



**FAO/GLOBAL ENVIRONMENT FACILITY
PROJECT DOCUMENT**



PROJECT TITLE: Climate Change adaptation in Wetlands Areas (CAWA) in Lao PRD	
PROJECT SYMBOL: GCP/LAO/022/LDF	
Recipient Country: Lao Peoples Democratic Republic	
Resource Partner: LDCF	
FAO project ID: 622577	GEF/LDCF/SCCF Project ID: 5489
Executing Partners: Ministry of Natural Resources and Environment (MONRE) International Union for Nature Conservation (IUCN)	
Expected EOD (starting date): 1st January 2016	
Expected NTE (End date): 31st December 2020	
Contribution to FAO's Strategic Framework	<p>a. Strategic objective/Organizational Result: Strategic Objective 5: Increase the resilience of livelihoods to threats and crises Organizational Outcome 4: Countries and regions affected by disasters and crises prepare for, and manage effective responses</p> <p>b. Regional Result/Priority Area: 32nd Regional Conference for Asia Pacific “requested FAO...and to address climate change adaptation and mitigation (paragraph 24 (g) of the Report)</p> <p>c. Country Programming Framework Outcome: Outcome 4: Enhanced capacity of Government and communities to adapt to and mitigate climate change and reduce natural disaster vulnerabilities related to agriculture, forestry and fisheries</p>
GEF Focal Area/LDCF/SCCF: LDCF	
GEF/LDCF/SCCF Strategic Objectives: GEF6 CCA-1, CCA-2, CCA-3¹	
Environmental Impact Assessment Category (insert √): A B[√] C	
Financing Plan:	
GEF/LDCF/SCCF allocation:	USD 4,717,579
<u>Co-financing:</u>	
MONRE	USD 500,000
MAF	USD 500,000
KfW	USD 2,187,380
IWMI	USD 600,000
World Bank	USD 8,430,000
IUCN	USD 2,400,000
FAO	USD 750,000
Subtotal Co-financing:	USD 15,367,380
Total Budget:	USD 20,084,959

¹ Although this is a GEF5 project the IA was advised that the GEF6 tracking tool could be used and therefore that alignment be shown with GEF-6 Strategic Objectives

EXECUTIVE SUMMARY

The project will help local communities in two important wetland areas of Lao PDR adapt to the impacts of climate change, and contribute to the sustainability of their livelihoods, by supporting the restoration and sustainable management of the globally important Ramsar-designated wetlands on which they depend. The project will use an ecosystem-based adaptation (EBA) approach, whereby the ability of the wetlands to buffer local peoples' livelihoods against CC impacts will be safeguarded through a combination of improved planning and governance conditions, direct investments in climate change adaptation (CCA) measures and livelihoods strengthening, and support to CC resilient forms of sustainable use, with a strong focus on creating lasting capacities among national stakeholders at all levels to sustain and replicate these benefits. These activities will be supported and oriented through investments in knowledge generation regarding the vulnerability of local communities to disasters and CC, the importance of wetlands for CCA, and options for their sustainable and resilient management. Lessons learned in these two wetlands regarding community-based vulnerability risk assessment and strategies for CCA, based on principles of EBA and sustainable use, will be replicable elsewhere in Lao PDR, the greater Mekong region and beyond.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AWP/B	Annual Work Plan and Budget
BH	Budget Holder
BKN	Beung Kiat Ngong
CAM	Climate Change Adaptation and Mitigation Methodology
CAWA	Climate Adaptation in Wetland Areas
CBNA	Capacity Building Needs Analysis
CC	Climate change
CEO	Chief Executing Officer (GEF)
CCA	Climate change adaptation
CCAI	Climate Change Adaptation Initiative
CPS	Champasak
CTA	Chief Technical Advisor
DAFO	District Agriculture and Forestry Office
DEQP	Department of Environment and Quality Promotion
DLM	Department of Land Management
DM	Disaster Management
DMC	Disaster Management Committees
DONRE	District Office of Natural Resources and the Environment
DRM	Disaster Risk Management
DWR	Department of Water Resources
EBA	Ecosystem Based Adaptation
EP	Executing Partner
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organization of the United Nations
FE	Final Evaluation
FPMIS	Field Project Management Information System
GEBs	Global Environmental Benefits
GEF	Global Environment Facility
GEFSEC	GEF Secretariat
INRM	Integrated Natural Resource Management
IPM	Integrated Pest Management
IRAS	Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts
IUCN	International Union for the Conservation of Nature
IWRM	Integrated Water Resource Management
LDCF	Least Developed Countries Fund
LNMC	Lao National Mekong Committee
LTO	Lead Technical Officer
LTU	Lead Technical Unit
LUP	Land Use Planning
LWU	Lao Women's Union
M&E	Monitoring and Evaluation
MAF	Ministry of Agriculture and Forests
MEM	Ministry of Energy and Mines
MONRE	Ministry of Natural Resources and the Environment
MPI	Ministry of Planning and Investment
MRC	Mekong River Commission
MLSW	Ministry of Labour and Social Welfare
MWD	Mekong Water Dialogue
NAFRI	National Agriculture and Forestry Research institute
NAPA	National Adaptation Programme of Action

NBSAP	National Biodiversity Strategy and Action Plan
NDC	National Disaster Committee
NEC	National Environment Committee
NPC	National Project Coordinator
NSCCC	National Steering Committee on Climate Change
NTFP	Non-timber forest product
NSEDP	National Social and Economic Development Plan
PAFO	Provincial Agriculture and Forestry Office
PDR	People's Democratic Republic
PIF	Project Identification Form (GEF)
PIR	Project Implementation Review
PMCU	Project Management and Coordination Unit
PONRE	Provincial Office of Natural Resources and the Environment
PPG	Project Preparation Grant (GEF)
PPR	Project Progress Report
PRC	Provincial Ramsar Committee
PRODOC	Project Document
PSC	Project Steering Committee
PY	Project Year
RBC	River Basin Committee
REDD	Reducing Emissions from Deforestation and Degradation
SAFREC	Southern Agriculture and Forestry Research Centre
STAP	Scientific and Technical Advisory Panel
SVK	Savannakhet
TCI	Investment Centre Division (FAO)
TOR	Terms of Reference
UNDP	United Nations Development Programme
USD	United States Dollar
VDRA	Vulnerability and Disaster Risk Assessment
WB	World Bank
WCS	Wildlife Conservation Society

SECTION 1 – RELEVANCE (strategic fit and results orientation)

1.1 GENERAL CONTEXT

a) General development context related to the project

National Context

1. The Lao People’s Democratic Republic (PDR) has a total area of 236,800 km² and an estimated population in 2014 of 6,803,699, up from 4,574,848 in 1995. The Human Development Index in 2013 was 0.569, placing it 139th worldwide; per capita GDP is USD1,646.

2. The country lies mostly between latitudes 14° and 23°N. It is landlocked, with a thickly forested landscape consisting mostly of rugged mountains, with some plains and plateaus. Its geography is also dominated by the Mekong River, which enters the country in the north from Myanmar, defines the country’s long western border with Thailand and then flows out of the country south into Cambodia. Almost all of the country therefore coincides with the eastern portion of the Mekong drainage basin: the target areas covered by this project (see below) are located on two of the many tributaries of the Mekong that flow eastward out of the Annamite mountain range, which forms most of the eastern border with Vietnam.

3. The climate is tropical and influenced by the monsoon pattern. There is a distinct rainy season from May to November, followed by a dry season from December to April.

4. Subsistence agriculture accounts for half of GDP and provides 80% of employment. Only 4.01% of the country is arable land, and 0.34% used as permanent crop land, the lowest percentage in the Greater Mekong Subregion. Rice dominates agriculture, with about 80% of the arable land area used for growing rice. Approximately 77% of Lao farm households are self-sufficient in rice.

5. Tourism is the fastest-growing industry in the country. The country's plentiful water resources and mountainous terrain enable it to produce and export large quantities of hydroelectric energy: of the potential capacity of approximately 18,000MW, around 8,000MW have been committed for exporting to Thailand and Vietnam.

Target Sites

6. The project will target the two wetland areas in Lao PDR, which contain the country’s only two declared Ramsar sites: Xe Champone wetlands in Savannakhet province and Beung Kiat Ngong (BKN) wetlands in Champasak province. The Xe Champhone Ramsar site currently covers 12,400ha and contains around 14 villages with a total population of around 7,000 people), and it is proposed that it will be expanded to cover the entire 45,000ha of the target area (containing a total of around 40 villages with 20,000 people). The boundaries of the BKN target area coincide with those of the Ramsar site: this covers 2,360ha, with 13 villages and around 11,500 people.

7. The poor rural communities in and around the wetlands depend heavily on them for livelihood support: in the two sites, around 20 “first tier” villages (with around 21,000 inhabitants) depend most heavily on the wetlands and are most directly involved in their management, and a further 40 “second tier” villages (with around 42,000 inhabitants) are less directly involved in their management but also depend on the goods and services that they provide. These people are highly exposed and vulnerable to climate change (CC) impacts, associated with expected increases in temperatures, evapotranspiration and the incidence and intensity of storms. Climate change vulnerability is increased by the communities’ and the wetlands’ low adaptive capacity. Expected CC impacts are discussed in paragraphs 30-36; an

adequate understanding of these and of the adaptation strategies proposed by the project is dependent however on first having a clear appreciation of the biological and physical characteristics of the wetlands.

1) **Xe Champhone**

8. This site is a large wetland area covering about 45,000 ha, located on a level flood plain in the centre of the country. A central portion covering 12,400ha was designated in 2010 as one of the country's first Ramsar Sites², consisting of two core zones, one in the centre of the wetlands and one in the south (see Map 1 below).

9. The wetlands consist of a mosaic of different wetland types, comprising perennial and seasonal rivers, freshwater lakes, ponds, meanders, oxbows, marshes, rice paddy fields³ and a small area of peat land in the east (currently being exploited by a fertiliser company). Perennial and seasonal streams and ponds are major components of the important southern section of the wetland, which, although lying outside the designated Ramsar Site, includes a series of marshes and ponds, some of which are considered sacred wetlands and are traditionally protected by local communities. The many marshes, as well as evergreen and bamboo forests associated with the wetland, provide habitat for a number of globally threatened species, including Siamese crocodiles. Some patches of mixed evergreen forest remain in good condition in the eastern part of the wetland.

10. The wetlands are fed by the Xe Champhone River, draining from the Annamite Mountain Range to the east. There is only around 10m elevation change between the north and south of the wetland, so the Xe Champhone is a gentle, slow-flowing river, even when full. The river then drains out of the wetlands into the Xe Banghieng River and thence into the Mekong River.

11. River flow, wetland ecology and socioeconomic impacts in the area are determined by a combination of climate, the size of the upstream drainage basin, and artificial flow modifications (the rivers' tributaries have to pass through the artificial reservoirs⁴ before entering the wetlands). The climate is monsoonal and highly seasonal: average annual rainfall is 1,478mm, with strong variation between the November-May dry season and the May-October wet season (mirrored by a difference between a minimum low temperature of 13°C in January and a maximum high of around 39°C in April).

12. The combination of strongly seasonal rainfall and a large upstream watershed mean that river levels vary widely, from around 10-15m in the wet season to as low as 1.5m in the dry season, when the river even becomes blocked in places. During the early wet season, the river flow is strong and there is a high rate of soil runoff, but it slows later when backwater from the Mekong River arrives and flows against the river. High wet season flows lead to the different wetland types becoming interconnected, providing important breeding and feeding habitats and migration pathways for fish; these floods also lead to negative social and economic impacts, and in addition damaging flash floods sometimes also occur because of the wide, flat nature of the floodplain and the shallowness of the river, which allows it to overflow its banks. During the dry season, by contrast, falling water levels mean that many lakes and ponds in the wetland become isolated, and drought becomes a serious problem for local communities. Groundwater is found about 4-5 metres below the surface in the wet season but 8 metres down in the dry season.

13. The recharge and discharge functions of the wetlands are important for maintaining the wetland habitats and water resources for wildlife populations and local residents. In the southern section, the existing oxbows function well in this respect, as shown by the relatively shallow ground water level in the dry season, at about 3-4m. In the north, Ang Soui and Buk Lakes provide this function to some degree.

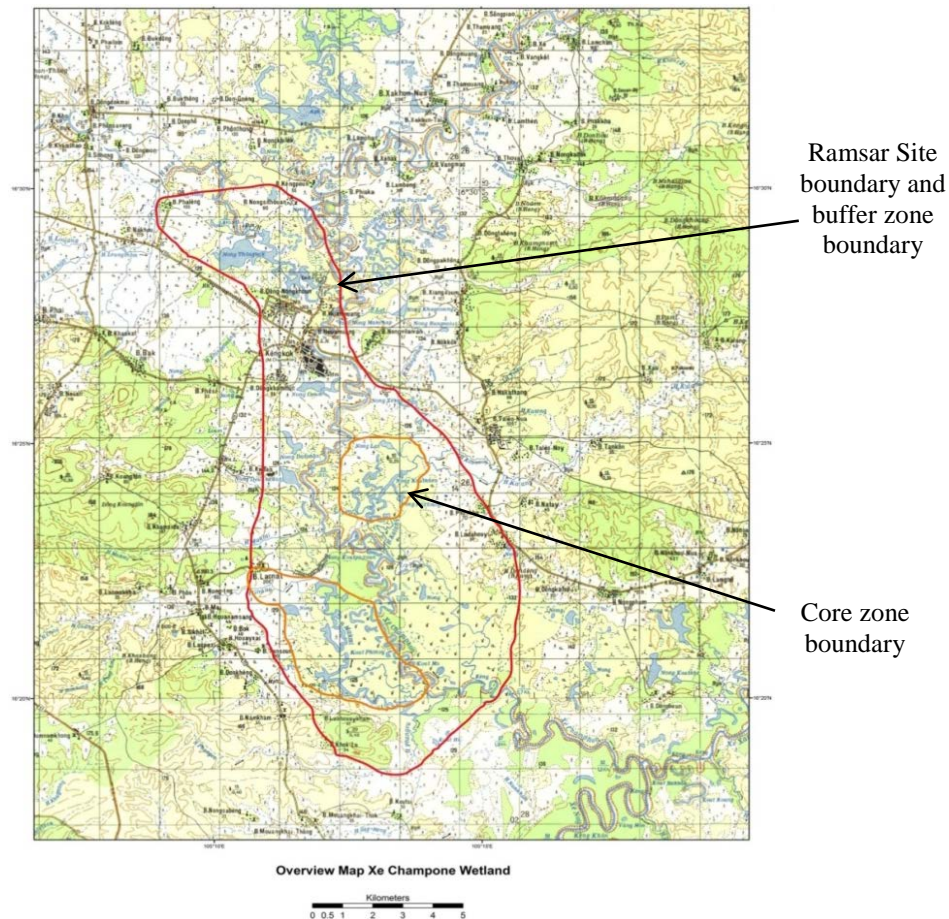
²WREA 2011

³ Claridge, 1996

⁴ The biggest and most important man-made reservoirs are Ang Soui, Buk and Phai Cheo lakes, together covering an area of about 3,000 ha; these were built in 1980s to support agriculture and fisheries as part of an irrigation programme.

Water stored in these lakes ensures that a sufficient level is maintained in the dry season and can be drained into the Xe Champhone River when more water is needed.

Figure 1. Boundary Map of Xe Champhone Wetlands Ramsar Site



14. The wetlands also provide important natural resources for the people living in and around them. More than 95% of the labour force in Champhone District is engaged in occupations related to wetland ecosystem services and more than 80% of gross income in the district comes from sources related to the wetland. They are the main source of food, income and drinking water for local residents. In addition, their cultural and natural features, such as the Monkey Forest, Turtle Pond and temples such as Hotay Pidok, attract around 3,000-4,000 tourists a year. The key ecosystem services of the wetlands include the provision of natural resources, including fish and other aquatic wildlife, regulation of water quality and quantity, support for biodiversity, including globally threatened species, and cultural services, such as spiritual significance and tourism. Importantly, these services can vary depending on season.

15. Key infrastructure in the area includes the following (see Appendix 15):

- 18 bridges, of varying widths and conditions ranging from very poor to excellent
- 2 dams, with associated water management structures
- 2 irrigation canals, one of which is earth lined and the other cement lined
- 8 community-owned electric irrigation pumps, installed on floating rafts
- 7 wells, with depths from 4-10m and electric pumps (apart from one shallow spring, from which water is extracted by bucket).

2) Beung Kiat Ngong (BKN)

16. The BKN wetlands cover about 2,360ha in the southern province of Champasak. They lie between 120 and 200m above sea level, partly within the Xe Pian National Protected Area (NPA) and to the south

of Dong Hua Sao NPA which covers the southern slopes of the Bolaven Plateau; both of these NPAs provide the streams which feed the wetland.

17. Climatic conditions are similar to those in Xe Champhone, with a distinct dry season between late October and early May, and a wet season from mid to late May to October, and temperatures ranging from a minimum low of 14.5°C in January to a maximum high of 38.3°C in April. Average rainfall is around 2,000mm, with one third of the rainfall usually occurring in August (IUCN, 2011).

18. The site has two almost separate wetland areas, linked by a narrow corridor (Figure 2). The water in the northern area is fed by streams from the north and from hills to the west, while the water flowing into the southern area comes from a larger catchment to the south. The general direction of the water flow in the wetland is from north to south.

19. The wetlands lie in a series of shallow basins, which have filled with peat and form a wetland complex of marsh, swamps, perennial and seasonal ponds, and seasonally flooded grasslands. Around the perimeter of the wetlands, the land has been converted to rain-fed rice paddy, especially in the southeastern portion where the wetlands have naturally filled in with accumulated sediment and decayed vegetation. Interspersed within these marshes and open waters, there are islands with shrubs and trees, and there are areas of rich semi-evergreen and seasonally flooded forest.

20. Much of the wetland is not open water, but consists of relatively shallow water covered by a thick layer of decaying grasses with new shoots and emergent weeds, as well as bushes, growing on top of this layer. The deepest parts of the wetland may be as much as 2-3m deep in the dry season. Within the main part of the wetland, the area of permanent water that remains through the dry season is 300-400ha, while other scattered small marshes and pools retain water throughout the year. During the wet season the whole area becomes inundated with water levels rising to 2m above the dry season levels.

21. The ecosystem services of the wetland have been recognized in the Ramsar site profile as:

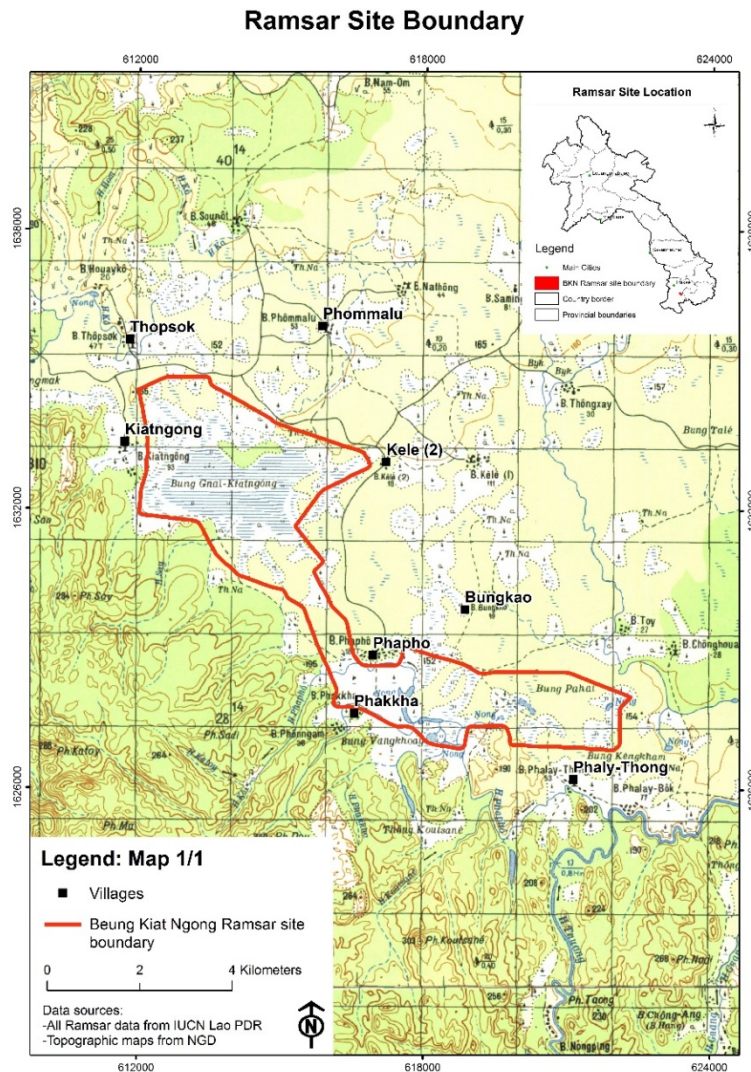
- Flood mitigation
- Sediment trapping due to the slow water flow
- Storage and maintenance of ground water
- Fish spawning ground, plus habitat for other aquatic animals such as frogs, snails and turtles
- Habitat for other wild animals, including a number of threatened species
- Contribution to securing local livelihoods, with villagers earning direct income from wetlands resources – fish, frogs, wetland vegetables
- Grazing for livestock – buffalo, cattle and elephants
- The site is an important for its eco-tourism opportunities.

22. Over most of the wetland, there is free access and use of the wetlands and wetland products. However, certain small areas have been designated as fish conservation areas, both continuously and seasonally, and other areas have restricted use limiting agriculture and forestry: there are 3 continuous protected areas for fish conservation, covering 265.5ha, 8 seasonal PAs for fish conservation covering 14.5ha, and 2 conservation areas where no logging or agriculture are allowed, covering 4.7ha.

23. Key infrastructure in the area includes:

- 6 bridges, with condition ranging from poor to good
- 10 culverts (mostly concrete pipes running underneath the road)
- 2 weirs, with no road crossings or active water control structures
- 2 irrigation canals
- 5 wells

Figure 2. Boundary Map of Beung Kiat Ngong (BKN) wetlands



b) Climate Change (CC) vulnerability and problems the project will address

Climate projections

24. Regional projections for the Mekong basin as a whole suggest that, by 2030:

- Temperatures will increase by around 0.8°C
- Potential evapotranspiration will increase in all months and catchments, by an average of around 0.03m (+2%)
- Annual rainfall will increase by around 0.2m (+13.5%), with considerable variation (0.05-3.0m) between catchments⁵.
- Annual mean Mekong river flow will increase by 4-13% in the wet season and 10-30% in the dry season.

25. In Lao PDR, it is projected that by 2050:

- Minimum and mean temperatures will increase by up to 2°C⁶

⁵ Greatest increases will occur in the wet season (May-October) and especially in south of basin, while dry season rainfall is projected to increase in north of basin, but decrease in south by about 0.13m.

- Maximum temperatures will increase by up to 5°C (range of increase is 3-6°C)⁷
- Rainfall will increase, but with considerable seasonal variation⁸;
- There may be delays in the start of the main wet season, with possibility of a false start to wet season in April.

26. Climate variability, therefore, will remain a major challenge for Lao farmers. Evidence is increasing that extreme events are driven by changes in extreme values of temperature, e.g. fewer cold nights and more hot nights, and incidence of heavy and very heavy rainfall. Incidence of tropical storms and typhoons is highly variable and influenced by El Nino-Southern Oscillation, but the number and intensity of storm events has increased. This trend is likely to continue in Lao PDR.

27. Similar phenomena are expected in the provinces where the target wetlands are located (Savannakhet and Champassak), with increases in mean annual temperature of 1.7°C and 2.2°C respectively, resulting in increased evapotranspiration, and increases of 21% and 10% in average annual rainfall (related more to increases in the incidence and intensity of storms than to increases in the numbers of rainy days, and with no significant reduction in the risk of drought years).

28. For the Xe Champhone target wetland area, CC projections⁹ suggest the following:

- Although the local climate record shows declining rainfall in recent decades, with CC there will be an approximate 14% increase in annual average rainfall (under scenario A2), with the greatest increase expected in May (as high as 30% in wet years).
- The increase in rainfall will manifest as more intense rainfall, rather than more rainy days.
- Increases in local rainfall may have only a minor impact on flooding, but may affect rain-fed agriculture and water supply.
- However increases in rainfall in the three major upstream tributaries that feed the wetland may lead to increases in the frequency, intensity and length of floods.
- Although wet years will be wetter, dry years are unlikely to become drier, and no significant changes to the timing of the rain (e.g. the arrival of the wet season) are expected.
- Increased temperatures and longer dry seasons may be expected to exacerbate problems with groundwater levels and salinity.

29. In the other target wetland area, Beung Kiat Ngong (BKN), it is projected that:

- Total annual rainfall will increase by 8.6% (+6.5% in the dry season and +9.2% in the wet season).
- Rainfall amounts will decrease slightly in January-April but increase significantly in May, and also throughout the wet season from June to October (between 5-15%).
- Minimum rainfall years in June/July/August (the key months for rice growing) will only increase slightly, i.e. the risk of drought years will not be significantly reduced.
- Storms and extreme events are likely to increase in frequency and intensity with climate change.

Climate impacts

30. Climate change, coming on top of existing anthropic pressures, will have significant impacts on the flow regimes of the two wetlands, affecting their habitats and the livelihoods of local people. Because of the physical characteristics of the areas, with only slight slopes between their upper and lower extremities, the rivers that run through them are shallow and wide, with many meanders; this makes them prone to overflowing, especially when water flow is slowed when it receives backwater. In Xe Champhone, the construction of Ang Soui Lake and irrigation schemes have further slowed down the flow, and those villages located near the reservoir consequently suffer more from floods than the villages downstream.

⁶Relative to the mean value for 1982-2002

⁷The south will remain the hottest part of the country; increases in annual maximum temperatures will be greatest in the north.

⁸Expected to increase at the start of the wet season (April) and the end of the wet season (October), but with decreases in May

⁹Mekong River Commission (MRC) wetlands and climate change study, 2012

Poor management of the watersheds upstream also contribute to this situation, generating sediment which is deposited on reaching the areas of slow flow in the wetlands, further raising the profile of the river beds and exacerbating flooding risk.

31. All of these pressures will be exacerbated as a result of the increased frequency and intensity of flooding that is expected under conditions of climate change. In addition, individual ponds and marshes within the wetlands will become increasingly isolated, due on the one hand to sediment buildup in the watercourses that currently link them, under conditions of increased sediment input and flooding during the wet season, and drying out of the marshes and connecting watercourses during the hotter dry seasons.

32. Attempts to adapt to the changing flow regime by local communities and the authorities may also have negative impacts, such as increased water extraction and attempts to change the courses of the rivers that run through the wetlands. The potential impacts on recharge, discharge, and groundwater are also significant for the wetland, as certain wetland habitats and species, and local communities, rely on this water supply. Increased flooding and sediment loads will have the greatest impacts in the Xe Champhone River, potentially increasing riverbank erosion, making the river even shallower and more blocked by sediments piling up after wet season. If greater amounts of sediment reach marshes and ponds in other parts of the wetland, this may also affect habitats. The effects of erosion and sedimentation are tempered in some areas (such as the southern part of the wetlands) by the presence of wetland forests.

33. Climate change and its implications will also affect the biodiversity of the two wetlands. At species level:

- **Large water birds** (ducks, egrets and herons), which rely mainly on open water wetlands, are already affected by hunting and by the degradation or closing of wetlands (through encroachment and invasion by *Mimosa picra*), and will be further impacted by the shrinkage and closing of wetlands during dry season.
- **Fish** are currently affected by overfishing, obstacles to migration and the degradation or closing of wetlands; climate change may result in more habitats for fish in wet season (e.g. in reservoirs), but it is also likely to result in further loss of other important habitats, such as the deep pools in the Xe Champhone River and the open wetlands, leading to an overall reduction in fish numbers. Changes in temperature may also affect influence the metabolism, growth rate, reproduction, recruitment and susceptibility to toxins and disease; because of their higher temperature tolerance, there may be a shift towards greater populations of resident (“black”) fish at the expense of migratory (“white”) fish. Fish (especially migratory species) are also likely to be negatively affected by increased acidity in the water, due to atmospheric CO₂ and drying/wetting cycles of peat.
- The Critically Endangered **Siamese crocodile** (*Crocodylus siamensis*), which is found in oxbows and marshes, is also affected by hunting and by the degradation or closure of wetland habitats, and is vulnerable to CC-related changes in rain patterns and the shrinkage of wetlands, as well as the direct impact of change in temperature and rain pattern on the sex ratio and survival of nests.

