

**Kingdom of Cambodia**  
**Nation Religion King**



**Ministry of Water Resources and Meteorology**

**Climate Change Action Plan for Water Resources  
and Meteorology**  
(2014-2018)

Phnom Penh, March 2014

## PREFACE

Cambodia is considered as one of the water-abundant country with 86% of its territory under Mekong Floodplain. Throughout history, this water resource plays important roles for nation state foundation, national economic development in many sectors such as agriculture, manufacturing and small-scale industries, hydropower, navigation, tourism, environmental protection, and religion and daily life. The country's economy is highly dependent on water; in particular water for food and energy production, rural livelihoods and economic development is recognized in the government Rectangular Strategy (RS), the National Strategic Development Plan (NSDP) and the Strategy for Agriculture and Water Resources.

This Climate Change Action Plan (CCAP) 2014-2018 is developed in line with the ministry development policy and strategy, National Strategic Development Planning, and the respond the Strategic Plan for Climate Change Strategy for Water Resources and Meteorology in 2013. This CCAP is the result of hard working from our technical working group on water and climate change which consisted of all key technical departments representative as well as department of planning, finance, and administrative.

On behalf of the Ministry, I wish to thank our technical working group for their efforts and commitment to development this action plan. Thanks to our donors and development partners who have been actively support our efforts both financially and technically.

Finally, we wish to acknowledge the support of CCCA trust fund donors for their cooperation, technical and financial support throughout the planning process.



Phnom Penh..

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## EXECUTIVE SUMMARY

### The project impact

Water resources are highly vulnerable to CC. The Draft Second National Communication (SNC) identified the main risks from CC. By 2050, temperatures are expected to be 0.5°C to 1.5°C higher. CC models do not yet give clear indications of the expected change in total annual rainfall, but it seems likely that total rainfall will increase in some areas and decrease in others. However, it is clear that floods and droughts will become increasingly frequent and severe.

Increased temperatures will raise evapotranspiration, thus increasing demand for crop water. In some upland areas, there may be potential to increase crop productivity, but most areas will experience lower yields. The changes in rainfall that may occur with CC in Cambodia are not yet fully clear, with some models suggesting significant regional differences in average annual rainfall trends. However, it is clear that there will be a major increase in the variability of rainfall and that most areas of Cambodia will have more frequent and severe floods and droughts, with the available rainfall concentrated into fewer periods of more intense rainfall and with shorter and less predictable seasons. This will have a strong impact on the hydrology of the Mekong River and of the Tonle Sap, affecting water supply, agriculture, water supplies, and inland fisheries and flooding. There will be a major increase in the benefits derived from water storage in dams and water control through the design of roads and through floodwater protection. Improved management of groundwater will also become more important, with CC. Finally, sea level rise will place coastal areas under greater risks of flooding, erosion and saltwater intrusion, so raising the importance of coastal protection. These problems are increased by deforestation in the upper areas of many watersheds, which increases the rapidity of flooding, the level of erosion and the siltation of reservoirs.

MOWRAM is currently coordinating 15 irrigation projects, with total commitments of over \$500m. Most of these are loans and are funded by ADB, China or Korea. There are also a further 11 projects currently under discussion, mostly with the same donors, with costs totalling nearly \$1bn.

### The CCAP methodology

CC Action Plans (CCAPs) include a planning matrix which identifies the priority actions required to deliver the CCSP strategies and priorities, proposed activities and costing and financial mechanism. The process has taken place about 8 months through internal consultation, consultation with sector and public consultation with key stakeholders to ensure technical aspects.

### The strategy

The MOWRAM CCSP identifies four strategic areas for responding to CC in the water sector. These strategic areas are pursued by the actions described in the planning matrix below.

- Improved hydrological planning and management and early warning
- Improved flood and drought management, through changes in design of reservoirs and irrigation and protection infrastructures, especially in vulnerable zones
- Capacity development for MOWRAM staff
- Promoting gender responsiveness in CC planning in the water sector

The proposed action and costing for 2014-2018 (USD, 000)

Key actions	Total budget (US\$,000)
<b>Hydro-Meteorology</b>	
<i>Strengthening Climate Information and EWS</i>	5,500
<i>Capacity building for national and provincial department of water resources for climatic data collection, recording etc.</i>	3,500
<i>Improving institutional structure, networking with mass media for public weather and climate forecasting dissemination</i>	5,000
<i>Installation of guaging station to monitor rainfall, wind speed, storms and sea level rise (4 provinces)</i>	3,500
<b>Irrigation Related Works</b>	
<i>Climate risk management and rehabilitation of small, medium and large-scale irrigation infrastructure</i>	200,000
<i>Promoting innovative irrigation technology structure in areas affected by torrential rain (Mondulkiri, Pursat, Sihanouk)</i>	15,000
<i>Capacity building and awareness raising on CC and DRR for FWUC</i>	2,000
<i>Capacity development for irrigation engineers on climate risk management</i>	1,500
<i>Upscaling mobile pumping stations (20) and permanent stations (10) in responding to mini-droughts</i>	20,000
<b>Flood and drought</b>	
<i>Development and rehabilitation of flood protection dikes (Kampong, Trabek, Bateay) for agricultural/ urban development</i>	4,000
<i>Improve capacity for flood and drought forecasting and modelling for technical offices at national and subnational level (ADB) GMS</i>	2,000
<i>Establishment of national hydrology forecasting centre (ADB)</i>	2,000
<i>Promoting scientific and comprehensive methods on Ground Water Study in responding to drought and climate risks</i>	2,500
<b>Sea level rise/saline intrusion</b>	
<i>Promoting climate resilience of agriculture through building sea dikes in coastal areas</i>	3,000
<i>Assessment of potential impact of sea level rise, salt water intrusion (Mekong delta and coastal areas)</i>	1,500
<b>Climate change and gender</b>	
<i>Promoting gender responsiveness in water management, CC impact and adaptation</i>	1,500
<b>Grand Total</b>	303,000
<b>Ceiling</b>	301,000

**Indicators, Management & Monitoring**

The main departments in MOWRAM are: Water Resources Management and Conservation, Water Supply and Sanitation, Irrigated Agriculture, Hydrometeorology and Administration and Personnel. Most of the project development work in irrigation is managed by the Project Management Office (PMO). The PMO is supported by various Project Management Units and reports directly to the Minister, using an accounting system that is separate to the ministry and outside the treasury. There are no budget programmes. Key entry points are likely to be the routine preparation of budget submissions; Annual Operating Plans; and project appraisal work.

The key monitoring indicators are as follows:

- Effective hydrology and meteorology networks and stations upgraded and installed nationwide.
- 25,000 ha/year and 24% of climate proofed irrigation networks.
- Ha of agricultural land drought proofed.
- The areas of cropping land with access to irrigation services increased by 100,000 ha
- The incidence of drought or flood affected farmland reduced by 20%/year
- Reduced impact from saltwater, flood and drought for at least 10,000 hhs in vulnerable areas
- % of households in vulnerable areas with year round access to water supply (agricultural)
- At least 50% of total FWUCs (350 FWUCs) are fully functioning throughout the country
- At least 500 members from selected 150 FWUCs (70% women) understanding climate change.

To achieve these action plans and indicators of the CCAP, there is a need for strong commitment from royal government of Cambodia, donors/DPs as well as the ministry in term of political, institution, capacity development as well as financial and technological commitment.

## ACRONYM

ACIAR	Australian Center for International Agricultural Research
ADB	Asian Development Bank
AFD	Agent Francaise de Développement
BAU	Business As Usual
CC	Climate Change
CCCSP	Cambodia Climate Change Strategic Plan
CCAP	Climate Change Action Plan
CCD	Climate Change Department (MOE)
DHRW	Department of Hydrology and River Work
DRR	Disaster Risk Reduction
DOM	Department of Meteorology
FWUC	Farmer Water User Community
GEF	Global Environmental Facility
ITSC	Irrigation Technical Services Center
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
MAFF	Ministry of Agriculture, Forestry and Fisheries
MOE	Ministry of Environment
MOWRAM	Ministry of Water Resource and Meteorology
MRC	Mekong River Commission
MRD	Ministry of Rural Development
NSDP	Strategic Development Planning
PDOWRAM	Provincial Department of Water Resource and Meteorology
PPCR	Pilot Project for Climate Resilient
SAW	Strategy for Agriculture and Water
TA	Technical Assistance
TWGAW	Technical Working Group on Agriculture and Water
UNDP	United Nation Development Programme
UNFCCC	United National Framework Convention for Climate Change
MRMP	Water Resources Management Project

## 1. BACKGROUND

Water is the foundation for development of all sectors of the national economy. At its peak, the Angkor state was frequently known as the 'Hydraulic Civilization', implying not only that the water was strictly and centrally managed, but also that actual state governance was based on the central control of the water resource (Ojendal 2000). This idea was also central to the period of Khmer Rouge control where irrigation development was central to the party's policy and ultimately tragic results. Almost three decades (1970s-1990s) of civil war, left much Cambodia's infrastructure, human resource and state institutions in tatters. Since early 2000 onward, the water sector has re-emerged as high priority development for economic growth and poverty alleviation. This sector is fundamental to all aspects of human and economic development, encompassing agriculture, fisheries, forestry, health and disasters.

### 1.1 Policy analysis

The formation of the Ministry of Water Resource and Meteorology (MOWRAM) in 1999 resulted in most development work related to the water sector falling under one ministry's responsibility. MOWRAM has two major roles in dealing with water resources: (i) the rehabilitation of major irrigation infrastructure to provide enough water for agriculture, daily consumption of humans and animal and tourism, and (ii) the construction of flood control and polders to protect agricultural land and public property.

Various legal framework developments by MOWRAM which include:

- The law on water resource management was official approved and signed by the king on 29 June 2007 with various sub-decrees being developed.
- The national policy on water resources management approved by the Council of Ministers on 16 January 2004.
- The Strategy for Agriculture and Water (SAW 2006-2010) with final update for 2009-2013 prepared by Technical Working Group on Agriculture and Water (TWGAW) from MOWRAM AND MAFF.
- The formation of the Farmer Water User Community (FWUC) to take over the operation and maintenance of irrigation schemes after scheme renovation and construction. From 2004-2011, there were 350 FWUCs<sup>1</sup> established nationally comprising 305,550 households, covering 245,100 hectares of rainy season cultivation and 105,200 hectares in the dry season, with major involvement of women in their leadership (TWGAW 2009 and JICA, MOWRAM 2012).

The SAW (2009-2013) is composed of five components: (i) institutional capacity building and management, (ii) food security support, (iii) agriculture and agri-business support, (iv) water resources, irrigation, and land management, and (v) agricultural and water resources research, education, and extension services. This strategy aims to ensure enough safe and accessible food and water for all people; to reduce poverty while increasing the Gross Domestic Product per capita; and to ensure the sustainability of natural resources. The goal for agriculture and water resources management is to improve agricultural productivity and diversification and water resources development and management (TWGAW 2009).

The main national policy interests concerning water resources relate to expansion of water infrastructure for irrigation and hydropower. Given that water is underutilized in Cambodia, both

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<sup>1</sup> Up to late 2011, there are only 150 are officially registered to MOWRAM due to legal and criteria requirements.

irrigation and hydropower are considered to have great potential to facilitate economic growth. In addition, with the vast proportion of agriculture dependent on rainfall, the development of irrigation is seen as the main mechanism for reducing vulnerability to the variability of the seasons and for increasing agricultural production.

## 1.2 Situation analysis

This section highlights the current status of water resource development and planning as well as its vulnerability to climate change impact.

Currently, the collection of water resource data is limited, does not cover the whole country, and datasets are unlinked and prone to loss. There are improvements required in both physical collection of water resource information, as well as the capacity of government staff in being able to fully utilize the information; particularly in the context of flood and drought forecasting and the likely impacts of climate change. While the flood and drought forecasting system exists, there are significant opportunities for improvement (TWGAW 2009).

In term of hydrology, data are available for 83 stations but only 32 stations have data series longer 10 years ( which is vary minimum to make statistics) and only 40 have discharge data. The available data are stored by the Department of Hydrology and River Work (DHRW). The DHRW used the HYMOS software which is recommended by the World Meteorological Organization (WMO).

For meteorology, data collection is done mostly by the department of meteorology (DoM). Observation system of meteorology is comprised of 2 networks:

- A basic network of synoptic stations with a large range of parameters measured: rainfall, temperature, humidity, wind speed, wind direction, evaporation, sunshine duration and pressures
- A complementary network of rainfall stations.

DoM is currently monitoring 19 annual synoptic stations and has 10 automatic synoptic stations (6 out of order). The rainfall network is comprised of around 175 stations out of which 125 were operational in 2006. 23 stations (19 synoptic and only 4 rainfall stations) are daily reported and the information is transferred through the global transmission system (GTS) of the world meteorological organization (WMO). Currently, meteorological data are not stored with adequate software by the DoM (TWGAW 2009).

Flood and drought forecasting in Cambodia exists through DHRW activities and the flood and management and mitigation program developed by the MRCs since 2000. The program objective is to "prevent, minimize or mitigate people's suffering and economic losses due to floods, while preserving the environmental benefits of floods. Cambodia is currently making use of regional flood forecast center based in Phnom Penh (MRC) produce short term forecast from 1 to 5 days for 23 locations throughout the Lower Mekong Basin. Its medium term is to improve forecasts (10 days forecast) and its hydrological models.

To reach medium term, there are need to need to gather an increased data amount and especially near real time rainfall data by helping key departments (meteorology, and hydrology and river work) to develop their own stations and staff capacities in operating the stations and data collection and recording.

Climate change poses immense threats and new opportunities for development of water resources in Cambodia. The Royal Government of Cambodia (RGC) understands that climate change impact is

an urgent and critical issue. The Ministry of the Environment's Second National Communication Report to UNFCCC (2010) and MOE/PPCR (2013) projected that climate change is likely to bring significant changes to the Mekong River Basin; however more detailed studies are required to fully understand the impacts on this important water body. Under future climate (2025 and 2050), most of Cambodia's agriculture areas are predicted to be exposed to higher drought risks. The growing period for most agriculture areas will be between 2 and 3 months<sup>2</sup>. Other recent studies predict various climate change impacts for water resources in Cambodia (TKK and SEA START RC 2009). These include:

- Climate change is likely to significantly alter the Mekong River hydrological regime, upon which inland fisheries and agriculture depend (MRC 2009)
- Changes in seasonal distribution of rainfall, with drier and longer dry seasons, and shorter, more intense wet seasons (MoE/SNC 2010).
- Increased volume and intensity of wet season rainfall, leading to increased floods and a marginal decrease in dry-season rainfall (Clausen 2009)
- Reduced flow of the Mekong and its tributaries in the dry season and increased flow in the rainy season (TKK and SEA START RC 2009)
- Higher drought risks in most of Cambodia's agricultural areas as a result of future climate change from 2025 to 2050 (MoE 2010)
- Increased temperatures, with corresponding increases in evapo-transpiration (Fraiture et al 2007)
- Increased frequency and intensity of extreme events, such as floods and droughts (Eastham et al 2008)
- Sea Level Rise will potentially impact on coastal systems in a number of ways including inundation, flood and storm damage, loss of wetlands, erosion, saltwater intrusion, and rising water tables (MOE/SNC 2010).

The main implications of climate change impact on the water sector are potentially exacerbated by the current poor condition of watersheds, catchments and floodplains management that affect the runoff and recharge of groundwater, surface water quantity and its ecosystems services.

Existing impacts from climate change in Cambodia include:

- Cambodia will suffer from the effects of global warming due to excessive emissions in other parts of the world. Like other countries in Southeast Asia, Cambodia is expected to experience higher and more intense rainfall. The effects are likely to include more severe water scarcity and more frequent floods, resulting in crop failures and food shortages.
- Accelerated loss of biodiversity will negatively affect ecosystems.
- Coastal communities and eco-systems are likely to be affected by rises in sea levels, and higher temperatures and humidity will create conditions incidence of malaria and dengue fever. The poor and marginalized, particularly women and children, will be worst affected.

### **1.3 The impacts of climate change on water include:**

**a) Water resources sector:** problems of increased flood and drought, changes in water supply and water quality, and competition for water. The irregular seasonal times of wet and dry months caused by climate change, especially during the last few decades, has impacts on water resources management and development efforts. At the same time, there is increased demand for water from

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<sup>2</sup> In order to meet the government program for increasing the planting index, the establishment of irrigation facilities in agriculture areas with a growing period of less than 5 months has to be prioritized before 2025 (MOE 2010 in press).

emerging sectors, including industry, livestock, domestic use, and especially agriculture. Coupled with seasons changing due to climate change, this creates many more social problems. With global warming, Cambodia's temperature has increased making it difficult to prevent loss of water from evaporation. Ground water requires recharging annually from rain water. Due to climate change impacts on the amount of rain water needed to recharge ground water, the recharge rate is seriously reduced, leading to Cambodian farmers having insufficient ground water for farming. Ground water shares 3.1% of the total 4.5% of current irrigation water, while surface water takes the rest (MOWRAM, 2008).

**b) Reservoir:** Many reservoirs are gradually getting shallower because of sedimentation, which leads to reduced capacity for water storage.

