk and Kep Provinces.

Stage 3 – Program Implementation

The investment will be implemented as per the implementation documentation plan and documentation produced within the Stage 1 works. Works within this phase includes, but not exclusive to:

- Construction of Demo Houses and associated latrines / storm water tanks;
- Identification of beneficiaries within local community i.e. members suitable to attend the capacity building workshops ("Local Capacity Building Workshops");
- Training and Local Capacity Building Workshops:
  - Workshop on identifying and understanding commune specific hazards inclusive of hazard mapping
  - Workshop on construction materials and technical detailing
  - Workshops on house layouts and associated construction budgeting
  - Sanitation and hygiene awareness workshops promoting healthy behaviours and latrine use
- Development and distribution of design manuals for workshop attendees; and
- Ongoing program monitoring and evaluation to assess effectiveness of the workshops.

Example housing designs are below.



3.6 Prey Nob Green-Grey Coastal Defence

INTRODUCTION

Deliverables	• Repairing water gates • Reforestation of mangroves
Beneficiaries	20,000
Budget	US$ 303,280
Location	Protects Ou Oknha Heng, Prey Nob, Ou Chou and Veal Rinh communes

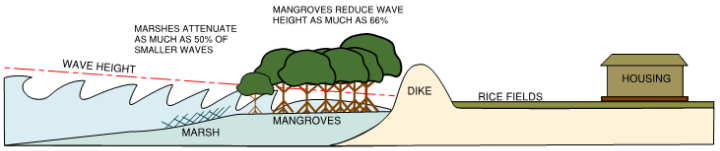
Problem Statement

The communities of Prey Nob district lying on the west side of the Kampong Smach estuary have been protected from sea flooding since 2001 by an earth embankment and roadway separating the paddy fields from the mangrove forest. On the landward side of the embankment is a 30m wide flood drainage canal for conveying freshwater floods in the rainy season and this empties under the embankment through a series of 36 manually operated vertical sluice gates.

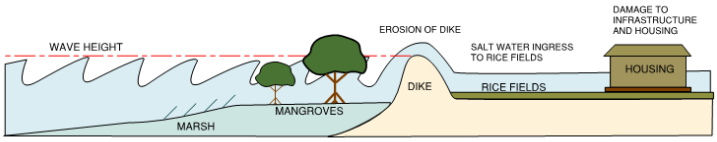
Several of the sluice gates along the existing coastal flood embankment are identified as damaged and in need of repair. There are also locations where the current flood embankment is being overtopped in severe storms, approximately once every 2-3 years – damaging the flood embankment and resulting in salt ingress into the rice fields. A site inspection historically affected zones affected by storm surges and embankment topping were adjacent to zones of localised mangrove deforestation.

This project looks to provide rehabilitate the hybrid mangrove/flood embankment seawall through targeted repairs to the sluice gates to and the rehabilitation of coastal mangroves adjacent to the flood embankment.

These works are expected to synergise well with government proposals involving the improvement of the coastal road/flood embankment for eco-tourism projects.



WAVES WITH HEALTHY COASTAL HABITATS



WAVES WITH DEGRADED COASTAL HABITATS

Location

The existing flood embankment extends from the main road in Ou Oknha Heng Commune towards the sea and then turns north-east and continues between the existing mangrove and paddy fields to join National Road 3 just west of the bridge over Kampong Smach River. The area where the existing vertical sluice gates are reported to be not working correctly is near the southern corner (indicated on the map below), where two sets of gates are not functioning.

Beneficiaries

The existing sea defence protects houses and approximately 2,000 ha of paddy fields in the communes of Ou Oknha Heng, Prey Nob and Veal Rinh. The commune of Ou Chrou is also affected. In these communes there are 27,667 residents listed and it is understood that due to the low-lying nature of the coastal strip here a significant majority are directly affected by sea flooding and the entire community is affected by crop loss as a result of the flooding. Failure of the sluice gates in the open position will allow salt water ingress which will damage crops, and failure in the closed position will lead to fresh water flooding of the paddy fields during the rainy season as floodwaters would be restricted from egress to the sea. Mangrove reforestation would reduce the impact of storm surges on the rice fields and protect the existing flood embankment from further erosion and degradation.