34. At habitat level:

Xe Champhone:

- **Deep pools and river beds** will be affected by increased flows, more severe flooding and ongoing drought, resulting in increased sedimentation and their eventual disappearance (exacerbating the current implications of poor upstream watershed management). This will lead to a loss of biodiversity, because many fish species rely on these pools during the dry season (when the river dries and becomes blocked in places).
- **Open wetlands (oxbows, lakes and ponds)** will be increasingly affected by closure as a result of sedimentation and the introduction of organic matter, due to increases in flooding. Also, higher temperatures may increase evapo-transpiration from the water bodies and further favour invasive species.

- **Flooded forests**, which play important roles in limiting the sedimentation of oxbows and marshes, providing habitat for species such as the Siamese Crocodile, for retaining soil moisture and for maintaining the local micro-climate, are currently under pressure from agricultural encroachment, but are not expected to suffer significant additional impacts as a result of climate change (apart from some possible impacts of flooding on the regeneration of bamboo) and may in fact benefit from increased sediment inputs.

BKN:

- **Seasonally inundated grasslands, peatlands and freshwater marshes**, especially around the edges of the wetland, will be affected by drying out and eventual reduction of area, as a result of higher temperatures and lower rainfall in the dry season, and may be more at risk from fire.
- **Ponds** will have lower dry season water levels and will cover a larger area in the wet season
- There may be changes in species composition in response to changes in climate stresses: for example, in ponds, towards flora able to cope with deeper wet season water levels; at the landward edges of grasslands, towards more terrestrial species; and in deeper parts of grasslands, towards species that can tolerate higher water levels for longer.
- Areas of **shrubland** may expand, since the shrubs are able to withstand both the dry periods and the deeper water levels, with some potential for invasion by *Mimosa pigra*

35. A number of aspects of local livelihoods are likely to be affected by climate change:

- **Rice production:** although increases in rainfall and temperatures (especially in May) may result in better conditions for crop production and may help reduce salinity, they are likely also to facilitate crop pests (such as Golden apple snail and rice borers), potentially increasing production costs due to more use of chemical insecticides. In addition, wet season rice be increasingly affected by flooding; this in turn is expected to lead to an expansion of dry season rice production, thus increasing the need for irrigation infrastructure and the use of chemical fertilisers and pesticides, and so further degrading natural resources in the area, indirectly causing additional threats and pressures on other sources of livelihoods for local communities (fish, NTFPs). The main vulnerability issue for irrigated (dry season) rice in BKN is temperature increases; coupled with overall reductions in water availability during the dry season, this would make irrigated rice highly vulnerable. The crop yield model for rainfed rice indicates a decrease in annual yield of 5.6%.
- **Livestock production:** increasing rainfall may improve livestock production conditions, particularly the slight increases in dry season rainfall by improving water and food availability; however increasing temperatures and humidity will increase stress and may facilitate animal diseases. The predicted increase in dry season rice production would also have indirect impacts on livestock production, reducing the availability of pasture and increasing the chances for chemical contamination.
- **Fishing:** climate change may have both positive and negative effects on fish populations, reducing some pond habitat but potentially providing more habitat in wet season. Fish populations in Champhone District have declined significantly during the last decade, according to local perceptions but this is likely more linked to overfishing than to the impact of CC.
- **NTFP collection:** increasing temperature and continued flooding and droughts may affect productivity of wild vegetables including bamboo shoots and mushrooms, as well as populations of wild animals, however, as with fishing, much of the decline in these activities may be attributed to factors not directly related to climate change, particularly over-extraction. In BKN, production of Malva nut (*Scaphium macropodumis*), an important NTFP, will be affected due to the effects of increased temperatures on flowering and pollination.

36. Climate change is also expected to have significant impacts on the infrastructure of the wetlands and their surrounding areas:

- **Bridges** will be affected by increased frequency and intensity of storms, and by increased flash flooding, resulting in a general weakening of bridge structures, especially the abutments which may be weak points for bank erosion, and the junctions between the bridges themselves and their approach roads.
- **Culverts** are at risk from increased flooding, and increased frequency and intensity of storms
- **Dams and weirs** will also be affected by increased frequency and intensity of storms and by increased flash flooding, which may damage intake and water regulating structures (sluices), as may the tops and sides if they are overtopped.
- **Wells** may be affected by flooding, which may both damage their structures and give rise to increased contamination with coliform bacteria.
- **Irrigation canals** are likely to require more regular maintenance to clean out sediment, and their walls may also be damaged by flood waters.
- **Irrigation pumps**, which are typically installed on floating rafts, may be at risk of damage in the event of flash floods.

c) Institutional and policy framework

Key institutional actors

37. The institutional stakeholders of the project are described in detail in section 1.1.3 below. In summary, the lead institution in the environment and natural resources sector is the Ministry of Natural Resources and Environment (MONRE), which also has lead responsibility for issues related to climate change and natural disasters, and is the focal ministry for the implementation of the Ramsar Convention. The Ministry of Agriculture and Forestry is responsible for the agriculture and forestry sectors; its role in managing agriculture and agribusiness (including irrigation), as well as fisheries, means that it is influential in wetlands management and CCA aspects of local livelihoods (for example through adaptation measures focused on irrigation, livestock and fisheries, and crop production).

38. The central level structures of MONRE and MAF are mirrored at regional and local levels by Provincial and District Offices for Natural Resources and Environment (PONRE and DONRE) and Provincial and District Agriculture and Forestry Offices (PAFO and DAFO), which will play crucial roles in the orientation and implementation of the project at these levels and in ensuring effective participation and strengthening of community-level stakeholders and their organisations.

39. There are a considerable number of other Government ministries with direct or indirect relevance for wetland management, CCA and Disaster Risk Management issues, including the Ministry of Labour and Social Welfare, the Ministry of Planning and Investment (MPI) and the Ministry of Energy and Mines (MEM).

Strategies, policies and action plans

40. Recent years have seen the development of numerous strategies, policies and action plans relevant to this project. Strategic planning documents with important influence over natural resources and climate change include the following:

- **The 7th National Social and Economic Development Plan (2011-2015), which** defines future directions for the development of Lao PDR. The main aspects related to the water sector in the “specific directions” of the 7th NSEDP are under: agriculture and forestry (e.g. irrigation); industry and commerce (e.g. expansion of agricultural production); energy and mining (which is focused on hydropower); and environmental protection and natural resource management, which includes the target of protecting environmental quality in 25 towns with development projects. The NSEDP provides the basis for sectoral and provincial plans, and sets targets that have significant influence over the economic and developmental policies and projects promoted in that period.

- **The National Forestry Strategy to 2020 (FS2020)**, which analyzes the status of the Lao forest sector and provides targets and recommendations for its development. Importantly, it sets out the categories of forests: production forests; conservation forests; protection forests; regeneration forests; and degraded forests.
- **The National Biodiversity Strategy to 2020 & Action Plan to 2010 (NBSAP)**, which was approved in 2004 and aims to protect biodiversity resources and to ensure their sustainable use. The NBSAP covers terrestrial and aquatic biodiversity and concentrates on the conservation of indigenous biodiversity. Water resources are one of many issues addressed in NBSAP document.

41. The National Climate Change Strategy (2010) outlines both adaptation and mitigation priorities in key sectors including agriculture, food security, forestry, land use and water resources. Proposed approaches in the water sector are the integration of climate risks into planning processes, the development of reliable early warning systems to reduce disaster impacts and the downscaling of climate and hydrological models to the river basin scale. The proposed project will narrow down these approaches by focussing on very distinct, vulnerable and important parts of river basins.

42. The project supports the nine policy priorities under the National Water Resources Policy: 1) Institutional strengthening and coordination; 2) Legislation, plans and their implementation; 3) River basin and sub basin water resource planning; 4) Data collection and analysis; 5) Water allocation ; 6) Protection of water quality and eco-systems; 7) Management of floods, droughts and climate change; 8) Financial aspects of water resource management; 9) Awareness, participation and capacity building.

43. The Government has developed a corresponding draft National Water Resource Strategy and Action Plan (2011 to 2015) with support from ADB providing a comprehensive set of programs and activities linked to 9 major policy statements. This project will be fully aligned with several of the priority programmes and activities and **Programme 7, Activities 7.1, 7.2 and 7.3** “Manage Water Resources to Mitigate Impacts of Floods, Droughts and Climate Change” in particular.

44. The National Adaptation Programme of Action (NAPA, 2009) has identified agriculture, water resources, forestry and health as priority sectors. The project will address key NAPA priorities linked to water resources and agriculture by contributing to the following NAPA Priority 1 and Priority 2 Activities:

First Priorities for the Water Resources (WR) & Agriculture (A) sectors

- Awareness raising on water and water resource management (WR);
- Mapping of flood-prone areas (WR);
- Establish early warning systems for flood-prone areas (WR);
- Strengthen institutional and human resource capacities related to water and water resources management (WR);
- Promote secondary professions in order to improve the livelihoods of farmers affected by natural disasters induced by climate change (A).

Second Priorities for the Water Resources (WR) & Agriculture (A) sectors

- Conservation and development of major watersheds (WR);
- Repair/rehabilitate infrastructure and utilities damaged by floods in agricultural areas (WR);
- Land use planning in hazard prone areas (WR);
- Technical capacities of local agricultural officers in natural hazard prone areas strengthened (A);
- Establishment and strengthening of farmers groups in natural hazard prone areas (A);
- Develop appropriate bank erosion protection systems for agricultural land in flood prone areas.
-

1.1.1 Rationale

a) **Baseline projects and investments addressing the development of the CC vulnerable sector (main co-financing sources of the project)**

45. ***Knowledge and understanding of climate change impacts and risks.*** Currently, in Lao PDR, the available information on climate and vulnerability to CC (e.g. through National Communications or the NAPA) lacks specificity. The level of knowledge and understanding of the main elements of CC vulnerability with respect to the agriculture and water resources sector, is very general at the national level and even more so at the local level. This in turn hampers stakeholders' abilities to design targeted, cost-effective CCA strategies and solutions.

46. The LDCF investment will benefit from an initial baseline case study of the Xe Champhone and Siphandone wetlands' climate vulnerabilities, conducted under MRC's Climate Change Adaptation Initiative (CCAI). This study, even though focused on the vulnerability of the wetlands eco-systems and less on the climate impact on local associated livelihoods, provides initial site and eco-system specific information and a partial and preliminary vulnerability assessment methodology for wetlands.

47. Fact sheets¹⁰ on the XC and BKN wetlands, developed as part of the submission to the Ramsar Convention, and subsequent baseline reports produced by IUCN's Mekong Water Dialogues Programme do not describe CC impacts or vulnerabilities but do provide valuable baseline information on population, livelihoods and biodiversity for the XC and BKN wetlands sites. Baseline data were also collected in Champhone District by MRC's CCAI to inform the development of a CCA pilot in the agricultural sector. This initial vulnerability assessment covers only 3 of the 45 villages located in and around the XC wetlands. The assessment also remains sector specific and does not address the more complex wetlands scenario. FAO, as part of the 2011 Agricultural Census, collected nation-wide data on food security and vulnerability but this information has yet to be used to inform more targeted climate change vulnerability assessments.

48. ***Climate adaptation and risk reduction measures.*** The MONRE together with IUCN, the Provincial Ramsar Committees and Ramsar District Implementation Teams, has developed a management plan for the BKN Ramsar site and will soon initiate the development of a plan for XC. The development of these site specific management plans is or will be based on initial socio-economic and biodiversity baseline surveys and experiences gained from past or on-going biodiversity conservation, participatory fisheries management and livelihoods development projects in and around these sites.

49. IUCN planned support for XC is the revision and demarcation of the boundaries of the Ramsar site, rehabilitation of critical forest habitats and the development of an eco-tourism strategy. In BKN, IUCN is currently supporting livelihoods development activities including crop diversification and the promotion of organic fertilisers.

50. The Wildlife Conservation Society (WCS), financially supported by the Minerals and Metal Group (MMG) is supporting the conservation of the critically endangered Siamese Crocodile. Current and future WCS activities include the strengthening of community based protection measures, habitat management and livelihoods support such as eco-tourism development and small scale support to agriculture.

51. MONRE is currently seeking additional KFW support to implement elements of the BKN management plan and to contribute to the development and implementation of the future XC management plan. Possible KFW support would focus on tangible or hardware investments in wetlands management and protection (e.g. demarcation, alternative livelihood development, removal of invasive species, development of irrigation or flood protection infrastructure, etc.).

¹⁰http://www.wetlands.org/reports/ris/2LA002_RIS_FINAL.pdf and http://www.wetlands.org/reports/ris/2LA001_RIS.pdf

52. WB support to the Sustainable Floodplain Management Component of the National Integrated Water Resources Management (IWRM) Programme will focus on two key river basins in the south of Lao PDR including the Xe Bang Hiang river basin which covers the XC wetlands. Some of the important elements of this component include the rehabilitation of critical infrastructure (flood gates, village based irrigation and the construction of fish hatcheries). Other measures will aim at the enhancement of the ecological value of wetlands of basin wide significance.

53. The Ministry of Agriculture and Forestry (MAF), through its provincial and district offices, is focussing its investment budget on the development of rice production, especially irrigated or dry season rice cultivation. These investments are concentrated in high potential areas including wetlands. Champhone District, including over half the XC wetlands, will receive USD2.3 million (2013-2015) to secure and improve rice production. CC vulnerability and adaptation needs have not been considered in the above mentioned investments, with the exception of the BNK management plan which refers to climate change risks and the need to conduct a CC vulnerability assessment for the site.

54. MRC's CCAI has piloted on-farm adaptation activities in the agricultural sector in 3 villages of Champhone District. The initial phase focused on the impact of droughts on rice cultivation and a second phase will address the impacts of floods. By the time the project starts implementing adaptation and disaster management measures, CCAI pilots will have benefited from a number of years of consolidation and will be drawing to an end. This will offer the project a rare opportunity to build on these achievements, giving it the necessary longer term perspective when developing a more integrated and eco-systems based approach to adaptation in the XC but also BKN wetlands. The new project will also up-scale interventions to all concerned villages as part of developing a comprehensive, site specific and eco-systems based approach to adaptation.

55. The project will also build upon the achievements of the UNDP LDCF project "Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts" (IRAS) implemented by the National Agriculture and Forestry Research Institute (NAFRI), MAF (Savannakhet and Xayabury provinces). Specifically,

- 1) Initial baseline data collected in Savannakhet Province (Champhone District in particular) by the IRAS project will inform the initial Vulnerability Assessment for XC. Results of the Vulnerability Assessments in both XC and BKN will in turn reinforce climate vulnerability data and information for the agricultural sector compiled by the IRAS project.
- 2) The project will be able to build on the valuable experience gained from the IRAS CCA pilots, especially in Champhone District. In Champhone on-farm pilots are being implemented in 8 villages and are focused on rice cultivation, crop diversification, small-scale husbandry and aquaculture. By the time the project starts implementing CCA and disaster management measures (2015), sector specific IRAS interventions will have benefited from a number of years of consolidation and will be drawing to an end. This will offer the project a rare opportunity to build on these achievements, giving it the longer term perspective and scale needed for the development of a more integrated, multi-sector and eco-systems based approach to adaptation in the XC but also BKN wetlands.
- 3) The project will also benefit from capacity building activities implemented by the IRAS project. Improved capacity of the MAF offices in Savannakhet Province and Champhone District in particular will be an asset when conducting a comprehensive vulnerability assessment, designing integrated CCA and disaster management measures and developing long term CCA planning for XC. IRAS's contribution to mainstreaming CCA into sector policies and plans will also guide and inform the development of site specific (XC and BKN) and national CCA and disaster management plans for wetlands.

56. ***Integration of climate change adaptation and risk management measures into planning processes.*** A management plan for BKN exists and the one for XC is being developed. There is an increasing recognition of the need to address the impact of CC and increasing incidence of natural disasters through these site specific plans, corresponding provincial and district development plans or management plans covering wider landscapes (e.g. protected areas, river basins). The lack of practical experience in CCA and disaster management has prevented the effective mainstreaming of CCA and disaster management in local planning processes. Furthermore local development plans are generally compilations of sectorial plans, lacking the necessary integrated response to climate impact.

57. The development of climate related policy documents such as the NAPA (2009) and the National Climate Change Strategy (2010) has contributed significantly to general awareness and capacity building. These climate specific national policies and plans remain general and provide limited guidance in terms of implementation of tangible and targeted adaptation programmes. The ADB supported “Capacity Enhancement for Coping with Climate Change” project is currently developing specific action plans or programmes to guide the implementation of the National Climate Change Strategy. This includes the development of adaptation programmes in key sectors such as agriculture and water resources.

58. Within the water resources sector, wetlands have already been identified as important and specific areas of intervention due to their significance in terms of resource and resilience building. FAO is currently assisting the MAF in developing a Plan for Disaster Risk Reduction in Agriculture. These different policies and plans provide an increasing amount of detail and guidance but remain sectorial and often difficult to translate into concrete measures and plans at local level or in more complex eco-systems such as wetlands.

b) Remaining barriers to addressing CC vulnerabilities

59. **Barriers to CCA in wetlands:** a number of barriers, explained below, prevent stakeholders at the local and national levels from taking the necessary additional steps to adapt to climate change in an integrated and sustainable manner. The capacity-related aspects of these barriers were validated during the PPG phase by means of a Capacity Building Needs Analysis (CBNA).

Barrier 1: Inadequate knowledge and understanding of CC impacts and the complex and interrelated nature of vulnerabilities to CC and natural disasters

60. The principal barrier, confirmed through PPG studies, to the development and planning of effective strategies to increase the resilience of wetland communities to climate change and natural disasters, is the inadequate understanding and knowledge among key stakeholders at diverse levels regarding the nature, magnitude and implications of climate change, the specific forms and levels of vulnerability affecting the target wetlands and their constituent communities, and the relations between wetlands and CC resilience. Specifically:

- While there is some awareness in Government and local communities regarding the contributions that wetlands make to food security, income generation and the productivity of associated agricultural systems, other **less tangible environmental services provided by wetlands, such as flood control, water storage, etc. are not properly valued.** This is despite levels of overall knowledge of wetlands often being reported as good for sectors linked with water, Ramsar or livelihoods; this knowledge was gained through direct experience and also opportunities provided by the accession of the country to the Ramsar Convention, which opened the door to on-the-ground projects related to the management of Ramsar sites, along with training and other learning opportunities.
- **Awareness is limited at all levels regarding the concepts, nature and implications of climate change:** most of the members of government organizations assessed through the CBNA reported

“very low” levels of knowledge about climate change. Among those who reported “medium to good” levels of knowledge, this was based more on individual empirical observations than on knowledge of scientific projections or long-term trends. What progress has been made on developing awareness regarding climate change and adaptation has mostly occurred at central level, rather than at provincial or district levels.

- **Knowledge on adaptation measures is correspondingly low**, for example among Disaster Management Committees (DMCs); although these perform well in some cases, effectively raising money and responding to incidents, their approach is largely reactive, through post-disaster response (or in the best case “last minute” pre-disaster planning) rather than focused on actual planning to adapt to the changes and decrease the risks. In particular, the increasingly important contribution of wetlands to climate resilience is therefore often overlooked.

61. CBNA respondents reported that these knowledge limitations are attributable in part to shortcomings in the coverage, but also in the nature of current learning opportunities related to these issues. Specifically:

- **The format** of learning opportunities and knowledge/capacity strengthening opportunities is often not useful or adapted to the respondents’ needs or way of learning, with insufficient opportunity for the audience to practise the topics and tools presented, and interactions being limited to question-and-answer sessions.
- **The target audience** for knowledge development activities is often inadequate, being largely targeted at high level central or provincial officials (heads of departments, sectors, or sometimes units), with few opportunities for technical staff from provincial or district departments, who are normally in charge of planning and implementation of CCA and DRM measures in practice. In the Lao context, where horizontal and vertical information sharing tends to be limited, the result is that the benefits of the training (in terms of knowledge on CC, DRM or wetland management) tend to remain limited to those who were directly involved. At community level, opportunities to learn are very rare and mainly target village heads or high-level representatives.
- **The frequency of learning opportunities** for specific topics is inadequate. CBNA respondents considered topics such as climate change and DRM to be too complex to be understood in one event, and that long-term capacity strengthening opportunities should be supported.
- **The content of trainings** was considered by CBNA respondents as being insufficiently specific: the expectation from local stakeholders is normally to learn about their level or in a very detailed way; some respondents from PoNRE reported having general knowledge of climate change in the Mekong Region, but felt they unable to relate this broader knowledge to their specific geographical area of work.

Barrier 2: Limited knowledge and experience for the development and implementation of specific CC adaptation measures

62. The **limitations of knowledge and understanding**, set out above, regarding the nature and implications of CC, vulnerability, and the relations between CC resilience and wetlands, also impede the development and implementation of effective strategies for promoting CC resilience at field level in specific sites. Appropriate and integrated adaptation and disaster management measures in wetlands and associated floodplain agriculture are not known and tested and appropriate livelihoods improvement activities and livelihoods alternatives remain to be defined.

63. Personnel from PAFO tend to have an advantage in terms of their access to training on issues related to their sector, such as agricultural irrigation, livestock and fisheries. However, topics related to environment, wildlife conservation, wetlands and rivers management (outside irrigation and water

“control”) are not yet fully available in education organizations in Lao PDR. In addition, most of the staff in PoNRE and DoNRE come from PAFO and DAFO and were assigned to these new positions in 2011 without adequate training, resulting in a learning-by-doing process. A clear distinction in education could also be made between the provincial and district level: while the first had staff with overall an education background related to their topic, most of the staff at the district level, particularly from DoNRE had a background in finance, administration or education (teachers).

64. These limitations, among government institutions and community members, have in many cases led to partial, short-term and sometimes unsustainable forms of adaptation, or “mal-adaptation”, which provides short-term fixes but in the longer term undermines resilience. In XC, for example, communities have started adapting by shifting from rainy season rice production to fishing and natural resources extraction in the wet season, and to irrigated rice cultivation around permanent water bodies in the dry season. Expansion of irrigated agriculture has in turn exacerbated vulnerability to droughts and increased soil salinity problems. Irrigated rice cultivation has affected fisheries by converting important fish habitat and by reducing water levels in permanent water bodies. The expansion of irrigation infrastructure has also affected natural water flows and fish migrations and has reduced the available dry season pasture for livestock. These local efforts to adapt, which may prove effective in the short-term, add to the initial climate impact on wetlands and undermine long term-climate resilience of these agro eco-systems.

65. **Inadequate human resources** in all government departments and sectors were also reported by respondents in the PPG consultations as a major impediment, for roles including those related to climate change and wetlands. Although technically responsible for a number of very demanding sectors (water resource management, Ramsar Convention and climate change, livestock, fisheries, irrigation), provincial and district offices are often relatively understaffed (especially at the district level) and tend to provide technical oversight more than on-the-ground management. Understaffing was reported to be around 50% to 130%. This is compensated by the hiring of low level, junior volunteers who work for free to get work experience. The main issue is that in some particularly understaffed sectors these volunteers end up occupying a proper position without any background or skills. This understaffing arises primarily from a lack of investment in the overall development of human resources, and specifically in the area of sustainable development.

Barrier 3: Long term CC adaptation (CCA) planning is sector specific, general, not yet translated or integrated into local planning and is not informed by tested and cost-effective CCA measures

66. For the CCA and DRM measures necessary to field level to be sustained and scaled-up, it is necessary for them to be supported by an adequate planning framework at both local (district and provincial) and national levels, that recognises the complex cross-sector issues involved.

67. At present, national CCA planning tends to be rather theoretical, as there is **little tangible experience** to build on so far, as explained above. Planning and local and national levels is also hindered by the same kinds of **limitations of knowledge and understanding** that affect the development of specific CCA and DRM strategies, as described above. Long term CCA planning at the local level can only be effective when local stakeholders understand the complex and long term implications of CC and have been directly involved in designing and improving CCA measures or disaster management systems and activities. Even with this exposure there is a need to build capacities of local planners, stakeholders and community leaders for designing long term CCA and disaster management plans and for monitoring their implementation.

68. **Planning also tends to be sector specific**, with limited coordination between the different agencies responsible for wetlands and climate change. Wetland management and CCA are governed by numerous laws, regulations and planning instruments, as well as by different (and sometimes competing) departments and organizations. Problems in the past with coordination between key agencies for natural resource governance, such as MAF, WREA and NLMA, have to a certain extent been resolved with the creation of MONRE; the departments and divisions responsible for conservation, wetlands issues and

climate change are now located within the same ministry. Important other areas where interinstitutional coordination remains a priority include irrigation, agriculture and livestock, and fisheries, which remain with MAF; and planning and investment, which is under the remit of the MPI.

69. Local stakeholders in particular emphasize **limited coordination** as a problem, both vertically and horizontally, despite the terms of reference of individual institutions being generally clear (except for some specific topics e.g. fish conservation or land use); indeed, the clearness of the definition of institutional ToRs may act against coordination as it may act as a disincentive for institutions to go beyond what they see as their individual remits (by, for example, MAF addressing adaptation issues – a MONRE concern – in its areas of focus on agriculture, irrigation, livestock and fisheries). These local stakeholders sometimes perceive that ministries at local level do not work together and seem at times to be in a competition for funds, rather than implementing projects in a coordinated manner. Similar dividing lines occur between different sectors within the same ministries, which may have little motivation to work spontaneously together if they are not obliged to; for cross-cutting issues such as wetlands management or CC, this constitutes a clear limitation.

70. In this sense, cross-sectoral committees such as the Ramsar Provincial Committees or the Natural Disaster Management Committees play key roles in developing multi-sector cooperation. Nevertheless, these committees are still very high level and more oriented toward reporting and sharing information than on-the-ground management. These committees still lack a technical arm, such as a clear district or community level subcommittee with a more operational ToR which would improve the actual work in common between ministries and sectors at site level. The Xe Champhone Ramsar site officially has a Ramsar District Implementation Team, which has not been clearly explained or identified by the participants in the field (including those supposed to be part of the District Implementation Team according to the decree).

71. **Inadequate access to financial and operational resources** is a major underlying cause of the other capacity deficiencies reported. Even if plans are developed, budget will still be lacking from the higher levels to validate and support them. Equipment is also a strong limitation for capacity improvement since most of the activities related to the management of wetlands and CC adaptation require specific material such as efficient weather station or weather data monitoring, GPS to map zoning or flood-prone areas, computers, etc. Village funds exist in some villages but still not the majority and are used more to support emergencies (school fees, buying food, repairing a house) than to long-term investments such as those related to CCA.

*c) **Additional reasoning (added value of the LDCF financing)***

72. As shown in Section 1.1.1c) above, the project will build upon a substantial and diverse baseline of institutional investments by Government and development partners. The additional value of LDCF funding is demonstrated in Table 1.