**c) Irrigation systems and hydraulic infrastructure** are vital in responding to climate change in Cambodia. Irrigation provides stability in dealing with cropping water shortages in the dry season. Irrigation systems and hydraulic infrastructure have not yet been modernized, or taken climate change into consideration in almost all areas of the country. Floods and droughts impact on irrigation systems and hydraulic infrastructure. Most importantly, floods cause tremendous negative impacts on irrigation systems located in low land areas.

**d) Dam/weir:** Frequent floods destroy dams; most of them are old and the impacts of climate change on them have not been considered. For instance, floods in late 2009, 2011 and 2013 provide strong evidence for such an impact on these critical infrastructure.

**e) Flood Protection Dikes:** Most dikes have been destroyed by floods, as during each flood, water overflows on these Flood Protection Dikes. The potential impacts of climate change were not taken into account during the construction of the Dikes. Moreover, these Dikes are made from soil.

**f) River Bank and Coastal Areas:** the erosion of beaches/banks caused by floods and/or high speed waves, brought on by the impacts of unpredictable climate change, leads to negative impacts on rural livelihoods, especially on farmers who are completely dependent on limited land areas.

**Table 1: Summary Potential impact of climate change (2030)**

Se San river	Southern Lao and Northeast Cambodia and Central Highlands of Vietnam. Agricultural productivity increases, food availability is excess the demand decreased, temperature and annual precipitation increased, Dry season precipitation decreased, Annual runoff increased; Dry season runoff decreased; Potential for increased flooding (not quantified).
Kratie	Southern Lao and Central Cambodia Agricultural productivity increased; Food availability in excess of demand decreased; Temperature and annual precipitation increased; Dry season precipitation decreased, annual runoff increased, Dry season runoff decreased, Frequency of extreme floods increased from 5% to 76% annual probability; Peak flows, flood duration and flooded areas increased, Dry season minimum flows increased.
Tonle Sap Lake	Central Cambodia Agricultural productivity increased, food availability in excess of demand decreased, Temperature and annual precipitation increased, Dry season precipitation decreased, annual runoff increase, Dry season runoff decreased, Dry season water stress increased and remains high, High probability of increased flooding (not quantified); seasonal fluctuation in Tonle Sap Lake area and levels increased, Minimum areas of Tonle Sap Lake increased, area of flooded forest permanently submerged and possibly destroyed reducing fish habitat, Net impact on capture fisheries uncertain, Maximum areas of Tonle Sap Lake increased with possible negative impacts on agricultural areas, housing and infrastructure.
Phnom Penh	Southern Cambodia Food scarcity due to population increased; Temperature and annual precipitation increased, Dry season precipitation decreased, annual runoff increase, Dry season runoff increased, Dry season runoff decreased, High probability of increased flooding, Flooded areas increased.
Border	Southern Cambodia and Southern Vietnam Agricultural productivity decreased, Food scarcity due to population increase, Temperature and annual precipitation increased, Dry season precipitation decreased, Annual runoff increased, Dry season runoff decreased, High probability of increased flooding, Flooded areas increased.

Source: ACIAR (2009)

#### 1.4 Initiatives already introduced in recent years

Currently, there is an on-going water development program project called, "Water Resources Management Project (WRMP), Ref: NDF C19 from 2011-2015 funded through ADB focusing on three provinces: Siem Reap, Battambang and BanteayMeanchey province. The program will assist Cambodia to address national water resources management and irrigation policy issues. The NDF financed part will assist the Cambodian Government to mainstream climate change concerns in water resource planning and management at both policy and operational levels by taking into account the projected changes in the climate.

The project consists of a policy/investment loan (ADB/OFID financed) and a related TA (ADB/AusAID/NDF financed) for program support and monitoring as well as climate change adaptation.

The project has three major components:

1. Policy component to address water resources management and irrigation policy issues.
2. Investment component to assist the Ministry for Water Resources and Meteorology (MOWRAM) to deliver irrigation services.
3. Technical assistance (TA) for program support and monitoring, as well as climate change related activities including:
  - Assessment of water resources at a nationwide scale including development and implementation of a GIS system;
  - Preparation, approval and implementation of an improved water data management plan, testing of cost-effective approaches for water conservation to cope with increasing intensity of droughts and floods;
  - Improved plan for flood/drought forecasting and observing prepared, approved and implemented;
  - Coordination of activities between MOWRAM and Ministry of Environment for an improved capacity to mainstream adaptation to climate change in water resources management.

### **1.5 Priority issues**

Irrigation expansion, flood and drought management are the key priority issues in dealing with climate change.

The MOWRAM development strategy (2009-2013) is therefore to improve irrigation capacity by 25,000ha/year in addition to the potential irrigated area of 1.1 million ha by harmonizing and climate proofing the existing irrigation systems and new irrigation structures to areas which have potential water to cultivate two crops/year to increase the income and provide job to farmers in rural areas.

The second priority would be flood and drought management through climate proofing of dike construction especially along the Tonle Sap Lake, the Cambodian Mekong delta and the coastal zone. The third priority would be hydrological and meteorological data management and meteorological forecasting. This can be done through updating and modernizing the existing networks of hydrological and meteorological stations and data collection.

Capacity building will be carried out for government staff to improve skills and coordination within MOWRAM especially for hydrology, climate change and water user committees. Similarly, capacity building will be carried out for farmers, especially FWUC members, especially on the planning and management of climate responsive cropping systems

And the fifth priority will be for gender and climate change in the water sector. Gender balance will be mainstreamed at both national and sub-national levels, and women will be engaged in capacity building, and it will be ensured that water resources-related services benefit women, especially in the FWUCs.

## **2. STRATEGIES FOR CLIMATE CHANGE ADAPTATION**

Based on CCCSP for water resource and meteorology sector, there are five major strategies<sup>3</sup> to deal with climate change adaptation and mitigation. These include:

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<sup>3</sup> Based on MOWRAM's BAU development frame, there are five principle areas of works (i) water resources management and development, (ii) flood and drought management, (iii) water-related legislation and regulation, (iv) water resources information management and (v) administration, management, and human resources development.

1. Improvement of meteorology planning and management including improved modeling and methodology to underpin more robust climate change information and awareness raising as well as for stronger early warning.
2. Improved flood and drought management against climate risk and vulnerability through climate proofing of reservoirs, irrigation structures, flood and drought dike protections in vulnerable zones such as around surround Tonle Sap Lake, the Mekong delta, upland areas and coastal zone<sup>4</sup>.
3. Capacity development for Ministry technical staff and for farmers (FWUCs) in climate change related topics
4. Promote gender and climate change mainstreaming into water related development work.

### 3. PROPOSED ACTION PLAN

This section is to list down the proposed action plan for climate change action plan. It covers the scope of planning, the planning matrix, the impact of expenditure and the potential benefit of applying these prioritized actions.

#### 3.1 Summary of scope of planning

MOWRAM has prepared a series of long lists that are relative importance for both adaptation and mitigation<sup>5</sup>. Based on guideline, the Action Plan covers the following categories of action.

- *Category 1: **Re-scaling** existing and planned actions to take account of their contribution to adaptation and/or mitigation. This may include up-scaling pilot activities.*
- *Category 2: **Modifying** existing actions through climate proofing and/or by adding mitigation*
- *Category 3: **Dedicated** new climate change actions*

#### 3.1 Action Plan Matrix

This section presents a prioritized matrix of actions, with the corresponding estimated budgets, constrained by the total resources available in the baseline resource scenario. The Planning Matrix has been prepared and discussed through a three stage process: long listing of all actions; shortlisting of actions; resource allocation to these actions.

For long list of action (see annex 1) for short list of actions or prioritize of actions and resource allocation can be summarized below:

##### Hydro-Meteorology

1. Strengthening Climate Information and Early Warning System (GEF-Nationwide with \$5.5 million from 2015-2017).

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<sup>4</sup> MOE (2010) of SNC report suggest adaptation measures include – factoring in climate change into the design of infrastructure, new building codes to protect against strong winds and sea level rise.

<sup>5</sup>The importance of taking into account the synergies between adaptation and mitigation actions is increasingly recognized (e.g. IPCC); therefore adaptation actions will have to be screened for mitigation aspects (e.g. the change in emissions due different fertilizer consumption for a new rice variety introduced, or the creation of a carbon sink by afforestation of slopes subject to landslides during heavy rains). Creating synergies between adaptation and mitigation can increase the cost-effectiveness of actions and make them more attractive to potential funders and other decision-makers (IPCC).

2. Capacity building for national and provincial department of water resource on climatic data collection, recording, reporting and forecasting and predicting.
3. Improving institutional structure, networking with mass media for public weather and climate forecasting dissemination.
4. Installation of gauging station to monitor seas level rise, wind speed, storms and sea waves (three provinces), (develop oceanography).

#### **Irrigation Related Works**

1. Climate risk management and rehabilitation of small, medium and large-scale irrigation infrastructure
2. Promoting innovated irrigation technology structure in areas affected by torrential rain such as in Mondulkiri, Pursat, and Koh Kong.
3. Capacity building and awareness raising on CC and DRR for Farmer Water User Community (FWUC) (nation-wide).
4. Capacity development for irrigation engineers on climate risk management
5. Upscaling mobile pumping stations in responding to mini-drought 20 places.

#### **Flood and Drought**

1. Development and rehabilitation of flood protection dike (Kampong Trabek, Bateay ) for agricultural and urban development.
2. Improve capacity for flood and drought forecasting and modeling for technical officers at national and subnational level ( mostly at Mekong Delta)
3. Establishment of national forecasting center (ADB) (two departments)
4. Up scaling ground water management by using ISOTOP application (original source of water, recharge areas, water balancing) current implemented in Saang (Kandal) and other two districts in Kampong Spue.

#### **Sea level rise/saline intrusion**

1. Promoting climate resilience of agriculture through (especially rice, agriculture) building sea dikes in coastal areas.
2. Assessment of potential impact of seas level rise, salt water intrusion (Mekong delta) and coastal areas.

#### **Climate change and Gender**

Promoting gender responsiveness in water management, climate change impact and adaptation.

**Table 2: Planning matrix for prioritized actions for water resource and meteorology in responding to climate change**

Action Number	MOWRAM Actions	Preliminary Estimated budget (USD'000)					
		<i>(note: present costs to the nearest 1000 USD)</i>					
		2014	2015	2016	2017	2018	Total
	<b>Hydro-Meteorology</b>						
1	<i>Strengthening Climate Information and EWS</i>		1,500	2,000	2,000		5,500
2	<i>Capacity building for national and provincial department of water resources for climatic data collection, recording etc.</i>	500	1,500	500	500	500	3,500
3	<i>Improving institutional structure, networking with mass media for public weather and climate forecasting dissemination</i>	500	1,500	1,000	1,000	1,000	5,000

4	<i>Installation of gauging station to monitor rainfall, wind speed, storms and sea level rise (4 provinces)</i>	500	1,000	1,000	500	500	3,500
	<b>Sub-Total</b>	1,500	5,500	4,500	4,000	2,000	17,500
	<b>Irrigation Related Works</b>						
5	<i>Climate risk management and rehabilitation of small, medium and large-scale irrigation infrastructure</i>	30,000	50,000	50,000	50,000	20,000	200,000
6	<i>Promoting innovative irrigation technology structure in areas affected by torrential rain (Mondulkiri, Pursat, Sihanouk)</i>	1,000	2,000	3,000	4,000	5,000	15,000
7	<i>Capacity building and awareness raising on CC and DRR for FWUC</i>	200	300	400	500	600	2,000
8	<i>Capacity development for irrigation engineers on climate risk management</i>	250	400	400	250	200	1,500
9	<i>Upscaling mobile pumping stations (20) and permanent stations (10) in responding to mini-droughts</i>	100	400				20,000
	<b>Sub-Total</b>	31,550	43,100	53,800	64,750	75,800	269,000
	<b>Flood and drought</b>						
10	<i>Development and rehabilitation of flood protection dikes (Kampong, Trabek, Bateay) for agricultural/ urban development</i>	400	600	800	1,000	1,200	4,000
11	<i>Improve capacity for flood and drought forecasting and modelling for technical offices at national and subnational level (ADB) GMS</i>	200	700	500	300	300	2,000
12	<i>Establishment of national hydrology forecasting centre (ADB)</i>	450	450	340	360	400	2,000
13	<i>Promoting scientific and comprehensive methods on Ground Water Study in responding to drought and climate risks</i>		700	750	500	550	2,500
	<b>Sub-Total</b>	1,050	2,450	2,390	2,160	2,450	10,500
	<b>Sea level rise/saline intrusion</b>						
14	<i>Promoting climate resilience of agriculture through building sea dikes in coastal areas</i>	500	600	650	650	600	3,000
15	<i>Assessment of potential impact of sea level rise, salt water intrusion (Mekong delta and coastal areas)</i>	250	400	400	250	200	1,500
	<b>Sub-Total</b>	750	1,000	1,050	900	800	4,500
	<b>Climate change and gender</b>						
16	<i>Promoting gender responsiveness in water management, CC impact and adaptation</i>		300	350	400	450	1,500
	<b>Sub-Total</b>		300	350	400	450	1,500
	<b>Grand Total</b>	34,850	52,350	62,090	72,210	81,500	303,000
	<b>Ceiling</b>	51,000	55,000	60,000	65,000	70,000	301,000

### 3.3 Implications for Expenditure in the Ministry

According to the strategic plan of MOWRAM 2009-2013, there is a total required budget of intervention (capital expenditure) of US\$ 735.6 million. Different sources of funds are coming from (i) government budget, and (2) foreign grants and loans.

Total public expenditure in the water sector amounted to 1,125 billion riels in 2012 (approx. 281.3 million USD)<sup>6</sup>. This included 304 billion riels (76 million USD) through the national budget (including recurrent and capital expenditure), and 821 billion riels (205.3 million USD) through off-budget support. For off-budget support, the level of involvement of the ministry in programme implementation varies significantly depending on the donor's management arrangements.

<sup>6</sup> Source: 2012 Budget Law, DIC 2012 database on grants and loans managed by MEF, and CDC-CRDB ODA database.

Of this total, about 250.3 billion riels (approx. 62.6 million USD) have been identified as directly climate related in 2012<sup>7</sup>. The proposed annual budget for climate change actions (60.6 million USD on average) would represent about 21.5% of total public expenditure for the sector, and a stable level of climate-relevant expenditure (based on 2012 expenditure), with a strengthened quality of climate expenditure.

Several irrigation projects have been taken up under the North West Irrigation Sector Project (NWISR) (to be implemented between 2005-2011) in Pursat, Battambang, Banteaymeancheay and Siemreap provinces. The NWISR focused on creating storages, irrigation systems and development of other infrastructures mainly for mitigating the drought issues of these regions.

Economic and Social Relaunch of Northwest Province in Cambodia (ECOSORN) is dealing with the irrigation intervention for rice growing community in Siem Reap, Battambang, Bantey Mean Cheay provinces. The 26 million Euro project is funded by the European Union (EU) and implemented by MAFF. There are other agencies like FAO and JICA, who are dealing with the drought events for agricultural and social sustainability in specific locations at commune and district levels.

The external sources to the flood and drought management come mainly from the international funding agencies, which include the World Bank, Asian Development Bank, and UN related organizations. The Mekong River Commission's various basin-level programs and country projects also benefit Cambodia. Other donors such as the European Union, France, Italy, Korea, China and Japan are active in projects related to flood and drought. Some of the other investments under implementation or proposed are given in table below:

Table 3: **Committed and Other Proposed Investment Projects**

S. No.	Project/Program	Cost (Mil. US\$)	Implementation
1	Northern Upstream of PrekThnot River Basin WRD Project (Korean Loan/EDCF)	50	2010 - 2013
2	Pursat River Basin WRD (Dam and Dam 2) Project (Korean/EDCF)	50	2010 -2014
3	Kampong Trabek River Flood Control Project in Prey Veng (Chinese Loan)	30	On-going
4	Kanghot Irrigation Development in Battambang (Chinese Loan)	50	On-going
5	Prek Stung Kev WRD project (proposed for Chinese Loan)	40	2014
6	Stung Pursat Dam No. 3 and No. 5 Development (proposed for Chinese Loan)	60	2014
7	Staung River Basin WRD Project (proposed for Chinese Loan)	80	2014
8	Streng River Basin WRD Project (proposed for Chinese)	100	2014
9	MoWRAM Emergency Rehabilitation (29 Projects)	50	-
10	MRC FMMP C2 IFRM West Bassac	330	-
11	MRC FMMP C2 IFRM in East Mekong	83	-

Source: MOWRAM and MRC-FMMP cited in ADB 2011.