Improved fishing yields resulting from the improved marine ecosystem. As per the International Federation of Red Cross and Red Crescent Societies (IFRC) study dated 2011 *Mangrove plantation in Viet Nam: Measuring impact and cost benefit* mangroves have also had a positive impact on the provision of additional income for coastal communities through an increase in per hectare yield of aqua culture products such as shellfish and oyster by 209-789 per cent.

Mangrove plantations also provide protection against coastal erosion, salt water ingress to rice fields and protection of residents, infrastructure property against storm surges and other environmental impacts.

Approximately 20,000 people are included as benefitting directly from this investmet.

BUDGET

Refurbishment of two water gates not currently working and replacement of ladder

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Provision of stop boards to enable access (approx. 2.5m x 1m, 2 per gate)			$510
New steel gates and mechanism and refurbish runners	4 sets	$5,000	$20,000
Remove rusted rungs and install new steel ladder access	10 locations		$5,000
Labour – skilled (1 team leader for 10 days)	10	$30	$300
Labour – unskilled (5 operatives for up to 10 days each)	46.5	$15	$700
		Total	**$26,510**

Mangrove Reforestation

Description	ZONE	LAND SIZE (Ha)	ALLOCATED BUDGET
Prey Nob District Mangrove Reforestation	Mangrove Plantations within High to Medium Intertidal Zones	208.97	$224,643

Prey Nob District Mangrove Reforestation	Densification programme	48.5	$52,128
		Total	**$303,280**

Notes:

1. Assumed plantation cost is $1075 per hectare ($850 with a 26% augmentation due to inflation) in accordance with IFRC (International Federation of Red Cross and Red Crescent Societies) paper 'Mangrove plantation in Viet Nam: Measuring impact and cost benefit' (2011)
2. Community awareness programmes, mangrove plantation assessments and nursery construction costs are outlined and costed within the subproject 3.1 Mangrove Plantations

DATA COLLECTION

Inputs

This study has been informed by data provided by the Ministry of the Environment, Preah Sihanouk Provinicial Department of Water Resources and Meteorology, Preah Sihanouk Provincial Department of the Environment and the leaders of Boeng Taprom, Ou Oknha Heng, Prey Nob, Ou Crou and Veal Rinh Communes. Costings data has been provided with reference to various online resources including the Ministry of Public Works and Transport contract for the upgrading of National Road no 3 (dated 2012), adjusted for inflation. Mapping has used Google Earth satellite imagery and openly available GIS data including geology, land use and watercourses.

Site Records

A site visit took place, where several of the sluice gates were inspected and the entire embankment was traversed by vehicle. There are areas of informal settlement buildings along the sides of the embankment, mostly on the seaward (mangrove) side, although there were several instances of buildings on the opposite side of the flood drainage canal, accessed via boat or makeshift bridges. If the embankment does require significant raising in future it is likely the bulk of the work will need to be done on the mangrove side in order to retain maximum flow capacity in the drainage canal, although we were advised that the canal is very shallow and it might be possible to increase capacity by deepening the channel if needed.

The sluice gate structures are all of approximately the same age and the same design. The rusted-through rungs were only observed on one gate but not all the gates were inspected in detail. Consultation with the Department of Water Resources and Meteorology indicated this issue applied to a further 9 gates, so funding has been requested to replace 10 ladders.

IMPLEMENTATION

Design

The design comprises five elements, grouped into two sub-headings. These are:

Repair of gates

- **Repair of the existing sluice gates**
    a. Remove existing gates and either refurbish or replace the gates with new steelwork to the same design.
    b. Refurbish the gate mechanism and the vertical runners.
    c. Reassemble the gates.
- **Replace ladder**
    d. Cut away the existing steel rungs which are corroding (Photo 2 in the Photos section below).
    e. Install new off-the-shelf stainless steel ladder of suitable length with a minimum of three brackets pre-welded to it (top, middle and bottom) and secure this into the concrete uprights using resin anchor bolts at a minimum of six locations (either side of ladder at top, centre and bottom, two bolts to each bracket).