Table 1. Additional reasoning of LDCF funding

Baseline investments	Business as Usual Scenario	LDCF additionality	LDCF scenario
Outcome 1: Improved understanding of CC impacts and risks, enhancing capacities of communities, local and central administrations to design, prioritise and implement CCA and disaster management measures in XC and BKN wetlands.			
<p>Initial baseline case study by MRC/CCAI of the Xe Champhone and Siphandone wetlands' climate vulnerabilities, providing initial site and eco-system specific information and a partial and preliminary vulnerability assessment methodology for wetlands.</p> <p>Ramsar fact sheets on the target wetlands, and IUCN/MWD baseline reports provide information on population, livelihoods and biodiversity Sector specific assessment in 3 out of 45 villages in XC by MRC/CCAI.</p>	<ul style="list-style-type: none"> - Government and local stakeholders will have some awareness of wetland value for food security, income generation and agricultural productivity, but not of less tangible services such as flood control, water storage, etc. - A solid base of meteorological data and CC predictions exists, but awareness will continue to be limited among decision-makers at all levels (Government and communities) regarding the concepts, nature, significance and implications of climate change and associate risk, at national and site-specific levels - Understanding of measures to reduce climate risk will continue to focus predominantly on infrastructural solutions and irrigation, with significant potential for maladaptation 	<p>Additional LDCF support will focus on:</p> <ul style="list-style-type: none"> - Supporting the generation, especially at community level in the target sites, of additional information on CC vulnerability that will permit the formulation of corresponding resilience strategies - Bringing together disparate sources of information (on e.g. climate, ecology, livelihoods, productive sectors) to permit an integrated appreciation of the nature and implications of climate change and the potential for wetland-related adaptation/resilience strategies. 	<p>CCA strategies are guided by solid and integrated understandings of the climatic, ecological, social and productive factors on which their viability and sustainability depend.</p>
Outcome 2. Efficient and cost-effective adaptation measures in place to reduce the impact of CC and natural disasters on wetlands eco-systems and/or local livelihoods.			
<p>Management plan development in BKN, and soon for XC. IUCN support to revision and demarcation of XC Ramsar site boundaries, forest rehabilitation and eco-tourism strategy development; supporting to livelihood development in BKN.</p> <p>WCS/MMG support to Siamese Crocodile conservation, strengthening community-based protection, habitat management and livelihood support.</p> <p>MONRE seeking KFW support for BKN management plan implementation, and</p>	<ul style="list-style-type: none"> - Planning, coordination and governance in the target wetlands will continue to be piecemeal and ineffective in the face of complex and emerging pressures (including climate change) - Wetland management will continue to be dominated by partial, short-term and sometimes unsustainable practices, resulting in “mal-adaptation” that undermines longer term resilience. 	<p>Additional LDCF support will focus on:</p> <ul style="list-style-type: none"> - Strengthening and integrating planning, coordination and governance in order to support integrated resilience strategies - Promoting integrated and sustainable adaptation strategies, with an ecosystem-based approach wherever possible, that provide for the interests of different stakeholder groups, including women 	<p>CCA measures in the target wetlands are viable and sustainable, and recognize the interdependence and potential for synergies between wetland management and the resilience and livelihoods of local communities in the short, medium and long terms.</p>

Baseline investments	Business as Usual Scenario	LDCF additionality	LDCF scenario
<p>development and implementation of future plan in XC (demarcation, alternative livelihoods, invasive species removal, irrigation or flood protection infrastructure, etc.)</p> <p>WB support to IWRM Programme, including infrastructure rehabilitation and enhancement of the ecological value of important wetlands.</p> <p>MAF investments in developing rice production, concentrated in high potential areas including wetlands.</p> <p>MRC/CCAI pilots of on-farm adaptation activities, focused on impact of droughts and floods.</p>		<ul style="list-style-type: none"> - Supporting early warning systems with short, medium and long term perspectives of extreme weather events, climate variations and climatic trends 	
<p>Outcome 3. Efficient and cost-effective CC adaptation and disaster management measures in wetlands integrated in local and national planning processes</p>			
<p>Increasing recognition of need for CCA mainstreaming in plans.</p> <p>Contribution of NAPA (2009) and National Climate Change Strategy (2010) to awareness and capacity building.</p> <p>Development by ADB Capacity Enhancement for Coping with Climate Change project of specific action plans/ programmes for implementation of National Climate Change Strategy.</p> <p>FAO support to MAF in developing Plan for Disaster Risk Reduction in Agriculture.</p>	<ul style="list-style-type: none"> - Local and national planning processes will not make adequate provision for the implications of climate change or for the development and application of appropriate, effective and integrated responses. - Inadequate coordination between sector institutions will impede the application of integrated approaches to CC resilience and may undermine CCA measures. 	<ul style="list-style-type: none"> - Provision of methodological guidance and training to permit the incorporation of CCA strategies into planning processes - Promotion of inter-sector institutional coordination to permit the application of integrated approaches to CC resilience 	<p>The CCA and DRM measures to be developed and implemented at field level are sustained and scaled-up, due to the existence of an adequate planning framework at both local (district and provincial) and national levels, that recognises the complex cross-sector issues involved.</p>

1.1.2 FAO's comparative advantages

73. FAO has a long standing experience in working closely with communities to help them increase their agricultural productivity, while ensuring that the natural resources they depend on are not depleted. FAO brings in a wealth of experience in sustainable agriculture, food security and nutrition, livelihoods improvement, natural resources management, disaster risk reduction and rural development. This expertise allows FAO to support countries in transitioning to climate-smart agriculture and in increasing eco-system and livelihood resilience through sustainable natural resources management. FAO provides implementation support to projects designed specifically to address climate change adaptation, climate-related disaster risk management or a combination of adaptation and mitigation. This means that while these activities reduce existing adaptation deficits and lay a foundation for long term resilience, they will simultaneously enhance sustainable production increases and food security. FAO has developed a wide range of innovative, user-friendly data systems and tools for assessing climate impact and vulnerabilities and for planning adaptation practices. FAO furthermore has specific comparative advantages in the fisheries sector, having pioneered the Ecosystem Approach to Fisheries Management¹¹.

74. In Lao PDR, FAO has been engaged in the forestry, fisheries and biodiversity sectors since 1980. In 2007, FAO supported the development of a dedicated fisheries and aquaculture law introducing new principles of fisheries co-management. A number of projects have piloted and demonstrated integrated livestock, crop and fish production and the viability of semi-intensive fish production methods. The combination of experiences in the natural resources management sector and integrated agriculture will allow FAO to use past field level and capacity building experiences to work in a complex agro-ecological environment such as wetlands.

75. FAO, together with the World Food Programme is leading the Food Security and Nutrition Cluster of the Inter-Agency Standing Committee for Disaster Management. FAO conducted a nationwide Food Security Risk and Vulnerability Survey as part of the 2011 agricultural census. This information and experience will help conduct the more site specific vulnerability assessment to be undertaken by the project. FAO's experience in the implementation of post-disaster emergency response projects and its current assistance in developing the Disaster Management Plan for the agricultural sector in Lao PDR, demonstrates the in country expertise and mandate to work on climate and disaster risk reduction at both field and strategic levels.

1.1.3 Participants and other stakeholders

76. Please refer to detailed stakeholder analysis in Appendix 9.

Project formulation

77. In MONRE, the Department of Environmental Quality Promotion (focal point for the Ramsar Convention) was the lead government agency during project formulation and facilitated the national and sub-national consultations and studies undertaken during the PPG phase, including the design of project coordination and management mechanisms at different levels and across ministries. The Department of Disaster Management and Climate Change, Department of Water Resources, Department of Meteorology and Hydrology, Department of Forest Resources Management and the Lao National Mekong Committee Secretariat participated in stakeholder consultations, provided the necessary background information and data, and reviewed the project proposal.

78. In MAF, the National Agriculture and Forestry Research Institute (which implements the LDCF IRAS project "Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts"), the Department of Irrigation, the Department of Planning and the Department of Livestock and Fisheries contributed to project formulation by participating in stakeholder consultations, reviewing the final project proposal, and providing the necessary information and data to the project formulation team.

¹¹ <http://www.fao.org/fishery/topic/13261/en>

79. Provincial, district and village level stakeholders were critical to the project development process. The following local stakeholders, which were also involved in the development of the PIF, were consulted during the PPG phase: a) Provincial Ramsar Committees and corresponding District Implementation Teams (including provincial/district governors, provincial/district line agencies (including MONRE and MAF) and community representatives); b) Provincial and District Disaster Management Committees; c) River Basin Committees for the Sekong and Xe Bang Hieng Rivers; and d) Local Civil Society and Mass Organizations (e.g. Lao Women's Union).

80. Development partners, including IUCN, KFW, WCS, ADB, UNDP, WWF, WB, MRC and FAO, participated in stakeholder consultations and contributed to project design, in order to ensure the project built on past and on-going initiatives, promote coordination and collaboration (including co-financing) and identify opportunities for scaling up.

81. IUCN was an Executing Partner during project development and will also be so during implementation (as a member of the National Ramsar Committee, IUCN has been mandated by the government to assist with the development and implementation of management plans for the XC and BKN Ramsar sites).

Project implementation

Ministries

82. Previously, Government structures were characterised by overlapping roles and responsibilities between key agencies. In 2011, this system was reformed, with the creation of MONRE (along with the creation of 3 other new ministries).

1) Ministry of Natural Resources and the Environment (MoNRE):

83. MoNRE was created in 2011 as part of a reform process aimed at reducing overlaps of institutional roles and responsibilities (the respective responsibilities of MONRE and MAF are summarised in Table 2). MONRE has departments responsible for Planning and Cooperation, Land Management (DLM), Water Resources (DWR), Environment and Quality Promotion (DEQP), Pollution Control, Forestry Control and Management, Mining, Meteorology, and Disaster Management and Climate Change, as well as a Committee of Environment Evaluation and Monitoring, Natural Resources and Environment Institute, LNMC, and Natural Resources and Environment Information Centre.

Table 2. Responsibilities of MONRE and MAF

MONRE	MAF
- Water resources	- Production forests
- RBCs, incl. LNMC	- Agriculture & extension
- ESIA's	- Agribusiness
- Wetlands & Ramsar	- Irrigation
- Climate change, disasters & REDD	- Fisheries and Livestock
- Environmental monitoring & pollution	- Land & Forest Allocation (on agriculture land)
- Environmental policy	
- Forest management (incl. PAs)	
- Wildlife conservation	
- Land allocation, development & management	
- Geology & mining	

84. Under the reform process, MONRE's Department of Disaster Management and Climate Change and National Disaster Management Office took over responsibility for climate change and natural disasters, previously the responsibility of MAF. The Department of Meteorology also plays a key role in DM and CC through the provision, management, storage and dissemination of information related to weather and possibly climate change.

85. MoNRE is also the focal ministry for the implementation of the Ramsar Convention and the designation and management of Ramsar sites through the DEQP. DEQP is in charge of the secretariat for the Ramsar National Committee, and its head is also the national focal point for GEF. Other natural wetlands and rivers are under the responsibility of the DWR. LNMC plays a key role in government planning of the Mekong Basin, as a national government body for the MRC; it will coordinate the upcoming KfW-funded, “Sustainable management of the Beung Kiat Ngong Ramsar site” in close partnership with DEQP. DEQP also plays a key role in environmental awareness and dissemination of environment-related laws and guidelines. The DLM is also influential in wetlands management and adaptation-related projects, through its responsibility for land use planning (LUP) in non-agricultural land, and the granting of land use permits.

2) Ministry of Agriculture and Forestry (MAF)

86. Following the 2011 restructuring, the principal responsibilities of MAF are agriculture and production forestry¹². MAF is mandated to carry out land and forest allocation (LFA), and also issues agribusiness certificates. MAF’s continued role in managing agriculture and agribusiness (including irrigation), as well as fisheries, means it is still influential in wetlands management (especially as so many wetlands are located outside of protected areas) and on Climate Change adaptation of local livelihoods (through possible adaptation measures on irrigation, livestock and fisheries, and crops production).

87. MAF also hosts the National Agriculture and Forestry Research institute (NAFRI), which is mandated to undertake integrated agriculture, forestry and fisheries research in order to provide technical information, norms and results which help to formulate strategy in accordance with the government policies. NAFRI has four main functions including: carrying out adaptive research, developing methods, tools and information packages, providing policy feedback, and coordinating and managing research (seed/variety improvement etc). NAFRI includes several departments relevant to agriculture adaptation such as the Rice Research Centre (RRC), Forestry Research Centre (FRC), Livestock Research Centre (LRC), Living Aquatic Resources Research Centre (LARReC) and Conservation Agriculture Centre (CAC) and the Agriculture Land Research Centre (ALRC). NAFRI led the UNDP IRAS project in close coordination with the relevant sectors at provincial and district levels.

88. There are a number of other agencies of relevance to natural resource governance, DM and CC. Despite being ostensibly concerned with other policy areas, these agencies remain influential in decisions about natural resources. These include:

3) Ministry of Labour and Social Welfare

89. This Ministry still plays a very strong role in DRM at provincial and district level: prior to the 2011 restructuring, it had responsibility for disaster management, and social welfare and was the focal office for disaster relief and management efforts, and although these responsibilities have been transferred to MONRE, the handover has not been completed.

4) The Ministry of Planning and Investment (MPI)

90. MPI is the lead agency for the promotion of investment, and is responsible for coordinating the investment approval process at the national, provincial and district levels: it therefore plays an important coordinating role in approving investments in the natural resource sector, such as plantations and infrastructure, with potential implications for CCA.

5) The Ministry of Energy and Mines (MEM)

91. MEM is responsible for mining, electricity generation and other energy resource policy making, administrative and technical management, surveying and associated environmental and social protection measures. As such, MEM plays an important role in the development and management of hydropower.

¹² Previously, MAF was the main agency responsible for the management of natural resources, including agricultural land allocation and management, forestry and forest conservation, fisheries, wildlife conservation and protected areas. It was also mandated under the Land Law to manage wetland areas.

Lao government “mass organizations”

92. Multi-stakeholder participation in Lao PDR is largely achieved through Civil Society Organisations (CSOs) rather than private Non-Governmental Organisations (NGOs). Key mass organizations/CSOs include the Lao Front for National Construction (also responsible for ethnic affairs) and the Lao Women’s Union (LWU). These organizations are extended to the local level, with branches and representatives at provincial, district and village levels. The LWU is particularly active, well organized and represented at all levels: its members often take part in Ramsar related activities and are usually suggested as members for committees and working groups by other provincial, district and village authorities. Its status has ministerial equivalence at the central level. Its relevance to the project stems from its role in improving and increasing women’s role in decision making and supporting their advancement, as well as promoting gender equality in family and society.

Multi-sector cooperation

93. There is a growing trend towards multi-sector cooperation between different government agencies and other stakeholders. A number of multi-sector committees are involved in wetlands policy and management, as well as climate change. These are:

1) National Committee for Wetland Management and Ramsar Convention:

94. The duties of this committee¹³ are to:

- Provide guidance on the implementation of management in the designated Ramsar sites (BKN and XC);
- Provide guidance on preparation and proposal of new wetlands to UNESCO/Ramsar Secretariat as Ramsar sites;
- Provide guidance and comment on plans;
- Consider development of a technical organization and secretariat;
- Provide guidance for coordination and cooperation with international actors/organizations;
- Perform other duties and jurisdictions as assigned by the appropriate leading government office.

95. The Committee is high-level, chaired by the Vice-Prime Minister and President of the National Environment Committee, and has broad membership including MAF, MoNRE, MIC, Ministry of Education, Ministry of Justice, Ministry of Public Works and Transport, Lao National Tourism Authority, UNESCO Committee Secretariat, PONREs and MONRE. Notable absences include MPI, MEM and Water Supply. In addition, the two provinces with Ramsar sites, Champasak and Savannakhet, have established provincial level Ramsar Committees, following the same model.

2) The National Disaster Committee:

96. This is a structure which is repeated at the provincial and district levels. It is focused on investigating and coordinating relief, although it is also mandated to raise public awareness in order to prevent disasters. Its membership comprises MLSW, MAF, the Ministry of Foreign Affairs, the Ministry of Defence, the Ministry of the Interior, the Ministry of Finance, the Ministry of Communications, Post and Telecommunications, the Ministry of Industry and Commerce, the Ministry of Health, the Ministry of Education and Lao Red Cross.

97. The NDC is complemented by Provincial committees and, according to decree, by district committees and village disaster protection units (in practice, these district level and village level structures are not operational in the project area).

3) The National Steering Committee on Climate Change:

98. Established in 2008, the NSCCC consisted of eleven member agencies that oversaw the development of the National Strategy on Climate Change (NSCC), as well as strengthening of disaster management and the National Disaster Management Office. It was chaired by the Deputy Prime Minister, with deputy chairs from MAF, MPI and formerly WREA. The NSCCC is to be disbanded, as the Strategy is complete. Instead, climate change discussions at the high level will now take place in

¹³ Decree on the Appointment of National Committee for Wetland Management of the Ramsar Convention in Lao PDR

the National Environment Committee (NEC), which meets once a year. The REDD Taskforce will also now report to the NEC¹⁴.

Local government

99. There are two main aspects characterizing the governance of natural resources, including wetlands, and climate change at the local level in Lao PDR. One is the extension of the same system seen at the national level to the provinces and districts, incorporating the same agencies and implementation of same laws and regulations. The other comprises particular actors and regimes which only occur below the district level.

100. Important agencies for the governance of natural resources function through their networks at the provincial and district levels, such as MoNRE and MAF.

1) PoNRE and DoNRE:

101. PoNRE and DoNRE are responsible for implementing national strategies and planning from the central MoNRE, at provincial and district level respectively. They develop their own technical plans, which have to be approved by PoNRE and central level, from where funds are allocated.

102. Since MoNRE is the main government agency for the CAWA project, PoNRE and DoNRE will be critical in implementation of and authorization for the project at local level; they could act as local secretariats for the project and support the implementing agencies in organizing activities. PoNRE and DoNRE staff will also be targets for project implementation since they play a key role in Ramsar sites and natural resource management in the project areas. PoNRE and DoNRE also play key roles in early warning of disasters and weather monitoring. DoNRE are particularly relevant to work with considering their role in developing plans at very local levels and interacting regularly with local communities (e.g. through village clusters). The role of PoNRE in the project will be more related to coordination and validation role in the project by revising/approving the component related to NR/Ramsar of plans developed at District level.

103. The main impact of the project on PoNRE and DoNRE will be to enhance their capacities for planning, implementing and monitoring CC adaptation activities in wetlands. This will result in long-term sustainability of the project and the replicability and dissemination in other parts of the districts/provinces. Through improved coordination with other relevant ministries, the project will also improve long term coordination mechanisms between PoNRE/DoNRE and the Ministry of Agriculture. The project will strengthen/build the capacities of the upcoming CC DRM sector.

104. The PoNRE and DoNRE sector offices that are relevant to the project are as follows¹⁵:

- The ***water sector***, responsible at this level for the management of natural water resources such as rivers and streams, as well as wetlands (water management in irrigation systems and the management of artificial wetlands are the responsibility of PAFO); implementation of Ramsar Convention commitments (functioning as secretariat or district-level focal organization for the Ramsar Provincial Committee); and monitoring and implementing plans related to fisheries (capture fisheries and aquaculture) and the collection of aquatic products.
- The ***forest sector***, which is in charge of activities related to conservation forests and protection forests, and to some extent to NTFP collection. Their role is important in BKN since they are responsible for the management of the National Protected Areas, including the Xe Pian National Protected Area overlapping most of the Ramsar site. They have limited activity in XC due to the lack of conservation forest in the two districts there (except some in Xonabuly but outside the project area). The PoNRE/DoNRE forest sector sometimes coordinates with PAFO sectors (forestry sector) on harvesting forest products and play a key role in creating inventory of resources and monitoring the harvest.
- The ***environment sector***, which is mainly in charge of activities related to Environmental Impact Assessment (EIA), pollution monitoring and environmental awareness issues. Their role is important at district level in the two Ramsar sites where district officials are involved in

¹⁴ Pers. comm. with consultant attached to Department of Forestry.

¹⁵ At district level in the target areas, water and forestry are merged under a single sector

awareness activities (World Wetland Days, training on Ramsar Convention) along with the water sector.

- The **meteorology sector**, which works closely with the central level and disseminates weather bulletin and/or warning bulletins from the provinces to the districts to the villages. They also share information with other relevant sectors on request and to the Disaster Management Committee when needed.
- The **land management/control sector**, which is in charge of the management of all land outside agricultural areas. They develop Land Use Plans (LUP) and survey village boundaries and land use. They are therefore important in natural resources governance at the local level. In the case of XC, provincial officials considered this sector one of the most important actors in management of the wetlands.
- The **CC DRM sector**, which is being handed over from the Ministry of Social Welfare to PoNRE (completed in SVK, to be done next year in CPS) following the handover carried out at central level in 2011-2012. At district level this responsibility falls under the Meteorology sector (the latter having been handed over from DAFO recently). The mandate of this sector is not yet clearly defined, between being a secretariat for the DM committee at provincial level and merged with hydrology/weather condition monitoring at district level.
- The **information sector**, which is in charge of collecting information from the 10 other sectors in the PoNRE (information from reports, meetings, workshops) and then for disseminating the information to the public through the website or local media (radio and TV). It therefore could act as an important dissemination stakeholder for information related to the project implementation.

2) PAFO and DAFO

105. Provincial and District Agriculture and Forestry Offices (PAFO and DAFO) are responsible for agriculture, irrigation, forests and fisheries at the local level, as well as being the key players in LFA, making them influential in the management of wetlands and on implementing adaptation measures. They are responsible for the achievement of production targets prepared by MAF, and for crop/livestock losses in the event of natural disasters.

106. Since MAF is in charge of agriculture, irrigation, livestock and fisheries, PAFOs and DAFOs will be critical for implementation of the project at local level. They could act as important members of project steering committees and support the implementing agencies in organizing activities. DAFOs are particularly relevant to work with, considering their role in developing plans at very local levels and interacting regularly with local communities (e.g. through the village clusters). PAFO will have more of a coordination/validation role in the project by revising/approving the component related to agriculture, irrigation, livestock and fisheries of plans developed at District level. The PAFO and DAFO of SVK and CPS have been involved in the IRAS project and are already familiar with CCA concepts.

107. The main impact of the project on PAFOs and DAFOs will be to enhance their capacities for planning, implementing and monitoring of CCA activities. This will result in the long term sustainability of the project and the replicability and dissemination in other part of the districts/provinces. Through improved coordination with other relevant ministries, the project will also improve long term coordination mechanisms between the PAFO and DAFO and the MoNRE.

108. Key sector offices at PAFO and DAFO levels, of relevance to the project, are as follows:

- The **irrigation sector**, in charge of surveying and managing infrastructure for irrigation/water control, developing effective and sustainable irrigation, planning and managing irrigation projects and coordinating the use of large irrigation/water control infrastructure¹⁶. They have a

¹⁶ According to the Irrigation Law, the size of the irrigation project, or the irrigated area, determines which level of government – central/provincial or district – will take the lead. The irrigation department at the central level with support from provincial government oversees projects over 1000ha, while smaller projects (100-1000ha) are handled by provincial

role in field monitoring of the existing infrastructure, as well as in ensuring that infrastructure is being maintained by villagers. The irrigation sector's mandate is also related to Disaster Risk Management but with more of a focus on emergency response (e.g. providing information on when to move pumps and other equipment to protect them from floods, providing empty rice bags that can be used to build dykes, proposing relocation of pumps if a drought is happening, etc.). They plan according to the information they receive from the Meteorology sector in the provincial capital or the department in Vientiane.

- The *livestock and fisheries sectors* are in charge of collecting information and statistics of fisheries and aquaculture, coordinating the import and export of wild fish, farmed fish, frog and snails. They sector also collects information and statistics on livestock and family farming and plan for food production for livestock, as well as coordinating vaccination campaigns and disease monitoring. The role of this sector in relation to DRM is mainly on disaster response related to livestock, by providing information to local communities to protect the livestock and also after floods to support vaccination campaigns and advise on cattle health.
- The *agriculture and crop sectors* are in charge of food security, plant quarantine, developing clean/organic agriculture, controlling the import of chemical fertilizer and seeds according to the regulation, supporting technical capacity for local farmers on seed plantation, fertilizer use, training on law on agriculture and planning for food production. They provide the plans to the extension sectors, who implement them. The agriculture sector also decides the yield per hectare in each area. The sector is also in charge of documenting the impact of disasters on crop production, and reporting this to the PAFO. The sector in PAFO also warns the District level if they receive information from the Meteorology sector that indicates a potential upcoming impact on crops. One staff member of each agriculture/crop sector is a member of the Provincial DRM committee. In CPS province, activities related to changing crop varieties have been handed over to the SAFREC.
- The *land management sector* (which dates only from 2014) is responsible for Land Use Planning (LUP) on agricultural land and in production forests. The mandate is still unclear but includes soil analysis, management of irrigation in agriculture land, and crop allocation. Their role will be particularly important in XC where most of the land is classified as agricultural. LUP in BKN will be under the Land Management sector of the PoNRE.
- The *extension sector* is in charge of providing technical advice on livestock management, crop production, forest management and agriculture in general. The mandate also includes support to setting up farmers' groups and training community members. The extension sector works with District and Province sectors under PAFO coordination¹⁷. Workplans and topics for the provision of training and technical advice can come either from the extension sector itself or on request from other sectors or projects (livestock, fisheries and agriculture sectors also sometimes inform which sector needs training). The extension sector has a training center in each district.

3) Provincial Department of Planning and Investment (PoPI) and District Office of Planning and Investment (DOoPI)

109. As with MPI at the national level, provincial and district Investment Promotion and Management Offices are influential, despite lacking a direct role in natural resource management. These offices can approve certain sizes of investments at the provincial and district levels, and are responsible for ensuring the investment and concession regulations are properly implemented and monitored. Provincial planning and investment departments also play an important role in promoting and selecting investments for the province.

government together with district officials and local communities. 10-100ha projects are handled by district officials and very small projects, under 10ha, are handed over to the village.

¹⁷ Sometimes it can work under the PONRE on the sustainable use of natural resources and NTFP collection, but this is rare

Multi-sector cooperation at Province level

110. In addition to the local replication of ministries, multi-sector committees are also often recreated at the provincial and district levels.

1) Provincial Ramsar Committees

111. Mirroring the national level, both provinces with a Ramsar site have set up a Provincial Ramsar Committee (PRC). The PRC in Champassak province is chaired by Vice-Governor. Its members include: the Provincial Tourism Office; Provincial Education Office; Provincial Land Management Office; Provincial Health Office; Provincial Water Resources and Environment Office; Provincial Agriculture and Forestry Office; Provincial Transport and Communications Office; and the District Governor for the Ramsar site. The Champassak committee meets every three months, and can call ad-hoc meetings if necessary. It mainly addresses issues in BKN, but is also proactively preparing a provincial wetlands strategy. The Savannakhet PRC is less well-established and still lacks resources, although a secretariat was created in August 2011. The Savannakhet Committee's membership is similar to that in Champassak. In addition, Savannakhet Province created a Ramsar Site Management field work team, made up of Champhone District staff from key sectors (such as DoNRE and DAFO) as well as women's and village representatives.

2) Provincial Disaster Management Committees (DMC)

112. The DMC at the national level has been replicated at the provincial and district levels. These maintain the same membership and carry out similar work (assessing and investigating disasters; determining needs for compensation, and raising funds); these committees are one of the only forms of multi-sector cooperation at the district level.

113. Their composition (similar at province and district levels), still gives a very strong role to DLSW, but since this mandate is being transferred to PoNRE it is likely that this will be revised soon. The Provincial DMCs include the Provincial Vice Governor, DLSW, PONRE, PAFO, the Departments of Public Works, Public Health, Education & Sport, and the District governor concerned. The different members have the following mandates:

- DLSW is in charge of collecting information on the number of victims, impacted households and impacts/damage/losses, in order to provide urgent aid, drinking water; food etc.
- PAFO is in charge of surveying impacts related to agricultural loss (area flooded, crops destroyed, livestock missing etc.) and for developing response measures such as providing rice seed and support to re-cultivation.
- PoNRE is in charge of providing information related to weather forecasting and flood warning.
- The Department of Public Works is in charge of the maintenance of roads and communication infrastructure;
- The Education Department is in charge of repairing and rebuilding damaged schools.

114. Concerned districts facilitate the work of the DMC and work together with the line agencies concerned to ensure quick rehabilitation of impacted sites. All expenses during the disaster event are covered by line agencies themselves. Meetings are chaired by the Vice Provincial Governor, reporting to the central government. In the near future, the Natural Disaster Management sector will be established in PONRE (this has been done in SVK and is coming soon in CPS).