Based on JICA/MOWRAM (2012), there are various projects with on-going as shown in table below:

<sup>7</sup> Source: Draft Report on Climate Change Financing Framework, MoE, 2014

**Table 4: List of On-going Irrigation Projects**

Project	External Support		Implementation		Province	Project Cost (US\$* 000)	Fund Resource (US\$* 000)		Status as of March 15, 2011
	Donor	Fund Type	From	To			External	Local	
North West Irrigation Sector Project	ADB+ AFD	Loan+ Grant	2005	2012	Pursat, Battambang, BanteayMean chey, Siem Reap	30,870	21,740	9,130	On-going
Eastern Rural Irrigation Development Project	IMF	MDRI	2007	2013	Kampong Cham, Prey Veng, SvayRieng, Kratie, Stung Treng, RotanakKiri, MondulKiri	33,380	32,763	617	On-going
KrangPonleyMul tipurpose Water Resource Project	Korea	Loan	2008	2012	Kampong Speu	29,505	26,098	3,407	On-going
Tonle Sap Lowlands Rural Development Project (TSLRDP)	ADB	Loan+ Grant	2008	2015	Kampong Chhnang, Pursat, Kampong Thom	24,000	20,000	4,000	On-going
Water Resources Management Sector Development Program (WRMSDP)	ADB+ OPEC+ AFD	Loan+ Grant	2011	2018	Kampong Thom, Siem Reap, BanteayMean chey	31,900	24,800	7,100	On-going
Kampong Trabek River Flood Control Project	China	Loan	2010	2014	Prey Veng	31,010	31,010	0	On-going
Stung Sreng Irrigation Development Project	China	Loan	2011	2015	PreahVihear, Kampong Thom	65,000	54,780	10,220	Loan Processing
MongkolBorey Dam Development Project	Korea	Loan	2009	2013	Battambang	24,301	18,700	5,601	On-going
Kong Hort Irrigation Development Project	China	Loan	2010	2014	Battambang	61,000	49,900	11,100	On-going
Dauntri Multipurpose Dam Development Project	Korea	Loan	2009	2013	Battambang	45,958	40,283	5,675	Loan Processing
Stung Pursat Dam No. 3 and No. 5 Development Project	China	Loan	2011	2014	Pursat	80,000	66,460	13,540	On-going
Stung Tasal Storage Reservoir	India	Loan	2011	2013	Kampong Speu	19,000	19,000	0	On-going

Development Project									
Surrounding BayongKouv Reservoir Improvement Project	Korea	Grant	2010	2013	Takeo	3,012	3,012	0	Committed
Prek Stung Kev Water Resources Development Project	China	Loan	2011	2015	Kampot	52,000	42,620	9,380	On-going
Technical Cooperation for TSC-Phase 3	Japan	Grant	2009	2014	Battambang, Pursat, Kampong Chhnang	4,625 (¥370x10 <sup>6</sup> )	4,625	0	On-going

Source: *Irrigation Development in Cambodia, Status as of March 2011* cited by JICA/MOWRAM (2012)

With climate change response, the ministry has proposed additional fund which combined together up to US\$303 million for 2014-2018, which slightly exceeds the ceiling cost identified by the Climate Change Financing Framework of US\$301 million from 2014-2018.

### 3.4 Expected benefits from the Implementation of the Action Plan

- The BCRs for irrigation are mostly between 2.5 and 3, which is high. These high BCRs show what is achievable if crops can be marketed and if irrigation schemes are maintained effectively (which are typically the main challenges for irrigation). Returns for rehabilitation are somewhat higher than for new schemes.
- CC proofing for irrigation results in modest net costs, if CC does not happen, but improves the BCR dramatically (from 2.1 or 2.2 to 3.0) if CC does happen, because of the reduced requirements for rehabilitation costs. For rehabilitated irrigation, the proofing actually produces a higher BCR even without CC, which suggests that, on the basis of these assumptions, the CC proofing includes an element of routine flood proofing expenditure that should anyway be undertaken regardless of whether CC takes place.

## 4. MANAGEMENT AND FINANCING MECHANISMS

### 4.1 Analysis of existing management and financing mechanisms

The ministry develops a portfolio of projects based on national priorities as reflected in the rectangular strategy of the Government and in the Strategy for Agriculture and Water (SAW), 2009-2013 update. A Technical Working Group on Agriculture and Water is active, bringing together MoWRAM, MAFF and other stakeholders involved in these sectors. However, most external resource mobilization in MoWRAM is done on a bilateral basis, through discussions with individual donors on one or several of the pipeline projects identified in the Public Investment Plan (rolling three-year plan). Domestic capital resources are allocated as counterpart funds and on the basis of decisions from the Prime Minister.

Both donors funded and nationally funded projects are managed through the central project management office and its units, and subsidiary provincial project implementation units. The PMO and its structure is not shown on the organization chart of MOWRAM as it is outside the line management structure. The PMO reports to the Minister via a project manager for each project, who may be at Secretary of State Level. The PMO financial accounting system is separate from that of the Ministry and funds do not flow through the Department of Finance, or line departments. The

establishment of a project management office (PMO) with project management units (PMUs) and project implementation units (PIU) outside line departments has created overlapping mandates of line departments and the PMOs. Staff has been attracted from departments into PMUs, because funding arrangements are more free and workable than in the ministry itself (TWGAW 2009).

The working group in charge of CCAP development, including representatives from relevant ministries, will remain active and coordinate the implementation of the CCAP within the ministry.

There is a need to strengthen the provincial offices PDWRAM of MOWRAM to enable them to implement national and sub-national level programs. There is usually no more than one member of staff with an engineering qualification and that person is usually the Director who is therefore taken up with management and does not work as an engineer.

#### **4.2 Analysis of potential sources and volume of finance for Climate Change actions**

The CCAP includes 16 actions for a total of 303 million USD over 5 years. Two thirds of the budget are allocated to the rehabilitation and climate proofing of irrigation infrastructure. Other actions include research, testing of technologies, capacity development, as well flood management and climate monitoring actions.

The ministry expects to source a significant portion of these resources through its existing donors, by raising the profile of climate change at project identification and design stage. Additional climate resources may be raised from LDCF and the Green Climate Fund.

Expenditure on infrastructure could be scaled up or down depending on whether a high or low climate change financing scenario materializes.

#### **4.3 Entry points for climate change mainstreaming in management and financing mechanisms**

Investment funds under MoWRAM are exclusively managed through a project modality. In the absence of strong coordination mechanisms, it is recommended to introduce standard procedures including climate change as a criterion for the identification and formulation of projects. The PMO could play a role in enforcing these standards for all new projects. A priority activity would be to conduct the necessary research to define adequate CC proofing standards for irrigation infrastructure.

Once approved, the CCCAP will be presented at the TWGAW for initial discussion with potential donors. Many CCAP actions are directly linked to projects already included in the ministry's PIP. New actions will be incorporated in the PIP by the Department of Planning.

### **5. MONITORING AND EVALUATION**

#### **5.1 Develop a framework for monitoring, reporting, evaluation and learning**

Monitoring and evaluation of the CCAP will be conducted consistently with the national framework for M&E of climate change response established by the CCCSP.

The [department of planning] will have the responsibility to manage the monitoring, reporting and evaluation process with the technical support of the climate change [working group]. It will carry out

these tasks with the support and in coordination with the NCCC and MoP. For details of the institutional arrangements see also the diagram of Figure 1.

Progress in the implementation of the CCAP will be reviewed on an annual basis in the framework of the Annual Progress Review of [the sectoral strategy or plan; please complete this]; a specific chapter reviewing the CCAP progress will be included. The CCAP indicator framework will be integrated within the MOWRAM indicator framework; relevant indicators for climate change will be also included in the NSDP submission.

A mid-term evaluation will be organized in year 2016 and a final evaluation in 2018. The evaluations will assess the progress in implementing the CCAP and CCSP, its relevance and contribution in addressing climate change and water issues and achieving impacts foreseen in sectoral plan and NSDP, the effectiveness in terms of mainstreaming climate change within the MOWRAM services, and integration in planning and monitoring systems of the ministry. The evaluations will also assess the alignment and contribution towards achieving the objectives set in the CCCSP<sup>8</sup>, and will provide recommendations for future adjustment of the policy response. To this effect it will be important that evaluations identify lessons learned and, if needed, entry points for improving policies and actions. A precondition for organization of quality evaluations at program (CCAP) and action levels will be that sufficient resources for monitoring and evaluation are budgeted in the actions.

The monitoring of the CCAP will be based on the following indicators framework:

Indicator Type	Purpose	Frequency
1. CCAP delivery and mainstreaming	Tracking the progress in fundamental aspects of CCAP implementation, such as fund mobilization.	Annual
2. Institutional readiness <sup>9</sup>	Tracking the progress in improving capacities and integration of climate change into sectoral policies and planning.	Annual
3. Results	Assessing the results of Actions.	Annual or depending on the nature of the action <sup>10</sup> .
4. Impact	Assessing the progress towards ultimate climate policy and development objectives.	Annual, ad-hoc for indicators that require specific studies (e.g. sectoral climate change vulnerability assessments).

To minimize costs and improve mainstreaming, whenever possible indicators will be based on relevant indicators already being monitored<sup>11</sup>. Baseline and targets for indicators for CCAP delivery and mainstreaming, and for impact indicators will be established by the end of 2014, and will be

<sup>8</sup> The national framework for M&E of climate change response foresees the establishment of a Long Term National Evaluation Program. Evaluations of the CCAP as a whole and of specific actions will be organized in coordination with the national evaluation program.

<sup>9</sup> These indicators will be using a qualitative assessment based on scorecards.

<sup>10</sup> Given that most actions will require formulation of project proposals to access the funds required for implementation, the indicators identified are preliminary and will be updated to reflect the actual scope of the action. Only indicators related to actions that have been funded for implementation will be monitored.

<sup>11</sup> Additional processing and analysis of existing indicators will often be required to address the climate change aspects; this might include classifying the data according to the vulnerability analysis included in the Draft SNC to the UNFCCC and subsequent vulnerability assessments.

included in the first CCAP progress report. Result indicators will be finalized, and respective baselines and targets established as the actions are financed. The indicator framework will be reviewed in 2016 during the mid-term evaluation.

Paddy field under irrigation services is one of the major key indicators for MOWRAM which also contribute to NSDP goal: Enhance Agricultural Production and Productivity. In 2009, paddy field is estimated to be 2,547,000 ha of which irrigation water was supplied only for about 777,000 ha (30%) in the rainy season and about 347,000 ha (9%) in the dry season. They are vulnerable to floods, drought and other forms of natural disasters.

The indicators for the CCAP are:

<b>1. CCAP delivery and mainstreaming indicators</b>	
1. Funds planned and actually disbursed, compared with the CCAP planning matrix <sup>12</sup> 2. Proportion of actions funded from national budget, which will indicate the progress in mainstreaming financing into national budgets	
<b>2. Institutional readiness indicators</b>	
3. Integration of Climate Change into sectoral policy and budgeting 4. Capacities for climate change mainstreaming <ul style="list-style-type: none"> <li>• 50% of total FWUCs (350 FWUCs) are fully functioning throughout the country</li> <li>• At least 500 members from selected 150 FWUCs (70% women) are capable to use knowledge and skills in agricultural planning, cropping calendar under the context of climate change.</li> </ul> 5. Availability and use of data and information <ul style="list-style-type: none"> <li>• Hydrology and meteorology networks and stations are upgraded and installed throughout the country and fully operation with accountable, accessible and reliable manner).</li> </ul>	
<b>3. Results indicators</b>	
<b>1. Strengthening Climate Change Information and early Warning System</b>	<ul style="list-style-type: none"> <li>• 27 hydrological stations and 8 meteorology and early warning stations will be fully functioning by the end of the project intervention.</li> <li>• Strong political commitment from government side and additional capacity building for government staffs with financial and quality insurance from UNDP/GEF.</li> </ul>
<b>2. Capacity building for national and provincial department of water resources for climatic data collection, recording etc</b>	<ul style="list-style-type: none"> <li>• At least 250 staffs from relevant departments and provincial level of MOWRAM have enhanced their knowledge and skills (measured through baseline and final tests):</li> <li>• Data on water available in the basin, Hydrological modelling (such as flood frequency prediction), climate change modelling are available to MOWRAM staff and all relevant ministries.</li> </ul>
<b>3. Improving institutional structure, networking with mass media for public weather and climate forecasting dissemination.</b>	<ul style="list-style-type: none"> <li>• Percentage of population (by gender and type of media) receiving timely information and warnings on floods and droughts.</li> </ul>
<b>4. Establish and install meteorology stations in the seas to monitor win, sea</b>	<ul style="list-style-type: none"> <li>• Meteorological station established, functional and maintained</li> <li>• Staffs are able to operate and maintain the stations</li> <li>• Meteorological Data produced by the newly installed stations is</li> </ul>

<sup>12</sup> This indicator will be calculated as the ratio of actual funds allocated and the budget foreseen in the planning matrix. For example if by 2016 the total funds actually allocated are 28 M (10 M in 2014, 8 M in 2015, 10 M in 2016) and the total budget is of 35.7 M (11.9 for each year), the indicator will be 78%.

wave, sea level rise in four provinces of coastal zone	<i>regularly and timely made available to all relevant users.</i>
<b>5. Climate risk management and rehabilitation of small, medium and large-scale irrigation infrastructure</b>	<ul style="list-style-type: none"> <li>• <i>Increase irrigated areas 25,000 ha/year</i></li> <li>• <i>Increase rice production in contributing to government policy of exporting 1 million tonnes per year starting from 2015.</i></li> <li>• <i>Percentage of irrigation engineers with adequate CC knowledge and skills</i></li> <li>• <i>Percentage of FWUC staffs with adequate CC knowledge and skills</i></li> </ul>
<b>6. Promoting innovative irrigation technology structure in areas affected by torrential rain (Mondulkiri, Pursat, Sihanouk)</b>	<ul style="list-style-type: none"> <li>• <i>Three demonstration sites are fully functional and operated with AWG (use electricity and hydraulic).</i></li> <li>• <i>Capacity of irrigation engineers and FWUCs developed</i></li> <li>• <i>Percentage reduction of loss/damage of crops productions, public assets and human lives</i></li> <li>• <i>Reduced operation cost (through automatic system rather than required people to guard all times)</i></li> </ul>
<b>7. Capacity building and awareness raising on CC and DRR for FWUC</b>	<ul style="list-style-type: none"> <li>• <i>At least 30 staffs from FWUC department (National level) and 100 staffs from provincial levels are capable deliver training throughout the country.</i></li> <li>• <i>At least 150 FWUCs from various provinces are strengthened and form a learning network throughout the country.</i></li> <li>• <i>Training documents and manuals produced and disseminated to farmers.</i></li> <li>• <i>Percentage of farmers trained that have a satisfactory knowledge of CC and DRR</i></li> </ul>
<b>8. Capacity development for irrigation engineers on climate risk management</b>	<ul style="list-style-type: none"> <li>• <i>120 engineers are trained and capable to develop and include climate resiliency in infrastructure design and development</i></li> <li>• <i>Training manuals on building climate resilience in infrastructure development based on appropriate design and adaptation from local experiences are developed and used.</i></li> <li>• <i>Policy dialogues conducted by 120 engineers are in place by the end of project.</i></li> </ul>
<b>9. Upscaling mobile pumping stations (20) and permanent stations (10) in responding to mini-droughts</b>	<ul style="list-style-type: none"> <li>• <i>Increase access to irrigation services to provinces with less access to formation irrigation.</i></li> <li>• <i>70,000 ha of potential rice crops affected by seasonal drought rescued.</i></li> <li>• <i>Farmers will reduce cost of pumping per hectar in some provinces such as Prey Veng and Svay Rieng (individual and private investment).</i></li> </ul>
<b>10. Development and rehabilitation of flood protection dikes (Kampong, Trabek, Bateay) for agricultural/ urban development</b>	<ul style="list-style-type: none"> <li>• <i>Baseline and guideline on development, flood protection and diversion for climate resilient in urban infrastructure development.</i></li> <li>• <i>Pilot sites established for flood diversion in newly established urban areas in proposed provinces</i></li> <li>• <i>At least 24% of the target beneficiaries which include local traders and farmers will benefit from flood diversions.</i></li> <li>• <i>Guideline development and lesson learn on climate resilience in urban infrastructure development ( multi-purpose dikes).</i></li> </ul>