Rehabilitating the Hybrid Grey/Green Flood Embankment – Mangrove Reforestation

- **Site Re-confirmation**: Sites selected as part of this proposal (see maps, above) were selected as they passed initial screening processes and are deemed to have a high likelihood of success based on the criteria listed below:
    a. Land use & Ownership
    b. Accessibility
    c. Topography
    d. Soil
    e. Pressure
    f. Beneficiaries & Safeguards

  Note - Refer to subproject 3.1 mangrove plantation for site re-confirmation design details.

- **Develop Mangrove Planting Management Plan:** The Mangrove Planting Management Plan should outline:
    a. Site baseline features;
    b. Plantation site map;
    c. Plantation methods approach including, but not exclusive to:
    d. Assessment of optimum mangrove seedling spacing;
    e. Assessment of optimum seedling protection methods;
    f. Assessment of direct sowing method vs seedling transplantation method;
    g. Assessment of preferred mangrove seedling species based on site location.

  Note - Refer to subproject 3.1 mangrove plantation for site re-confirmation design details.

- **Approvals:** Submit Mangrove Planting Management Plan and attain formal approval from the Fisheries Administration of Kep and Preah Sihanouk Provinces for proposed plantations and creation of Mangrove protected zones.

- **Planting and Monitoring:** Following approval of Mangrove Planting Management Plan planting and monitoring of seedlings to occur in accordance with the plan. For community awareness and seedling nursery details refer to subproject 3.1 Mangrove plantations.

3.7 STORM WATER DRAINAGE SYSTEM DESIGN AND ROAD SIDE IMPROVEMENTS IN VEAL RENH MARKET AREA PREY NOB DISTRICT

INTRODUCTION

The Veal Rinh market area and its surroundings consist of about 18 hectares located between the railway and National Road 4 Veal Rinh Commune, Prey Nob District. The area suffers from storm water flooding in the rainy season. The stretch of land between the road and the market area has the lowest elevation level. The current drainage system is poorly maintained and is too small to deal with the increasingly intense rainfall events that are likely to occur as a result of climate change. Therefore, floods occur inside and in front of the market in every time it rains.

Problem statement

- The current storm water drainage system is too small for the market area's surroundings, causing flooding and long-term damage to infrastructure in the area. Based on the climate change assessment in Cambodia, the prediction is that the total annual rainfall will drop until 2030 and afterwards will increase again. There will be a shorter and more intense rainfall events occurring causing severe problems arising from the design of the

current drainage system. To cope with the increased amount of high intensity precipitation in a shorter period, the drainage system around the market requires a new design.

- The poor solid waste management system in the market area and its surroundings, causes clogging of the drainage system. The drainage system around the market area is an open channel, it is easy for the people to throw garbage in to the channel. The existing drainage system is fully clogged with solid waste. This problem can further cause the stagnant water which can create the conditions for breeding bacteria, viruses or other micro-organisms. This can then lead to public health problems.

Resilience to natural hazards refers to the ability to protect lives, livelihoods and infrastructure from destruction and damage, and to the capability to restore areas after natural hazard has occurred. This investment seeks to improve the resilience of the affected communes to the vulnerability of increasingly intense rainfall events through the provision of:

- Improve storm water drainage system;
- Improved road layout and profile.
- Waste management education (provided under activities in Output 1.1, which are designed to support this activity)

Location

The market area is located on National Road 4, close to the junction of National Roads 3&4 on the Sihanoukville side. This makes the area the entrance to Preah Sihanouk. Therefore the area is suited as a example space for resilient living and integrated urban water management.