Village/Community level organizations

115. Some actors and regimes for the management of natural resources, including wetlands, only occur at the village or community level. As structures and processes for on-the-ground management, these can be very influential.

1) Khumbans, Khet

116. Village clusters (*khet*) or "development clusters" (*khumban*) are groupings of villages, designed to promote development and local governance. The *khumban* is composed of a head of cluster, designated by the district governor, 10 village heads (*Nai ban*) and two representatives of each village council of 10 villages. This governance body is very close to the district level and acts as an interface between district and village levels and is mainly an information sharing/coordination platform with limited decision making level. The clusters meet regularly and can also have enforcement (militia)

arms. There are three clusters concerned with the Ramsar site in Beung Kiat Ngong and 10 clusters for the Xe Champhone Ramsar site (no cluster gathers all the villages of one Ramsar site).

2) Village councils

117. Village councils are headed by a village chief (*Nai ban*) designated by the villagers and are composed of 15 people designated by village chief. The village councils meet as needed and manage village affairs and are responsible for certain community resources, such as village protection or production forests. Village leaders also play an important role in managing small-scale irrigation, enforcing fishing rules and allocating land (even where no land-use planning or titling has been carried out).

3) Villager groups

118. Provincial sectors of irrigation mentioned the water user group as a village body in charge for maintenance and monitoring irrigation activities and equipment. Nevertheless non-water user groups have also been reported for the project area. Ban Houmuang in XC Ramsar site has a fisheries group, following the installation of fish conservation zones in their village through a WWF project. Ban Kiat Ngong village has a malva nut collecting group, in charge of monitoring the harvest of the malva nut in the village. This group is currently discussing the expansion of its mandate to all NTFPs. Several villages have village fund mechanisms to support investments or as a direct financial support for village households, which can help to increase household resilience to natural disasters by providing loans to compensate for their loss.

Reporting mechanisms/information sharing mechanisms

119. Reporting mechanisms between different levels of stakeholder follow a pre-established, somewhat fixed pattern. Community groups meet as often as village matters require. Village clusters have one meeting per month during dry season only (head of villages are too busy during the wet season with rice cultivation). These meetings occasionally lead to a short report as minutes of meeting but it is not often the case.

120. District and provincial level organizations/departments have regular internal meetings, at least once a month, and produce a report to the higher level (provincial or national). Every three months, the provincial level board goes to Vientiane to meet with all ministries for quarterly meeting progress reports. These reports are usually short (15 minutes presentation per provincial ministry) and supported by short documents. Horizontal information sharing mechanisms (province-to-province or among districts) were not reported. Information is very briefly shared during the sector meeting.

1.1.4 Lessons learned from past and related work, including evaluations

121. Review of the IUCN Mekong Water Dialogue has highlighted the importance of realism regarding sustainability and institutionalisation of project results, given limitations on Government budgets, staff numbers and capacities. There may be a need for ongoing donor support especially when dealing with issues related to global common goods and services. Continuous capacity building and development support on the ground at selected sites is important. Capacity development and outreach must be continued to provide a sustainable path for the future. Related to this, more effort needs to be focused on developing local sustainable funding through e.g. Payment for Environmental Service (PES) schemes as well as biodiversity offsets, and on developing micro-credit facilities.

122. The review also emphasised the application of nature-based solutions, which are a central element in the present project; and in the importance of a strong gender focus, especially in projects dealing with governance issues and local livelihoods. The review considered as a good example the vulnerability assessment of Beung Kiat Ngong, in which different vulnerabilities of women and men to the same climate risks were considered, and the resilience-building interventions identified were examined from the different perspectives of their likely effects for both women and men's resilience-building.

1.1.5 Links to national development goals, strategies, plans, policy and legislation, LDCF and FAO's Strategic Objectives

Alignment with national development goals and policies

123. The project is aligned with the following policy and planning instruments:

- The aim of the 7th National Social and Economic Development Plan (2011-2015), to “ensure the sustainability of development by emphasizing economic development with cultural and social progress, preserving natural resources and protecting the environment”¹⁸, by virtue of its focus on integrating the sustainable management of the target wetlands with the satisfaction of the livelihood, resilience and development needs of the local population;
- The goal of the National Forestry Strategy to 2020 (FS2020) to regenerate up to 6 million ha of forest and plant up to 500,000 ha of tree plantations, through the inclusion in the project of reforestation activities, in watersheds and river banks, and, through its focus on the sustainable management of wetlands and associated ecosystems, the goal of ensuring a sustainable flow of forest products for domestic consumption and to generate household income;
- The proposal of the National Biodiversity Strategy to 2020 & Action Plan to 2010 (NBSAP), that “[w]ater resources such as ground water, lakes, rivers, streams and wetlands should remain clean and abundant, and where necessary, be improved, through their protection, conservation and sustainable use”, and objective 11 of the NBSAP, which is to manage water resources for socioeconomic development, including the sub-objective of protecting and maintaining wetlands.
- The proposal of the National Climate Change Strategy (2010) of, in the water sector, the integration of climate risks into planning processes, the development of reliable early warning systems to reduce disaster impacts, and the downscaling of climate and hydrological models to the river basin scale.
- The nine policy priorities under the National Water Resources Policy: 1) Institutional strengthening and coordination; 2) Legislation, plans and their implementation; 3) River basin and sub basin water resource planning; 4) Data collection and analysis; 5) Water allocation ; 6) Protection of water quality and eco-systems; 7) Management of floods, droughts and climate change; 8) Financial aspects of water resource management; 9) Awareness, participation and capacity building.
- The priority programmes and activities of the National Water Resource Strategy and Action Plan (2011 to 2015) particularly Programme 7, Activities 7.1, 7.2 and 7.3 “Manage Water Resources to Mitigate Impacts of Floods, Droughts and Climate Change”;
- The prioritisation in the National Adaptation Programme of Action (NAPA, 2009) of awareness raising on water and water resource management, mapping of flood-prone areas, establishment of early warning systems for flood-prone areas, strengthening of institutional and human resource capacities related to water and water resources management, promotion of secondary professions in order to improve the livelihoods of farmers affected by natural disasters induced by climate change, conservation and development of major watersheds, repair/rehabilitation of infrastructure and utilities damaged by floods in agricultural areas, land use planning in hazard prone areas, strengthening of technical capacities of local agricultural officers in natural hazard prone areas, establishment and strengthening of farmers groups in natural hazard prone areas and development of appropriate bank erosion protection systems for agricultural land in flood prone areas.

Alignment with GEF focal area and/or LDCF/SCCF strategies

124. The PIF for this project was approved under GEF5, and its alignment with GEF5 Outcomes is as follows:

- Through Component 1, project activities are aligned with CCA-2 Outcome 2.1 ‘Increased knowledge and understanding of climate variability and change-induced threats at country level and in targeted vulnerable areas’.

¹⁸ Ministry of Planning and Investment, 2010

- Through Component 2, the project activities are aligned to CCA-1 Outcome 1.2 ‘Reduced vulnerability to climate change in development sectors’ and Outcome 1.3 ‘Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas’.
- Through Component 3, the project activities are aligned to CCA-1 Outcome 1.1 ‘Mainstreamed adaptation in broader development frameworks at country level and in targeted vulnerable areas’.

125. The project will however use the GEF6 Tracking Tool for climate change adaptation, and it is aligned with GEF6 objectives and outcomes is shown in

- **Objective 1:** Reduce the vulnerability of people, livelihoods, physical assets and natural systems to the adverse effects of climate change
 - **Outcome 1.1:** Vulnerability of physical assets and natural systems reduced
 - **Outcome 1.2:** Livelihoods and sources of income of vulnerable populations diversified and strengthened
 - **Outcome 1.3:** Climate-resilient technologies and practices adopted and scaled up
- **Objective 2:** Strengthen institutional and technical capacities for effective climate change adaptation
 - **Outcome 2.1:** Increased awareness of climate change impacts, vulnerability and adaptation
 - **Outcome 2.2:** Access to improved climate information and early-warning systems enhanced at regional, national, sub-national and local levels
 - **Outcome 2.3:** Institutional and technical capacities and human skills strengthened to identify, prioritize, implement, monitor and evaluate adaptation strategies and measures
- **Objective 3:** Integrate climate change adaptation into relevant policies, plans and associated processes
 - **Outcome 3.1:** Institutional arrangements to lead, coordinate and support the integration of climate change adaptation into relevant policies, plans and associated processes established and strengthened
 - **Outcome 3.2:** Policies, plans and associated processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures

126. Consistent with the Conference of Parties (COP-9), the proposed project will implement priority interventions addressed in Lao PDR’s NAPA, therefore satisfying criteria outlined in UNFCCC Decision 7/CP.7 and GEF/C.28/18. It will address urgent and immediate climate change adaptation needs and leverage additional co-financing resources from bilateral and other multilateral sources. The Government requests the LDCF to finance the additional costs of achieving sustainable development imposed on Lao PDR by the impacts of climate change. It is country-driven, cost-effective, and focused on immediate needs of vulnerable people, especially women, living in an around wetlands areas which are particularly prone to increasing incidence of floods and droughts. The project focus is therefore aligned with the scope of expected interventions as articulated in the LDCF programming paper and decision 5/CP.9. As climate impacts fall disproportionately on the poor, the project recognizes the link between adaptation and poverty reduction (GEF/C.28/18, 1(b), 29).

Alignment with FAO Strategic Framework and Objectives

127. The project will be aligned with the following elements of FAO’s strategic framework and objectives:

- Strategic Objective 5: Increase the resilience of livelihoods to threats and crises
- Organizational Outcome 4: Countries and regions affected by disasters and crises prepare for, and manage effective responses
- Country Programming Framework Outcome 4: Enhanced capacity of Government and communities to adapt to and mitigate climate change and reduce natural disaster vulnerabilities related to agriculture, forestry and fisheries

SECTION 2 – PROJECT FRAMEWORK AND EXPECTED RESULTS

2.1 PROJECT STRATEGY

128. The project’s strategy for reducing the climate change vulnerability of communities and wetlands is centred on the concept of “Ecosystem-Based Adaptation” (EBA). This strategy involves empowering local communities to manage the wetlands in such a way as to maintain their abilities to buffer the impacts of climate change (both through acting as a physical buffer, for example by absorbing and smoothing high and low river flows, and through the provision of diversified and resilient livelihood support options).

2.2 PROJECT OBJECTIVES, OUTCOMES AND OUTPUTS

Project objective

129. The objective of the project is to reduce climate change (CC) vulnerability of communities and the fragile wetland eco-systems upon which they depend.

130. To achieve this objective, the project has been structured into three components as described below.

Component 1: Improved understanding of CC impacts and risks in XC and BKN wetlands

Outcome 1: Improved understanding of CC impacts and risks, enhancing capacities of communities, local and central administrations to design, prioritise and implement CC adaptation and disaster management measures in the two target wetlands.

131. As a result of the outputs to be delivered under this outcome, it is expected that by project end 70% of members of PONRE, DONRE, PAFO and DAFO staff covering the target wetlands (28 out of 40) and 70% of members of community organisations (both men and women) in the target villages will be aware of CC impacts and risks

132. LDCF investment will enable stakeholders to conduct comprehensive and participatory climate vulnerability and disaster risk assessments (VDRA) in the 2 targeted wetlands sites. These detailed assessments will cover the vulnerabilities of local people and their livelihoods to climate change impacts, and also the impacts of climate change on wetland ecosystems on which they depend, and on the multiple goods and services that the local populations receive from the wetlands.

133. An initial compilation of available data, including the information generated by baseline projects, hydro-meteorological data collected by MONRE's Meteorology and Hydrology Department and local agricultural and disaster related statistics, will be starting point for these detailed vulnerability assessments. The active involvement of local or community stakeholders in the vulnerability assessment will facilitate the integration of local knowledge and will ensure that proposed adaptation and risk reduction measures build on traditional coping mechanisms and resource management practices.

134. Representation of different groups (e.g. women, poorest, ethnic groups) in training and assessment activities will ensure the identification of group specific CC risks, vulnerabilities and adaptation needs. Initial vulnerability assessments will help design appropriate adaptation and disaster management measures and will include initial adaptation plans for the 2 sites and all concerned villages.

Output 1.1. Pilot methodological tool for participatory CC vulnerability and disaster risk assessment (VDRA) in wetlands developed.

135. The participatory VDRA tool to be developed and used by the project will constitute a pilot with potential for replication throughout Lao PDR, as a support to the country’s initiatives to respond to climate change and disaster risks within the framework of the National Adaptation Plan of Action (NAPA – see section 1.1.5). During PY1 a review will be carried out of existing baseline surveys and

initial vulnerability assessments and baseline studies conducted by the MRC, IUCN, and FAO¹⁹, on which this tool will build, following which the tool will be developed and then applied and progressively validated and adjusted during PY2 and 3.

136. . The VDRA tool to be developed under this output will be complemented by a participatory CC adaptation and disaster management planning and M&E tool, to be developed under Outcome 3. It will draw on FAO's extensive experience in incorporating climate change considerations into agricultural investment programmes²⁰, including the rapid assessments of impacts of climate variability and climate change and building ecosystem approaches for climate-smart agriculture; as well as tools and approaches developed and applied for other CC vulnerability contexts, such as the community planning tools of the Coastal Resilience network (www.coastalresilience.org). The tool will also be designed in such a way as to explicitly factor in levels of social, economic and cultural dependence on the target ecosystems and natural resources for food, income, employment or recreation; they will also factor in future change, including projected human impacts from climate change and other more local impacts, but also social, demographic and economic change²¹.

Output 1.2. Training programme on climate change/CC adaptation (CCA) and vulnerability and disaster risk assessment (VDRA) in wetlands.

137. The format of the training to be provided through the project will take into account the observations of respondents during the PPG CBNA, reported in paragraph 61 above, which will be further developed through processes of pre-selection and baseline assessment of candidates for training during PY1. Training, which will principally be carried out during PY2, will focus on dynamic approaches to learning, including peer-to-peer dialogue, on-the-job training, the training of trainers, testing tools and real-life application, as well as study tours in which topics are presented in contexts to which the trainees can relate. This will be complemented by regular knowledge assessments from PY3 to project end, to ensure knowledge has been assimilated and to identify difficulties or limitations that need to be addressed; this could take the form of awareness surveys and tests at either individual or institutional levels.

138. Initial training on climate change and climate vulnerability concepts and on the use of the tool will be conducted prior to the assessments. Initial training will build up the necessary technical capacity of different stakeholder but will also raise general awareness about the importance of wetlands, their contribution to climate resilience and the general project objectives.

139. In order to maximize the sustainability of uptake and ownership, the project will seek to strengthen existing entities such as water user groups, fisheries management committees, Ramsar Committees, Disaster Management Committees, and River Basin Committees. At community level, the training to be provided by the project in this regard will focus on individuals within the target communities identified during the CBNA as natural "champions" regarding the issues of relevance to the project. These individuals demonstrate a clear active role in information sharing, developing planning and a strong concern for the impacts of projects in the field, focusing on the local application of knowledge, the avoidance of duplication of efforts, the development of approaches jointly with communities, and working as much as possible with local governments. The training to be provided by the project will build on the capacities and knowledge already developed in these individuals through other projects supported by development partner, on Ramsar, climate change adaptation and agriculture, and fisheries. The role of these individuals as "champions" of the project message is in line with the peer-to-peer approach to knowledge transfer, favoured by Lao stakeholders).

140. Training priorities of relevance to this output, identified through the CBNA, are as follows:

- **Climate change at local level:** this issue was prioritized considering the very-low to low knowledge of the vast majority of the stakeholders interviewed. The need expressed across all

²⁰http://typo3.fao.org/fileadmin/templates/tci/pdf/climate_change_considerations.pdf

²¹ Spalding, M. et al "The role of ecosystems in coastal protection: Adapting to climate change and coastal hazards". Ocean & Coastal Management. 2013 (in press); Lacambra Segura, C.L., 2009. Ecosystem-inclusive Coastal Vulnerability Assessment in Tropical Latin America. Department of Geography. University of Cambridge, Cambridge, UK

sectors was to have information and knowledge specific to their area that could be used to build activities and workplans. Stakeholders referred to the need for site-specific vulnerability assessments of wetlands as a basis for their work, in order not to lose time studying the big picture of climate change. The approach proposed still had external actors (NGOs) providing information or reports rather than developing a joint tool with a participatory implementation.

- **Wetlands management and Ramsar implementation:** the two concepts are now linked due to the past work carried out by development organizations in the two sites. Although the level of knowledge on these issues is generally higher than that on climate change, further strengthening is required for the key stakeholders in wetlands management to feel confident in using the information to act and develop management plans on their own.
- **Disaster warning:** CBNA respondents identified the need for the development of knowledge and skills on how to predict disasters and their impacts, including the development of early warning systems and the planning of disaster responses. The project's training activities will go beyond the respondents' relatively limited focus on event-specific early/pre-disaster response, to include long-term approaches to planning aimed at developing resilience to disasters.
- **Information storage, analysis and dissemination:** including GIS tools, database management and improved local weather forecasting.

Output 1.3. Participatory CC vulnerability risk assessment carried out in BKN and XC wetlands

141. Detailed CC vulnerability risk assessments will be carried out of both target wetlands, covering the vulnerability of the wetlands eco-systems and the farming- and natural resource-based livelihoods of the communities located in and around them. These assessments, which will be planned on a community-by-community basis in PY1 and applied during PY2 and the beginning of PY3, will incorporate the methodologies developed under Output 1.1 but will also build on and incorporate methodologies and formats used in previous assessments, specifically in the case of Xe Champhone, where the assessment will update that carried out in 2012 (MRC CC Vulnerability Assessment, XeChamphone Case study).

Output 1.4: Studies of CC-related issues affecting the target wetlands

142. In addition to the participatory assessments proposed above, it is vital that CCA strategies in the target areas are informed and guided by sound science. To this end, the project will finance a number of carefully targeted and selected studies aimed at filling in key information needs. These studies will be planned during PY1 and carried out during PY2, and their results will be fed back to local communities during PY2 and 3.

143. The studies will cover issues including the following:

- Allowable rates and locations of water extraction for irrigation, in order to inform the norms and regulations proposed under Output 3.5, which are aimed at maintaining water levels to protect hydrological and ecological functioning of wetlands (particularly oxbows, lakes, ponds);
- Identification of spatial priorities for the re-opening of wetlands in order to maintain the water flow required for ecological functioning, biological connectivity and habitat maintenance, together with the definition of best technical approaches and options for sustainability;
- Definition of acceptable off-take levels of migratory and resident fish, the timing of closed seasons and the locations of no-take areas of importance for breeding and/or grow-on;
- Spatial priorities for the improved management of the watersheds draining into the wetlands, on the basis of catchment-level modelling of hydrological flows and the identification of areas of the wetlands that are particularly degraded or vulnerable to erosion, together with recommendations of corresponding technical options;
- Definition of sustainable limits and locations for the grazing of cattle and buffaloes in order to minimize their damage to fragile wetland habitats;

- Integrated pest management options capable of addressing expected increases in pest problems related to CC, while reducing farmers' dependence on agricultural chemicals that threaten the ecological functioning and ecosystem services provided by wetlands.

Component 2. Efficient and cost-effective adaptation measures

Outcome 2: Efficient and cost-effective measures in place to reduce the impact of CC and natural disasters on wetlands eco-systems and/or local livelihoods.

144. Based on the results of the studies presented in Section 1, the project will promote concrete measures aimed at increasing the resilience of the wetlands at Xe Champhone and BKN and their surrounding areas, as well as that of their inhabitants, to the impacts of climate change. Project activities and experiences under this outcome will also inform and complement investments made as part of the Sustainable Floodplain Management Component of the IWRM programme by introducing CC considerations in River Basin Management and by improving or reviewing important investments and designs.

145. Project actions will focus principally on improving the management of the target wetlands and the sustainability and resilience of wetlands-based livelihoods: this will involve addressing threats and livelihood support strategies that are directly carried out within the wetlands, but also others that are carried out in the surrounding areas but also affect or depend on the wetlands in less direct ways. **The project will improve livelihood resilience to CC in the following ways:**

- 1) Improving resilience of wetlands/natural resource-based livelihood support activities, as a result of improved management of the target wetlands (through e.g. physical reopening, habitat protection, tree planting, control of invasive species, controlled burning) in order to maintain the resilience of their ability to generate ecosystem-based goods and services essential to livelihoods
- 2) Reducing exposure of livelihoods to CC-related disasters, also as a result of improved management of the wetlands
- 3) Improving resilience of the physical infrastructure on which local livelihoods depend, including their subsistence aspects (e.g. through CC-resilient wells) and their productive aspects (e.g. through CC-resilient design of road and bridges)
- 4) Improving resilience of productive aspects of livelihoods through support to production systems (e.g. the creation of semi-natural reservoirs, small-scale irrigation, production and collection of fodder, use of drought-resistant varieties),
- 5) Diversifying livelihoods as an "insurance" option in case of the CC-related failure of existing core livelihood strategies, for example through the promotion of and development of corresponding capacities for environmental-friendly and low cost aquaculture, planting of NTFP species such as Malva nut, ecotourism, and value-adding to wetland products.

146. As a result of the actions proposed under this outcome:

- 1,280 families (8,400 members), in 20 villages within the current Ramsar site boundaries will be involved in adaptive agricultural practices, systems and infrastructure (e.g. climate smart agriculture, improved cropland management, dry and wet season rice cultivation, livestock production, aquaculture), that will reduce threats and vulnerabilities affecting the wetlands and the surrounding landscapes with which their management is linked.
- 800 families (5,250 members) in 20 villages within the current Ramsar site boundaries will have acquired at least one additional livelihood support option as a CC fallback option
- 6,400 families (42,000 members) in 40 other villages within the proposed expanded Ramsar site boundaries will have improved and more sustainable access to wetland products and services
- 47,360ha of wetland habitats in XC and BKN will have indices of CC-related management effectiveness maintained at least at baseline levels
- Between 600 and 1,220ha of target wetlands will be under improved direct management (improved forest management to increase resilience to effects of CC, invasive species

management, improved water flow, protection of habitats and nesting sites, and/or controlled burning to improve habitat condition

147. These impacts will be achieved through the delivery of the following outputs:

Output 2.1. Planning and coordination frameworks for the two sites promoting CCA measures

148. The project will support local and provincial governments in the inclusion of CCA measures into their **territorial land use plans**. A key focus in this regard will be on adapting the spatial configuration of anthropic elements in the landscape (such as infrastructure, settlements and agriculture) to the configuration and evolving dynamics of the wetlands, rather than necessarily seeking to “dominate” the wetlands. One aspect of this will be, for example, that according to the provisions of the plans housing will not be allowed to be located in areas that are currently, or potentially under conditions of climate change, subject to chronic flooding or river bank erosion.

149. Another aspect of this planning will be that actions directly aimed at increasing CC resilience will be located appropriately in the landscape, in relation to the current and future spatial configurations of the CC-related processes that they are intended to address. Actions to be targeted in this way will include, for example:

- Reforestation of watershed areas and river banks in order to reduce sediment inputs affecting deep pools and river beds, in order to ensure that they target the watershed areas most affected by degradation and consequent sediment generation, and the river banks most at threat from erosion;
- Conservation of riparian forests and flooded forests, targeting those whose locations make them most crucial as sediment filters;
- Re-opening wetland areas and channels, targeting locations of crucial importance for biological connectivity and/or habitat for wetland fauna such as crocodiles, fish, eels and waterbirds.

150. This spatial planning will be informed by the CC vulnerability assessments proposed under Outcome 1, which will yield vital information on the spatial configuration of CC threats and their likely evolution over time.

151. The project will also support the development of planning frameworks for the sector-based CC-resilient livelihood alternatives proposed under Output 2.4. These will include the development of ecotourism action plans for the two target wetlands, which will ensure that tourism investments and activities are appropriately designed and located and do not place unsustainable pressures on the target ecosystems; that they provide for equitable participation of community members in tourism activities and the receipt of benefits; and that they to provide for the adaptation of tourism management to the changes in conditions that are expected to occur in the wetlands under CC.

152. At the same time as capacities for CC adaptation and disaster management planning are being developed under Output 1.2, the project will invest directly in the application of the planning tools proposed under Output 1.1 in order to deliver improvements in planning frameworks in the immediate term. These investments will focus on integrating CCA and DM considerations into the management plans for the XC and BKN Ramsar sites, as well as the management plan for the Xe Pian Protected Area which includes the BKN Ramsar site, as well as corresponding district, provincial and sub-catchment/river basin development plans or disaster management plans.

153. LDCF funds will be invested directly in CCA measures in the two target wetlands, as proposed under Output 2.3 below. CC will, however, be an ongoing and evolving process in the long term, effective and sustained adaptation to which will require continued investment from other sources beyond the life of the project. In order to ensure that such funding is available, the project will support the development of **medium- and long-term investment plans** for both wetlands. These will set out the types and levels of financial resources that will be required over time, together with proposals of their sources, with central and regional Governments, and the corresponding planning and normative provisions required to ensure their availability. This planning will be based upon the results of PPG studies, and further studies of CC and adaptation needs to be carried out during the life of the project; beyond the project life, it will be further refined and updated on the basis of the results of the

vulnerability and risks assessments proposed under Output 1.3. To this end, the assessments will be accompanied by investments in raising awareness among decision-makers at central and provincial levels regarding their results and implications, and the corresponding importance of ensuring adequate investments in CCA measures.

154. Such advocacy and corresponding investment plans will be of particular importance, for example, in support of the following adaptation strategies:

- Reforestation of upper watersheds and river banks in Xe Champhone, in order to limit erosion of river banks and thereby reduce the sedimentation that is currently affecting deep pools and river beds;
- Reforestation and conservation of riparian and flooded forests, to filter sedimentation entering from the floodplain that is affecting deep pools and river beds;
- Enforcement of local regulations on hunting of key elements of wetland fauna, such as waterbirds, and on fishing of “white” (migratory) and “black” (resident) fish.

155. Continued livelihood sustainability in the target areas, under conditions of climate change, is also dependent on essential infrastructure being climate-resilient. Under Output 2.3, the project will fund direct investments in the climate-proofing of infrastructure: under this output, it will help to ensure the sustainability of such climate-proofing by supporting the inclusion of provisions for climate resilience into design specifications managed by local authorities. These design modifications will also include provisions for reducing the negative impacts of infrastructure on the ecological functioning of wetlands, and on their potential to generate EBA services, for example:

- Redesign of bridges (with stream width <10m) to increase capacity in the event of flash floods and storm flows;
- Ensuring spillways of dams and weirs are adequately sized to take projected increased flows without damage to structure or increased flooding, and maintain the condition of structures and strengthen weak points such as launching aprons and foundations;
- Ensuring adequate cross drainage across existing and new or upgraded roads, and that road culverts and bridges are of adequate size to cope with flash floods;
- Redesigning channels crossing streams that may be at risk from increased flows or flash floods, as well as ensuring that canals do not block natural drainage to the wetlands

156. Stakeholders consulted during the PPG phase at local, provincial and national levels also stressed the need for these planning frameworks to be developed and implemented in an environment of improved coordination between the institutions in question, both vertically (between local, provincial and national levels) and horizontally (between the different sector institutions operating in the same site). At the local level (under this output), the project will focus in particular on strengthening coordination at local (municipal and provincial) levels, especially between agricultural (MAF and PAFO) and environment/natural resource (MONRE and PONRE) sector institutions, but also between village level entities and municipal and provincial governments. Existing Provincial Ramsar Committees and Disaster Management Committees will continue to play an important role in this regard. The project will focus on strengthening the technical aspects of these entities, and on exploring strategies for their financial sustainability, while at the same time supporting the development, as appropriate, of district- and/or community-level subcommittees with operational ToRs.