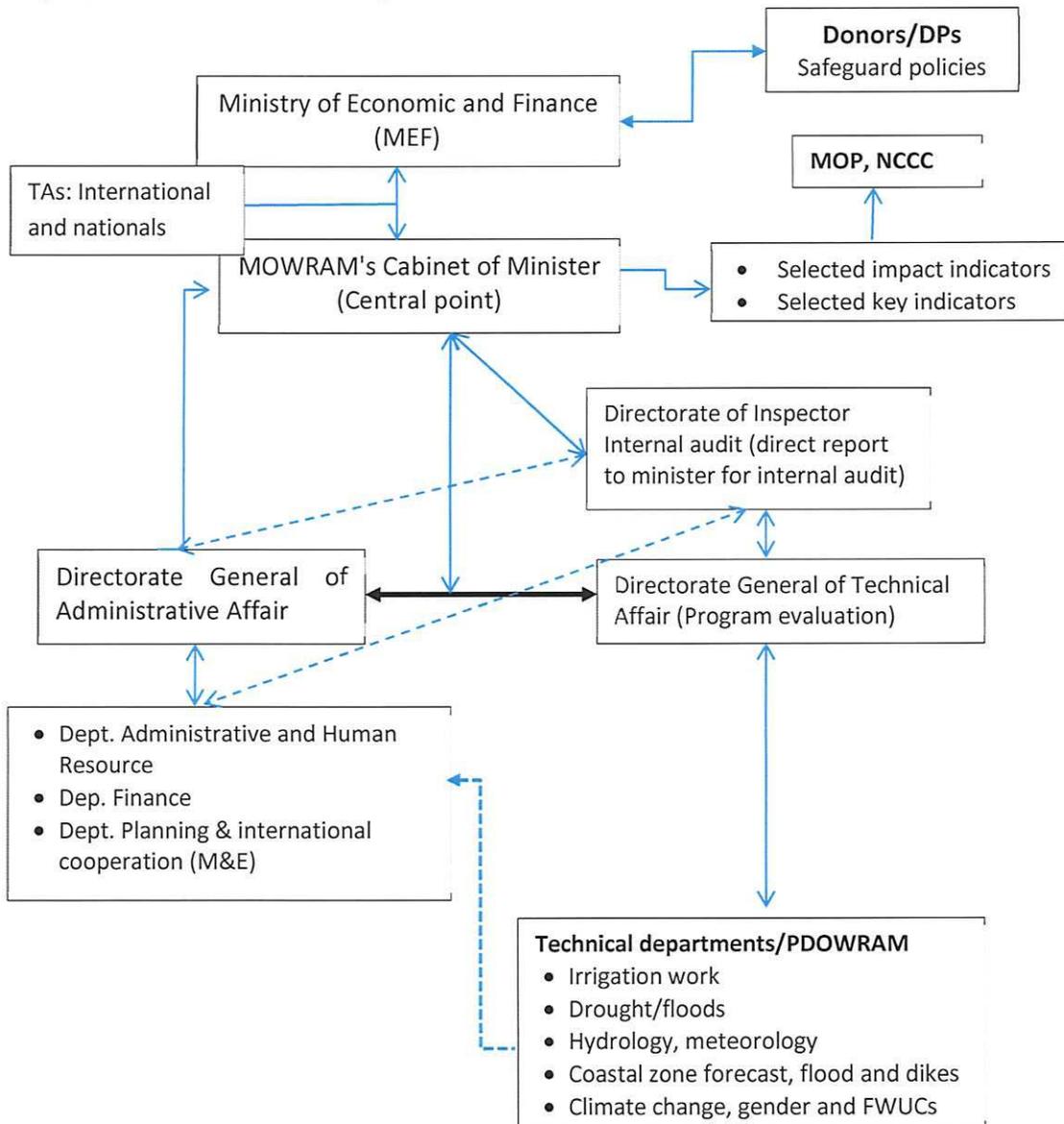
<p><b>11. Improve capacity for flood and drought forecasting and modeling for technical offices at national and subnational level (ADB) GMS</b></p>	<ul style="list-style-type: none"> <li>• <i>At least 25% flood risk reduction from flood profiling policies formulated</i></li> <li>• <i>Flood and drought forecasting, early warning and energy planning are strengthen</i></li> <li>• <i>Infrastructure resilient to climate change guideline and standards developed and applied.</i></li> </ul>
<p><b>12. Establishment of national hydrology forecasting center</b></p>	<ul style="list-style-type: none"> <li>• <i>Flood forecasting models are in place and used to inform water management and early warning systems</i></li> <li>• <i>Flood forecasting systems are available for the public both through public media, online and all relevant institutions at sub-national level</i></li> <li>• <i>Significant record of agricultural production loss to flood have been reduced (% of total production)</i></li> </ul>
<p><b>13. Promoting scientific and comprehensive methods on Ground Water Study in responding to drought and climate risks.</b></p>	<ul style="list-style-type: none"> <li>• <i>Ground water maps produced and used to inform planning and management of water resources</i></li> <li>• <i>Hydrological maps and network models are developed, and available to all relevant ministries</i></li> <li>• <i>At least X percent of staff have satisfactory knowledge of climate change impacts on ground water management</i></li> </ul>
<p><b>14. Promoting climate resilience of agriculture through building sea dikes in coastal areas</b></p>	<ul style="list-style-type: none"> <li>• <i>At least three dikes from coastal areas are renovated and modified again salt water intrusion, floods and drought</i></li> <li>• <i>10,000 ha of paddy will increase yield</i></li> <li>• <i>10,000 farmers received agricultural extension related to agricultural practices resilient to climate change</i></li> <li>• <i>Percentage of farmers applying adaptation techniques</i></li> </ul>
<p><b>15. Assessment of potential impact of sea level rise, salt water intrusion (Mekong delta and coastal areas)</b></p>	<ul style="list-style-type: none"> <li>• <i>Hydrological maps and networks are developed and are used for land use planning</i></li> <li>• <i>Climate vulnerability index and maps of climate vulnerable zones in proposed provinces are developed and available to all relevant institutions.</i></li> <li>• <i>At least X percent of staff have satisfactory knowledge of how to use the data produced</i></li> </ul>
<p><b>16. Promoting gender responsiveness in water management, CC impact and adaptation</b></p>	<ul style="list-style-type: none"> <li>• <i>30 staffs are capable of delivering training throughout the country related to climate change and gender in water sector</i></li> <li>• <i>At least 500 members from selected 150 FWUCs (70% women) are capable to use knowledge and skills in agricultural planning, cropping calendar under the context of climate change</i></li> <li>• <i>Training documents and manuals produced and able to use for farmers.</i></li> <li>• <i>Policy and guideline on climate change and gender within water development sector are developed.</i></li> </ul>
<p><b>Impacts</b></p>	
<p>1. 25,000 ha/year and 24% of climate proofed<sup>13</sup> irrigation networks.</p>	
<p>2. Ha of Agricultural land drought proofed.</p>	
<p>3. The areas of cropping land with access to irrigation services increased by 100,000 ha</p>	
<p>4. The incidence of drought or flood affected farmland reduced by 20%/year based on MOWRAM master plan 2019-2013</p>	

<sup>13</sup> Climate proofed infrastructure results from engineering designs that incorporate the increase in temperature, droughts, floods and other climate hazards projected in the next 20-30 years.

- |  |
|--|
| 5. At least 10,000 hhs from vulnerable areas affected by salt water intrusion, flood and drought in target areas will be able to reduce their annual impacts |
| 6. % of households in vulnerable areas with year round access to water supply (agricultural)   |

**5.2 Monitoring diagram and procedure**

Figure 1: MOWRAM's monitoring and evaluation framework



According to Standard Operation Procedure (SOP) for all externally financed projects/programs in Cambodia as published by the MEF in May 2012 highlights MEF is the key responsible for identifying the line ministry or other RGC or autonomous agency to act as the EA/IA5 for externally assisted projects, taking into account the following factors:

- a. The mandate of the line ministry or agency to undertake the project, in line with the Royal Decree and Sub-Decrees mandating it to carry out its various functions;

- b. The interest and commitment of the EA/IA to effectively carry out the project;
- c. The administrative and managerial skills required to effectively manage and administer the project, or at least the willingness and commitment to develop the required skills; and
- d. The ability to mobilize and commit the human resources required to support project implementation.

Once the EA/IA has been identified, the assessment of the required capabilities as outlined above is done in partnership with the representatives of the relevant DPs. At this stage, the absorptive capacity and ability of the EA/IA to handle development assistance is also taken into account in partnership with the relevant. There are times when more than one EA or IA may be involved in the implementation and administration of projects and programs. Where possible it is best practice to designate only one EA to simplify coordination and implementation.

### **DONORS/DPs**

A number of DPs have set up their own templates to identify the capabilities and capacities of the selected EA/IA. At this stage, an Action Plan is also developed to address any constraints identified during the assessment process. If any proposed corrective measures identified are beyond the scope of the RGC's resources, then DPs support is also agreed at this stage, to ensure that the project will be successfully implemented so as to achieve the identified Project Development Objective (PDO).

The MEF must confirm in writing the designation of a line ministry or other agency as the EA/IA, and clearly state that the guidelines and systems and procedures of both the RGC and the relevant DP must be adhered to. For its part, the designated EA/IA must confirm agreement to adhere to these in writing.

MEF plays an important role on behalf of the line ministries when entering into contractual arrangements for loan/credit/grant and technical assistance (TA) support from DPs. It plays the following role:

- Negotiates, with the participation of the line ministry and/or EA/IA, and signs the Financing Agreement, Subsidiary Loan, Project and TA agreements with Development partners (DPs). In the case of autonomous agencies however, MEF signs the Financing Agreement and the agency signs the Subsidiary Loan Agreement or Project Agreement ;
- Is responsible for amendments to loan/credit/grant agreements, including any subsequent amendments, including reallocations and extension of closing dates;
- Is accountable to the National Assembly and the Council of Ministers, with regards to all financial aspects of projects and TA activities. It also ensures that the line ministry complies with all financial covenants and other obligations in the Financing , Subsidiary Loan / Grant and TA agreements;
- Attends all wrap-up meetings between the project and DP's missions;
- Ensures the effective management and administration of loans/credits/grants and TA grants provided to Cambodia;

### **The ministry of planning (MOP)**

The MOP under Sub-Decree No. 55 on its Organization and Functioning has the following roles and responsibilities:

- To act as the government's arm in formulation of concepts, strategies, policies and in determining of priorities for national development in order to ensure the sustainability and balance between development equity and social justice and between economic development, and social and cultural development, between urban and rural areas, between exploitation and regeneration of natural resources and between development and environmental protection;

- To guide and manage methodologies and procedures used in the formulation of socioeconomic development plans according to the decentralized system in the whole country;
- To prepare long term, medium term and short term plans and national programs by coordinating with all relevant ministries/institutions in the provinces and regions in the whole country; Takes the lead role and in consultation with other arms of the RGC produces the National Strategy and Development Plan (NSDP) and ensures that the NSDP and the Rectangular Strategy of the RGC is implemented.
- To monitor the implementation of plans, national programs and projects in all sectors and make assessment and proposes measures to correct those plans and programs as needed;
- To work with concerned ministries/institutions in formulating strategies and policies and identifying priorities for investments both in public and private sectors in order to promote efficiency and optimize the use of internal and external potential resources;
- To collaborate with the Ministry of Economy and Finance in fixing the amount and in allocating annual budget for public investments; and

#### NCCC

NCCC will ensure climate indicators are mainstreaming into national development planning. NCCC and MEF will work together to encourage donors to consider providing support for CC in the form of budget support as soon as the PFM reforms deliver greater confidence in the transparency of public expenditure and more detailed budgets, at least down to the level of departments

## 6. LAW AND REGULATION DRAFTING SCHEDULE

In 2012, the ministry has provided significant steps in establishing the Working Group of Climate Change on water and meteorology with major role in formulating strategic plan, and policy formulation. However, there is no legal framework required for the ministry to implement its mandate in the Climate Change response. There are would be two types of responses which might include:

1. Legal and regulatory changes required for mainstreaming (eg procedures for regular climate screening of new projects, inclusion of climate change unit during annual workplan development, reference to climate change in budget submissions).
2. The principles and regulatory changes required for the feasibility of actions, especially where these changes affect several actions.

**Table 5: Typical format for legal framework requires for action plan implementation**

<b>Type of instrument</b>	<i>Ministerial decision (prakas)</i>
<b>Title</b>	<i>Procedures for Climate Change Screening of New Projects</i>
<b>Purpose</b>	<i>Establish standard procedures for all new projects to be screened, and, if there are considered climate-relevant, for the inclusion of climate-related activities, budgets and M&amp;E tools</i>
<b>Responsible department / unit</b>	<i>Climate Change Working Group Legal Unit of Administration Department</i>
<b>Drafting schedule</b>	<i>By July 2014</i>
<b>Requires inter-ministerial coordination?</b>	<input type="checkbox"/> Yes, if so indicate which ministry(ies): <input type="checkbox"/> No

## 7. CONCLUSIONS AND NEXT STEPS

The preparation of priority actions for CCAP is one of the starting points in mainstreaming climate change plan into formal development planning. It is important that these actions will included with the next or on-going and rolling plan for PIP of the ministry.

The CCAP can be a very effective tool to mobilize national and international resources. Thus, developing effective communication materials based on the CCAP will be one of the next steps to assist in mobilise resources and coordination with CCD and other ministries to present the CCAP in national and international events (eg UNFCCC side events, national climate change forum, DP coordination meetings). It could also include a launch workshop.

The key process by which the CCAP should influence domestic resource mobilization is by achieving marginal shifts in the budget in favour of those ministries, departments and actions that provide the most effective contribution to adaptation and mitigation. This could include the following.

- How best to refer to climate change in ministry budget submissions, including an analysis of how the proposed budget is going to improve adaptation and mitigation and the value of this improvement to the country.
- Implementation of a screening system for project preparation in which PIP submissions include a statement of the adaptation and mitigation benefits of all climate relevant projects. This could use the Action Fiches in the CCAP, though modification of the PIP template to take more account of climate change would also be useful.
- CCCA as the multi-trust fund coordination will also provide overall assistant to the ministry in identifying the potential sources of funding allocation and additional policy and capacity development for the officials from the working group of climate change on agriculture, forestry and fisheries.

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## 9. LIST OF ANNEX:

### ANNEX 1: LONG LIST SELECTION AND SCREENING

MoWRAM				Total Planned expenditure			2015	Total 2013-2015	
On-going projects	Project Title	CC's class.	M&C to CC		2013	2014		2,014.0	
	A. CAPs							-	
1	First and Second Pursat River Water Resource Development		2	a		14,950.0	44,850	14,950.0	74,750.0
2	Irrigation Development Project		2	a	25,801.0	875.0	1,189.0		2,064.0
3	Kang Hot Irrigation Development Project in Battambang Province		2	a	27,695.0	10,000.0	7,217.0		17,217.0
4	Kang Hot Irrigation Development Project in Battambang Province (second steps)		2	a		1,000.0	1,000.0	2,000.0	4,000.0
5	Kampong Trabek River Flood Control in Prey Veng Province		3	a	21,244.0	3,000.0	3,770.0		6,770.0
6	MongkulBorey Dam Development in BanteayMeanchey Province		2	a	4,110.0	10,000.0	5,555.0		15,555.0
7	Northwest Irrigation Sector		2	a	18,870.0	6,000.0	6,000.0		12,000.0
8	PDOWRAM Construction Projects		2	a	817.0	160.0	160.0	160.0	480.0
9	Rehabilitated 19 Irrigation System		2	a	12,741.0	2,400.0	2,500.0	2,573.0	7,473.0
10	Rehabilitated 19 Irrigation System		2	a	26,937.0	7,000.0	7,000.0	8,000.0	22,000.0
11	Rehabilitated East and Northeast Irrigation System Phase 1 and 2		2	a	30,045.0	4,000.0	4,955.0		8,955.0
12	Renovate Irrigation System and Tonle Sab River West Drainage Operation		2	a		1,668.0	1,573.0	2,298.0	5,539.0
13	Smallholder Agriculture and Social Protection Support Operation		1	a	1,000.0	2,000.0	2,000.0		4,000.0
14	SteungKeo Water Resource Development		2	a	24,800.0	8,500.0	818.0		9,318.0
15	Stung Sangker Multi-purpose (Battambang Dam I)		3	a		10,000.0	10,000.0	20,000.0	40,000.0
16	SteungSen Irrigation Development in Kampong Thom Province		2	a	1,000.0	9,000.0	10,000.0	11,000.0	30,000.0
17	SteungSreng River Basin Development in Siem Reap Province		2	a	16,000.0	12,900.0	12,984.0		25,884.0
18	TASAL River Basin Development		2	a	5,000.0	3,000.0	3,000.0	4,000.0	10,000.0

19	The Improvemen of Eastern Rural Agriculture Productivity and Irrigation System		2	a	3,600.0	3,800.0	3,800.0	3,800.0	11,400.0
20	The third and Fifth Pursat River Water Resource Development (First Phase)		2	a		15,000.0	12,000.0	12,040.0	39,040.0
21	Tonle Sap Lowlands Rural Development		1	a	8,000.0	6,800.0	2,400.0	1,500.0	10,700.0
22	VOICO River Basin Water Research Development ( First Phase)		2	a	20,000.0	10,000.0	10,000.0	10,000.0	30,000.0
23	Water Resources and Irrigation Management in Kampot,Takeo and Kampong Thom		2	a	21,167.0	3,000.0	3,000.0	3,000.0	9,000.0
24	Water Resource Development and Management		1	a	2,000.0	2,500.0	2,500.0	2,500.0	7,500.0
25	Water Resource Development and Management program		1	a	10,000.0	3,000.0	3,000.0	1,000.0	7,000.0
	<b>B.TA and other projects</b>								
1	Established 25 FWUCs		1	a	30.0	80.0	80.0	80.0	240.0
2	Gender Mainstreaming of Water Resources		1	a	13.0	30.0	30.0	30.0	90.0
3	Technical Service Center (TSC) Stept III		1	a	660.0	330.0	330.0		660.0
	<b>Planned</b>								
	<b>A. CAPs (Capital Investment Projects)</b>								
1	Irrigation System Developmet and Agriculture		2	a		8,000.0	1,500.0	1,500.0	11,000.0
2	Irrigation System Development in Takeo, Prey Veng, and SvayRieng Province		2	a		2,000.0	2,000.0	2,000.0	6,000.0
3	A Chang Irrigation Development Project		2	a		8,000.0	8,000.0	9,000.0	25,000.0
4	Construct new pumping stations 20 places		2	a		500.0	500.0	500.0	1,500.0
5	Doun Try Multi-Purposes Dam Development in Battambang		2	a		13,000.0	13,000.0	13,000.0	39,000.0
6	Flood and drought project		3	a		1,000.0	1,000.0	4,000.0	6,000.0
7	Improvement of RolangChreyHeadworks		2	a		2,000.0	2,000.0	6,000.0	10,000.0
8	KandalSroung-Bat RitatedIrrigaton and Drainage Sytem		2	a		10,000.0	8,000.0	7,000.0	25,000.0
9	KolmatagesRehabilitated		2	a		1,000.0	1,000.0	1,000.0	3,000.0
10	Manage KampingPouy Irrigation System		0			1,000.0	1,000.0	2,000.0	4,000.0
11	Mekong Water Resource Management		2	a		3,000.0	4,000.0	4,000.0	11,000.0
12	Rehabilitated Angsaong Irrigation		2	a		1,000.0	1,000.0	2,000.0	4,000.0
13	RehabilitatedBahonKor Irrigation		2	a		1,000.0	1,000.0	1,100.0	3,100.0
14	Rehabilitated of 85 main canals from pumping stations		2	a		1,000.0	1,000.0	1,300.0	3,300.0
15	Rehabilitated Prey Nob Basin		2	a		500.0	500.0	500.0	1,500.0