The problem location is in open area between the main road and the market as shown in the picture, this location has the lowest elevation levels. The precipitation in the market area and surroundings accumulates in the market area and is discharged by the open channel drainage and overland run-off. In the opposite site of the market, there is no drainage system. Rainwater runoff flows on surface to the discharging points.

Beneficiaries

The beneficiaries of this investment range from people who living in the area to the people who passing through the road in a safer manner than before. The benefits can be addressed in to different categories of beneficiaries:

- Local residents
- District population
- Traffic in and out of Prey Nob District
- Economy

Approximately 4,500 people depend on the market for their livelihood. These people are the direct beneficiaries of the investment. The area surrounding the market has 1,976 households, with a total population of 10,717. Many of these people also sell at the market (and all of them buy from it), so they are indirect beneficiaries (if not included in the 4500 sellers). Besides this group the Prey Nob district accounts as beneficiaries as well since this is the districts main shopping area. The total population of Prey Nob will be benefitting the improvement is 100,387 (in 2017). The market area itself has total 4500 sellers, whose daily income relies on the access to the market area. When flooded these 4500 sellers cannot make an income on these days. Given that the market area roughly floods 30 days a year. With a conservative estimate of US$10 income per shop per day, gives an approximate yearly loss of US$1,350,000 per year due to flooding.

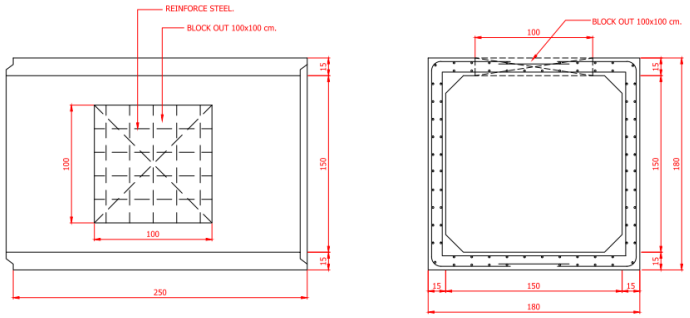
Cambodia is known for high casualties in traffic with figures up to 15.1 fatalities in each 10,000 registered vehicles in 2008 (ADB, infrastructure project). The construction of a central median in the road will prevent head-to-head crashes and guides the crossing traffic to safe zones (road safety toolkit). The limitation of crossing points will reduce congestion of traffic, which will benefit the wide range transport traffic, from Sihanoukville harbour to Phnom Penh and vice versa.

The regeneration of the road layout will increase the liveability of the area in total, creating shade and preventing flooding are essential focus points in the design for this investment. Rainwater harvesting can contribute the water scarcity solutions and greenery will reduce the dust and dirt in the area.

BUDGET

The cost for the improvement of the market area

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Culvert 1500 x 1500 mm	1060 m	300$/m	$318,000
Traffic culvert 1500 x 1500 mm	100 m	2,500$/m	$250,000
Labour	375 days	$15 per day	$5,625
Labour skilled	125 days	$30 per day	$3,750
Connection with existing drainage system of surrounding	20 points	250$/point	$5,000
Trees	244 unit	20$/unit	$4,880
Excavation	1360 m	2.5$/m	$7,650
Lighting (Existing)			
Asphalt	2160 m2	75$/m2	$150,000
Rainwater tank	100 unit	130$/unit	$13,000
Excavator	1000 hr	39$/unit	$39,000
Garbage trap	4 unit	3,000$/unit	$12,000
Eco-Treatment	2 unit	5,000$/unit	$10,000
		TOTAL	**$814,655**



PLAN **SECTION**

DATA COLLECTION

Inputs

Storm water design and the planning on road layout were suggested during the visit to the Veal Renh market together with the commune chief and the owner of the market. The community cleans the drainage system every two weeks, to remove the solid waste (plastics) to prevent the system from clogging. While visiting the site, there was still a significant amount of solid waste present in the drainage system, severely reducing its functionality. Below a summary on the site visit.