157. The planning of direct investments in resilience, and sector-based CC-resilient livelihood alternatives will be carried out between PY2 and 3, as will the integration of CCA/DM into XC, BKN and Xe Piang management plans, district, provincial and sub-catchment/river basin development plans or disaster management plans. This will be followed by the development of investment plans for target wetlands and the mainstreaming of resilience into infrastructure specifications in PY3 and 4. As a result of these activities, all infrastructure, agriculture and rural development plans in target districts will incorporate wetland-focused CC vulnerability assessment with corresponding CCA measures, and the following plans will incorporate CCA considerations:

- 1 CCA-friendly territorial LUP per wetland
- 1 CCA-friendly financial investment plan per wetland
- 1 specific CCA plan per wetland

Output 2.2: Capacities of water/natural resources/wetlands user groups strengthened to apply effective governance of NRM use and management

158. The sustainability of the proposed CCA strategies is strongly dependent on the existence of adequate governance conditions at local level, to ensure that the benefits that they generate are not undermined by anthropic pressures. Such pressures may in some cases become exacerbated under conditions of climate change, as a result of changes in demographic patterns and increases in ease of access to the wetlands as a result of the drying out of previously inaccessible areas. To this end, the project will provide training and organisational support to existing community-level and inter-community organisations, such as village clusters (*khet*) or “development clusters” (*khumban*), which promote development and local governance, and have enforcement (militia) arms; village councils, which are responsible for community resources such as village protection or production forests; and villager groups including water user, fisheries and NTFP user groups. It will facilitate the strengthening or development by them (in collaboration with local Government) of norms and regulations, covering issues including the following:

- The protection of riparian and flooded forests against illegal felling, in order to maintain their role in filtering sediment inputs from the floodplains, that are filling in deep pools and river beds;
- The protection of *Barringtonia aculata* trees against felling and lopping, particularly in BKN: this species is very important for EBA, given that it is very resilient to prolonged flooding, growing as it does at the edges of deeper parts of the wetland. It is also able to withstand periods of increased temperatures and drought.
- Restrictions on excessive or damaging harvesting of malva nuts; this species has potential for maintaining livelihood diversification under conditions of climate change, but its populations are themselves likely to be threatened by impacts on flowering of high temperatures in January and February, and lower rainfall in these months, impacts on fruiting of increases in temperature at end of the dry season, and CC-related impacts on pollinating bees;
- Limits on water extraction, in order to maintain water levels and thereby protect the hydrological and ecological functioning of wetlands;
- Controls on the hunting of water birds, which are likely to be particularly vulnerable to increased ease of access to the wetlands (the water birds play an important role in controlling some invasive species such as exotic snails, as well as being a potentially focus for ecotourism, which may become increasingly important as a livelihood alternative as existing options become more precarious under conditions of climate change);
- Restrictions on the hunting of turtles, which are likely to be affected by high temperatures during the breeding season (may skew the gender balance in the populations), and also by irregular rainfall in the dry season and the shrinkage of wetted areas, which will increase access and hunting pressure
- Controls on fishing levels and methods, and the designation and protection of fish conservation zones, given that populations of both migratory and resident fish are likely to become increasingly threatened by CC-related wetland closure and changes in demographic and access conditions.
- Clear demarcation of forest areas in the wetlands, and prohibition of encroachment into them by agriculture, as is occurring in BKN.
- Regulation of levels and locations of grazing of cattle and buffaloes, in order to minimize their impacts on fragile wetland habitats.
- Continued prohibition of peat extraction for fertilizer in BKN, in order to avoid ecosystem damage and loss of carbon sinks.

159. Particular emphasis will be placed on strengthening local, community-based natural resource governance. This approach will preferentially allow members of the communities located immediately in or around the wetlands to use and manage the resource in a sustainable manner, and will place greater levels of control on extractive activities by outsiders. This approach is based on the concept of “conservation through use”, which assumes that clearly identified stakeholders with long-term

familiarity with the wetland, and well-established social relations, will be the best qualified and motivated actors to manage the resource in a sustainable manner.

160. The project will also seek to strengthen governance aspects related to the management of infrastructure, for example in relation to:

- Ensuring that rates of water release from reservoirs, and the opening and closing of sluice gates on drainage canals, are adequately regulated in order to guarantee “ecological flows” and to maintain the biological health of wetlands, while at the same time meeting CCA objectives through ensuring dry season water availability and reducing flooding damage;
- Defining responsibilities for maintaining culverts and bridges free of debris and vegetation in order to reduce their vulnerability to flash floods;
- Ensuring that irrigation canals are regularly maintained, and silt buildups are removed;
- Ensuring that floating pump houses used for irrigation are well secured and protected against flash floods.

161. In the second half of PY1, participatory analyses will be carried out of governance needs and capacities, and a capacity development plan will be formulated; in PY2, strategic plans and internal rules will be developed for local governance entities, and in PY2-4 rules and norms will be developed for NRM in support of CCA, resilience and DM. As a result. By project end user and governance groups covering all key areas of target wetlands will have capacities to apply effective governance, with a specific focus on adaptation and resilience issues and a gender focus, and all target villages will have governance groups and wetland user group with rules, providing for adaptation considerations, applied and adhered to.

Output 2.3. Direct investment in CCA strategies.

162. In addition to the development of capacities for the adoption of CCA strategies, proposed under Output 2.4, the project will carry out direct investments of LDCF funds in CCA strategies in order to achieve rapid and significant improvements in the CC resilience of the target wetlands. These direct investments will include the following:

- **Physical re-opening of critical wetlands** (oxbows, lakes, ponds), in order to ensure the maintenance of ecosystem services and the preservation of flows that are essential to ecosystem health and the survival of aquatic fauna such as fish and crocodiles, as well as habitat and breeding areas for crocodiles, and the survival of key wetland vegetation such as sedges and *Sesbania sesban* (used for fibre, baskets and fish traps).
- **Protection of habitats and nesting sites** for other elements of wetland fauna such as turtles, in order to maintain biodiversity and also to maintain their contribution to local livelihoods.
- **Stabilisation and protection of river banks affected by erosion**, through a combination of bioengineering (revegetation and tree planting), soft engineering, and physical works such as protection by groynes and rip-rap, in situations where erosion threatens houses and property. This will be complemented by spatial plans, norms and governance mechanisms, aimed at preventing the construction of buildings in areas susceptible to river bank erosion.
- **Tree planting and the establishment of nurseries**, aimed at increasing tree cover in the watersheds draining into the wetlands and river banks within the wetlands, in order to reduce the increasing levels of sediment input that are having negative impacts on deep pools and river beds, and the restoration and maintenance of forests affected by overextraction and hydrological changes, to preserve their roles as CC buffers
- **Management/elimination of invasive species** such as *Mimosa pigra*, in order to maintain the spatial configuration and internal connectivity of wetlands (oxbows, lakes and ponds) affected by closure by invasive vegetation
- **Controlled burning**, to reduce the risk of uncontrolled wildfires: under normal conditions, dry season fires in grasslands and shrublands, of either natural or anthropic origin (for example for flushing out animals during hunting) may be beneficial for wetland ecosystems. Increasing temperatures and evapotranspiration in the dry season, under conditions of climate change, are expected to dry out grassland vegetation to a greater extent: resulting increases in the spatial extent, frequency and intensity of fires are likely to be ecologically unsustainable

and result in lasting damage to wetland ecosystems, leading to their permanent conversion into degraded grazing or agricultural land. Controlled burning, guided as necessary by technical studies carried out under Output 1.4 and subject to community-level norms and governance mechanisms, will reduce fuel buildup and therefore the risk of fires getting out of control or becoming unduly intense.

163. Infrastructure climate-proofing measures to be supported through direct investment by the project will include the following:

- The protection of drinking water wells and springs against contamination by animals and floods, with physical structures and vegetation;
- Establishment of community ponds with filtration systems to collect and purify water stored from floods/rain, and the provision of jars for rainwater harvesting facilities, together with improvements to roofs;

164. These direct investments will be complemented by further strategies aimed at ensuring that the resulting benefits are sustained over time; this is important to avoid, for example, areas opened during the life of the project becoming progressively silted up over time due to ongoing sediment inputs from upstream, or the benefits becoming undone as a result of the unpredictable and constant evolution in the nature and magnitude of pressures, that is expected to result from climate change.

165. The effectiveness and sustainability of these measures will be ensured by the following complementary strategies:

- Spatial land use planning (under Output 2.1), in order to ensure that investments in, for example, tree planting and wetland re-opening are targeted in the most effective manner in relation to the spatial configuration of threats and climate change phenomena;
- The provision of technical advice to local communities and to institutions of local, provincial and national offices of Government (under Output 2.4) in order to enable them to continue the CCA strategies (such as tree planting and invasive species management) in the long term;
- Support to the development of investment plans (under Output 2.1) to ensure the availability, in the medium and long terms, of financial resources to be invested in the continuation of CCA activities.
- Support to local governance mechanisms (under Output 2.2) in order to ensure that the direct investments in wetland management and restoration are not undermined by illegal activities such as the felling of trees in riparian belts, or the hunting of fauna or overextraction of fish that will be benefited by wetland reopening.

166. The project will also support direct investments in livelihood diversification in order to reduce livelihood vulnerability to CC impacts. The full list of livelihood diversification options being considered (which may be expanded as opportunities arise during project implementation) is presented in paragraph 173 below; the types of direct investment being considered in support of these options include the following:

- The establishment of aquaculture pilots, including initial investments in pond construction and basic equipment
- The establishment of small-scale installations for adding value to NTFPs such as Malva nuts, allowing them to be selected, sorted, dried and packaged under conditions that will allow them to gain optimum prices
- The establishment of visitor facilities for ecotourism, including small-scale interpretation/visitor reception centres, signs and walkways.

167. These investments will mainly be carried out between PY3 and PY5, but will be based on participatory analyses and priority definition in PY2 and 3. As a result, by project end:

- 1,600 families (male and female led) will be benefiting from one or more forms of direct investment in CCA
- 10 villages will have value-adding facilities for NTFPs established, benefiting men and women
- 10 villages will have visitor facilities for ecotourism established benefiting men and women

- 4 semi-natural reservoirs will have been established, benefiting men and women
- 200ha of riparian forest will have been replanted

Output 2.4: Capacity development programmes and innovation systems to support CC resilience strategies.

168. Activities under this output will focus on the one hand on adaptation in the agricultural sector and will build on existing coping mechanisms and adaptation options, providing viable alternatives to existing “maladaptive” practices; and on the other on adaptation through the promotion of non-agricultural livelihood support options in order to diversify local people’s livelihood portfolios and thereby reduce their exposure to the implications of CC-related failure of agricultural options. As a result, 50% of men and women in the target villages will have increased knowledge and awareness to apply CC-resilient wetlands management, CC-resilient agricultural practices and/or non-agricultural livelihood support options.

169. *Resilience of agricultural livelihood elements*: the definition and introduction of these practices will be informed as necessary by the technical studies proposed under Output 1.4. It is recognised, however, that top-down decision making, planning and implementation approaches undermine the value of local knowledge and traditional coping mechanisms; to ensure effectiveness and early adoption, support will therefore need to build on or complement these traditional knowledge and management practices and local investments and to integrate them into CC adaptation and disaster management. To this end, the principal approach to be used to ensure the relevance of CCA strategies to local conditions, and therefore their ownership and uptake by local farmers, will be that of farmer field schools (FFS). This approach is community-led and participatory, and at the same time will allow for effective inputs from Government agencies. There will be close coordination in this regard between this project and GEF project 5462 on Strengthening Agroclimatic Monitoring and Information Systems (SAMIS), which will include a component for field schools to pilot the roll-out of the centrally-driven information dissemination and communication systems derived from the Agromet and Land Resources Information Management Systems: Xe Champhone will be used as a principal focus area for the farmer field school work under that project.

170. CCA strategies to be promoted through the project will include the following:

- **Creation of semi-natural reservoirs (artificial wetlands)** able to stock some water during floods, in order to reduce the vulnerability of rain-fed rice farming to fluctuations in rainfall patterns, thereby again reducing dependence on the maladaptive coping strategy of increase water extraction from the existing wetlands.
- **Development of small scale, targeted and efficient irrigation systems**, compatible with the preservation of wetlands, for use during the dry season in order to reduce the risk of failure of rain-fed crops (rice and vegetables) due to CC-related rainfall fluctuations, together with improved regulation of water use during dry seasons.
- **Production and collection of fodder for livestock, particularly during the dry season**, in order to counter the reductions in fodder availability that are expected to result from CC-related dry season droughts and wet season flood events, as well as increasing shortages of grazing land due to competition with dry season rice and invasion by *Mimosa picra*. In addition to contributing to livestock productivity, this strategy will help to reduce grazing pressures on wetlands, particularly the pressures placed by cattle on wetland edges: these areas are expected to be particularly affected by climate stresses such as drying and flooding, and, as a result of overgrazing, will in addition undergo change in species composition and face increased vulnerability to dry season fires.
- **Use of drought- and/or flooding-resistant varieties of crops such as rice and vegetables**, in order to reduce the vulnerability of agricultural production and livelihoods to CC-related increases in the frequency and/or severity of these phenomena. Currently, crop farming depends significantly on climatic conditions such as rainfall, flooding and temperatures. Increasing flood events and increased temperature will have a significant impact on rice production, particularly for non-irrigated wet season rice; the current coping strategy is the increase of dry season rice production through the use of individual or community irrigation

systems (e.g using tractor pumps); in addition to this option not being open to all farmers for cost reasons, it constitutes “maladaptation” to climate change, given that it causes ecological damage to the wetlands and to its constituent elements (such as fish and other aquatic products) that are vital for maintaining the diversity, sustainability and resilience of local livelihoods. These varieties will also reduce farmers’ tendencies to rely on increased use of fertilizers and agricultural chemicals in order to compensate for crop failure, which is leading to the build up of contaminants in the wetlands, further affecting ecosystem function and services.

- **Integrated pest management:** carefully-formulated and targeted IPM practices have the potential to provide farmers with effective, sustainable and low cost alternatives for addressing the expected increases in pest problems (such as Golden apple snail and rice borers) that are likely to result from the environmental stresses caused by climate change, while limiting their dependence on agricultural chemicals that threaten ecosystem functions and services in wetlands.
- **Protection of wells and other water sources for livestock:** these will play an increasingly important role in ensuring the sustainability of livestock production, as temperatures increase and wetlands recede (especially during the dry season) under conditions of climate change; at the same time, CC will result in increased threats to wells as a result of over-extraction, falling ground water levels and contamination from floods. In addition to regulating extraction levels through improved water governance (Output 3.5) and improving the management of herds accessing wells and water sources in order to reduce the risk of damage and contamination, the project will help to reduce CC-related pressures on wells by investing in the establishment and maintenance of physical structures to protect against flood water incursion, increasing well depth in order to allow access to more secure water levels, and the protection of water sources against evaporation losses through the planting of shade vegetation around them.
- **Introduction of smaller and more heat resistant livestock varieties,** including goats, in order to address the impacts on livestock productivity of temperature stress. Some communities in the target areas are already increasing the production of poultry and other small livestock in this way.
- **Improved husbandry and veterinary care of livestock,** in order to improve the tolerance of animals to increasing temperatures and other climate stresses. Particular emphasis will be placed on training farmers to diagnose and treat animals, and on preventive approaches to animal health in order to minimize reliance on external actors.

171. The project will help assess the impact and efficiency of new irrigation schemes or rehabilitation work funded by the government or donors (including the WB-IWRM programme and KFW) by introducing concepts of climate risk and adaptation and will provide corresponding advice on appropriate designs.

172. *Non-agricultural livelihood options:* this aspect of the output will contribute to the improvement and diversification of existing wetlands-dependent livelihoods and the development of new sources of income. The consolidation and diversification of livelihoods activities, specifically targeting women and the poorest, will contribute to the adaptive capacity of the most vulnerable among farmer communities. The project will support value chain development and improved marketing of local products, eco-tourism development, vocational training and knowledge development and transfer (including, where appropriate, the use of Farmer Field Schools). Where appropriate, credit will be provided through existing user groups and associations.

173. Livelihood diversification options to be promoted through the project will include the following; these have been selected on the basis of discussions held with local communities during the PPG phase, and all of them have previously been applied in the project area:

- Environmental-friendly and low cost aquaculture, using local species wherever possible, and semi-natural ponds and infrastructures. Some villagers already have experience with building fish ponds, and with breeding fish and releasing them into water bodies, however at present fish farming is reported to be costly and so not accessible for all. The CC resilience of this

option will be promoted by strategies such as the construction of aquaculture ponds with higher bunds will enable them to continue culture during periods of drought.

- Planting of Malva nut trees as an income source, to compensate for losses to productivity caused by climate change.
- Ecotourism: this already makes a recognized livelihood contribution, especially in Beung Kiat Ngong. Degradation of the wetland and ongoing loss of biodiversity threaten to reduce its attraction for tourists. Measures to assist the realisation of ecotourism potential as livelihood alternative will include raising awareness of and protecting key habitats and species, especially birds, that tourists come to see, and monitor the impacts of tourism e.g. disturbance, degradation of habitats along paths, litter etc, and take appropriate action to manage the impacts.
- Value-adding to wetland products such as long grass for making mats and hats, and bamboo to make handicrafts , in order to offset the reductions in resource availability and other income sources that are likely to result from CC.

174. Following the same approach as in Output 1.2, the capacity development proposed under this output will start with participatory analyses of priority strategies and needs for capacity strengthening in PY1-2, followed by pre-selection and baseline assessment of candidates for training in PY2, the provision of training in PY2-4 and post-training follow-up in PY4-5. Particular emphasis will be placed on supporting capacities among community members for analysis and innovation, for example through the Farmer Field School model; this is important given that some of the examples of livelihood diversification given above may themselves be affected by climate change (see e.g. paragraphs 35 and 158), which will require community members continuously to explore additional livelihood options and to develop strategies for further “climate-proofing” their existing options.

Output 2.5. Early warning, disaster risk reduction and early recovery measures and systems in place

175. The project will build upon the existing activities and mandate of local Disaster Management Committees, by establishing or consolidating early warning systems and networks and developing or strengthening corresponding disaster management and early recovery plans and procedures. Special attention will be given to the increasingly critical effects of floods on settlements, community assets, wet season rice cultivation, irrigation infrastructure and livestock. The project will help establish and formalise linkages between local Disaster Management Committees and the River Basin Management Committees and will ensure the optimal use of information provided by hydro-meteorological networks supported and developed by the IWRM programme.

176. This process will begin with a participatory review of existing measures and systems in PY2, followed by the development of plans for strengthening measures and systems in PY2-3 and then the facilitation of the strengthening of measures and systems in PY4. As a result, by project end early warning messages will be delivered on time to 100% of all events in target villages in year 5, and effective action taken in response by 50% of all affected villagers

Component 3: Integration of CC adaptation and disaster management measures into planning processes.

Outcome 3. Efficient and cost-effective CC adaptation and disaster management measures in wetlands integrated in local and national planning processes.

177. Activities under this outcome will ensure that the CCA and DRM measures to be developed and implemented at field level can be sustained and scaled-up, by helping to ensure the existence of an adequate planning framework at both local (district and provincial) and national levels, that recognises the complex cross-sector issues involved.

178. The focus will be on developing integrated approaches to adaptation and disaster management planning, which at present suffers from the sector-based compartmentalization of the mandates of line ministries and their provincial and district offices. The use of existing multi-sector and multi-stakeholder management structures such as the Provincial Ramsar Committees and District Implementation Teams, Disaster Management Committees (Provincial, District and Village),

Protected Area²² Committees and River Basin (and sub-basin) Committees, will guarantee a more integrated approach.

179. As a result of the actions proposed under this component, the following local, regional and national level plans will incorporate CC vulnerability assessments, CCA measures and analyses (and mitigation measures as needed) of impacts on wetlands, with corresponding budget allocation:

- All projects and plans developed by PONRE/DONRE and PAFO/DAFO that directly affect the target wetlands
- At least 50% of all other provincial and district plans and projects in the target provinces and districts
- BKN Ramsar site management plan
- Water allocation and abstraction management plans/rules at district level in the target districts
- At least 5 national plans related to natural resources management and agriculture provide application of CC/DRM assessment approaches.

180. In addition, participatory CCA and DM planning and M&E will be used in 2 other districts within the province, and for 2 other wetlands nationally, and DONRE and DAFOs in four districts will be adopting tools for participatory CCA and DM planning and M&E in wetlands; and 70% of members of the institutions targeted for improved institutional coordination will have favourable perceptions of the effectiveness of institutional coordination at national level in support of CCA

Output 3.1. Methodological guidelines for integration of CC adaptation and disaster risk management into local and national plans.

181. Support by the project to the development and institutional adoption of methodological guidelines for the integration of CC adaptation and disaster risk management into local and national plans will complement project support, under Output 2.1, to the development of specific planning instruments required for the implementation and sustainability of site-specific CCA measures. This methodological support will go beyond that proposed under Output 2.1: it will contribute to replication and sustainability as the methodological guidelines will be able to be applied to plans in other areas beyond the target sites themselves, and in the updating of existing plans in the target areas in order to ensure that they are able to respond in an adaptive manner to evolving circumstances.

182. Experiences under Output 1.3 will be reviewed and systematized during PY3, and joint analyses will be carried out with national institutions of needs and opportunities for application of the guidelines; subsequently, the project will orient and facilitate the application of the guidelines in PY3-4, resulting in the guidelines being used in provincial and district plans and new proposals, the BKN Ramsar site management plan, and water allocation and abstraction management plans/rules at district level.

Output 3.2. Training programme for community, district and provincial stakeholders in participatory CC adaptation and disaster management planning and M&E..

183. Training will be provided to community level, district level and province level stakeholders on how to apply the tools for the planning of CC adaptation and disaster management, proposed under Output 3.1, and how to develop and implement corresponding M&E protocols. This training will focus principally on strengthening existing structures (e.g. members of water user groups, fisheries management committees, Ramsar Committees, Disaster Management Committees, and River Basin Committees). As with the other outputs focused on capacity development, a step-wise approach will be adopted commencing with participatory analyses of priority strategies and needs for learning/capacity strengthening in PY1-2. pre-selection and baseline assessment of candidates for training in PY2, provision of training in PY2-4 and post-training follow-up in PY4-5. As a result, by project end 10 PONRE and 10 PAFO staff in Savannakhet and in Champassack, 10 DONRE and 10 DAFO staff in each of 3 districts surrounding the wetlands 50 community members from the wetlands and their surrounding areas will have been effectively trained in these issues.

²² The BKN wetlands or Ramsar Site is located in the XePiang Protected Area.

Output 3.3. Institutional mechanisms for coordinating climate change resilience in wetlands strengthened

184. The project will provide facilitation, information and technical support in order to ensure that CCA issues in wetlands are permanently incorporated into the agendas of relevant existing inter-institutional coordination mechanisms, including the National Committee for Wetland Management and Ramsar Convention, the National Disaster Committee and the National Steering Committee on Climate Change. This will be of crucial importance in contributing to prospects for replication and sustainability.

185. In addition, complementing the site-specific, technically focused coordination support proposed under Output 2.1, under this output the project will invest in the continued strengthening of Provincial Ramsar Committees and Disaster Management Committees through facilitation and methodological support, in order to ensure their institutional sustainability and their effectiveness in providing for the needs and concerns of different stakeholder groups.

186. Coordination mechanisms will be reviewed and prioritised for this support in PY2, support will be provided in PY3 and the effectiveness of coordination support will be monitored and followed up in PY4-5. As a result, by project end 70-80% of institutional respondents in the target institutions will have positive perceptions of the effectiveness of institutional coordination at national level in support of CCA.

2.3 ADAPTATION BENEFITS

187. The project will reduce the vulnerability to the impacts of climate change of 55,650 people living in 60 rural communities located in and around two target wetlands of global importance (the only two wetlands in Laos designated as Ramsar sites)²³. The targeted reductions in vulnerability will be closely linked to improvements in the resilience and conservation status of the wetlands: the project's approach is centred on the concept of "Ecosystem-Based Adaptation" (EBA), whereby measures will be taken to improve the management and protection of the wetlands in such a way as to counter the pressures that they are facing from climate change and from anthropic pressures, and this in turn will increase the ability of the wetlands to buffer local populations against the impacts of climate change.

188. The project will deliver resilience benefits in relation to short term extreme climatic events and to longer term climatic trends. Activities foreseen under Component 2 in the two target wetlands will result in:

- 1,280 families (8,400 members), in the 20 villages within the current Ramsar site boundaries, involved in adaptive agricultural practices, systems and infrastructure (e.g. climate smart agriculture, improved cropland management, dry and wet season rice cultivation, livestock production, aquaculture)
- 800 families (5,250 members) in the 20 villages within the current Ramsar site boundaries, have acquired at least one additional livelihood support option as a CC fallback option
- 6,400 families (42,000 members) in 40 other villages within the proposed expanded Ramsar site boundaries have improved and more sustainable access to wetland products and services
- 47,360ha of wetland habitats in XC and BKN with indices of CC-related management effectiveness maintained at least at baseline levels
- Between 600 and 1,220ha of target wetlands under improved direct management:
 - 200ha of forests under improved management to increase resilience to effects of CC (floods, erosion etc.)
 - 200ha under invasive species management
 - 20ha with water flow improved due to wetland re-opening
 - 600ha with protection of habitats and nesting sites (e.g. lakes for crocodiles, forest patches for bird nesting)

²³ 20 villages located within the existing Ramsar site boundaries, who manage the wetlands more directly, and another 40 villages located within the proposed expanded Ramsar site boundaries, who depend on wetland goods and services but do not manage the wetlands so directly.

- 200ha with controlled burning to improve habitat condition

2.4 COST EFFECTIVENESS

189. The focus of the project on Ecosystem-Based Adaptation (EBA) will be considerably more cost-effective (and also sustainable) than the principal alternative, which would be to focus on “hard” infrastructural solutions such as dams (to buffer high river flows and retain water for irrigation during droughts), large canals for the drainage of flood waters, and dykes to protect communities against flooding. In addition to requiring high levels of initial investment, such solutions would incur ongoing maintenance costs and their environmental sustainability would be highly questionable, which in turn would require high levels of ongoing remedial expenditure. Major concerns have been raised in particular regarding the environmental sustainability of dams in the Mekong basin in general: their predicted impacts typically include interruption of fish migration routes (mitigation measures such as fish ladders are expensive and there is very little evidence of their effectiveness under the conditions of south-east Asia), with the risk of major impacts on fisheries-based livelihoods and the need for major compensatory investment in livelihood alternatives; modification of river hydrology and ecology through the elimination of the seasonal “flushing flows”, with similar implications for fisheries-based livelihoods; and the trapping of sediment, which on the one hand implies ongoing dredging costs to maintain the capacity and working life of the reservoir, and on the other can lead to increased levels of river bank recession downstream, with associated impacts on infrastructure, production and ecology.

190. The cost-effectiveness of the LDCF alternative is based on the fact that this approach will work with, rather than against, the targeted wetland ecosystems. CC-focused land use planning will result in infrastructure being located outside of vulnerable areas, thereby reducing the need for periodic reconstruction or for protective dykes; the wetlands themselves will be used as buffers against climatic variability and its implications, requiring only modest levels of initial and ongoing investment in small-scale management practices, tailored to the capacities of the local communities; and wetland-based livelihood activities will be promoted, supported and made more CC-resilient, thereby resulting in a cost-effective win-win solution whereby communities increasingly value and are committed to the protection of the wetlands that provide them with livelihood and resilience benefits.

191. Cost-effectiveness will be maximised through the promotion of a holistic approach which will include the strengthening of the natural resource base (the target wetlands), community-based small-scale infrastructure, sustainable livelihoods and planning for disaster mitigation. This will be more cost-effective than approaching each of these topics separately: for example, if the project were to focus only on livelihoods, then if the natural capital on which those livelihoods depended were severely affected the livelihoods could not be sustained and would require additional and unsustainable investment.

192. Although the project will include some expenditure on direct investments, under Output 2.3, in order to achieve concrete CCA benefits in the short term, the cost-effectiveness of the use of LDCF funds will be maximised through highly-targeted investments in the development of long-term capacities that will allow local stakeholders to sustain and scale-up CCA strategies beyond the scope and timeframe of the project itself. The project will further invest in cost-effective scaling-up through the actions proposed under the specific replication-focused Component 3.

193. The need for investment in costly “policing” of the management of the target natural resources will be minimized by concentrating on obtaining “buy-in” by local communities: as a result of increased awareness on their part of the importance of the wetlands for their livelihoods and resilience, they will commit to participating in their protection through community-level governance structures and self-regulation.