16	Rehabilitated Sala Ta Om Dam		2	a		1,000.0	1,000.0	1,000.0	3,000.0
17	Rehabilitated Takeo Irrigation		2	a		1,000.0	1,000.0	1,000.0	3,000.0
18	Renovate 30 hydrolic stations		2	a		150.0	150.0	200.0	500.0
19	Renovated small scale infrastructure Project (23 Provinces)		2	a		1,000.0	1,000.0	1,000.0	3,000.0
20	Smallholder Agriculture and Social Projection Support Operation		2	a		1,500.0	2,200.0	2,200.0	5,900.0
21	SteungChikreng River Water Resource Development		2	a			8,000.0	16,000.0	24,000.0
22	Stung Plearch River Development		2	a		2,000.0	3,000.0	4,000.0	9,000.0
23	SteungPrekThnot River and Basin Water Resource Management		2	a		5,000.0	8,000.0	10,376.0	23,376.0
24	Stung Pursat Water Resource Development Project		2	a		5,000.0	18,000.0	27,000.0	50,000.0
25	SteungSva Hap Irrigation System		2	a		3,000.0	3,000.0	3,900.0	9,900.0
26	SteungStong Water Resource Development		2	a			10,000.0	12,000.0	22,000.0
27	Stung Siem Reap Flood Control and Irrigation Development		2	a			10,000.0	10,000.0	20,000.0
28	Stung Sreng Water Development Phase II		2	a			15,000.0	15,000.0	30,000.0
29	Stung Staung Water Resource Development Phase II		2	a			10,000.0	10,000.0	20,000.0
30	Third and Fifth Pursat River Water Resource Development (second step)		2	a				11,000.0	11,000.0
31	Upper Slakou River Irrigation System Improvement		2	a		1,000.0	1,000.0	1,000.0	3,000.0
32	VOICO River Basin Water Research Development		2	a			30,000.0	30,000.0	60,000.0
	<b>B.TA and other projects</b>								-
1	Manage and Control the undergrown water resrouces		2	a		100.0	100.0	200.0	400.0
2	National Policy Published of Water Resources		1	a		60.0	70.0	70.0	200.0
3	Rehabilitated Irrigation System and Control Flood of Mekong River		3	a		700.0	700.0	700.0	2,100.0
4	Renovated Survey System, Forecast Meteorology and Meteorology of Agriculture		0			320.0	320.0	320.0	960.0
5	Study about renovate hydraulic controlling system		0			1,000.0	1,000.0	1,000.0	3,000.0
6	To strengthen the Water User Community		1	a		600.0	700.0	700.0	2,000.0

ANNEX 2: SCORING OF PRIORITIED ACTIONS FOR WATER RESOURCE AND METEROLOGY IN RESPONSE TO CLIMATE CHAGNE

No	Action	Effectiveness			Co-benefits			Feasibility		
		Scale of climate risk	Cost per beneficiary	Mitigation cost effectiveness	Economic	Social	Environmental	Political commitment	Capacity	Ease to implement
		-1 – 3	0 – 3	-1 – 2	0 – 2	0 – 2	0 – 2	Green (G), Yellow (Y), Red (R)		
1	<i>Strengthening Climate Information and EWS (Early Warning System)</i>	3	3	2	2	2	2	G	G	G
2	<i>Capacity building for national and provincial department of water resources for climatic data collection, recording etc.</i>	3	3	2	2	2	2	G	G	Y
3	<i>Improving institutional structure, networking with mass media for public weather and climate forecasting dissemination</i>	3	3	2	2	2	2	G	G	G
4	<i>Installation of guaging station to monitor rainfall, wind speed, storms and sea level rise (4 provinces)</i>	3	3	2	2	2	2	G	G	G
5	<i>Climate risk management and rehabilitation of small, medium and large-scale irrigation infrastructure</i>	3	3	2	2	2	2	G	G	G
6	<i>Promoting innovative irrigation technology structure in areas affected by torrential rain (Mondulkiri, Pursat, Sihanouk)</i>	3	3	2	2	2	2	G	G	Y
7	<i>Capacity building and awareness raising on CC and DRR for FWUC</i>	3	3	2	2	2	2	G	G	G
8	<i>Capacity development for irrigation engineers on climate risk management</i>	3	3	2	2	2	2	G	G	Y
9	<i>Upscaling mobile pumping stations (20) and permanent stations (10) in responding to mini-droughts</i>	3	3	2	2	2	2	G	G	G
10	<i>Maintenance and rehabilitation of flood protection dikes (Kampong, Trabek, Bateay) for agricultural/ urban development</i>	3	3	2	2	2	2	G	G	G
11	<i>Improve capacity for flood and drought forecasting and modeling for technical offices at national and sub-national level (ADB) GMS</i>	3	3	2	2	2	2	G	G	G
12	<i>Establishment of National Flood Centre (ADB)</i>	3	3	2	2	2	2	G	G	G
13	<i>Upscaling ground water management by using ISOTOP application (original source of water, recharge areas etc.)</i>	2	2	2	2	2	2	G	G	G
14	<i>Promoting climate resilience of agriculture through maintenance sea dikes in coastal areas</i>	3	3	2	2	2	2	G	G	G
15	<i>Assessment of potential impact of sea level rise, salt water intrusion (Mekong delta and coastal areas)</i>	2	2	1	1	2	2	Y	Y	Y
16	<i>Promoting gender responsiveness in water management, CC impact and adaptation</i>	3	3	2	2	2	2	Y	Y	Y

### ANNEX 3: ACTION FICHES FOR EACH PROPOSED AND PRIORITIED ACTIONS

#### ACTION FICHE 1

<b>Action</b>	<i>Strengthening Climate Change Information and early Warning System</i>
<b>CCCSP and Sector CCSP Strategic Objective</b>	<i>Code of the CCCSP and Sector CCSP Strategic Objective to which the Action refers</i>
<b>Rationale</b>	This action is to response to current national strategies of climate change information and early warning system
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 1 – Re-scaled <input checked="" type="checkbox"/> Cat 2 – Modified <input checked="" type="checkbox"/> Cat 3 – Dedicated
<b>Type of action</b>	<input type="checkbox"/> Mitigation <input type="checkbox"/> Adaptation <input checked="" type="checkbox"/> Mitigation and adaptation
<b>Short description of the action and expected results and benefits</b>	<i>Key activities of this action are improved existing hydro-meteorology observation network and Early Warning to support Climate Resilient Development, Adaptation and mitigation to Climate Change. Expected result include: 1-Water resources infrastructure development to Climate Change 2-Water use and adaptation 3-Disaster reduction and mitigation from extreme weather and climate risk Also the action is expected to provide benefit to both government, public as the whole country.</i>
<b>Cost effectiveness of the action</b>	<i>Where possible, an estimate of the benefit cost ratio of adaptation actions and the marginal abatement cost of mitigation actions, along with any notes about key assumptions or sensitivity analysis.  It is estimated with US\$5.5 million</i>
<b>Preconditions needed for successful implementation</b>	<i>Are some other actions required for this action to be implemented e.g. legislation or preliminary studies/works Key institutions: Two departments: Meteorology (DOM) and Hydrology and river work (DHRW) of MOWRAM, UNPD. Additional capacity building for the staffs from two departments is required in term of financial and technical administrative. The two major departments will be the key responsible for implementation representing the govt and these two departments also involves similar works and technical skills dealing with these issues. Strong political commitment from government side and additional capacity building for government staffs with financial and quality insurance from UNDP/GEF.</i>
<b>Indicator(s) of success</b>	<i>27 hydrological stations and 8 meteorology and early warning stations will be fully functioning by the end of the project intervention.</i>
<b>Implementation arrangements</b>	<i>Responsible department(s): DHRW and DOM will be key responsible both implementation and technical parts with technical adviser and quality insurance from UNDP/GEF. This action is also operated through sub-national line department throughout the country.</i>
<b>Estimated total cost</b>	<i>USD5.5 million</i>
<b>Possible funding sources</b>	Potential sources of funding: UNDP/GEF and in-kind contribution from MOWRAM
<b>Timeframe</b>	2015-2017

#### ACTION FICHE 2

<b>Action</b>	<b>Capacity building for national and provincial department of water resources for climatic data collection, recording etc</b>
<b>CCCSP and Sector CCSP Strategic Objective</b>	<i>Code of the CCCSP and Sector CCSP Strategic Objective to which the Action refers</i>
<b>Rationale</b>	<i>Links to the sector and national strategies This action is to strengthen capacity of MOWRAM technical staffs both at national and sub-national level to be more capable in observation, recording and collecting climate data and information with more analytical and more responsive to climate change impact and vulnerability in the country.</i>
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 2 and 3
<b>Type of action</b>	<input type="checkbox"/> Adaptation
<b>Short description of the action and expected results and benefits</b>	<i>Short description Total staffs with 250 both national and provincial level will obtain a series of short trainings course on:</i> <ul style="list-style-type: none"> <li>- <i>Hydro-meteorology observation for period of two years.</i></li> <li>- <i>Hydro-meteorology data collection and management done by trained staffs.</i></li> <li>- <i>Climate Change Modelling</i></li> <li>- <i>Provide information exchanges within WMO (World Meteorological Organisation) and regional organisation and countries.</i></li> </ul> <i>Key beneficiaries include MOWRAM staff from both national and provincial level as well other government agencies that need information for their work.</i>
<b>Cost effectiveness of the action</b>	<i>With more capable capacity of MOWRAM staffs at both national and sub-national level there will be chance to avoid and mitigate the impact of climate change and vulnerability areas.</i>
<b>Preconditions needed for successful implementation</b>	<i>The government acknowledge the need to build capacity for the staffs in dealing with climate change as mentioned in the strategic plan of MOWRAM 2014-2018. Currently, some senior staffs at national level equipped with knowledge and skills related to hydrological modelling, GIS map, hydro-meteorological modelling but still need more climate risk modelling and the need to simplify information at sub-national level through on job-trainings. Mention any minimum capacity requirements</i>
<b>Indicator(s) of success</b>	<i>At least 250 staffs from relevant departments and provincial level of MOWRAM will be able to enhance knowledge and skills: Water available in the basin, Hydrological modelling (such as flood frequency prediction), climate change modelling.</i>
<b>Implementation arrangements</b>	<i>Responsible department(s) DHRW, DOM and relevant departments of MOWRAM.</i>
<b>Estimated total cost</b>	<i>USD3.5 million</i>
<b>Possible funding sources</b>	<i>Name the proposed source(s) of funding. Small contribution expect from ministry, while the rest expect from donors and multi-bilateral aids.</i>
<b>Timeframe</b>	<i>2014-2018</i>

### ACTION FICHE 3

Action	<b>Improving institutional structure, networking with mass media for public weather and climate forecasting dissemination.</b>
CCCSP and Sector CCSP Strategic Objective	Code of the CCCSP and Sector CCSP Strategic Objective to which the Action refers
Rationale	Links to the sector and national strategies  This action is to response to water resource and meteorology and national warning system on weather and climate forecasting dissemination to be more affectively through public media, institutional coordination from national to relevant institutions at sub-national level to take action in time to be able to avoid great losses potential natural disaster.
Category of climate change action	<input type="checkbox"/> Cat 1,2 and 3
Type of action	<input type="checkbox"/> Adaptation and mitigation
Short description of the action and expected results and benefits	Short description  This action is to establish early warning canter where media rooms, video conference rooms and scenarios broadcasting to make it more effective with additional capacity building. Key beneficiaries will include researchers, scientist from other countries, private sectors, investors and the whole publics in Cambodia.
Cost effectiveness of the action	The whole public will benefits in particular will get more information on how to avoid and prepared themselves in coping with potential natural disasters.
Preconditions needed for successful implementation	Strong commitment and support from government Staff capacity are able to operate the system and networking Financial support available
Indicator(s) of success	Appropriated building with appropriate equipment's are installed and staff capacity are also well-equips in order to operate and manage the public medical in relation to early warning system, climate change forecasting.
Implementation arrangements	Responsible department(s) DHRW, DOM and relevant departments of MOWRAM.
Estimated total cost	USD5 million
Possible funding sources	Name the proposed source(s) of funding. Potential funding from ADB, government and MRCs
Timeframe	2014-2018

### ACTION FICHE 4

Action	<b>Establish and install meteorology stations in the seas to monitor win, sea wave, sea level rise in four provinces of coastal zone</b>
CCCSP and Sector CCSP Strategic Objective	Code of the CCCSP and Sector CCSP Strategic Objective to which the Action refers
Rationale	Links to the sector and national strategies  This action is to provide data and information related extreme weather events in the seas and off seas in coastal zone which is one of the key development zones of the country.
Category of climate change action	<input type="checkbox"/> Cat 3
Type of action	<input type="checkbox"/> Adaptation and mitigation

Short description of the action and expected results and benefits	<p><i>Short description</i></p> <ul style="list-style-type: none"> <li>- Establish and install meteorological stations in the seas of coastal provinces.</li> <li>- Conduct meteorology observation forecast and dissemination</li> <li>- Data and information sharing for end users (private sectors, researchers, investors and other stakeholder)</li> </ul> <p><b>Key beneficiaries:</b> Navigation, inland transportation, marine fishers, tourism and coastal zone community, private sectors and investors and government agencies in coastal zone.</p>
Cost effectiveness of the action	<i>The whole public will benefits in particular will get more information on how to avoid and prepared themselves in coping with potential natural disasters.</i>
Preconditions needed for successful implementation	<p><i>Strong commitment and support from government</i></p> <p><i>Staff capacity are able to operate the system and networking</i></p> <p><i>Financial support available</i></p>
Indicator(s) of success	<p><i>Meteorological station established</i></p> <p><i>Staffs are able to operation full function</i></p> <p><i>Available scientific informant that can be used for adaption and mitigation in time.</i></p>
Implementation arrangements	<p><i>Responsible department(s)</i></p> <p><i>DOM and relevant provincial departments of MOWRAM</i></p>
Estimated total cost	<i>USD3.5 million</i>
Possible funding sources	<p><i>Name the proposed source(s) of funding.</i></p> <p><i>To be identified</i></p>
Timeframe	<i>2014-2018</i>

#### ACTION FICHE 5

Action	<b>Climate risk management and rehabilitation of small, medium and large-scale irrigation infrastructure</b>
CCCSP and Sector CCSP Strategic Objective	<i>Code of the CCCSP and Sector CCSP Strategic Objective to which the Action refers</i>
Rationale	<p><i>Links to the sector and national strategies</i></p> <p><i>This action is to response to list of projects highlighted in NAPA 2006, SAW 2010-2013 and MOWRAM's Strategic Development Plan 2010-2013 and current 2014-2018 focus mostly provinces with major existing irrigation scheme, vulnerable to flood and drought and key agriculture production and high population density.</i></p> <p><i>This action is also response to current government strategy of exporting milled rice with 1millin tons per year by 2015 as well as the need to expanse 25,000 ha within existing potential irrigation of MOWRAM.</i></p>
Category of climate change action	<input type="checkbox"/> Cat 1 and 2
Type of action	<input type="checkbox"/> Adaptation and mitigation
Short description of the action and expected results and benefits	<p><i>Short description</i></p> <p><i>This action is to response to current flood and drought in target provinces: Siem Reap, BanteayMeanchey, Battambang, Kg. Thom, Kg. Chhnang, Pursat, Kandal) Kg. Speu, Prey Veng, Takeo, SvayRieng. These provinces are key agricultural production and high population density. Key activities include:</i></p> <ul style="list-style-type: none"> <li>- <i>Rehabilitating and upgrading existing irrigation schemes affected by floods to be more resilience to climate change.</i></li> <li>- <i>Increase operation and maintenance services</i></li> <li>- <i>Irrigation engineering staffs capacity development (design and prediction on floods and drought).</i></li> </ul>