- The existing system has a diameter of 300-500 mm which is too small to deal with the increasing of rainfall intensity due to climate change. There are 2 discharging points in the opposite site of the market. The crossing pipe is also small, creating a bottleneck.

- The market building is designed with rainwater drainage into the sewer.
- Due to the low elevation at the front of market, the rainfall runoff from the surrounding area flows directly to this area or via open channel drainage.
- The commune chief suggested to apply the rectangular culvert instead of a circular pipe. This culvert can be open and should be cleaned frequently.
- System clogging with solid waste is one of main problems.
- There is no rainwater harvesting facility, all rainfall drains directly to drainage system. To retain the rainwater by installation of rainwater tanks, can be used for cleaning the market hall.

Site Records

- The owner and local government are aware of the small drainage system and want to re-design it to cope with climate change.
- The Veal Rinh market area is also aware of the problems caused by solid waste.
- At the discharging point opposite side of the market, there is a concern about land ownership issues. The discharging channel cannot be extended, only deepened. The system discharge directly to the rice field behind the housing area.
    - The runoff from the surrounding area drained direct or discharges in the open channel and connects to the drainage system at the corner of the market. The runoff from this surrounding area has in fact no separated drainage route except via the market system. Therefore, causing the crossing pipe, underneath the road, a system bottle neck. New drainage system has to be able to deal with the runoff from the whole area (the market and its surroundings).
    - In the market, there is no rainwater harvesting facility, all rainwater drains directly to the system.
    - The road width is approximately 20 meters. The house to house cross section is between 45 – 50 meters. Both side of the road has low level, so that water can easily flood.
    - There is no proper solid waste management system.


IMPLEMENTATION

Design

The drainage design concern about the climate change, the increasing of rainfall intensity is taken into account. The catchment area is extend to covered whole area.

Inputs

- Catchment area: 187,905 m2 (include market area and residential area both side of the road).
- Rainfall intensity based on climate adaptation: 200 l/s.ha
- This refers to the measurement record as following;
- Maximum rainfall per month = 1,319.7 mm = 1.3197 m = 0.043 m/day

- Assume rain fell only 15% of the time, in intense bursts rather than continuously. this gives a rainfall rate of: 0.043 m/day divided by 15% = 0.284 m/day = 11.83 mm/hr.
- For the drainage design which has to deal with short peak intensity, assume rainfall burst (peak) in 10 minutes = 11.83 mm/hr x 60/10 = 70.98 mm/hr or circa 197.33 l/s.ha
- Design concept is 2 main drainage systems along the road no.4 with 2 discharging points at the rice field side with eco-treatment.
- Slope 5 permille (5:1000).

The maximum flow from rainfall runoff is: 200 l/s.ha x 187,905 m2 / 10,000 m2 / 2= 1,879.05 l/s

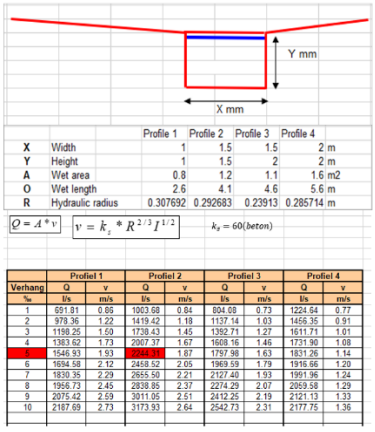
From the input, 4 culvert profiles been analysed. Based on the calculation details below, the most suitable culvert size at laying 5 permille is 1,5 m X 1.5 m.

It is suggested to have a garbage trap at the location of crossing road culvert for both sides. This trap will help community to collect solid waste before discharging and to prevent the clogging problem. At both discharging points is suggested to install a small eco-treatment facility like helophyte filter or wetland to treat the rainwater before discharge to the rice field.

The concept sketch design for the road no.4 in front of the Veal Renh market shown to the left.

For rainwater harvesting, the investment will have a small water tank spreading over entirety of the market area, especially the vegetable and meat zones. The harvested rainwater can be used for cleaning the wet area. The water tank will be connected to the existing roof drain.