2.5 INNOVATIVENESS

194. The project is innovative in several ways. It will promote a holistic, eco-systems based approach to adaptation, designed to integrate the strengthening of the resilience of local stakeholders’

livelihoods to climate change and natural disasters, with that of the natural wetland systems upon which these depend. The project will strategically focus its investment in 'adaptation hotspots' or well-defined, densely populated, vulnerable and disaster prone eco-systems which also significantly contribute to climate resilience of riparian and downstream communities through the various eco-systems services they provide. The methodological approaches to be applied by the project, particularly the VDRA methodology to be piloted under Output 1.1, will be particularly innovative in the context of Lao PDR and will have major potential for replication in accordance with the provisions of the NAPA; while initial VDRA has been carried out already in Xe Champhone, this will be the first time that it is applied as part of such a fully integrated package of measures.

SECTION 3 – FEASIBILITY (FUNDAMENTAL DIMENSIONS FOR HIGH QUALITY DELIVERY)

3.1 ENVIRONMENTAL IMPACT ASSESSMENT

195. Following FAO's *Environmental Impact Assessment (EIA): Guidelines for FAO Field Projects*²⁴, the proposed Project is classified under category B, and therefore does not require a full scale EIA. The Environmental and Social Review Form is attached in Appendix 6.

3.2 RISK MANAGEMENT

196. Project risks have been identified and analyzed during the full project preparation and mitigation measures have been incorporated into the project design (see Appendix 5). The Project Management Coordination Unit (PMCU) will be responsible for the day-to-day management of these risks and the effective implementation of mitigation measures. A Monitoring and Evaluation (M&E) system will be designed in Project Year 1 (PY1) by a short-term M&E Specialist, under the general oversight of the PMCU (see Section 4). The M&E system will serve to monitor project outcomes and outputs indicators, project risks and mitigation measures. The PMCU will also be responsible for monitoring the effectiveness of mitigation measures and adjusting mitigation strategies as needed, and identify and manage any eventual new risks not foreseen during project development, in dialogue with other project partners.

197. The six-monthly Project Progress Report (PPR) is the main tool for project risk monitoring and management. These reports include a section on systematic follow-up of risks and mitigation actions identified in previous reporting periods. The PPRs also include a section for identification of eventual new risks or risks that still need attention, their rating and mitigation actions, as well as the responsibility for monitoring those actions, and the expected timeline. FAO will monitor the project risk management closely and follow up if needed by providing support for the adjustment and implementation of risk mitigation strategies. Reporting on risk monitoring and rating will also be part of the annual Project Implementation Review (PIR) prepared by FAO and submitted to the GEF Secretariat.

3.2.1 Risks and mitigation measures

198. Please see risk matrix in Appendix 5.

²⁴ See <http://www.fao.org/docrep/016/i2802e/i2802e.pdf>

SECTION 4 – IMPLEMENTATION AND MANAGEMENT ARRANGEMENTS

4.1 INSTITUTIONAL ARRANGEMENTS

a) General institutional context and responsibilities

199. The main institutional stakeholders in the project, together with their roles and responsibilities, are presented in detail in Section 1.1.3. The two lead sector institutions of primary relevance to the project are the Ministry of Natural Resources and the Environment (MONRE), which will be the lead executing partner of the project, and the Ministry of Agriculture and Forestry (MAF) which will participate in the steering committee of the project. These ministries are represented at provincial and district level respectively by PONRE, DONRE, PAFO and DAFO offices, which will play key roles in the development of planning and governance conditions for CCA and disaster management, and for working with local communities in the implementation of CCA and disaster management measures.

200. A number of other Government ministries (as described in more detail in Section 1.1.3) will also be involved in the project, including the Ministry of Labour and Social Welfare, Planning and Investment (MPI) and Energy and Mines (MEM).

201. The arrangements for the involvement of these and other partners in project implementation are proposed in Section 4.2.

b) Coordination with other ongoing and planned related initiatives

202. MONRE's internal coordination mechanisms will ensure strong linkages between the project and baseline projects/programmes implemented by MONRE's central departments and sub-national offices: 1) the pipeline KFW Wetlands Management Programme, 2) the ADB "Capacity Enhancement for Coping with Climate Change" project, 3) the WB/ADB National Water Resources Management Programme, 4) IUCN's Water and Wetlands Programme, and 6) the WCS/MMG Siamese Crocodile Conservation Programme.

203. The project will also coordinate closely with initiatives of the Mekong River Commission (MRC) in relation to climate change adaptation. At the time of project formulation, however, the MRC was going through a process of institutional restructuring, and it is expected that its Climate Change and Adaptation Initiative (CCAI), as currently formulated, will close within the current year. Relations will be maintained with the MRC in order to monitor how the work currently covered through the CCAI will be addressed by MRC in the future and, depending on this, strategies will be developed for ensuring that project results and lessons learnt will be fed into the MRC.

204. These development partners were consulted during the formulation of the project, as were relevant MAF departments. Sub-national MAF Offices will be part of the local project management structure and will co-finance the project.

205. The project will be coordinated and collaborate with the following GEF-financed initiatives; there will be joint annual review and planning meetings between the different UNDP and FAO LDCF projects could be envisaged, and the project may also conduct joint capacity building activities with the UNDP LDCF projects wherever possible:

- The UNDP/LDCF project on "Effective Governance for Small Scale Rural Infrastructure and Disaster Preparedness in a Changing Climate" (GEF ID 4554) implemented by the Department of National Disaster and Climate Change (DDMCC) and MONRE (Saravan and Sekong Provinces). The project will benefit from UNDP LDCF activities and experiences (during overlap in 2014-2017) and will inform project activities in terms of 1) mainstreaming CCA in village and district level planning, 2) the design of CC resilient small scale infrastructure or climate proofing of existing infrastructure, especially in the agricultural sector and 3) protection of small scale infrastructure through eco-systems based adaptation. UNDP's LDCF project will benefit from wetlands specific experiences and activities implemented by the project and which could be replicated in Saravan and Sekong Provinces. The CC vulnerability assessments and CCA planning tools to be developed by the project will

be used to improve similar assessments and adaptation planning under the UNDP LDCF project.

- The FAO/GEF project on “Strengthening Agro-climatic Monitoring Information Systems to improve adaptation to climate change and food security in Lao PDR” (GEF ID 5462). MONRE’s Department of Meteorology and Hydrology and MAF’s Department of Planning and Cooperation, executing agencies of the proposed agro-meteorology project, will be member of the Project Steering Committee. Most proposed activities such as 1) the improvement of agro-meteorological monitoring and communication infrastructure at national and provincial level, 2) the enhancement of facilities to access and analyse agro-meteorological information at national and provincial levels, 3) the strengthening of institutional and technical capacity to facilitate data sharing, archiving, analysis to provide improved agro-meteorological information products, 4) the strengthening of institutional and technical capacity to interpret, analyze and use agro-meteorological information in agriculture at all levels, 5) the development of high resolution climate change scenarios (baseline and future) of for all agriculture production areas developed development of adaptation strategies, will contribute to better data quality available to project stakeholders and will therefore inform the development of appropriate adaptation and disaster management measures and long term plans.

206. GEF investment in the project will also be coordinated with the following two initiatives, which constitute project cofinancing but were not mentioned in this regard in the PIF:

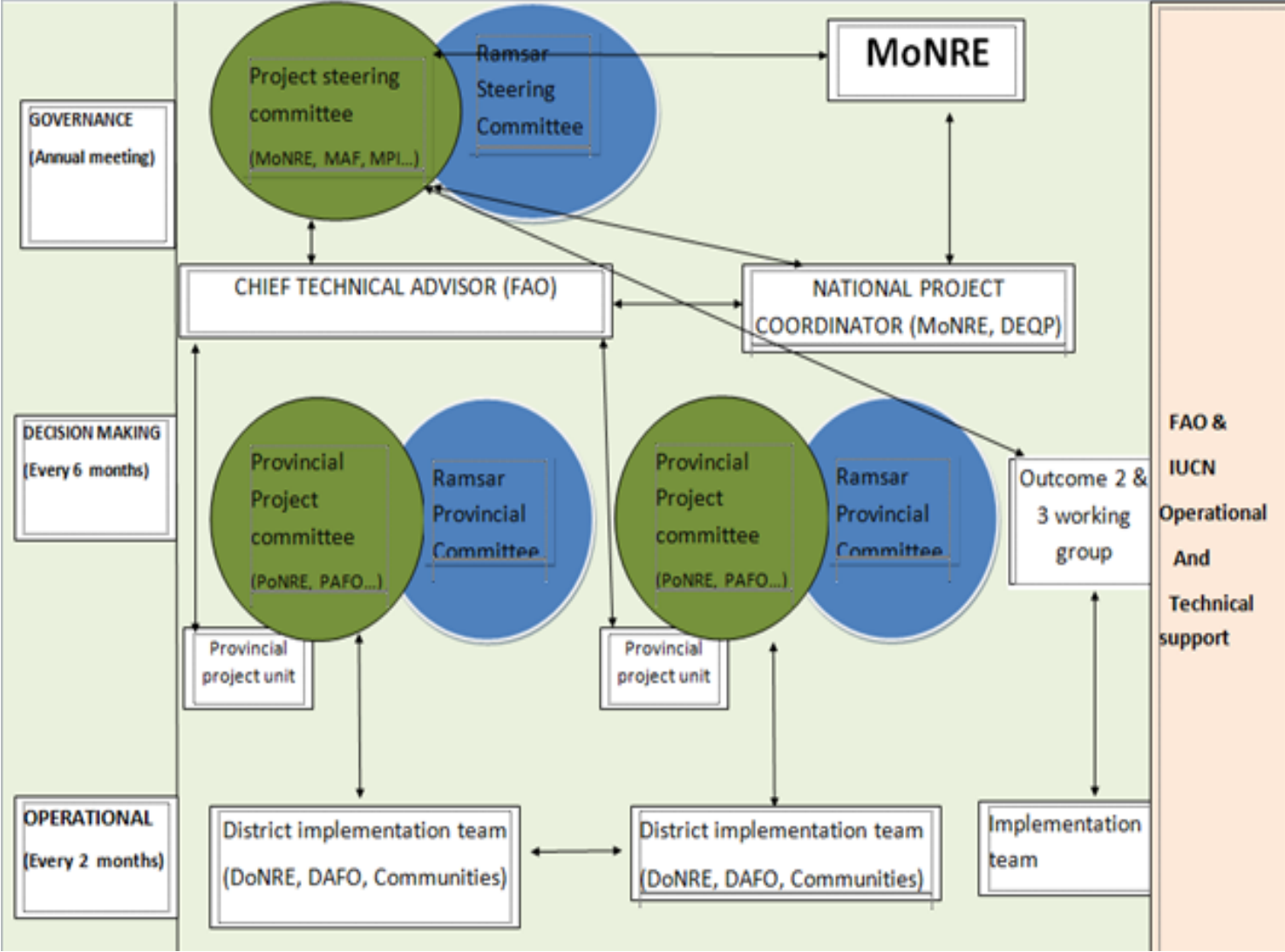
- The Mekong Integrated Water Resources Management Project (IWRMP) APL 1, supported by the World Bank. Coordination will focus on areas of shared interest, namely i) management of concerned river basins and floodplains; ii) development of river basin organizations and floodplain management plans; iii) assessment and rehabilitation of existing water resources infrastructure; and iv) fisheries management plans and institutional development.
- Lower Mekong Basin Wetland Management and Conservation Project, supported by KfW in association with IUCN, which will focus on implementing measures on sustainable rehabilitation, conservation and management of wetland ecosystem services while improving the livelihood of local communities.
- The project “Promotion of Climate-related Environmental Education” (ProCEED) financed by the German Development Cooperation and implemented by GIZ, to strengthen component 4 of the project (Knowledge management, dissemination of best practices, monitoring and evaluation).

207. Cooperation and opportunities for synergies and exchange of lessons learnt will also be sought with the UNDP/GEF project “Sustainable Forest and Land Management in the Dry Dipterocarp Forest Ecosystems of Southern Lao PDR” (GEF ID 6940), which is currently under formulation and will work in Savannakhet province.

4.2 IMPLEMENTATION ARRANGEMENTS

208. The Food and Agriculture Organization of the United Nations (**FAO**) will be the GEF Agency responsible for supervision and provision of technical guidance during project implementation. In addition, FAO will act as financial and operational Executing Agency, and will delivery procurement and contracting services to the project using FAO rules and procedures, as well as financial services to manage LDCF resources. The project will be technically executed by the Ministry of Natural Resources and Environment (MONRE), and will be managed through the institutional structure depicted below.

Figure 3. Organizational chart²⁵



²⁵ Site level Stakeholder Committees will also be established (see paragraph 214) but are not shown on this chart for reasons of space

209. Stakeholders committees and technical working groups (TWGs) will be established as needed under the different components.

a) Roles and responsibilities of the executing partners

210. The Food and Agriculture Organization of the United Nations (**FAO**) will be the GEF Agency responsible for supervision and provision of technical guidance during project implementation. In addition, FAO will act as financial and operational Executing Agency, and will deliver procurement and contracting services to the project using FAO rules and procedures, as well as financial services to manage LDCF resources.

211. The **Executing Partner/Lead Coordinating Agency (LCA)** of the project will be the Ministry of Natural Resources and the Environment (MONRE). The LCA shall be responsible for overall project coordination, cooperation with other government line agencies and other actors, and ensuring that the project is implemented so as to deliver the outputs indicated in the approved Project Document in a timely and cost-effective manner.

212. A **Project Steering Committee (PSC)** will be set up to provide oversight and coordinate the planning of project implementation (see below).

213. The LCA will be supported by a **Project Management and Coordination Unit (PMCU)**, which will have executive responsibility for the delivery of project outputs and the achievement of project outcomes. The PMCU will consist of a **National Project Coordinator (NPC)**, supported at central level by a **Chief Technical Advisor (CTA)** and at local levels (in the two target sites) by Provincial Project Units (PPUs) staffed by technical advisors: the technical advisers at central and local levels will all be appointed by FAO and funded by LDCF.

214. The PMCU will work in direct support of **District Implementation Teams** comprised of DONRE, DAFO and local communities: in addition to being the principal recipients of capacity development by the project, these teams will be directly responsible for supporting the execution of the proposed adaptation strategies, under the technical orientation and support of the advisers in the PMCU. This arrangement will maximize the potential for institutional sustainability.

215. Other project partners will play primary or secondary roles in relation to specific outputs, collaborating with the PMCU in their delivery. These partners will include MONRE, IUCN and IWMI. The work plan in Appendix indicates the partners with responsibilities for specific outputs; the precise identity and nature of these responsibilities with regard to specific outputs will be confirmed at project start. These outputs will be achieved through letters of agreements (LoAs) which will be elaborated and signed between the FAO and collaborating partners. Funds received by the service provider under a LoA will be used to execute the project activities in conformity with the FAO's rules and procedures. The respective LoAs are listed under the "Contracts" budget line of the project budget.

b) FAO's role and responsibilities, as the GEF Agency

216. FAO will be the GEF Agency of the Project as well as the financial and operational executing agency. As the financial and operational executing agency FAO will provide procurement and contracting services and financial management services of LDCF resources. As the GEF Agency FAO will supervise and provide technical guidance for the overall implementation process. Administration of the LDCF grant will be in compliance with the rules and procedures of FAO, and in accordance with the agreement between FAO and the GEF Trustee. As the GEF agency for the project, FAO will:

- Administrate funds from LDCF in accordance with the rules and procedures of FAO;
- Oversee project implementation in accordance with the project document, work plans, budgets, agreements with co-financiers and the rules and procedures of FAO;
- Provide technical guidance to ensure that appropriate technical quality is applied to all project activities and outputs;
- Carry out at least one supervision mission per year; and

- Report to the GEF Secretariat and Evaluation Office, through the annual Project Implementation Review, on project progress and provide financial reports to the GEF Trustee.

217. Based on a request from the Government of Lao PDR, FAO will also be the financial and operational executor of the LDCF resources including financial management, procurement of goods and contracting of services following FAO rules and procedures. As the financial executor, FAO will provide six-monthly financial reports including a statement of project expenditures to MONRE and other partners of the PMCU and the PSC. In accordance with the present project document, progress in the financial execution of the project, and the Annual Work Plan and Budget approved by the PSC, FAO will prepare budget revisions to maintain the budget current in the financial management system of FAO. The budget revisions will be provided to MONRE, other partners of the PMCU, and the PSC to facilitate project planning and execution. FAO will, in collaboration with MONRE and the other partners of the PMCU, participate in the planning and execution of contracting and procurement processes.

218. The FAO Representative in Lao PDR will be **the Budget Holder (BH)** and responsible for the management of the LDCF resources. As a first step in project start-up, the FAO Representation in Lao PDR will establish an interdisciplinary Project Task Force within FAO to guide the implementation of the project. In consultation with the LTO (see below) the FAO Representative will be responsible for timely operational, administrative and financial management of the LDCF project resources, including in particular: (1) contracting and procurement processes based on the request from MONRE/PMCU and in accordance with the approved Annual Work Plan and Budget; (2) process the payments corresponding to delivery of goods, services and technical products based on the prior clearance of the same by MONRE and the other partners of the PMCU as applicable in each case; (3) provide six-monthly financial reports including a statement of project expenditures to MONRE/PMCU and the PSC; and (4) at least one time per year or more frequent if required, prepare Budget Revisions for submission to TCI/GEF Coordination Unit for approval. In addition, the FAO Representative will give no-objection to AWP/B submitted by the PMCU, approve six-monthly progress reports and upload them on FPMIS. He/she will also support the LTO in the preparation of the annual Project Implementation Review (PIR). The FAO Representation in Lao PDR will work in close consultation with MONRE, the LTO, and the FAO GEF Coordination Unit for the management of LDCF resources.

219. The **FAO Representative** will in consultation with the LTU, LTO and the FAO-GEF Coordination Unit give no-objection to AWP/B submitted by the Project Management Coordination Unit (PMCU) as well as to the Project Progress reports which should be approved by the LTO before they are submitted to the FAO-GEF Coordination Unit for final approval and upload in FPMIS.

220. The **FAO Lead Technical Unit(s)**: The Climate, Energy and Tenure Division (NRC) of the Natural Resources Department of FAO will be the Lead Technical Unit (LTU) for this project and will provide overall technical guidance to its implementation. NRC will assign a Lead Technical Officer (LTO) or delegate LTO responsibility to FAO's Subregional office in Bangkok. The LTO will have specific expertise in land and water management practices and adaptation to climate change in degraded watersheds and agricultural systems and be responsible for direct technical supervision of the project.

221. **The FAO Lead Technical Officer (LTO)**: the LTO will provide technical guidance to the project team to ensure delivery of quality technical outputs. The LTO will coordinate the provision of appropriate technical backstopping from all the concerned FAO units represented in the Project Task Force responding to requests from the MONRE/PMCU. The Project Task Force is thus composed of technical officers from the participating FAO units and of operational officers and is chaired by the BH. The LTO, supported by the LTU when needed, will be responsible for:

- Reviewing and giving no-objection to TORs for consultancies and contracts to be performed under the project and to CVs and technical proposals short-listed by the PMCU for key project positions, goods, minor works, and services to be financed by MONRE resources;

- Supported by the FAO Representation in Lao PDR, reviewing and clearing final technical products delivered by consultants and contract holders financed by LDCF resources before the final payment can be processed;
- Assisting with review and provision of technical comments to draft technical products/reports on request from the PMCU during project execution;
- Review and provision of technical clearance of project progress reports submitted by the PMCU to the FAO Representation in Lao PDR;
- Supporting the FAO Representative in reviewing, revising and giving no-objection to AWP/B submitted by the PMCU and to be approved by the Project Steering Committee;
- Preparing the annual Project Implementation Review report, supported by the FAO Representation in Lao PDR and inputs from the PMCU, to be submitted for clearance and completion by the FAO GEF Coordination Unit (TCI) which will subsequently submit the PIR to the GEF Secretariat and Evaluation Office as part of the Annual Monitoring Review report of the FAO-GEF portfolio. The LTO must ensure that PMCU has provided information on co-financing provided during the course of the year for inclusion in the PIR;
- Annual (or as needed) project field supervision missions;
- Review and revision of TORs for the mid-term review/evaluation, participation in review mission including the mid-term workshop with all key project stakeholders, development of an eventual agreed adjustment plan in project execution approach, and supervise its implementation supported by the FAO.
- Review and revision of TORs for the final evaluation, participation in the final project closure workshop with all key project stakeholders and the development of and follow up on recommendations on how to ensure sustainability of project outputs and results after the end of the project.

222. The **FAO GEF Coordination Unit (TCI)** will review project progress reports, financial reports and budget revisions. The FAO GEF Coordination Unit will review and clear the annual PIR and undertake supervision missions if considered necessary. The PIRs will be included in the FAO GEF Annual Monitoring Review submitted to GEF by the FAO GEF Coordination Unit. The FAO GEF Coordination Unit will review the TOR and reports of the midterm review/evaluation and final evaluation. If necessary, the GEF Unit will participate in the mid-term review and final evaluation and support the FAO Representative in the development of corrective actions in project implementation. The FAO GEF Coordination Unit will in collaboration with the FAO Finance Division request transfer of project funds from the GEF Trustee based on six-monthly projections of funds needed.

223. The **FAO Finance Division** will provide annual Financial Reports to the GEF Trustee and, in collaboration with the FAO GEF Coordination Unit, call for project funds on a six-monthly basis from the GEF Trustee.

c) Project technical, coordination and steering committees

224. **Project Steering Committee (PSC)**. A project PSC will be established, chaired by the Minister of Natural Resources and Environment and including MAF, MPI (Planning and Investment), MOFA (Foreign Affairs), and MOF (Finance). FAO and IUCN will be observers. The PSC will meet minimally twice a year and its specific responsibilities will be: (i) overall oversight of project progress and achievement of planned results as presented in six-monthly Project Progress Reports; (ii) take decisions in the course of the practical organization, coordination and implementation of the project; (iii) facilitate cooperation between MONRE, other project partners and project support at the local level; (iv) advise the PMCU on other on-going and planned activities facilitating collaboration between the Project and other programmes, projects and initiatives in the target provinces; (v) facilitate that co-financing support is provided in a timely and effective manner; and (vi) review six-monthly Project Progress Reports and approve AWP/B.

225. **Provincial Project Committees** comprising MONRE, PONRE, PAFO, and the Provincial Departments of Planning and Investment, Foreign Affairs, and Finance, with FAO and IUCN as Observers. These Committees will all meet twice per year.

226. **Technical Working Groups (TWG)** will be established to provide technical advice on specific project components and outputs and may be composed of technical staff from MONRE, IUCN, PONRE, PAFO and FAO, among others. The main tasks of the TWGs will be to provide technical advice to the PSC, backstop the PMCU on request, advise the PMCU on other on-going and planned activities and facilitate collaboration between the Project and other programmes, projects, and initiatives of sector agencies and research institutions. The TWGs may also be involved in technical evaluation of project progress and outputs, and identification of possible solutions and/or changes in project activities when technical issues arise in the course of project implementation.

227. **Stakeholder Committees (SC)**. At least two stakeholder committees will be established, one for each of the target sites. These will be combined with the Ramsar Committees at National and Provincial level, that contain all relevant bodies (including Civil Society) related to the wetlands and surrounding areas. They will meet twice a year at national and provincial level. The mandate of the SCs will be to: (i) provide advice on relevant policies, actions and measures in particular in relation to the strengthening of local committees and civil protection committees in components 1 and 4; (ii) provide new ideas and thinking on better management options for increased CCA and sustainable use of NR, promotion of good agricultural practices among local farmers, and the reduction of CC threats at local level, all to be supported under the project; and (iii) promote communications between the government agencies and local communities and the private sector. The composition of the SCs will include representatives from local communities, women associations/networks, public schools teachers, farming and livestock associations, municipal governments, and the private sector.

4.3 FINANCIAL PLANNING AND MANAGEMENT

4.3.1 Financial plan (by component, outputs and co-financier)

228. The total cost of the project will be USD 20,084,959, to be financed through a USD 4,717,579 LDCF grant and USD 15,367,380 in co-financing from. Table 3 below shows the cost by component and outputs and by sources of financing and Table 4 shows the sources and type of confirmed co-financing. The FAO will, as the GEF Agency, only be responsible for the execution of the GEF and SCCF resources and the FAO co-financing.

Table 3. Budget breakdown by outcome

Component	IUCN	World Bank	KfW	IWMI	MONRE	MAF	FAO	CF total	GEF	Total
1: Improved understanding of CC impacts and risks, in XC and BKN wetlands.	229,731	806,931	209,379	14,358	47,861	47,861	71,791	1,427,912	391,158	1,819,070
2: Efficient and cost-effective adaptation measures in place to reduce the impact of CC and natural disasters on wetlands eco-systems and/or local livelihoods	1,493,929	5,247,428	1,361,580	521,943	311,235	311,235	466,853	9,714,203	3,503,526	13,217,729
3: Efficient and cost-effective CC adaptation and disaster management measures in wetlands integrated and budgeted in local and national planning processes	545,965	1,917,701	497,597	34,122	113,742	113,743	170,614	3,393,484	448,151	3,841,635
4: Knowledge management, dissemination of best practices, monitoring and evaluation	16,089	56,511	14,663	1,006	3,352	3,351	5,028	100,000	150,097	250,097
Project Management	114,286	401,429	104,161	28,571	23,810	23,810	35,714	731,781	224,647	956,428
Total Project	2,400,000	8,430,000	2,187,380	600,000	500,000	500,000	750,000	15,367,380	4,717,579	20,084,959

Table 4. Sources of confirmed co-financing

Sources of Co-financing	Name of Co-financier	Type	Amount (\$)
NGO	International Union for the Conservation of Nature	Cash	2,400,000
GEF agency	World Bank	Cash	8,430,000
Bilateral Cooperation	KfW	Cash	2,187,380
NGO	IWMI	Cash	600,000
Government	MONRE	In kind	500,000
Government	MAF	In kind	500,000
GEF agency	FAO	Cash	750,000
Total Co-financing			15,367,380

4.3.2 LDCF inputs

229. LDCF inputs are broken down by component, outcome and item in Appendix 3. As shown in section 1.1.1c), LDCF inputs will focus on:

- Supporting the generation, especially at community level in the target sites, of additional information on CC vulnerability that will permit the formulation of corresponding resilience strategies
- Bringing together disparate sources of information (on e.g. climate, ecology, livelihoods, productive sectors) to permit an integrated appreciation of the nature and implications of climate change and the potential for wetland-related adaptation/resilience strategies. Additional LDCF support will focus on:
 - Strengthening and integrating planning, coordination and governance in order to support integrated resilience strategies
 - Promoting integrated and sustainable adaptation strategies, with an ecosystem-based approach wherever possible, that provide for the interests of different stakeholder groups, including women
 - Supporting early warning systems with short, medium and long term perspectives of extreme weather events, climate variations and climatic trends Provision of methodological guidance and training to permit the incorporation of CCA strategies into planning processes
 - Promotion of inter-sector institutional coordination to permit the application of integrated approaches to CC resilience.

230. In concrete terms, in order to achieve this LDCF resources will principally be used for the following:

- Salaries, travel and other operational costs of technical advisers, including vehicle, office and equipment costs;
- Travel costs of Government staff attached to the project (the National Project Coordinator and the members of the District Implementation Teams) for activities specifically related to the delivery of the outputs of the project. LDCF funds will not be used to cover the salaries of Government staff members, travel or other costs not related to the delivery of project outputs, or (in order to avoid undermining sustainability) travel costs required for carrying out their institutional functions that would need to be continued after project end;
- Fees, travel and other operational costs of national and/or international consultants required to provide specific expertise in support of the delivery of project outputs or for filling key information gaps;
- Costs of the development and implementation of the project's M&E plan
- Costs of capacity development (e.g. training courses and farmer field schools, including necessary equipment, trainer fees, venue hire and the travel and lodging costs of participants)
- Direct investments in adaptation as proposed under Output 2.3.