	<ul style="list-style-type: none"> <li>- Improve water efficiency used for agriculture and irrigation managements.</li> <li>- Improve capacity of multi-reservoir dams to reduce floods and drought.</li> </ul> <p>Key beneficiaries include farmers, local traders from above provinces and MOWRAM staff as well as other government agencies such as MAFF and MRD.</p>
<b>Cost effectiveness of the action</b>	<i>Estimated with around 6-8 million rural people benefit</i>
<b>Preconditions needed for successful implementation</b>	<p><i>Strong commitment and support from government</i></p> <p><i>Staff capacity to operate the scheme and deliver extension services</i></p> <p><i>Strong participation from local farmers and authority</i></p> <p><i>Incentive for PPP (Public Private Partnership) investment</i></p>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>- Increase irrigated areas 25,000 ha/year</li> <li>- Increase rice production in contributing to government policy of exporting 1 million tonnes per year starting from 2015.</li> <li>- Capacity of irrigation engineers developed</li> <li>- Capacity of FWUC staffs developed</li> </ul>
<b>Implementation arrangements</b>	<p><i>Responsible department(s)</i></p> <p><i>Department of Irrigated agriculture, Department of Engineering and Department of Farmer Water User Community, and all provincial departments in target provinces (MOWRAM)</i></p>
<b>Estimated total cost</b>	<i>USD200 million</i>
<b>Possible funding sources</b>	<p><i>Name the proposed source(s) of funding.</i></p> <p><i>ADB, CHINA, KOREA, JICA, INDIA and government</i></p>
<b>Timeframe</b>	<i>2014-2018</i>

#### **ACTION FICHE 6**

<b>Action</b>	<b><i>Promoting innovative irrigation technology structure in areas affected by torrential rain (Mondulkiri, Pursat, Sihanouk)</i></b>
<b>CCCSP and Sector CCSP Strategic Objective</b>	This action is to response to CCSP strategy (ix) Improve and introduce technologies in water work development to respond to the negative impacts of climate change
<b>Rationale</b>	<p><i>Links to the sector and national strategies</i></p> <p><i>This action link to current struggle of government renovation on irrigation and drainage sustainability against the climate change and weather extreme events.</i></p> <p><i>To reduce natural disaster affecting agricultural land, and products as well as farmers assets.</i></p> <p><i>To mitigate flash floods and floods and disaster risk reduction which often affect people property and public asset such as roads</i></p>
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 1,3
<b>Type of action</b>	<input type="checkbox"/> Adaptation and mitigation
<b>Short description of the action and expected results and benefits</b>	<p><i>Short description</i></p> <p><i>This action is to introduce modern technology and innovative irrigation systems with Automatic Water Gates that can reduce flash flood in provinces are highly affected extreme weathers mostly caused by storms (wild winds and torrential rains).</i></p> <p><i>Key activities include:</i></p> <ul style="list-style-type: none"> <li>• <i>Apply modern technology and materials in selected irrigation in three provinces (Mondulkiri, Koh Kong and Sihanouk)</i></li> <li>• <i>Build additional capacity for technical staffs both at national and provincial in term of technical and hydraulic structure design skills.</i></li> </ul>

	<ul style="list-style-type: none"> <li>• <i>Piloting.</i></li> <li>• <i>Modifying existing automatic water gate in Damnak Ampil scheme in Pursat and applying in Modulhiri and Koh Kong.</i></li> </ul> <p><i>Key beneficiaries government staffs, and target farmers.</i></p>
<b>Cost effectiveness of the action</b>	<i>Reduce annual cost of O &amp;M and rehabilitation of irrigation affected by annual flash floods, reduce loss of crop production and other loss from target farmers and public.</i>
<b>Preconditions needed for successful implementation</b>	<i>Strong commitment and support from government Staff capacity to operate the scheme and deliver extension services Strong participation from local farmers and authority</i>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>- <i>Three demonstration sites are fully applied and operated with AWG (use electricity and hydraulic).</i></li> <li>- <i>Capacity of irrigation engineers and FWUCs developed</i></li> <li>- <i>Reduce loss/damage of crops productions and public assets</i></li> <li>- <i>Reduce labor cost (through automatic system rather than required people to guard all times)</i></li> </ul>
<b>Implementation arrangements</b>	<i>Responsible department(s) Department of Irrigated agriculture, Department of Engineering and Department of Farmer Water User Community, and target provincial departments (MOWRAM)</i>
<b>Estimated total cost</b>	<i>USD15 million</i>
<b>Possible funding sources</b>	<i>Name the proposed source(s) of funding. To be identified</i>
<b>Timeframe</b>	<i>2014-2018</i>

#### **ACTION FICHE 7**

<b>Action</b>	<b>Capacity building and awareness raising on CC and DRR for FWUC</b>
<b>CCCSP and Sector CCSP Strategic Objective</b>	This proposed action is to response to CCCSP strategy 3: Capacity development for Ministry technical staff and for farmers (FWUCs) in climate change related topics.
<b>Rationale</b>	<p><i>Links to the sector and national strategies</i></p> <p>This action contributes to MOWRAM's strategy Irrigation System Maintenance with farmers participatory and the formation of FWUC which is currently involving with some of 305,550 households practicing rice cultivation by using irrigation scheme with 245,122 ha in wet season and 105,157.5 ha in dry season respectively. However, capacity of the FWUC members to take over the schemes from government after construction in term of operation and maintenance and agricultural services remain key challenges in achieving sustainable irrigating management.</p>
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 2
<b>Type of action</b>	<input type="checkbox"/> Adaptation
<b>Short description of the action and expected results and benefits</b>	<p><i>Short description</i></p> <p>The formation of the Farmer Water User Community (FWUC) is to take over the operation and maintenance of irrigation schemes after scheme renovation and construction. From 2004-2011, there were 350 FWUCs<sup>14</sup> established nationally comprising 305,550 households, covering 245,100 hectares of rainy season cultivation and 105,200 hectares in the dry</p>

<sup>14</sup> Up to late 2011, there are only 150 are officially registered to MOWRAM due to legal and criteria requirements.

	<p>season, with major involvement of women in their leadership (MOWRAM 2009, RGC 2010a).</p> <p>Flood and drought as well as outbreak of an insect again agricultural production remain key issues in recent climate change impact. It is envisaged that FWUC members will play key role in capacity development, planning and awareness rising to all farmers within targeted FWUC throughout the country.</p> <p>Key activities:</p> <ol style="list-style-type: none"> <li>1. Conduct TOTs and training manual development on DRR and CC impact on water and agriculture to all national staff within FWUC department (5 TOTs to 30 staffs)</li> <li>2. Conduct an extended training services to provincial department with at least two times per year/2 years on the training manuals (200 staffs from provinces)</li> <li>3. Conduct trainings to 150 FWUCs member on DRR, agro-ecological analysis and climate change impacts on irrigation scheme and water productivity (around 750 members from 150 FWUCs received trainings with better knowledge).</li> <li>4. Conduct awareness raising to at least 750,000 farmers within 150 FWUCs receive mass media educations (poster, Video spots) on DRR and impact of climate change to irrigation and water productivities.</li> </ol> <p><i>Target provinces: National staffs and provincial staff as well as member of 150 FWUCs officially registered with MOWRAM.</i></p>
<b>Cost effectiveness of the action</b>	<ul style="list-style-type: none"> <li>• 30 staffs from national and 200 staffs from provincial level are trained with well-equipped skills and knowledge in dealing with DRR and CC impact on irrigation and water productivities</li> <li>• Members from 150 FWUCs trained and able to form as FWUCs network throughout the country for lesson learn and sharing knowledge.</li> <li>• At least 75,000 farmers obtained knowledge and skills through various forms of disseminations.</li> </ul>
<b>Preconditions needed for successful implementation</b>	<ul style="list-style-type: none"> <li>• Strong commitment and support from government</li> <li>• There will be enough staff from FWUC department as well a provincial level committed to the work.</li> </ul>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>• At least 30 staffs from FWUC department (National level) and 100 staffs from provincial levels are capable deliver training throughout the country.</li> <li>• At least 150 FWUCs from various provinces are strengthening and form as learning network throughout the country.</li> <li>• Training documents and manuals produced and able to use for farmers.</li> </ul>
<b>Implementation arrangements</b>	<p><i>Responsible department(s)</i>  <i>Department of Farmer Water User Community (FWUC)</i>  <i>Department of Gender and women affair of MOWRAM</i>  <i>All provincial department of MOWRAM</i></p> <p><b>Others:</b>  <i>Department of Agricultural Extension and DPA through the country</i>  <i>Provincial Committee for Disaster Management (PCDM)</i></p>
<b>Estimated total cost</b>	US\$ 2,000,000
<b>Possible funding sources</b>	<p><i>Name the proposed source(s) of funding.</i></p> <p>Small amount of budget form government, additional fund are seeking from donors, AFD, UN agencies, and NGOs</p>
<b>Timeframe</b>	2014-2018

## ACTION FICHE 8

<b>Action</b>	<b>Capacity development for irrigation engineers on climate risk management</b>
<b>CCCSF and Sector CCSP Strategic Objective</b>	This proposed action is to response to: CCSPS Strategies 3. Capacity development for Ministry technical staff and for farmers (FWUCs) in climate change related topics.
<b>Rationale</b>	<i>Links to the sector and national strategies</i> This action also link to MOWRAM strategic development on human resource development and capacity development and the need for irrigation engineering in influencing the design of existing and on-going scheme to make it more climates resilient in irrigation and infrastructure development.
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 3
<b>Type of action</b>	<input type="checkbox"/> Adaptation
<b>Short description of the action and expected results and benefits</b>	<p><i>Short description</i></p> <p>Climate change impact, in particular extreme floods and droughts have seriously impacted on infrastructure (irrigation and drainage system) in recent years. The lack of climate data projects, lack of quality control of infrastructure and options and the capacity of institution in charge of the works are the key challenge in dealing with this impact.</p> <p>Up to March 2011, there are 666 staff at central level and 623 staffs at provincial level (24 PDOWRAM). There are five categories in staff qualifications: (i) Engineers, (ii) Technician, (iii) vocational staff, (iv) qualified staffs, and (v) non-qualified staffs. Staffs in the first and second category remain challenges in term of numbers. It is estimated that around 1 engineer exist per province and some of them are getting older and older (JICA, MOWRAM 2012). Thus, the need to build up additional staff capacity in dealing with human resource shortage and the need to deal with irrigation designed to make climate resilient in infrastructure development required in order to reduce economic loss of climate impacts as well as the need to achieve its sustainability of constructed infrastructure such as irrigation and drainage system.</p> <p><b>Key activities</b></p> <ol style="list-style-type: none"> <li>1. Conduct a series of short course trainings (both inside and outside country) to national and provincial staffs (120 engineers and vocational staffs) on climate resilient infrastructure designs and constructions through external technical assistance (TA).</li> <li>2. Conduct on-job trainings to selected 120 staffs within existing and planned infrastructure development at least 10 selected sites covering Tonle Sap Area and Mekong Delta of Cambodia.</li> <li>3. Document lesson learnt and conduct case studies form 10 selected sites on mainstreaming climate change into infrastructure development.</li> <li>4. Develop climate modelling for climate resilient in infrastructure development and constructions.</li> </ol>
<b>Cost effectiveness of the action</b>	<ul style="list-style-type: none"> <li>• 120 Irrigation Engineers capacity developed and able to influence irrigation design with more responsive to climate change impacts and accountable to farmers throughout the country.</li> <li>• 10 case studies from selected sites on climate resilient in infrastructure construction and development</li> <li>• Develop training manual on climate resilience in infrastructure development and lesson learnt and knowledge sharing with other</li> </ul>

	ministries and countries.
<b>Preconditions needed for successful implementation</b>	<ul style="list-style-type: none"> <li>• Political commitment from government in building human resource</li> <li>• Technical Service Center (TSC) are well equipped with staff capacities and equipment in providing the trainings services</li> <li>• Additional financial commitment and technical support from external donor.</li> </ul>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>• 120 engineers are trained and capable to develop and influence climate resilient in infrastructure design and development</li> <li>• Training manuals on building climate resilience in infrastructure development based on appropriate design and adaptation from local experiences are developed.</li> <li>• Policy dialogues conducted by 120 engineers are in place by the end of project.</li> </ul>
<b>Implementation arrangements</b>	<i>Responsible department(s)</i> <ul style="list-style-type: none"> <li>• Irrigation Technical Service Centre (ITSC)</li> <li>• Department of irrigated agriculture</li> <li>• Department of engineering and construction.</li> </ul> <i>Others:</i> <ul style="list-style-type: none"> <li>• Institute of Technology of Cambodia ( Department of Hydrology and Rural Engineering)</li> <li>• 24 Provincial Department of Water Resource and Meteorology (PDOWRAM)</li> </ul>
<b>Estimated total cost</b>	US\$ 1,500,000
<b>Possible funding sources</b>	<i>Name the proposed source(s) of funding.</i> Government, JICA, AFD, ADB, ACIAR
<b>Timeframe</b>	2014-2018

#### ACTION FICHE 9

<b>Action</b>	<b>Upscaling mobile pumping stations (20) and permanent stations (10) in responding to mini-droughts</b>
<b>CCCSP and Sector CCSP Strategic Objective</b>	<i>Code of the CCCSP and Sector CCSP Strategic Objective to which the Action refers</i>
<b>Rationale</b>	<i>Links to the sector and national strategies</i> This action is response to on-going structural interventions for drought risk management on areas are not feasible with irrigation scheme provision, and to response to current proposed strategy of disaster risk reduction. It is also linked to drought to management of WOWRAM strategy 2014-2018.
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 2 and 3
<b>Type of action</b>	<input type="checkbox"/> Adaptation and mitigation
<b>Short description of the action and expected results and benefits</b>	<i>Short description</i> Key activities are to provide access to the cost-effectiveness of pulling water for rescuing crops and rice in wet and dry seasons, whenever those areas encounter the water shortage or drought, especial for the location that are close to water sources, but not having conveyance system for supply the required water for crop fields. Continue to encourage people, institutions and other NGOs to participate in the flood and drought hazard alleviation such as preparing and providing upland areas and lowland areas through provision of additional pumping machine. Currently, MOWRAM has 93 pumping machines to assist province with highly prone to droughts in Kep, Koh Kong, Sihanouk, Pailin, Mondulhiri, It is expected additional mobile 20 pumping machines added to these provinces. It is estimated around 50,000 ha/year of wet rice faced with

	<p>season drought to be rescued.</p> <p>10 present stations: Prey Veng and SvayRieng estimated with 20,000 ha of drought periods (Mostly in wet season).</p> <p>Key beneficiaries include farmers in the selected provinces</p>
Cost effectiveness of the action	Estimated with around 1.5 million rural people benefit
Preconditions needed for successful implementation	<p>Strong commitment and support from government</p> <p>Staff capacity to operate the scheme and deliver extension services</p> <p>Strong participation from local farmers and authority</p> <p>Incentive for PPP (Public Private Partnership) investment</p>
Indicator(s) of success	<ul style="list-style-type: none"> <li>• Increase access to irrigation services to provinces with less access to formation irrigation.</li> <li>• 70,000 ha of potential rice crops affected by seasonal drought will be rescued.</li> <li>• Farmers will reduce cost of pumping per hector in some provinces such as Prey Veng and SvayRieng (individual and private investment).</li> </ul>
Implementation arrangements	<p>Responsible department(s)</p> <p>Department of Irrigated agriculture</p> <p>Department of Farmer Water User Community</p> <p>All provincial departments in target provinces (MOWRAM)</p>
Estimated total cost	20,000
Possible funding sources	<p>Name the proposed source(s) of funding.</p> <p>Government budget allocation (PIP), Private sectors, seeking from donors.</p>
Timeframe	2014-2018

#### ACTION FICHE 10

Action	<b>Maintenance and rehabilitation of flood protection dikes (Kampong, Trabek, Bateay) for agricultural/ urban development</b>
CCCSP and Sector CCSP Strategic Objective	This proposed action is to response to strategic 3: of flood and drought sections
Rationale	<p><i>Links to the sector and national strategies</i></p> <p>This action is to contribute to MOWRAM strategies of flood control 2014-2018 as well as the current Master Plan of Water Resources Development in Cambodia 2010-2025 on section of water resource management. This action is called flood diversion project which provides the means of diverting excess flood water in the main river into emergency or auxiliary canals. They are used to control annual floods or when a high degree of flood control by embankments is not practicable. In Cambodia, these are found in the lower reaches of the river in the intermediate zone of the Delta. This action is also to <i>provide flood control alternative in Cambodia by building up from existing system of dike along Mekong from Kampong Cham to the Border Vietnam, in particular in PrevyVeng and SvayRieng.</i></p>
Category of climate change action	<input type="checkbox"/> Cat 3
Type of action	<input type="checkbox"/> Adaptation and mitigation
Short description of the action and expected results and benefits	<p><i>Short description</i></p> <p>This action is to build up from existing work on Diversion Canal from NeakLoug to West Vaico River (through Stung Slot and PrekTrabek) canal construction.</p> <p>The proposed target areas is rather high of hill chain with an elevations of 8-14 m along the Mekong River in northeast areas while in southeast areas</p>