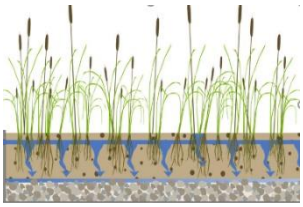
The drainage system of the surrounding/residential area is not included in this project as this would be prohibitively expensive and highly complex from an environmental and social safeguard point of view due to the ownership of the land and gaining the necessary consent from the communities.

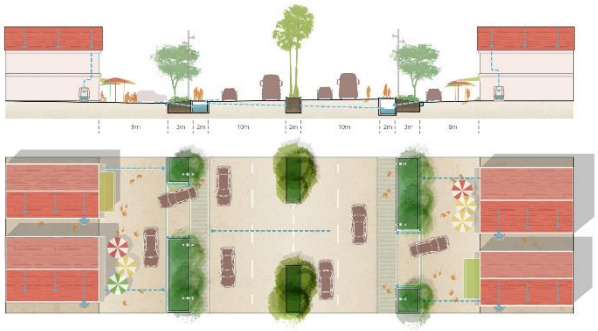


		Profile 1	Profile 2	Profile 3	Profile 4	
X	Width	1	1.5	1.5	2	m
Y	Height	1	1.5	2	2	m
A	Wet area	0.8	1.2	1.1	1.6	m2
O	Wet length	2.6	4.1	4.6	5.6	m
R	Hydraulic radius	0.307692	0.292683	0.23913	0.285714	m

$Q = A * v$ $v = k_s * R^{2/3} I^{1/2}$ $k_s = 60(beton)$

	Profiel 1		Profiel 2		Profiel 3		Profiel 4	
Verhang	Q	v	Q	v	Q	v	Q	v
‰	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
1	651.91	0.89	1003.68	0.84	804.08	0.73	1224.64	0.77
2	978.36	1.22	1419.42	1.18	1137.14	1.03	1456.35	0.91
3	1198.25	1.59	1738.43	1.45	1392.71	1.27	1611.71	1.01
4	1383.62	1.73	2007.37	1.67	1608.16	1.46	1731.90	1.08
5	1546.93	1.93	2244.30	1.87	1797.98	1.63	1831.26	1.14
6	1694.58	2.12	2458.52	2.05	1969.59	1.79	1916.66	1.20
7	1830.35	2.29	2655.50	2.21	2127.40	1.93	1991.96	1.24
8	1956.73	2.45	2838.85	2.37	2274.29	2.07	2059.58	1.29
9	2075.42	2.59	3011.05	2.51	2412.25	2.19	2121.13	1.33
10	2187.69	2.73	3173.93	2.64	2542.73	2.31	2177.75	1.36





Construction

Construction of the market area road side and the storm water drainage system are two separate investments. These two investments are good practice examples that can be replicated throughout the country. This concept design combines the urban landscape and water works to adapt to climate change and promote a better living environment for the community. A large number of markets are prone to flood events in Cambodia. With increasing urbanisation and expanding paved surfaces, storm water floods likely to become more frequent and severe in the near future.

For the construction, it will require a local contractor who can do excavation works and laying of new drainage system. The culvert can be fabricated at factory and transport to the site for installation.

Contractor Requirements

Material:

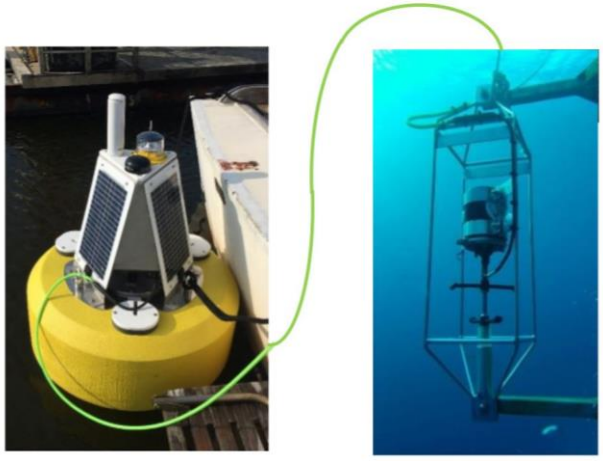
- A concern is the quality of the culverts used for the drainage system. These culverts need to be easily maintainable. Therefore, the top should be possible to lift up.