4.3.3 Government inputs

231. The Government will provide the following inputs:

- Salaries of Government staff attached to the project

- Offices for Government staff and LDCF-funded technical advisers
- Support to coordination and communication between institutional participants
- Information on social, economic and biophysical conditions in the project areas and beyond, as required by the PMCU to guide the implementation of the project
- Information on Government and other investments and policy directions, in order to maximize the relevance and effectiveness of the project.
- *Other cofinancing contributions*

4.3.4 FAO inputs

232. FAO will provide technical assistance, support, training and supervision of the execution of activities financed by GEF resources. The GEF project will be complemented and co-financed by several projects and activities implemented by the FAO Representation in Lao PDR, funded by the FAO Technical Cooperation Programme and by various donors through trust fund arrangements, including the following:

- 1) FAO Regional Rice Initiative (USD550,000 allocated for the Lao PDR)
- 2) Support for the Rice Strategic Implementation Plan for Lao PDR (USD200,000)

4.3.5 IUCN inputs

233. In collaboration with the Government and FAO, IUCN will support the delivery of all technical outputs of the project with the exception of Output 2.4 (direct investments in CCA strategies), which will be under the direct responsibility of FAO.

234. IUCN will bring to the project significant technical expertise and local field experience. IUCN has worked with the Government of LAO PDR for 26 years: through the Mekong Water Dialogues Programme and other sources, IUCN Lao PDR is supporting implementation of the Convention and improvement of wetlands management in Lao PDR, working with partners such as the Water Resources and Environment Administration, Ministry of Agriculture and Forestry and the Mekong River Commission. Key areas of work include:

- Updating the wetlands inventory for Lao PDR;
- Development of management plans for the two Ramsar sites; celebration of World Wetlands Day each year;
- A study on the role of customary law in wetlands governance in Xe Champhone.

235. IUCN has well-established and highly qualified teams of in-house specialists and consultants in the region and in Lao PDR, in diverse areas including wetlands ecology, hydrology, governance, community development and sustainable livelihood alternatives. It will draw upon these resources to provide the technical expertise required for the delivery of the project outputs, under the provisions of Letters of Agreement signed with FAO and the Government.

236. Furthermore, IUCN will provide USD2.4 million cofinancing to the project, made up as follows:

- Lower Mekong Basin Wetland Management and Conservation Project (MRWP)
- Global Resilience Partnership (GRP)
- Mekong WET Programme
- Capacity Enhancement to Integrate Ecosystem-based adaptation into Sub-national Development Planning in Laos PDR (CEEbA)

4.3.6 Financial management of and reporting on LDCF resources

237. Financial management and reporting in relation to the LDCF/GEF resources will be carried out in accordance with FAO's rules and procedures.

238. All financial reporting shall be in US dollars. Within one month of the end of each six month, i.e. on or before 31 July and 31 January, the FAO Representation in Lao PDR shall submit six-monthly statements of expenditure of GEF resources to the PMCU and the PSC. The purpose of the financial statement is to list the expenditures incurred on the project on a six monthly basis so as to monitor

project progress and to reconcile outstanding advances during the six month period. The financial statement shall contain information that allows for a financial overview of the execution of the project.

239. FAO shall prepare annual financial reports on the use of the LDCF resources to be submitted with the 2nd six monthly Project Progress Report to the PSC, showing amount budgeted for the year, amount expended since the beginning of the year, including un-liquidated obligations (commitments) as follows: Details of project expenditures on an output-by-output basis, reported in line with project budget lines as set out in the project budget included in this Project Document Appendix 3, as at 31 December each year.

240. An annual budget revision will be prepared by the FAO Representation in Lao PDR and inserted in the GRIMS in collaboration with the PMCU for clearance by the LTO, and the FAO GEF Coordination Unit. The financial execution will be monitored by the LTO and the FAO GEF Coordination Unit.

241. Financial reports for submission to the donor (GEF) will be prepared in accordance with the provisions in the Financial Procedures Agreement with the GEF Trustee and submitted by the FAO Finance Division (CSFE).

242. Responsibility for cost overruns. The BH shall utilize the LDCF project funds in strict compliance with the project document. The BH shall be authorized to make variations not exceeding 20 per cent on any total output budget line or any cost category line of the project budget provided that the total allocated for the specific budgeted project component is not exceeded and the reallocation of funds does not impact the achievement of any project output as per the project Results Framework Appendix 1. Any variations exceeding 20 per cent on any total output budget line or any cost category line, that may be necessary for the proper and successful implementation of the project, shall be subject to prior consultations with the LTO and the FAO-GEF Coordination Unit. In such a case, a revision to the FAO-LDCF budget in FPMIS should be prepared by the BH and approved by the LTO and the FAO-GEF Coordination Unit. Cost overruns shall be the sole responsibility of the BH.

4.4 PROCUREMENT

243. The Budget Holder, in close collaboration with the Project Coordinator, the LTO and the Budget and Operations Officer will procure the equipment and services provided for in the detailed budget in Appendix 3, in line with the Annual Work Plan and Budget and in accordance with FAO's rules and regulations.

244. Prior to commencement of procurement, the BH, in close consultation with the Project Coordinator and the LTO, will complete the procurement plan for all services and equipment to be procured by FAO.

245. The procurement plan shall be updated by the BH every 12 months and submitted to and cleared by the LTO with the AWP/B and annual financial statement of expenditures report for the next instalment of funds.

4.5 MONITORING AND REPORTING

246. Monitoring and evaluation of progress in achieving project results and objectives will be done based on the targets and indicators established in the Project Results Framework (Appendix 1). The project Knowledge Management and Monitoring and Evaluation Plan has been budgeted at USD150,097 (see Appendix 3, Component 4). Monitoring and evaluation activities will follow FAO and GEF monitoring and evaluation policies and guidelines.

4.5.1 Oversight and monitoring responsibilities

247. At the initiation of implementation of the LDCF/GEF Project (PY1), a short-term M&E Specialist will design and set up a project progress monitoring system, in close consultation with the PMCU. Participatory mechanisms and methodologies for systematic data collection and recording will be developed in support of outcome and output indicator monitoring and evaluation. During the inception workshop (see section 4.5.3 below), M&E related tasks to be addressed will include: (i) presentation and clarification (if needed) of the project Results framework with all project stakeholders; (ii) review of the M&E indicators and their baseline; (iii) drafting the required clauses to

include in consultants' contracts to ensure they complete their M&E reporting functions (if relevant); and (iv) clarification of the respective M&E tasks among the Project different stakeholders. One of the main outputs of the workshop will be a detailed monitoring plan agreed to by all stakeholders based on the monitoring and evaluation plan summary presented in section 4.5.4 below.

248. The day-to-day monitoring of the Project implementation will be the responsibility of the PMCU driven by the preparation and implementation of an AWP/B followed up through six-monthly PPRs. The Project Coordinator will closely support the PMCU in the mentioned tasks. The preparation of the AWP/B and six-monthly PPRs will represent the product of a unified planning process between main project partners. As tools for results-based-management (RBM), the AWP/B will identify the actions proposed for the coming project year and provide the necessary details on output targets to be achieved, and the PPRs will report on the monitoring of the implementation of actions and the achievement of output targets. Specific inputs to the AWP/B and the PPRs will be prepared based on participatory planning and progress review with local stakeholders and coordinated through the PMCU and facilitated through project planning and progress review workshops. An annual project progress review and planning meeting should be held with the participation of the PMCU. The AWP/B will be developed in a manner consistent with the project's Results Framework to ensure adequate fulfillment and monitoring of project outputs and outcomes.

249. Following the approval of the Project, the project's first year AWP/B will be adjusted (either reduced or expanded in time) to synchronize it with an annual reporting calendar. In subsequent years, the work plan and budget will follow an annual planning and reporting cycle as specified below.

4.5.2 Indicators and information sources

250. To monitor project outputs and outcomes including contributions to adaptation benefits, specific indicators have been established in the Project Results Framework (see Appendix 1). The Project Results Framework indicators and means of verification will be applied to monitor both project performance and impact. Following FAO monitoring procedures and progress reporting formats, data collected will be sufficiently detailed to track specific outputs and outcomes, and flag project risks early on. Output target indicators will be monitored on a six-monthly basis, and outcome target indicators will be monitored on an annual basis, if possible, or as part of the mid-term review and the final evaluation. The project output and outcome indicators have been designed to monitor on-the-ground impacts and progress in building and consolidating capacities for watershed planning, INRM and CCA, SLM, and disaster risk management both at the municipal institutional level as well as at the level of local farmers and communities. The baseline and target for these indicators are established in the Project Results Framework and will be fine-tuned and included in the M&E plan to be designed by the short-term M&E specialist in PY1. Key indicators at the outcome level include:

4.5.3 Reporting schedule

251. Specific reports that will be prepared under the M&E program are: (i) Project inception report; (ii) Annual Work Plan and Budget (AWP/B); (iii) Project Progress Reports (PPRs); (iv) annual Project Implementation Review (PIR); (v) Technical Reports; (vi) co-financing Reports; and (vii) Terminal Report. In addition, assessment of the LDCF Monitoring Evaluation Tracking Tools (METTs) against the baseline (completed during project preparation) will be required at the midterm review and at the final project evaluation.

252. **Project Inception Report.** After FAO approval of the project and signature of the GCP Agreement an inception report will be drafted and discussed during the inception workshop. Immediately after the workshop, the PMCU supported by the Project Coordinator will finalize the project inception report in consultation with the FAO Representation in Lao PDR and other project partners. The report will include a narrative on the institutional roles and responsibilities and coordinating action of project partners, progress to date on project establishment and start-up activities and an update of any changed external conditions that may affect project implementation. It will also include a detailed first year AWP/B, a detailed project monitoring plan based on the monitoring and evaluation plan summary presented in section 4.5.4 below. The draft inception report will be circulated to FAO and the Project Steering Committee for review and comments before its

finalization, no later than three months after project start-up. The report should be cleared by the FAO BH, LTO and the FAO GEF Coordination Unit and uploaded in FPMIS by the BH.

253. **Annual Work Plan and Budget (AWP/B)**. The PMCU will submit to the FAO Representation in LAO PRD a draft Annual Work Plan and Budget no later than 10 January. The AWP/B should include detailed activities to be implemented by project outputs and divided into monthly timeframes and targets and milestone dates for output indicators to be achieved during the year. A detailed project budget for the activities to be implemented during the year should also be included together with all monitoring and supervision activities required during the year. The draft AWP/B is circulated to and reviewed by the FAO Representation in Lao PDR, PMCU incorporates eventual comments and the final AWP/B is sent to the PSC for approval and to the FAO for final no-objection and upload in FPMIS by the FAO GEF Coordination Unit.

254. **Project Progress Reports (PPR)**: The PMCU will prepare six-monthly PPRs and submit them to the FAO Representation in Lao PDR no later than July 31 (covering the period January through June) and 31 January (covering the period July through December). The 1st semester six months report should be accompanied by the updated AWP/B, for review and no-objection by FAO. The PPR are used to identify constraints, problems or bottlenecks that impede timely implementation and take appropriate remedial action. PPRs will be prepared based on the systematic monitoring of output and outcome indicators identified in the project's Results Framework Appendix 1). The FAO Representation will review the progress reports and collect and consolidates eventual FAO comments from the LTO, and the FAO GEF Coordination Unit and provide these comments to the PMCU. When comments have been duly incorporated the BH will give final approval and upload in FPMIS.

255. **Annual Project Implementation Review (PIR)**: The LTO supported by the FAO Representation in Lao PDR and with inputs from the PMCU, will prepare an annual PIR covering the period July (the previous year) through June (current year) to be submitted to the FAO GEF Coordination Unit for review and approval no later than 31 July. The FAO GEF Coordination Unit will upload the final report on FAO FPMIS and submit it to the GEF Secretariat and Evaluation Office as part of the Annual Monitoring Review report of the FAO-GEF portfolio. The FAO GEF Coordination Unit will provide the updated format and the exact deadline when the first PIR is due.

256. **Technical Reports**: Technical reports will be prepared as part of project outputs and to document and share project outcomes and lessons learned. The drafts of any technical reports must be submitted by PMCU to the FAO Representation in Lao PDR who will share it with the LTO and the LTO for review and clearance and to the FAO GEF Coordination Unit for information and eventual comments, prior to finalization and publication. Copies of the technical reports will be distributed to the PSC and other project partners as appropriate. The final reports will be posted on the FAO FPMIS by the LTO.

257. **Co-financing Reports**: The PMCU will be responsible for collecting the required information and reporting on in-kind and cash co-financing provided by MONRE, MAF, IWMI, IUCN, KfW, World Bank and eventual other partners not foreseen in the Project Document. The PMCU will submit the report to the FAO Representation in Lao PDR in a timely manner on or before 31 July covering the period July (the previous year) through June (current year).

258. **LDCE Tracking Tool**: Following the GEF policies and procedures, the GEF 6 tracking tool for Climate Change Adaption will be submitted at three moments: (i) with the project document at CEO endorsement; (ii) at the project's mid-term evaluation; and (iii) with the project's terminal evaluation or final completion report.

259. **Terminal Report**: Within two months before the end date of the GCP Agreement, the PMCU will submit to the FAO Representation in Lao PDR a draft Terminal Report. The main purpose of the final report is to give guidance at ministerial or senior government level on the policy decisions required for the follow-up of the Project, and to provide the donor with information on how the funds were utilized. The terminal report is accordingly a concise account of the main products, results, conclusions and recommendations of the Project, without unnecessary background, narrative or technical details. The target readership consists of persons who are not necessarily technical specialists

but who need to understand the policy implications of technical findings and needs for insuring sustainability of project results..

4.6 PROVISION FOR EVALUATIONS

260. A mid-term review/evaluation will be at project midterm to review progress and effectiveness of implementation in terms of achieving project objective, outcomes and outputs. Findings and recommendations of this review will be instrumental for bringing improvement in the overall project design and execution strategy for the remaining period of the project's term if necessary. FAO will arrange for the review in consultation with project management. The review will, *inter alia*:

- (i) review the effectiveness, efficiency and timeliness of project implementation;
- (ii) analyze effectiveness of partnership arrangements;
- (iii) identify issues requiring decisions and remedial actions;
- (iv) propose any mid-course corrections and/or adjustments to the implementation strategy as necessary; and
- (v) highlight technical achievements and lessons learned derived from project design, implementation and management.

261. An independent Terminal Evaluation (TE) will be carried out three months prior to the terminal review meeting of the project partners. The TE will be managed by the FAO Evaluation Office (OED) according to FAO procedures. The TE will aim to identify the project impacts and sustainability of project results. It will also serve the purpose of indicating future actions needed to sustain project results and disseminate products and best practices within the country and to neighbouring countries.

Table 5. Summary of the main M&E reports, responsible parties and timeframe

Type of M&E Activity	Responsible Parties	Time-frame	Indicative budget
Inception Workshop	PMCU, supported by the FAO LTU, BH, and the FAO GEF Coordination Unit	Within two months of project start up	National workshop \$5,000, local workshops \$5,000
Project Inception Report	PMCU, cleared by FAO LTU, BH, and the FAO GEF Coordination Unit	Immediately after workshop	\$17,800 of CTA salary assigned to Component 4 \$39,600 of M&E specialist salary assigned to Component 4 FAO costs covered by agency fee
Project day to day monitoring	PMCU, participating executing partners and other relevant institutions.	Continually	
Supervision visits and rating of progress in PPRs and PIRs	PMCU, FAOSV, FAO LTU and FAO GEF Coordination Unit	Annual or as required	
Project Progress Reports	PMCU and Project Coordinator (supported by the Project Bilingual Assistant) with inputs from other partners	Six-monthly	
Project Implementation Review report	Inputs provided by the Project Coordinator, assisted by the Project Bilingual Assistant. FAOSV and LTUs supported by the PMCU. PIRs cleared and submitted by the FAO GEF Coordination Unit to the GEF Secretariat	Annual	
Co-financing Reports	PMCU	Annual	
Technical reports	PMCU, /LTU	As appropriate	
Terminal Report	PMCU, FAOSV, LTUs, TSCR report Unit	At least two months before the end date of the GCP Agreement	

Type of M&E Activity	Responsible Parties	Time-frame	Indicative budget
Mid-term Review	External Consultant, in consultation with the project team including the FAO GEF Coordination Unit, the LTU, and other partners	At mid-point of project implementation	\$40,000
Final evaluation	External Consultant, FAO independent Evaluation Office in consultation with the project team including the FAO GEF Coordination Unit, the LTU, and other partners	At the end of project implementation	\$50,000
Total			\$157,400

4.7 COMMUNICATION AND VISIBILITY

262. Due to its cross-sector nature, the project will require participation and buy-in by multiple stakeholders at national and local levels, and its success will therefore depend on effective communication and a high level of visibility.

263. A significant base has been established in this regard during the PPG phase, in the form of numerous consultation meetings with Government agencies and other key stakeholders at central and provincial levels, including high profile launch and integration workshops near the beginning and end of the design process. This approach will be continued into the implementation phase. A national inception workshop will be held in the second quarter of Year 1, in order to maintain the profile raised during the PPG phase and ensure concrete participation and buy-in by partners in the definition of detailed operational aspects of the project's implementation. This will be followed by provincial level inception workshops, with the same aim but focused on provincial, district and community-level actors.

264. The National Project Coordinator and the Chief Technical Advisor will play key roles in maintaining fluid and regular communication about the project with national stakeholders at all levels, but most importantly among high level actors in agencies of central Government, aimed at maintaining their interest in and commitment to the project throughout its entire lifetime. This will be achieved through personal bilateral communication with these actors (the selection criteria for the individual to fill the CTA post will include the ability to communicate effectively in this way), taking advantage in particular of the strategic position of the NPC to channel messages regarding the project to other Government stakeholders. Given their broad stakeholder base, the Project Steering Committee and Stakeholder Committees (see Section 4.2) will also serve as vehicles for communication and raising visibility regarding the project and its aims and approaches.

SECTION 5 – SUSTAINABILITY OF RESULTS

5.1 SOCIAL SUSTAINABILITY

265. The social sustainability of the project will be ensured through the following approaches:

- Support to participatory vulnerability assessments, and the development of corresponding capacities among local communities and institutions, in order to enable the communities themselves to analyse their circumstances, recognise their needs and identify adaptation strategies that meet these needs and are in accordance with their cultural and socioeconomic contexts.
- Promotion and climate-proofing of livelihood support activities based on the sustainable use of wetlands, in order to ensure that local populations are able to enjoy continued livelihood benefits (monetary, through the sale of wetland products; supply of food and other products for subsistence needs; and environmental services including climate change resilience), leading to their acceptance, adoption and support of the CCA measures proposed.
- Diversification of livelihood support options, to include activities directly based on wetland management and others, in order to ensure that members of the target population have fall-back options in the case of failure of their existing livelihood support activities.
- Emphasis on strengthening the roles of local, community-based organisations in planning and governance of the management of the target wetlands and their surrounding areas of influence.
- Focus on horizontal, participatory approaches to the generation and transmission of technologies and practices for natural resource management, including (but not necessarily limited to) the well proven Farmer Field School model; this will help to ensure their relevance, acceptance and therefore the social sustainability.

266. The approach of the project to addressing aspects of gender sustainability is detailed in Appendix 8.

5.2 ENVIRONMENTAL SUSTAINABILITY

267. The approach of the project will be fundamentally focused on ensuring environmental sustainability, through promoting the sustainable management of wetlands in order to safeguard their roles in ecosystem-based adaptation. As necessary, the CCA strategies to be promoted under the project will incorporate mitigation measures to ensure their environmental sustainability, and/or by subject to case-specific technical analyses to identify and address any potential risks. For example:

- Tree planting programmes will incorporate appropriate species in order to avoid risks of invasiveness, and will not involve the elimination of existing vegetation of ecological importance;
- Techniques for the management/elimination of invasive species will avoid collateral negative impacts on native ecosystem elements important for environmental sustainability, such as might occur through the indiscriminate use of fire, burning or mechanical clearance;
- The physical re-opening of critical wetlands will be planned on the basis of detailed local studies of wetland hydrology and ecology, in order to avoid, for example, disturbance to habitat or nesting sites of important fauna.
- Controlled burning will be carefully timed in order to avoid the risk of escapes and consequent wildfires, and will be located in areas of suitable vegetation composition and structure which is likely to recover and benefit from burning.
- The production and collection of fodder for livestock will be carried out in areas where it does not affect ecologically vulnerable habitats.

- Integrated pest management practices will be formulated and targeted in such a way as to avoid unintentional negative impacts on non-pest fauna of ecological importance (especially pollinators or natural control agents), and the risk of invasiveness.
- The creation of semi-natural reservoirs (artificial wetlands) will be carried out in such a way as to avoid damage to natural habitats or the disturbance of ecologically-important hydrological flows
- The irrigation systems to be promoted will be small scale, targeted and efficient, in order to avoid negative impacts on wetland hydrology and ecology.
- The introduction of resilient livestock varieties, such as goats, will be subject to strict community-based norms on grazing practices in order to avoid ecological damage.

5.3 FINANCIAL AND ECONOMIC SUSTAINABILITY

268. At institutional level, the project will promote financial sustainability through the actions proposed under Output 2.1, recognising that in addition to the one-off direct investments proposed under Output 2.3, effective CC will require continued investment from other sources beyond the life of the project. This will be ensured through supporting the development of medium- and long-term investment plans for both target wetlands, setting out the types and levels of financial resources that will be required over time, together with proposals of their sources, with central and regional Governments, and the corresponding planning and normative provisions required to ensure their availability. This will be complemented by awareness among decision-makers at central and provincial levels regarding the implications of CC, and particularly the results of the vulnerability assessments proposed under Output 1.3, together with information on the nature, costs and effectiveness of the CCA strategies recommended through those assessments.

269. At local level, financial and economic sustainability will be ensured through a focus on incorporating CCA considerations into farm families' existing productive activities, thereby reducing costs and increasing productivity. Costs will be reduced, for example, by promoting preventative pest and disease control measures, thereby minimising the need for replanting, agrochemical use or veterinary care; productivity and therefore profitability will be sustained for example through the introduction of CC-resilient crop varieties capable of sustaining or increasing crop yields despite changing environmental conditions. In addition, the livelihood alternatives to be promoted will focus on those with high potential for economic success, such as NTFP production and ecotourism, and project support will include capacity strengthening in areas such as value-adding and marketing, to enable producers to maximise income from such activities.

5.4 SUSTAINABILITY OF CAPACITIES DEVELOPED

270. The capacity development activities to be undertaken will respond to the findings of the Capacity Building Needs Assessment carried out during the PPG phase, in order to maximize the likelihood of impact and sustainability (see paragraphs 61 and 137). Key strategies aimed at ensuring sustainability, in addition to impact, will include the following:

- Complementing capacity development in middle and upper levels of Government with the strengthening of community-level organisations, which typically have low levels of participant turnover and which have the potential to sustain and support the capacities of individual community members in the long term.
- Development of community-level capacities for analysis, experimentation and dialogue, so that community members are able to update their technical capacities in the future in response to evolving conditions (particularly of climate and demography). This form of capacity development will include peer-to-peer exchanges and the well-proven farmer field school approach;
- At the same time, "training of trainers" as a complement to the provision of direct training to the final beneficiaries themselves, in order to ensure that the community-level beneficiaries of capacity development will have ongoing support from extension agents beyond the life of the project to help troubleshoot and update their capacities.

271. Sustainability will further be assured carrying out follow-up activities with the recipients of training in order to ensure that knowledge is adequately assimilated and consolidated before the

project ends. These will include regular knowledge assessments, for example through awareness surveys and tests at either individual or institutional levels; and follow-up on-the-job training as a complement to the initial more classroom-based approach, in order to help beneficiaries contextualise their acquired capacities.

5.5 APPROPRIATENESS OF TECHNOLOGY INTRODUCED

272. The technologies to be promoted will in all cases be selected according to criteria of environmental, social and financial/economic sustainability, as explained above; this selection and validation process will be carried out with the participation of the community-level beneficiaries in order to ensure their relevance and acceptability.

273. Wherever possible the project will focus on adapting already-existing technologies in order to make them climate-resilient, before considering the introduction of new ones..The technologies to be promoted will include the following (see also section 5.2 above regarding their environmental sustainability):

- Production and collection of fodder for livestock: this will use native species as much as possible, which are familiar to local people, and any proposals to introduce new fodder species will be assessed in terms of their acceptability to local people and livestock, their suitability for integration into existing farming systems, and their potential for invasiveness.
- Use of drought- and/or flooding-resistant varieties of crops such as rice and vegetables: wherever possible use will be made of agricultural biodiversity already existing in the target communities; any other varieties that it may be necessary to introduce will be subject to participatory evaluation of their acceptability and compatibility with local farming systems.
- Integrated pest management: IPM practices will be as “low tech” as possible and will be supported by culturally-appropriate training activities and materials, as well as being subject to local participatory validation, and assessment of their potential to generated unintended impacts on ecosystem function and beneficial species.
- Creation of semi-natural reservoirs (artificial wetlands): these will be small in scale and as far as possible will mimic the characteristics of natural wetlands in order to avoid unintended negative impacts on hydrology, ecology or productive lands.
- Development of irrigation systems: these will be designed to be compatible with the preservation of wetlands, by virtue of their small-scale, efficiency and consequently low volumes extracted. Irrigation pumps already exist in many parts of the wetlands and so the technical aspects of their management and maintenance are already familiar to many villagers; in any case, their design will be kept as simple as possible so that if necessary they can be repaired in local workshops.
- Protection of wells and other water sources for livestock: protection will be ensured through simple structures capable of being made and maintained by local builders,
- Introduction of smaller and more heat resistant livestock varieties, including goats: the husbandry and grazing practices will be designed to be easily manageable by local people, for example through the use of stalls made of local materials and the production of feed from locally available fodder crops.
- Improved husbandry and veterinary care of livestock: the use of preventive approaches to animal health will minimize reliance on external actors, as will the use wherever possible of well-validated local remedies (subject to review by veterinary specialists).

5.6 REPLICABILITY AND SCALING UP

274. The use of existing multi-sector structures such as Provincial Ramsar Committees, District Ramsar Implementation Teams, Provincial/District Disaster Management Committees, Protected Area Committees or River Basin Committees and the mainstreaming of climate adaptation and disaster management in corresponding planning processes, will increase sustainability of project results. The

participatory approach used for 1) vulnerability assessments, 2) the integration of local knowledge and initial coping mechanisms in the prioritisation and design of adaptation and risk reduction measures and 3) the development of long term adaptation plans, will ensure local ownership and therefore contribute to the sustainability of project activities. The systematic knowledge transfer, the promotion of community based resource management and the introduction of adaptive planning will empower local stakeholders to take over and to further improve/sustain project outputs.

275. The replication of experiences gained in these ‘adaptation hotspots’ which combine high climate impact and significant adaptation potential, will help focus adaptation efforts in the more populated lowlands of Lao PDR which remain key to the country's food security and overall development. Project outputs such as vulnerability assessment and planning tools, improved national and local capacities and the availability of practical examples of assessments, measures and local plans, will be used to develop a detailed and costed national adaptation and disaster management programme for wetlands. This plan should facilitate the replication of project experiences in the many wetlands around the country. Similar to the proposed project, the future national programme should help mobilise the necessary climate finance and leverage substantial provincial and district level government co-finance as floodplain agriculture and the development of irrigated agriculture will remain a national priority²⁶. Securing funding will be essential for the programmatic up-scaling and replication of project results. This national programme will also be ‘plugged-in’ to key national sector programmes such as the Development and Investment Master Plan for Agriculture or the National Integrated Water Resources Management Programme and the National Action Plan on Climate Change Programme. This will further facilitate the replication and up-scaling of project results.

276. Replication at regional level within the greater Mekong basin will be facilitated through coordination with regional bodies such as the Mekong River Commission (MRC). Opportunities and strategies for achieving this will be confirmed at project start-up, by which time the current processes of institutional restructuring of the MRC are expected to be complete.