	<p>is rather low area of old alluvial soil with elevation of 2-4 m. Water from the Mekong starts to rise in May and arrived at peaks in September or October and inundated from 3-6moths. Floods often come from Mekong River from Kampong Cham destroying agricultural production and current urbanisation areas at NeakLoung, Kampong Trabek and Bateay.</p> <p><i>Key activities include:</i></p> <ul style="list-style-type: none"> <li>• <i>Conduct baseline assessment for potential impact by climate extreme events such as flood and drought effecting infrastructure assets, people livelihoods and water supply and quality and agricultural production.</i></li> <li>• <i>Additional modification in some section of the canals in helping to protect current urbanisation and new town development at the proposed areas.</i></li> </ul> <p><i>Target provinces: Kampong Cham, Prey Veng</i></p>
<b>Cost effectiveness of the action</b>	<ul style="list-style-type: none"> <li>• <i>MOWRAM staffs at national and provincial level</i></li> <li>• <i>Data base used for researcher and urban development planners</i></li> <li>• <i>Ministry of Pubic work and transport and Ministry of Agriculture, Forestry and Fisheries (MAFF) and Rural Development (MRD).</i></li> <li>• <i>Urban people, traders and farmers in target areas</i></li> </ul>
<b>Preconditions needed for successful implementation</b>	<ul style="list-style-type: none"> <li>• <i>Strong commitment and support from government</i></li> <li>• <i>Staff capacity to operate the scheme and deliver extension services</i></li> <li>• <i>Strong participation from local farmers, provincial department of water resources, local authority.</i></li> </ul>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>• <i>Baseline and guideline on development, flood protection and diversion for climate resilient in urban infrastructure development.</i></li> <li>• <i>Conduct pilot sites on flood diversion in newly established urban areas in proposed provinces</i></li> <li>• <i>At least 24% of the target beneficiaries which include local traders and farmers will benefit from flood diversions.</i></li> <li>• <i>Guideline development and lesson learn on climate resilience in urban infrastructure development ( multi-purpose dikes).</i></li> </ul>
<b>Implementation arrangements</b>	<p><i>Responsible department(s)</i></p> <p><i>Department of water resources management and conservation</i></p> <p><i>Department of Farmer Water User Community</i></p> <p><i>Department of Water Supply and Sanitation</i></p> <p><i>Provincial department in Kampong Cham, Prey Veng and SvayRieng</i></p> <p><i>Others include: Ministry of Public Work and Transport and Ministry of Agriculture, Forestry and Fisheries (MAFF).</i></p>
<b>Estimated total cost</b>	US\$ 4,000,000
<b>Possible funding sources</b>	<p><i>Name the proposed source(s) of funding.</i></p> <p><i>4,000 (fund source to be expect from donors, bilateral aids and ADB GMS economic corridor town development.</i></p>
<b>Timeframe</b>	2014-2018

#### **ACTION FICHE 11**

<b>Action</b>	<b>Improve capacity for flood and drought forecasting and modeling for technical offices at national and subnational level (ADB) GMS</b>
<b>CCCSP and Sector CCSP Strategic Objective</b>	This proposed action is to response to: CCSP strategy (ii) on staff capacity building on water resources/climate change through long-term studies, (iv) establishment and/or improvement of networks for meteorology and hydrology for both potential productivity development and water supply for other sector.

<b>Rationale</b>	<i>Links to the sector and national strategies This action links to national policy in term flood and drought management and mitigation measures and capacity building for key staffs.</i>
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 1,3
<b>Type of action</b>	<input type="checkbox"/> Adaptation and mitigation
<b>Short description of the action and expected results and benefits</b>	<p><i>Short description</i></p> <ul style="list-style-type: none"> <li>• To provide and upgrade additional technical training skills through on job training on key topics land use control, hydrological monitoring, flood emergency planning, flood forecasting and early warning system, drought monitoring.</li> <li>• To support additional irrigation/reservoir and river bank protection infrastructure costs for increased resilience to climate change.</li> <li>• To strengthen capacity of communities to better manage and reduce risks associated with extreme climate events</li> <li>• To strengthen regional coordination for management of climate extremes – including design standard for climate resilient infrastructure</li> </ul> <p><i>Key beneficiaries: national staffs and provincial, farmers and public as the whole national wide.</i></p>
<b>Cost effectiveness of the action</b>	<i>Key staffs from national wide</i>
<b>Preconditions needed for successful implementation</b>	<ul style="list-style-type: none"> <li>• <i>Strong commitment and support from government</i></li> <li>• <i>Key staff from national and provincial commit to additional skills and use for public interest.</i></li> </ul>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>• <i>At least 25% flood risk reduction from</i></li> <li>• <i>flood profiling policies formulated</i></li> <li>• <i>Flood and drought forecasting, early warning and energy planning are strengthen</i></li> <li>• <i>Infrastructure resilient to climate change guideline and standards developed.</i></li> </ul>
<b>Implementation arrangements</b>	<i>Responsible department(s) Department of hydrology and river work Department of meteorology</i>
<b>Estimated total cost</b>	US\$2,000
<b>Possible funding sources</b>	<i>Name the proposed source(s) of funding. ADB, MRCs</i>
<b>Timeframe</b>	<i>2014-2018</i>

#### **ACTION FICHE 12**

<b>Action</b>	<b><i>Establishment of National Flood Centre</i></b>
<b>CCCSP and Sector CCSP Strategic Objective</b>	<i>This proposed action is to response to: CCCSP strategy (iii) Establishment of a data management system for collecting and sharing data and information on water resources, in particular hydrological and flood forecasting network and mappings, (iv) establishment and/or improvement of networks for meteorology and hydrology for both potential productivity development and water supply for other sector.</i>
<b>Rationale</b>	<p><i>Links to the sector and national strategies</i></p> <p><i>Based on rice export policy target with 1million ton by 2015 and 3 million tons for long term, additional investment and expansion of irrigation</i></p>

	<p>facilities are need. However, flood preparedness in terms of floods protection again agricultural production, river bank protection, and flow forecasting in the Mekong River and its tributaries as well as those tributaries surround Tonle Sap Basin is essential for management of flood and drought risks that are frequently happened in recent years.</p> <p>The proposed action is also linked to both national development strategies of flood and drought management and regional level (MRCs, GMS) on flood and drought risk control and management.</p>
Category of climate change action	<input type="checkbox"/> Cat 3
Type of action	<input type="checkbox"/> Adaptation and mitigation
Short description of the action and expected results and benefits	<p><i>Short description</i></p> <p>Floods in Cambodia has become more frequently extreme both areas along the Mekong River floodplain and those areas surrounded Tonle Sap Basin, in particular along those tributaries that flow into Tonle Sap. In addition, these areas are the cornerstone agricultural production and many new towns are being developed along key tributaries of the Tonle Sap Lake as well as Mekong River and its tributaries. Every year, floods have become key extreme events that destroyed key infrastructures, cutting off public services and production sector. There are huge gaps of flood historical and future forecasting information available for planners, development and farmers.</p> <p><i>Key activities<sup>15</sup></i></p> <ol style="list-style-type: none"> <li>1. Establish technical training for national and provincial staffs through ABD TA grant.</li> <li>2. Improve existing gauging network (build new building for forecasting center and media rooms?)</li> <li>3. Development of forecasting models based on piloting projects in the Mekong and its tributaries and those areas surrounded Tonle Sap Lake.</li> <li>4. Improve dissemination system of information to the affected areas and public as the whole.</li> </ol> <p><i>Key beneficiaries: national wide, government agencies, development partners, planners and farmers</i></p>
Cost effectiveness of the action	<ul style="list-style-type: none"> <li>• Planners and policy makers, researchers, private development sectors, farmers throughout the country</li> <li>• Flood forecasting from other country in the Mekong Region to be benefit from this work.</li> </ul>
Preconditions needed for successful implementation	<ul style="list-style-type: none"> <li>• Financial support from ADB with strong commitment and support from government</li> <li>• Staff capacity to operate the scheme both at national and sub-national</li> <li>• Strong cooperation with regional centre for flood forecasting of MRCs.</li> </ul>
Indicator(s) of success	<ul style="list-style-type: none"> <li>• Flood forecasting models and building are in place t</li> <li>• Flood forecasting systems are available for the public both through public media, online and all relevant institutions at sub-national level</li> <li>• Significant record of agricultural production loss to flood have been reduced (% of total production)</li> </ul>
Implementation arrangements	<p>Responsible department(s)</p> <p>Department of hydrology and river works</p>

<sup>15</sup> The proposed activities are taken mostly from ADB TA 6456-REG: Preparing the Greater Mekong Subregion Flood and Drought Risk Management and Mitigation Project, Final Report for Cambodia 2011.

	Department of Meteorology Department of water resources management and conservation Department of Farmer Water User Community
Estimated total cost	US\$2,000,000
Possible funding sources	Name the proposed source(s) of funding. ADB, MRCs
Timeframe	2014-2018

### ACTION FICHE 13

Action	Promoting scientific and comprehensive methods on Ground Water Study in responding to drought and climate risks.
CCSP and Sector CCSP Strategic Objective	This proposed action is to response to: CCSP strategy (ii) on staff capacity building on water resources/climate change through long-term studies, (iii) Establishment of a data management system for collecting and sharing data and information on water resources, in particular ground water and hydrological network and mappings, (iv) establishment and/or improvement of networks for meteorology and hydrology for both potential productivity development and water supply for other sector.
Rationale	<i>Links to the sector and national strategies</i> This action is response to on-going structural interventions for drought risk management on areas are not feasible with irrigation scheme provision, and to response to current proposed strategy of disaster risk reduction. It is also linked to drought to management of WOWRAM strategy 2014-2018.
Category of climate change action	<input type="checkbox"/> Cat 3
Type of action	<input type="checkbox"/> Adaptation and mitigation
Short description of the action and expected results and benefits	<i>Short description</i> This activity is to response the need of scientific information on ground water availability, quantity and sources within the country that will be used for multi development purposes.  <i>Key activities</i> <ul style="list-style-type: none"> <li>• Conduct hydrological survey for preparation of different kind of maps for identification of favourable site for Open Wells/Hand pumps/Tube Wells.</li> <li>• Estimation and evaluation of ground water potential to facilitate creation of Irrigation infrastructure especially for raising second Paddy Crop during the non-rainy season</li> <li>• Analysis of chemical characteristics of water and deciphering of elements having detrimental effects on human health and Irrigated agriculture.</li> <li>• Exploring the feasibility for sinking of deep Tube Wells based on hydro geological data so generated.</li> <li>• To create ground water map, hydrological and other maps</li> <li>• To development mathematical management models.</li> <li>• To apply nuclear techniques by using ISOTOP application in order to find original source of water, recharge areas, aquifer and determine water dating, quality, water balancing).</li> </ul> <i>Target provinces: Kampong Speu of which two districts (KorngPisey and Borsedth districts and Kandal province.</i>
Cost effectiveness of the action	Farmers from Kampong Spue province ( two districts) and Kandal province ( ISOTOP application).

	<i>MOWRAM staffs at national and provincial level Scientist data and information for planning and investment for both planners, researchers</i>
<b>Preconditions needed for successful implementation</b>	<ul style="list-style-type: none"> <li>• <i>Strong commitment and support from government</i></li> <li>• <i>Staff capacity to operate the scheme and deliver extension services</i></li> <li>• <i>Strong participation from local farmers, provincial department of water resources, local authority.</i></li> </ul>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>• <i>Create ground water maps</i></li> <li>• <i>Create hydrological maps and networks</i></li> <li>• <i>Development of mathematical material models</i></li> <li>• <i>Staff capacity developed</i></li> </ul>
<b>Implementation arrangements</b>	<i>Responsible department(s) Department of water resources management and conservation Department of Farmer Water User Community Department of Water Supply and Sanitation Provincial department in Kampong Spue and local authority</i>
<b>Estimated total cost</b>	US\$2,500,000
<b>Possible funding sources</b>	<i>Name the proposed source(s) of funding. Currently fund available from India is US\$1,800,000 million of which US\$1,799,997 are needed.</i>
<b>Timeframe</b>	2014-2018

#### **ACTION FICHE 14**

<b>Action</b>	<b>Promoting climate resilience of agriculture through maintenance sea dikes in coastal areas</b>
<b>CCCSP and Sector CCSP Strategic Objective</b>	This proposed action is to response to strategic location of coastal areas and the intrusion of salt water against agricultural production. It contributes to Climate Change Strategic Plan for Water Resources: (i) Protect manage and use water resources in effective, equitable and sustainable manners, and (iv) Adapt to climate change and mitigate its effects on water resource-based livelihoods. It also contributes to NAPA document (2006) focus on coastal zone protection, in particular agricultural sector. It also link to categories: (i) capacity building/training (ii) awareness raising/education, and (iii) infrastructure development.
<b>Rationale</b>	<p><i>Links to the sector and national strategies</i></p> <p>This action is response to on-going structural interventions in protecting agricultural loss against natural disasters (floods and drought) that are becoming more unpredictable because of climate change in coastal provinces.</p> <p>The action will be achieved through the construction of community water reservoirs, the development and improvement of community irrigation systems, the rehabilitation of coastal protection infrastructures that will allow farmers both adapt to climate change and achieve its national sustainable development objectives.</p>
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 2&3
<b>Type of action</b>	<input type="checkbox"/> Adaptation
<b>Short description of the action and expected results and</b>	<i>Short description<sup>16</sup></i>

<sup>16</sup> Most of activities adopted from NAPA 2006 proposed action in coastal zone sector with additional modification based on current practices.

<b>benefits</b>	<p>This action is to rehabilitate selected canals and dikes protected the salt water intrusion in coastal provinces which were built mostly in 1970s to irrigate the rice fields. The dikes have been used as a road and a flood refuge, while the canals have been used for irrigation, navigation, and to provide freshwater for household use and livestock raising. The canals, which are also affected by seawater intrusion and high tide, require rehabilitation; the water gates also need repair. However, rules governing the use of the gates and canals need to be established. Its objective is to enhance water storage capacity for general use in the village during both the dry and wet seasons for farmers.</p> <p><i>Key activities</i></p> <ol style="list-style-type: none"> <li>1. Three critical infrastructures vulnerable to climate change impact will be protection, rehabilitation or construction of infrastructure.</li> <li>2. Provide water availability and accessibility for target farmers and establish water utilization groups and fee collection for maintenance and operations.</li> <li>3. Piloting Community Based integrated farming system Koh Kong, Sihanouk Vill and Kom Pot.</li> </ol> <p><i>Target provinces: Koh Kong, Kam Pot, Kep and Sihanouk Ville</i></p>
<b>Cost effectiveness of the action</b>	<p>At least 10,000 farmers from vulnerable areas affected by salt water intrusion, flood and drought in target areas will be able to reduce their annual impacts.</p> <p>Both MOWRAM and MAFF staffs from national and sub-national level gain better knowledge and skills in helping farmers addressing climate change impact to their agricultural production.</p>
<b>Preconditions needed for successful implementation</b>	<ul style="list-style-type: none"> <li>• <i>Strong commitment and support from government for inter-governmental agency coordination.</i></li> <li>• <i>Staff capacity to operate the scheme and deliver extension services</i></li> <li>• <i>Strong participation from local farmers, provincial department of water resources, local authority.</i></li> </ul>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>• <i>At least three dikes from coastal areas are renovated and modified again salt water intrusion, floods and drought</i></li> <li>• <i>10,000 ha of paddy will increase yield</i></li> <li>• <i>10,000 farmers received agricultural extension work related to agricultural practices resilient to climate change</i></li> </ul>
<b>Implementation arrangements</b>	<p><i>Responsible department(s)</i>  <i>Department of water resources management and conservation</i>  <i>Department of Farmer Water User Community</i>  <i>Department of Water Supply and Sanitation</i>  <i>Department of irrigated agriculture</i>  <i>Department of Engineering</i></p> <p><b>Others</b>  <i>Department of Agricultural Extension of MAFF and PDA provincial office, in particular extension offices from the four provinces.</i></p> <p><i>Provincial department in Kampot, Koh Kong, Sihanouk Vill and Kep</i></p>
<b>Estimated total cost</b>	US\$3,000,000
<b>Possible funding sources</b>	<p><i>Name the proposed source(s) of funding.</i>  Government with additional source of funding from JICA, KOICA, World Bank.</p>
<b>Timeframe</b>	2014-2018

**ACTION FICHE 15**

<b>Action</b>	<b>Assessment of potential impact of sea level rise, salt water intrusion (Mekong delta and coastal areas)</b>
<b>CCCSP and Sector CCSP Strategic Objective</b>	This action contributes to CCSP strategy (ii) on staff capacity building on water resources/climate change through long-term studies and (iii) establishment of a data management system for collecting and sharing data and information on water resources, in particular strategic location of Mekong Delta and coastal province of Cambodia where high population and projected food demands and its impact from drought.
<b>Rationale</b>	<i>Links to the sector and national strategies</i> This proposed action is to response to strategic location and strategic sectoral issues by focusing on Cambodia coastal zone and Mekong delta identified by MOWRAM strategic plan 2014-2018.
<b>Category of climate change action</b>	<input type="checkbox"/> Cat 3
<b>Type of action</b>	<input type="checkbox"/> Adaptation
<b>Short description of the action and expected results and benefits</b>	<p><i>Short description</i></p> <p>The proposed areas of assessment cover one province of coastal zone (Kampot and two provinces in the Mekong delta provinces (Takeo and Kandal). This areas sometimes known as West Basac area is located in the southwest of the Mekong Delta with a total areas of 228,253 ha. Diversion canals from Kampong Toul to Takeo and From Takei to Gulf of Thailand are planned in the West Basac River covering Kandal, Takeo, Kampot and Kep provinces<sup>17</sup>. Land areas along the border are low with an average elevations ranging from 2.0 m to 3.0 m high which is potentially affected by salt water intrusion. There are small existing canals in the areas are located along the tributary of Stung PrekThnot<sup>18</sup> of which key source of water coming from Cardamom mountain. MOWRAM and JICA (2012) have proposed a series of irrigation renovation within these areas. Historically, a system of dams were built during the 1970s, while majority of current areas of rice fields that can no longer be cultivated due to an increasing sand sedimentation by flash floods and salt water intrusion.</p> <p><i>Key activities</i></p> <ul style="list-style-type: none"> <li>• <i>Conduct hydro-meteorological survey for preparation of different kind of maps for identification of climate vulnerable zones in the proposed areas.</i></li> <li>• <i>Estimation and evaluation of past extreme and its impact on infrastructure, agricultural products and people livelihoods.</i></li> <li>• <i>Capacity development for provincial and national staff through technical assistance and external resources.</i></li> <li>• <i>Documents lesson learns and key recommendations for future development adaptation and mitigation.</i></li> </ul> <p><i>Target provinces: Kandal, Takeo, Kampot and Kep</i></p>
<b>Cost effectiveness of the action</b>	<ul style="list-style-type: none"> <li>• <i>MOWRAM staffs at national and provincial level</i></li> <li>• <i>Scientist data and information for planning and investment for both planners, researchers.</i></li> </ul>
<b>Preconditions needed for successful implementation</b>	<ul style="list-style-type: none"> <li>• <i>Strong commitment and support from government</i></li> <li>• <i>Staff capacity to operate the scheme and deliver extension services</i></li> <li>• <i>Strong participation from local farmers, provincial department of water resources, local authority.</i></li> </ul>

<sup>17</sup>MOWRAM and KOICA (2008) Master Plan of Water Resource Development of Cambodia.