Contractor:

- The contractor must have enough heavy machinery capacity for excavation works especially be able to do speed works crossing road no.4. The crossing must be done in short time, to minimize effect to the traffic. Good planning is essential.
- Contractor must have ability to do a detail design for the system.

3.8 TIDE GAUGE & AUTOMATED WEATHER STATION IN PREY NOB DISTRICT

INTRODUCTION



Deliverables	Providing and installing a tide gauge and providing training in its operation and maintenance
Beneficiaries	Approximately 30,000
Budget	US$ 102,380
Location	Provides improved flood warning to all low-lying areas of Prey Nob district

Problem statement

The communities of Prey Nob district lying on the coastal plain either side of the Kampong Smach estuary are increasingly experiencing flooding from the sea, and a sea defence embankment built in the period 1997-2001 is now reported as being overtopped every 2-3 years. There is a tide gauge within Preah Sihanouk province at Sihanoukville port, but this is on the opposite side of the Sihanoukville peninsula and does not necessarily record data reflecting the unusual tidal circumstances at the Kampong Smach, which has a shallow offshore shelf, a funnelling estuary mouth and the effects of several offshore islands affecting the tidal regime.

The Preah Sihanouk Provincial Department of Meteorology and Water Resources has requested installation of a tide gauge at the outer edge of the mangrove forest at Ou Oknha Heng, to provide accurate data on sea level rise in this location and thereby improve flood warning capability for the low-lying communities of Prey Nob district on both sides of the Kampong Smach.

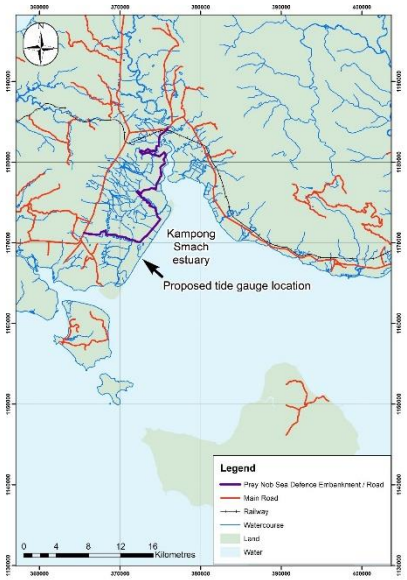
Location

The proposed location is 700m from the Prey Nob sea defence embankment at the outer edge of the mangrove, on the edge of open sea water. At high tide the depth to the muddy sea bed is only 1.7m, and the mangroves reach approx. 15m height. The location is shown on the map below. This location has been selected by the Preah Sihanouk Department of Water Resources and Meteorology as a relatively accessible location within the bay beyond the Kampong Smach estuary. The bay here is very shallow, reaching no more than 3m water depth at normal high tide over 1km beyond the mangrove according to openly available

bathymetric mapping. A tide gauge at this location will be able to give a good representation of the tidal regime within the entire bay.

Beneficiaries

There are 55,776 people listed as resident within the affected communes of Prey Nob District and of those approx. 30,000 live or work close to sea level in the low-lying coastal areas. The entire area depends on food produced in the coastal strip. On increasing occasions in recent years homes and crops have been damaged by incidences of sea water overtopping existing defences and coming further inland, and the district has a growing population which is straining the existing resources.



BUDGET

Construction and installation of tide gauge

- Assume exchange rate of us$1.32 = GB£1.00, which is the approximate average over the period 01/04/2016 – 31/03/2018. Supplier's quote in GB£ is annexed to the end of this document – includes supply and installation. Shipping costs assumed based on commercial shipping charges.

There will also be ongoing running costs, including regular maintenance and a telemetry fee to the mobile phone network. It is assumed these will be paid by the Department of Water Resources and Meteorology once the installation is complete. The costing assumes installation by a trained specialist provided by the supplier.

DESCRIPTION	COST
Provision of wave and tide gauge for remote, shallow location – type 'FSI Remote Coastal Reporter'	$23,250
Shipping, customs clearance, local shipping taxes, transhipment to shallow draught vessel for access to site and delivery	$23,760
Installation of same	$5,370
Automated Weather Station	$50,000
	$102,380

DATA COLLECTION

Inputs

This study has been informed by bathymetric data collected during a site visit, publicly-available online maps showing nearshore bathymetry in the estuary area and a quote from a commercial supplier of wave and tide gauges. Mapping has used Google Earth satellite imagery and openly available GIS data including geology, land use and watercourses.

Consultations

Consultation has been carried out with the national Ministry of the Environment, Preah SihanoukProvincial Department of Water Resources and Meteorology, Preah Sihanouk Provincial Department of the Environment and the leaders of Boeng Taprom, Ou Oknha Heng, Prey Nob, Ou Crou and Veal Rinh Communes.

Site Records

A site visit took place during approximately local normal high tide conditions, and a record was taken of the depth to bed at the location proposed for the gauge. This was 1.7m from the high tide water surface to the mud. It was observed that the area was sheltered on two sides by established mangrove forest at least 4m in height, open to the north-west to a shallow navigable channel between the mangroves approx 4m wide and open to the south-east to the sea. There

is no mains electricity supply within 5 km of the site, so the gauge will have to work on solar / battery power. It was observed that the Smart mobile phone network provides coverage at the proposed deployment site to enable telemetry of the data.

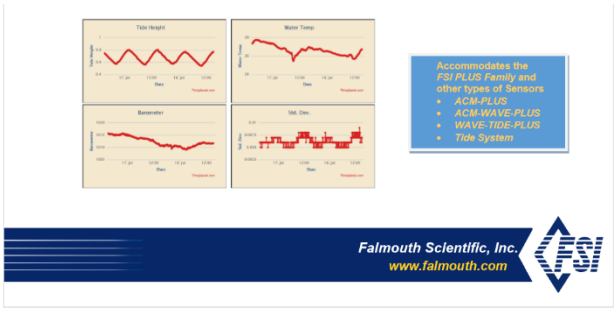
The particular constraints of this site are that the water is shallow throughout the bay, but this is a location that is relatively easily accessed by small boat. With high tides only 3m deep well off shore, the bay is not capable of taking deep draught vessels. The risk of vandalism is considered unlikely and the risk of damage by boat impact should be minimised as the channel is generally only used by a small fishing community and the above-water equipment is finished in hi-visibility yellow paint. The gauge will be used to build up a dataset of tidal conditions in the bay to facilitate prediction of high tidal levels. The next nearest existing tide gauge is in Sihanoukville port, in deeper water 20km away on the other side of a peninsula.

IMPLEMENTATION

Design

The requirements and constraints of the site were provided to a commercial supplier of wave and tide gauges for their advice. They recommended the FSI Remote Coastal Recorder, which is an acoustic device fixed under the water but with a cable connection to a small buoy on which is mounted the solar panels and telemetry equipment. Their brochure is attached on the next page and their costing is annexed to the end of this investment sheet. Although this form of gauge is designed to operate in a range of water depths up to 25m, it can also function effectively in much shallower waters, whereas many other gauges cannot.

Installation costs by a specialist approved by the supplier is included in the supplier's costing. The equipment will be provided with an O&M Manual and we have included a sum for training of maintenance operatives – this includes translation of the O&M Manual into Khmer.



Construction

Access for installation will be from the water. It is assumed that the gauge and associated equipment will be transhipped at a local sea port (Sihanoukville) onto a shallow draught vessel which can then access the shallow waters where the gauge is proposed for deployment.

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