<sup>18</sup> MOWRAM and JICA (2012) Preparatory survey for Irrigation and drainage system rehabilitation and improvement project in the Kingdom of Cambodia.

Indicator(s) of success	<ul style="list-style-type: none"> <li>• Create hydrological maps and networks</li> <li>• Staff capacity developed</li> <li>• Climate index and maps of climate vulnerable zones in proposed provinces.</li> </ul>
Implementation arrangements	<p>Responsible department(s)</p> <p>Department of water resources management and conservation</p> <p>Department of Farmer Water User Community</p> <p>Department of Water Supply and Sanitation</p> <p>Provincial department in Kampong Spue and local authority</p>
Estimated total cost	US\$1,500,000
Possible funding sources	Name the proposed source(s) of funding: government, and further support from KOICA, JICA, World Bank.
Timeframe	2014-2018

#### ACTION FICHE 16

Action	<b>Promoting gender responsiveness in water management, CC impact and adaptation</b>
CCCSP and Sector CCSP Strategic Objective	This proposed action is to response to: CCCSPS Strategies on Gender and climate change. it is a cross-cutting issues required by the royal government of Cambodia as well as the ministry CCCSP strategy.
Rationale	<p><i>Links to the sector and national strategies</i></p> <p>Gender issue has become a mandate for both governments of Cambodia National Strategic Development Plan as well as the Cambodia Millennium Development Goal. Ministry of Water Resource and Meteorology is highly considering this as one of the main development agenda.</p>
Category of climate change action	<input type="checkbox"/> Cat 3
Type of action	<input type="checkbox"/> Adaptation
Short description of the action and expected results and benefits	<p><i>Short description</i></p> <p>More than 50% of labor force within agricultural sector is women and most of them are living in rural areas (FAO 2010). Cambodia rural women and girl still play important role in food security, sanitation, collecting clean water for household and thus climate change impact are projected to be serious impact to women and children and elders.</p> <p>Most women stay at home while facing extreme floods with low capacity to cope such as unable to swim and need to take care many household works.</p> <p><i>Key activities</i></p> <ol style="list-style-type: none"> <li>1. Develop TOT of gender and climate change through external technical assistance.</li> <li>2. Conduct 10 trainings to key staffs from national and provincial level (150 staffs to be trained) and 30 trainers selected.</li> <li>3. Conduct trainings to member of FWUCs throughout the country.</li> <li>4. Conduct awareness raising to farmers from selected 150 FWUCs on climate change impact on gender within water and agricultural sector.</li> <li>5. Document lesson learnt to see the level of impacts and conduct policy dialogue on gender and climate change.</li> </ol>

	<i>Target provinces: National staffs and provincial staff as well as member of 150 FWUCs officially registered with MOWRAM.</i>
<b>Cost effectiveness of the action</b>	<i>All MOWRAM staff from department of gender, Department of Farmer Water User Community Representatives from all provinces of MOWRAM All official registered 150 FWUCs (out of current 350 FWUCs) member throughout the country</i>
<b>Preconditions needed for successful implementation</b>	<ul style="list-style-type: none"> <li>• <i>Strong commitment and support from government</i></li> <li>• <i>Staff capacity to operate the scheme and deliver extension services</i></li> <li>• <i>Strong participation from FWUCs, provincial department of water resources, local authority.</i></li> </ul>
<b>Indicator(s) of success</b>	<ul style="list-style-type: none"> <li>• <i>Capacity of 30 staffs are capable deliver training throughout the country related to climate change and gender in water sector</i></li> <li>• <i>At least 500 members from selected 150 FWUCs (70% women) are capable to use knowledge and skills in agricultural planning, cropping calendar under the context of climate change</i></li> <li>• <i>Training documents and manuals produced and able to use for farmers.</i></li> <li>• <i>Policy and guideline on climate change and gender within water development sector are developed.</i></li> </ul>
<b>Implementation arrangements</b>	<i>Responsible department(s) Department of Gender and women affair of MOWRAM Department of Farmer Water User Community Department of Water Supply and Sanitation All provincial department of MOWRAM</i>
<b>Estimated total cost</b>	US\$ 1,500,000
<b>Possible funding sources</b>	<i>Name the proposed source(s) of funding. Small amount of budget form government, additional fund are seeking from donors, UN agencies, bilateral aids, and NGOs</i>
<b>Timeframe</b>	<i>2014-2018</i>



**ព្រះរាជាណាចក្រកម្ពុជា**  
**ជាតិ សាសនា ព្រះមហាក្សត្រ**  
នាម \* ៤៤៤

**ក្រសួងធនធានទឹក និងឧតុនិយម**

លេខ ១០៦៩ ចមឌ

រាជធានីភ្នំពេញ, ថ្ងៃទី ២១ ខែ ឧសភា ឆ្នាំ ២០១៤

**រដ្ឋមន្ត្រី ក្រសួងធនធានទឹក និងឧតុនិយម**  
**សូមជម្រាបជូន**  
**ឯកឧត្តម រដ្ឋមន្ត្រីក្រសួងបរិស្ថាន**

**កម្មវត្ថុ** ៖ ឯកសារសកម្មភាព ប្រែប្រួលអាកាសធាតុសម្រាប់ក្រសួងធនធានទឹក និងឧតុនិយម (២០១៤-២០១៨) ។

**យោង** ៖ លិខិតលេខ ៣១៣ ស.ជ.ណ.ប.ស្ត ចុះថ្ងៃទី ១៣ ខែ មិថុនា ឆ្នាំ ២០១៣ របស់ក្រសួងបរិស្ថាន

ន័យដូចមានចែងក្នុងកម្មវត្ថុ និងឯកសារយោងខាងលើ សូមឯកឧត្តមរដ្ឋមន្ត្រីជ្រាបថា ក្រសួងធនធានទឹក និងឧតុនិយម បានចងក្រង និងរៀបចំរួចរាល់នូវឯកសារផែនការសកម្មភាពប្រែប្រួលអាកាសធាតុសម្រាប់ក្រសួង(២០១៤-២០១៨) និងសូមបញ្ជូនឯកសារនេះជូនក្រសួងបរិស្ថាន។

អាស្រ័យហេតុដូចបានជម្រាបជូនខាងលើ សូមឯកឧត្តមរដ្ឋមន្ត្រីមេត្តាពិនិត្យ និងសម្រេចតាមការគួរ ។

សូមឯកឧត្តមរដ្ឋមន្ត្រី ទទួលនូវការរាប់អានដ៏ស្មោះពីខ្ញុំ ។

**ចម្លងជូន ៖**

- ថ្នាក់ដឹកនាំក្រសួងធនធានទឹក និងឧតុនិយម
- អគ្គនាយកក្រសួង
- ឧទ្ធរាជ្ញាឯកឧត្តមរដ្ឋមន្ត្រី
- នាយកដ្ឋានឧតុនិយម
- “ដើម្បីជូនជ្រាប”
- ឯកសារ-កាលប្បវត្ត



**ល្អ គាន់ហោ**



ក្រសួងបរិស្ថាន

Ministry of Environment

បណ្ត

លេខ: ៣១៣ ល.រ.ណ.ប.ស្ត

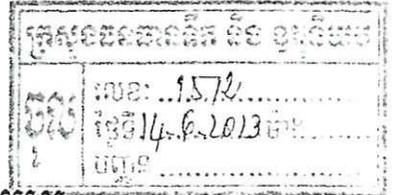


ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

បណ្ត

រាជធានីភ្នំពេញ, ថ្ងៃទី១៣ ខែ ឧសភា ឆ្នាំ២០១៣



គោរពជូន

ឯកឧត្តមរដ្ឋមន្ត្រីក្រសួងធនធានទឹក និងឧតុនិយម

កម្មវត្ថុ: ការរៀបចំផែនការសកម្មភាពប្រែប្រួលអាកាសធាតុតាមវិស័យសម្រាប់ក្រសួងធនធានទឹក និងឧតុនិយម  
យោង: កិច្ចព្រមព្រៀងរវាងក្រសួងបរិស្ថាន និងក្រសួងធនធានទឹក និងឧតុនិយម ចុះថ្ងៃទី១៩ ខែមេសា ឆ្នាំ២០១២  
ស្តីពីការរៀបចំផែនការយុទ្ធសាស្ត្រប្រែប្រួលអាកាសធាតុ វិស័យធនធានទឹក និងឧតុនិយម

ន័យដូចមានចែងក្នុងកម្មវត្ថុ និងយោងខាងលើ ខ្ញុំមានកិត្តិយសសូមជម្រាបជូន ឯកឧត្តមរដ្ឋមន្ត្រី ជ្រាបថា ក្នុងនាមជាប្រធានគណៈកម្មាធិការជាតិគ្រប់គ្រងការប្រែប្រួលអាកាសធាតុ ខ្ញុំសូមថ្លែងអំណរគុណយ៉ាងជ្រាលជ្រៅចំពោះឯកឧត្តមរដ្ឋមន្ត្រី និងក្រុមការងាររៀបចំផែនការយុទ្ធសាស្ត្រប្រែប្រួលអាកាសធាតុរបស់ក្រសួងធនធានទឹក និងឧតុនិយមដែលបានដឹកនាំរៀបចំឯកសារផែនការដ៏មានសារៈសំខាន់នេះបានសម្រេចបានប្រកបដោយជោគជ័យ ។ បច្ចុប្បន្នក្រសួងស្ថាប័នអាទិភាពចំនួន ៩ បានដាក់ជូនគណៈកម្មាធិការជាតិគ្រប់គ្រងការប្រែប្រួលអាកាសធាតុនូវឯកសារផែនការយុទ្ធសាស្ត្រប្រែប្រួលអាកាសធាតុតាមវិស័យរបស់ខ្លួន ហើយដែលកំពុងត្រូវបានប្រើជាធាតុចូលមិនអាចខ្វះបានក្នុងការចងក្រងផែនការយុទ្ធសាស្ត្រប្រែប្រួលអាកាសធាតុកម្ពុជា ដែលស្ថិតនៅក្នុងដំណាក់កាលពិគ្រោះយោបល់បញ្ចប់ មុននឹងដាក់ជូនទីស្តីការគណៈរដ្ឋមន្ត្រី ដើម្បីពិនិត្យ និងសម្រេច។ ដើម្បីធានាបាននូវការឆ្លើយតបនឹងបញ្ហាប្រែប្រួលអាកាសធាតុមានប្រសិទ្ធភាព និងអនុលោមតាមអនុសាសន៍ដ៏ខ្ពង់ខ្ពស់របស់ ឯកឧត្តមឧបនាយករដ្ឋមន្ត្រី យីម ឆែលី ក្រសួងបរិស្ថានកំពុងរៀបចំបញ្ជីសុចនាករទាក់ទងនឹងការប្រែប្រួលអាកាសធាតុជាធាតុចូលជូនក្រសួងផែនការ សម្រាប់ការរៀបចំផែនការយុទ្ធសាស្ត្រអភិវឌ្ឍន៍ជាតិ (២០១៤-២០១៨)។

ជំហានបន្ទាប់នៅក្នុងដំណើរការនេះ គឺការរៀបចំផែនការសកម្មភាពប្រែប្រួលអាកាសធាតុ ដែលរួមមានព័ត៌មានលំអិតស្តីពីការចាត់អាទិភាព និងថវិកានៃបណ្តាសកម្មភាពនានា នៅក្រោមផែនការយុទ្ធសាស្ត្រប្រែប្រួលអាកាសធាតុតាមវិស័យរបស់ក្រសួងឯកឧត្តម។ ផែនការសកម្មភាពនេះមានសារៈសំខាន់ណាស់ សម្រាប់កំណត់នូវធនធានដែលចាំបាច់ពេលវេលាអនុវត្ត និងអ្នកទទួលខុសត្រូវក្នុងការអនុវត្តវិធានការឆ្លើយតបទៅនឹងបញ្ហាប្រែប្រួលអាកាសធាតុតាមវិស័យ។

ក្នុងន័យនេះ ខ្ញុំសូមស្នើសុំការគាំទ្រពី ឯកឧត្តមរដ្ឋមន្ត្រី លើការរៀបចំផែនការសកម្មភាពប្រែប្រួលអាកាសធាតុសម្រាប់ក្រសួងធនធានទឹក និងឧតុនិយម និងចាត់តាំងក្រុមអ្នកទទួលបន្ទុកការងារ ដែលរួមមានមន្ត្រីបង្គោលសម្រាប់

From: Oum Ryna  
Director  
Department of Meteorology  
Ministry of Water Resources and Meteorology

Date: May, 22, 2014

To: Mr. Sum Thy  
National Project Coordinator  
Cambodia Climate Change Alliance (CCCA)  
Ministry of Environment

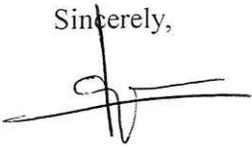
### Request for Final Payment

Dear Mr. Thy,

With reference to the contract between Cambodia Climate Change Alliance and The Department of Meteorology of The Ministry of Water Resources and Meteorology, I would like to request you to release the final payment of **US Dollar 2,000.00** (Two Thousand US Dollar Only) in check.

Moreover, I authorize Mr. Thach Sovanna, Deputy Director of Water Resources Management and Conservation Department that holding Identity Card Number 1691200057 and Passport Number S0003559, to receive this payment.

Sincerely,



Oum Ryna  
Director  
Department of Meteorology

Ms. Sopha  
pls arrange this  
payment 23/5/2014



Sum Thy

From: Mr. Oum Ryna  
Director  
Department of Meteorology  
Ministry of Water Resources and Meteorology

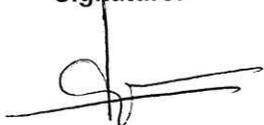
Date: May, 22 05, 2014

To: Mr. Sum Thy  
National Project Coordinator  
Cambodia Climate Change Alliance (CCCA)  
Ministry of Environment

**OFFICIAL RECEIPT**

No.	Description	TOTAL (USD)
1	Final payment of the contract between Cambodia Climate Change Alliance and The Department of Meteorology Ministry of Water Resources and Meteorology	2,000.00
<b>Grand Total:</b>		<b>2,000.00</b>

Signature:



Oum Ryna  
Director  
Department of Meteorology

From: Oum Ryna  
Director  
Department of Meteorology  
Ministry of Water Resources and Meteorology

Date: , 2014

To: Mr. Sum Thy  
National Project Coordinator  
Cambodia Climate Change Alliance (CCCA)  
Ministry of Environment

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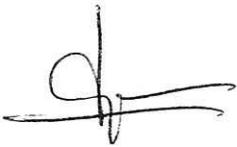
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Oum Ryna  
Director  
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