²⁶ The development of rice cultivation in lowland areas of Lao PDR is one of the main priorities of the current Agriculture Development and Investment Master Plan as it will contribute to food security and the contribution of agriculture to GDP growth.

APPENDICES

Appendix 1. Results Matrix

Results Chain	Indicators	Baseline	End of Project Target	Means of Verification and Responsible Entity	Assumptions
Component 1: Improved understanding of CC impacts and risks in XC and BKN wetlands					
Outcome 1: Improved understanding of CC impacts and risks, in XC and BKN wetlands.	Outcome Indicator 1.1 Perceptions and understandings of CC impacts and risks resulting from training and from vulnerability assessments in PONRE, DONRE, PAFO and DAFO and communities around the target wetlands	Some limited awareness of CC vulnerability due to a) the CC and wetlands study in XC by the MRC, and in BKN due to Mekong Water Dialogues work and b) MRC CCAI work in Savannakhet, c) PPG discussions.	70% of members of PONRE, DONRE, PAFO and DAFO staff covering the target wetlands (28 out of 40) and 70% of members of community organisations (both men and women) in the target villages are aware of CC impacts and risks	Awareness scorecards to be developed in Year 1. KAP surveys to be carried out in provincial and district offices (PONRE, DONRE and PAFO, DAFO), and communities around the wetland areas, in year 1, immediately prior to mid-term review and immediately prior to final review	Commitment among local authorities and community members Trained staff remain in the provinces
Output 1.1. Pilot methodological tool developed for participatory CC VDRA in wetlands	Output Indicator 1.1.1. State of development and use of pilot methodological tool for participatory CC VDRA in wetlands	CAM ¹ method has been used in XC, BKN and Siphandone wetlands and also in Xe Pian, (but not in a participatory manner there), and by Mekong ARCC in Phou Hin phoun.	Participatory CC VDRA tool available in Lao language for national replication, based on test and refinement at two wetland sites	Project reports, including: Quarterly and annual progress of the project • Reports of training events • Review and assessment of quality of applications of CAM method and adaptation measures recommended	
Output 1.2. Effective ² training programme on CC/CCA ³ and VDRA ⁴ in wetlands	Output Indicator 1.2.1. Numbers of stakeholders trained in participatory CC vulnerability and DRM management (<i>CCA Outcome 2.1 Indicator 5</i>)	None ⁵	Totals: • 15 PONRE and 15 PAFO staff in each target province (= 60) • 15 DONRE and 15 DAFO staff in each of 3 districts surrounding the wetlands (=60) • 400 villagers, of which 200 female (20 villagers in each of 20 villages)	• Records of meetings and trainings • Quarterly progress reports of project	

¹ CAM = Climate Change Adaptation and Mitigation Methodology (<http://www.icem.com.au/documents/climatechange/cam/CAM%20brief.pdf>)

²“Effectively Trained” = based on good learning practices for effective capacity development in FAO Learning Module 3 on Effective Learning (www.fao.org/capacitydevelopment), including action-oriented peer-to-peer adult learning such as farmer field schools

³ CCA = Climate Change Adaptation

⁴ VDRA = vulnerability and disaster risk assessment

⁵ A learning needs assessment will be carried out in Year 1 at PONRE, PAFO, DONRE, DAFO and village level, to generate a baseline to be tracked through KAP methodology

Results Chain	Indicators	Baseline	End of Project Target	Means of Verification and Responsible Entity	Assumptions
Output 1.3. Participatory VDRAs carried out in BKN and XC wetlands	Output Indicator 1.3.1. Numbers of participatory VDRAs carried out ¹ in wetland communities, addressing aspects of wetlands, wetland based livelihoods and gender	VDRAs have been carried out on XC and BKN, focused on wetland habitats and species and to some degree, livelihoods.	By year 2, one in each of 20 key villages, including focus on gender differences in vulnerability	<ul style="list-style-type: none"> • Reports of participatory vulnerability assessments • Progress reports of implementation of adaptation plans • Project quarterly and annual reports 	
Output 1.4. recommendations for appropriate adaptation measures based on analyses of CC-related issues affecting the target wetlands (including traditional knowledge)	Output Indicator 1.4.1. Number of studies generated ² on CC-related issues affecting the target wetlands, including analysis of gender dimensions	See endnote	Reports available on the following key topics available in English and Lao languages³: <ul style="list-style-type: none"> - Allowable rates and locations of water extraction for irrigation - Spatial priorities for wetland re-opening - Acceptable fish off-take levels, timing of closed seasons, locations of no-take areas - Spatial priorities and technical recommendations for improved watershed management - Sustainable limits and locations for grazing - Integrated Pest Management options - Measures for management of invasive alien species - Appropriateness for controlled burning to protect valuable wetland habitats - Protection measures for key wetland species (e.g. crocodile, turtles) 	Project publications	

¹ By District Implementation Teams (DONRE, DAFO, communities) with technical and facilitation support from Provincial Project Units

² With support from external consultants hired by the project, working in collaboration with national and regional institutions

³ Indicative list, subject to ongoing review on the basis of needs analyses and discussions with local stakeholders

Results Chain	Indicators	Baseline	End of Project Target	Means of Verification and Responsible Entity	Assumptions
Component 2. Efficient and cost-effective adaptation measures					
Outcome 2. Efficient and cost-effective adaptation measures in place to reduce the impact of CC and natural disasters on wetlands ecosystems and local livelihoods.	Outcome Indicator 2.1: Numbers of families, in the 20 villages within the current Ramsar site boundaries, involved in adaptive agricultural practices, systems and infrastructure (e.g. climate smart agriculture, improved cropland management, dry and wet season rice cultivation, livestock production, aquaculture)	Around 160 families are applying two or more of these practices.	1,280 families (total 8,400 family members) apply two or more of these practices.	Farmer surveys, focus group discussions	Recognition of CC implications by community members and commitment to taking corresponding CCA actions and accepting short term costs Acceptance of EBA-based approach rather than “quick fixes” based on maladaptive practices Continuation of generally favourable governance environment at community levels
	Outcome Indicator 2.2 Numbers of families in the 20 villages within the current Ramsar site boundaries, who have acquired ¹ at least one additional livelihood support option as a CC fallback option	50% of vulnerable people surveyed have no reliable fall-back livelihood support option if their main option fails due to climate change	800 families (total 5,250 family members), with equal benefits for men and women	Questionnaire applied to villagers in target wetlands (complemented by focus group discussions)	
	Outcome Indicator 2.3 Numbers of families in 40 other villages within the proposed expanded Ramsar site boundaries with improved and more sustainable access to wetland products and services	Baseline to be established in year 1	6,400 families (total 42,000 family members), with equal benefits for men and women	Questionnaire applied to villagers in target wetlands (complemented by focus group discussions)	
	Outcome Indicator 2.4 Area of target wetlands under effective management and protection to promote resilience and the flow of ecosystem services	Baseline values to be determined in project year 1	Indices of management effectiveness are maintained at least at baseline levels over the entire area of the target wetlands (around 47,360ha)	Management effectiveness indices (adapted from GEF BD1 tracking tool) to be developed in project year 1 by knowledge management specialist and applied with participation of DONRE/PONRE, DAFO/PAFO and community	

¹ “Acquired” means that they are carrying out the additional livelihood support option(s) or that they have the capacities to do so, and that the additional livelihood support option(s) account(s) for at least 10% of their income (or has the possibility to do so)

Results Chain	Indicators	Baseline		End of Project Target	Means of Verification and Responsible Entity	Assumptions
					organisations.	
	Outcome Indicator 2.5 Area of wetland habitats in XC and BKN under improved forms of direct management to address CC-induced risks	Practices	ha	ha	<ul style="list-style-type: none"> •CAM assessments and development of wetland management measures for each habitat •Implementation reports of adaptation measures •Reviews of effectiveness of management measures •Quarterly progress reports and annual reports 	
		Improved management of forests to increase resilience to effects of CC (floods, erosion etc.)	0	200 ha		
		Invasive species management	0	200 ha		
		Water flow improved due to wetland re-opening	0	20 ha		
		Protection of habitats and nesting sites (e.g. lakes for crocodiles, forest patches for bird nesting)	2,550 ¹	600 ha		
		Controlled burning	0	200ha		
Output 2.1 Planning and inter-sectoral coordination frameworks for the two sites promoting CCA measures	Output Indicator 2.1.1. Numbers of plans that incorporate CCA considerations	No specific planning for wetlands introducing CC adaptation.		<ul style="list-style-type: none"> - 1 CCA-friendly territorial LUP per wetland - 1 CCA-friendly financial investment plan per wetland - 1 specific CCA plan per wetland - All infrastructure, agriculture and rural development plans in target districts incorporate wetland-focused CC vulnerability assessment with corresponding CCA measures 	Review of plans	
	Output Indicator 2.1.2. Frequency of meeting of coordination mechanisms that embrace CCA in target wetlands and buffer zones.	<p style="text-align: center;">Meetings/year</p> Current meetings do not address CCA		1 Ramsar National Committee meets annually; 2 provincial Ramsar committees meet at least 2 times annually Site specific wetland stakeholder committees meet at least 2 times annually	Review of meeting minutes of coordination mechanisms	
Output 2.2 Capacities of	Output indicator 2.2.1:	Village clusters (<i>khet</i>) or “development		User and governance groups	Focus group discussions and KAP	

¹ WCS has supported restoration of wetland habitat through community programmes to remove invasive weed species such as water hyacinth (*Eichhornia* spp), and has assisted nine communities to develop zoning of critical habitat areas (2,550 ha) and regulations to manage use of natural resources in these areas.

Results Chain	Indicators	Baseline	End of Project Target	Means of Verification and Responsible Entity	Assumptions
water/natural resources/wetlands user groups strengthened to apply effective governance of NRM use and management	Capacities of user and governance groups ¹	<p>clusters” (<i>khumban</i>) promote development and local governance, and have enforcement (militia) arms.</p> <p>Village councils are responsible for community resources such as village protection or production forests.</p> <p>Village leaders play important roles in managing small-scale irrigation, enforcing fishing rules and allocating land.</p> <p>Villager groups include:</p> <ul style="list-style-type: none"> - Water user groups in charge for maintenance and monitoring irrigation activities and equipment. - Ban Houmuang (XCP) fisheries group, following the installation of fish conservation zones. - Ban Kiat Ngong village has a malva nut collecting group, in charge of monitoring nut harvesting. 	covering all key areas ² of target wetlands have capacities ³ to apply effective governance, with a specific focus on adaptation and resilience issues and a gender focus	surveys	
	Output Indicator 2.2.2: Number of villages in wetland and buffer areas covered by effective governance groups and water user groups ⁴ .	Local governance groups do not currently address wetland management and do not specifically provide for CC adaptation measures	All target villages have governance groups and wetland user group with rules, providing for adaptation considerations, applied and adhered to.	<ul style="list-style-type: none"> • Note development and acceptance of rules covering water use and release. Note local application and adherence to water governance rules. • Specific VA report on water use by each community • Quarterly and annual project reports 	

¹ Inspired by FAO Learning Module on Organizational Development and Analysis (<http://www.fao.org/capacitydevelopment/en/>)

² Those parts of the target wetlands with highest levels of threat and/or vulnerability

³ Formal groups have clearly defined mandates and rules, and meet regularly: formal and informal groups are considered by community members (in focus group discussions) to be effective and inclusive of different gender and socioeconomic groups

⁴ Village clusters (*khet*), “development clusters” (*khumban*), village councils and resource user groups

Results Chain	Indicators	Baseline	End of Project Target	Means of Verification and Responsible Entity	Assumptions
Output 2.3 Direct investment in CCA strategies	Output Indicator 2.3.1: numbers of families (male and female led) benefiting from one or more forms of direct investment in CCA ¹	NA	1600 families	Focus group discussions and questionnaires	
	Output Indicator 2.3.2: number of villages with value-adding facilities for NTFPs established, benefiting men and women	NA	10 Villages	Focus group discussions and questionnaires	
	Output Indicator 2.3.3: number of villages with visitor facilities for ecotourism established benefiting men and women	NA	10 Villages	Focus group discussions and questionnaires	
	Output Indicator 2.3.4: number of semi-natural reservoirs established benefiting men and women	2 small/medium reservoirs	4 small/medium reservoirs	Focus group discussions and questionnaires	
	Output Indicator 2.3.5: Area of riparian forest replanted (ha)	NA	200ha	Focus group discussions and questionnaires	
Output 2.4 Strengthened individual capacities through effective programmes and innovation systems to support CC resilience strategies	Output Indicator 2.4.1: # men and women with increased knowledge and awareness to apply CC-resilient wetlands management, CC-resilient agricultural practices and/or non-agricultural livelihood support options	Knowledge and awareness TBD through baseline Knowledge, Awareness and Practice (KAP) surveys and learning needs assessment	50% of men and women's population in project target area	KAP surveys	
Output 2.5. Early warning, disaster risk reduction and early recovery measures and systems in place	Output Indicator 2.5.1. Effectiveness of early warning systems in 20 target villages, as measured by promptness of receipt of, and effectiveness of response to,	Early warning messages delivered on time to 10% of all events in year prior to project startup. Effective action taken by 5% of affected villagers	Early warning messages delivered on time to 100% of all events in target villages in year 5, and effective action taken in response by 50% of all affected villagers	•Interviews with provincial, district and communities after each early warning has been issued and passed to follow chain of warning and action being taken	

¹ e.g. CC-resistant livestock and cropping materials, small-scale irrigation equipment, improved veterinary facilities, access to wells with improved CC resilience, pilot aquaculture projects, rainwater harvesting and water storage equipment

Results Chain	Indicators	Baseline	End of Project Target	Means of Verification and Responsible Entity	Assumptions
	early warning messages				
Component 3: Integration of CC adaptation and disaster management measures into planning processes					
Outcome 3. Efficient and cost-effective CC adaptation and disaster management measures in wetlands integrated and budgeted in local and national planning processes	Outcome Indicator 3.1: # local, regional and national level plans that incorporate CC vulnerability assessments, CCA measures and analyses (and mitigation measures as needed) of impacts on wetlands, with corresponding budget allocation	No local plans provide for application of CC/DRM assessment approaches At least 1 national plan provides for application of CC/DRM assessment approaches	<ul style="list-style-type: none"> - All projects and plans developed by PONRE/DONRE and PAFO/DAFO that directly affect the target wetlands - At least 50% of all other provincial and district plans and projects in the target provinces and districts - BKN Ramsar site management plan - Water allocation and abstraction management plans/rules at district level in the target districts - At least 5 national plans related to natural resources management and agriculture¹ provide application of CC/DRM assessment approaches. 	•Review of plans and project documents from national, provincial and district levels.	Continued political commitment to addressing CC implications Willingness to coordinate between institutions
	Outcome indicator 3.2 Number of institutions adopting tools for participatory CCA and DM planning and M&E in wetlands	None	<ul style="list-style-type: none"> - Participatory CCA and DM planning and M&E is used in 2 other districts within the province, and for 2 other wetlands nationally - DONRE and DAFOs in four districts 	<ul style="list-style-type: none"> •Community based climate events records. •DONRE/DAFO records •Reports to local and national Ramsar committees •Questionnaire on levels of adoption 	
	Outcome indicator 3.3: Perceptions of effectiveness of institutional coordination at national level in support of CCA	TBD through baseline evaluation of perceptions	# of respondents by scorecard rating 70% of members of the institutions targeted for improved institutional coordination have favourable perceptions of the effectiveness of this coordination	Questionnaires/focus group scorecard ratings	
Output 3.1. Methodological guidelines for integration of CC adaptation and DRM into local and national plans	Output Indicator 3.1.1. Numbers of methodological guidelines used in planning instruments at different levels	None	Guidelines used in: <ul style="list-style-type: none"> - Provincial and district plans and new proposals. - BKN Ramsar site management 	Review of plans	

¹ Including the 15 year MONRE Action Plan, the NAPA, the CC Sub-sector working group strategy and the National Strategy on Environment and Climate Change Education and Awareness

Results Chain	Indicators	Baseline	End of Project Target	Means of Verification and Responsible Entity	Assumptions
			plan - Water allocation and abstraction management plans/rules at district level		
Output 3.2. Effective learning programme for community, district and provincial stakeholders in planning and M&E for participatory CC adaptation and disaster management.	Output Indicator 3.2.1 Numbers of stakeholders effectively trained in participatory adaptation and DRM planning and M & E	None	- 10 PONRE and 10 PAFO staff in Savannakhet and in Champassack - 10 DONRE and 10 DAFO staff in each of 3 districts surrounding the wetlands - 50 community members from surrounding wetlands	• Training meeting reports • Project quarterly and annual reports • Reports of progress of implementing adaptation measures	
Output 3.3. Institutional mechanisms for intersectoral coordinating CC resilience in wetlands strengthened at national level	Output Indicator 3.3.1 Existence and frequency of meeting of coordination mechanisms for CC resilience in wetlands	Existing coordination mechanisms: - National Committee for Wetland Management and Ramsar Convention - National, Provincial, District and Village Disaster Committee (district and village levels not operational in the target areas) - National Steering Committee on Climate Change	Revise members of committees to integrate new sectors into wetlands management.	Composition of members.	

Baseline for Output Indicator 1.4.1: Studies generated to date on CC-related issues affecting the target wetlands:

- ADPC for Mekong Wetlands Biodiversity Programme, 2005 (UNDP, IUCN); Vulnerability assessment of climate risks in Attapeu Province Lao PDR.
- Eastham, J. et al. 2008 Mekong River Basin Water Resources Assessment: Impacts of Climate change. CSIRO: Water for a Healthy Country National Research Flagship. Australia
- MRC/SEA START/IWMI – Hoanh, C.T., et al. Impacts of Climate change and development on Mekong flow regime. 2009Project: Reducing vulnerability of water resources, people and environment to climate change impacts led by CSIRO
- MRC Adaptation to climate change in the countries of the Lower Mekong. MRC Management Information Booklet Series No 1. 2009
- Arief Anshory Yusuf &Herminia A. Francisco: Climate Change Vulnerability Mapping for Southeast Asia. January 2009. Economy and Environment Program for Southeast Asia/IDRC/SIDA
- Norwegian Church Aid.November 2009GROWING RESILIENCE Adapting for Climate Change in Upland Laos. A Report Prepared by Sean Foley, EcoAsia Limited
- Strategy on Climate Change of the Lao PDR; March 2010
- Rod Lefroy, Laure Collet & Christian Grovermann. July 2010 Study on Potential Impacts of Climate Change on Land Use in the Lao PDR.CIAT for Land Management and Registration Project (LMRP)
- World Bank, Global Facility for Disaster Reduction and Recovery (GFDRR): 2011 Climate Risk and Adaptation Profile – Lao PDR
- UNDP project document 2011 – Improving Resilience the Agricultural Sector in Lao PDR to Climate Change Impacts and website[1](IRAS)
- FAO. 2011 Regional Integrated Multi-Hazard Early Warning System. Managing Climate change risks for food security in Lao PDR. (RIMES)

- MRC 2011. Climate change adaptation demonstration projects in LMB. Building community resilience to climate change in Champhone district, Savannakhet.
- ICEM – MRC Basin-Wide Climate Change Impact and Vulnerability Assessment for Wetlands of the Lower Mekong Basin for Adaptation Planning, 2012
- EcoLao (2012). Scoping Assessment of Climate Change Adaptation Priorities in the Lao PDR. Regional Climate Change Adaptation Knowledge Platform for Asia, Partner Report Series No. 6. Stockholm Environment Institute, Bangkok.
- ICEM – Mekong ARCC, 2014. Climate Change Impact and Adaptation study for the Lower Mekong Basin. USAID and DAI

Appendix 2. Work plan (results based)

OUTPUTS	ACTIVITIES	Year 1				Year 2				Year 3				Year 4				Year 5				
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
PROJECT START UP	Recruit PMU members of PMU team																					
	Orient PMU members																					
	National Inception workshop																					
	Local level inception workshops																					
	LOA among participating agencies																					
Capacity development	Initial capacity development consultancy																					
	Follow-up capacity development consultancy																					
Gender mainstreaming	Detailed analysis of gender mainstreaming needs																					
	Development of gender mainstreaming strategy																					
	Monitoring and follow-up of gender mainstreaming effectiveness																					
Monitoring and evaluation	Review of logical framework and indicators																					
	Generation of missing baseline data for indicators																					
	Measurement of indicators																					
	Internal review and organisation of indicator data																					
	Mid-term review																					
	Final evaluation																					
PROJECT CLOSURE	Negotiation of details of exit/sustainability strategy																					
	Review/feedback workshop																					
	Administrative closure																					
1.1. Pilot methodological tool developed for participatory CC VDRA in wetlands	Review of existing baseline surveys and initial vulnerability assessments (MRC, IUCN, FAO)																					
	Development of tool for validation																					
	Validation and adjustment of tool																					
1.2. Effective training programme on CC/CCA and VDRA in wetlands	Pre-selection and baseline assessment of candidates for training																					
	Provision of training																					
	Post-training follow-up																					
1.3. Participatory VDRAs carried out in BKN and XC wetlands	Participatory planning of VDRAs																					
	Application of VDRAs																					
1.4. Studies of CC-related issues affecting the target wetlands	Participatory planning of studies																					
	Realisation of studies																					
	Feedback of study results to communities																					

OUTPUTS	ACTIVITIES	Year 1				Year 2				Year 3				Year 4				Year 5				
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
2.1 Planning and coordination frameworks for the two sites promoting CCA measures	Advice to local governments on territorial land use planning																					
	Planning of direct investments in resilience, based on studies (Output 1.4), VDRA assessments (Output 1.3) and participatory analyses (Output 2.3)																					
	Planning of sector-based CC-resilient livelihood alternatives (Output 2.4) based on studies (Output 1.4), VDRA assessments (Output 1.3) and participatory analyses (Output 2.4)																					
	Integration of CCA/DM into XC, BKN and Xe Piang management plans, district, provincial and sub-catchment/river basin development plans or disaster management plans (based on Output 1.1)																					
	Development of investment plans for target wetlands																					
	Mainstreaming of resilience into infrastructure specifications																					
	Facilitate interinstitutional coordination																					
2.2 Capacities of water/natural resources/wetlands user groups strengthened to apply effective governance of NRM use and management	Participatory analyses of governance needs and capacities and development of CD plan																					
	Participatory development of strategic plans and internal rules for local governance entities																					
	Participatory development of rules and norms for NRM in support of CCA, resilience and DM																					
2.3 Direct investment in CCA strategies	Participatory analyses and planning of priorities for direct investment																					
	Establishment of nurseries and tree planting																					
	Management/elimination of invasive species																					
	Physical reopening of wetlands																					
	Protection of habitats and nesting sites																					
	Controlled burning																					
2.4 Strengthened individual capacities through effective programmes and innovation systems to support CC resilience strategies	CC-proofing infrastructure																					
	Participatory analyses of priority strategies and needs for capacity strengthening																					
	Pre-selection and baseline assessment of candidates for training																					
	Provision of training																					
2.5. Early warning, disaster	Post-training follow-up																					
	Participatory review of existing measures and systems																					

OUTPUTS	ACTIVITIES	Year 1				Year 2				Year 3				Year 4				Year 5				
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
risk reduction and early recovery measures and systems in place	Development of plans for strengthening measures and systems																					
	Facilitation of strengthening of measures and systems																					
3.1. Methodological guidelines for integration of CC adaptation and DRM into local and national plans	Review and systematization of experiences under Output 1.3																					
	Joint analysis with national institutions of needs and opportunities for application of guidelines																					
	Orientation/facilitation of application of guidelines																					
3.2. Effective learning programme for community, district and provincial stakeholders in participatory CC adaptation and disaster management planning and M&E	Participatory analyses of priority strategies and needs for learning/capacity strengthening																					
	Pre-selection and baseline assessment of candidates for training																					
	Provision of training																					
	Post-training follow-up																					
3.3. Institutional mechanisms for coordinating CC resilience in wetlands strengthened	Review and prioritisation of coordination mechanisms for incorporation of CC resilience																					
	Facilitation of incorporation of CC resilience into agendas of coordination mechanisms																					
	Monitoring and follow-up of effectiveness of coordination support																					

Appendix 3. Results budget by component

Notes:

- Flights @ \$2,000 are international
- Flights @ 200 are domestic
- Nights @ \$100 are DSA in Vientiane
- Nights @ \$35 are DSA in provinces

Oracle code and description	#	Unit	Unit cost	Components					Total
				1	2	3	4	PM	
5011 Professional salaries				99,580	744,640	290,180	57,400	224,647	1,416,447
Chief Technical Adviser	54.5	months	12,000	52,800	342,400	241,000	17,800		654,000
Knowledge management/participation specialist	58	months	2,000	4,600	64,800	7,000	39,600		116,000
National Capacity Development Specialist	54	months	2,000	10,800	86,400	10,800			108,000
Admin support (salaries)	60	months	600	3,600	28,800	3,600			36,000
Provincial Project Unit	60	months	4,630	27,780	222,240	27,780			277,800
Operations and finance assistants	72	months	3,120					224,647	224,647
5013 contracts				224,206	396,058	111,411	2,520	-	734,195
Communication costs - website development and web-publishing	25	products	1,200	2,400	23,700	3,000	900		30,000
Communication and training products (printed) - design, layout, editing, translation, printing	45	products	1,200	4,320	42,660	5,400	1,620		54,000
Gender mainstreaming consultancy	20	days	500	1,000	8,000	1,000			10,000
	5	nights	100	50	400	50			500
	6	nights	35	21	168	21			210
	1	flights	2,000	200	1,600	200			2,000
	1	flights	200	20	160	20			200
Interpreters for missions	200	days	150	3,000	24,000	3,000			30,000
Field costs for carrying out risk assessments				10,000					10,000
Consultancy to design pilot methodological tool (Output 1.1)	20	days	500	10,000					10,000
	8	nights	100	800					800
	7	nights	35	245					245
	1	flights	2,000	2,000					2,000
	1	Flights	200	200					200
Design of training programme and development of materials (identify potential trainers/service providers) (Output 1.2)	20	days	500	10,000					10,000
	8	nights	100	800					800

Oracle code and description	#	Unit	Unit cost	Components					Total
				1	2	3	4	PM	
	7	nights	35	245					245
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
International consultancy to facilitate risk assessment processes and systematise results (Output 1.3)	20	days	500	10,000					10,000
	8	nights	100	800					800
	7	nights	35	245					245
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Study on allowable rates and locations of water extraction for irrigation (Output 1.4)	35	days	500	17,500					17,500
	8	nights	100	800					800
	20	nights	35	700					700
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Identification of spatial priorities for the re-opening of wetlands together with the definition of best technical approaches and options for sustainability (Output 1.4)	35	days	500	17,500					17,500
	8	nights	100	800					800
	20	nights	35	700					700
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Definition of acceptable off-take levels of migratory and resident fish, the timing of closed seasons and the locations of no-take areas of importance for breeding and/or grow-on; (Output 1.4)	35	days	500	17,500					17,500
	8	nights	100	800					800
	20	nights	35	700					700
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Study on spatial priorities for the improved management of the watersheds draining into the wetlands together with recommendations of corresponding technical options; (Output 1.4)	30	days	500	15,000					15,000
	6	nights	100	600					600
	18	nights	35	630					630
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Definition of sustainable limits and locations for the grazing of	30	days	500	15,000					15,000

Oracle code and description	#	Unit	Unit cost	Components					Total
				1	2	3	4	PM	
cattle and buffaloes in order to minimize their damage to fragile wetland habitats; (Output 1.4)	6	nights	100	600					600
	18	nights	35	630					630
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Hydrological studies (Output 1.4)				50,000					50,000
Consultancy for development of ecotourism plans (Output 2.1)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Consultancy for development of infrastructure specifications (Output 2.1)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Consultancy for development of protocols for reservoir outflow management (Output 2.1)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Consultancy for development of investment plans for CCA (Output 2.1)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Training events for local governments on spatial planning and financial planning addressing CCA considerations (Output 2.1)	5	events	2,000		10,000				10,000
Consultancy to review local institutions' mandates/ToRs in order to	30	days	500		15,000				15,000

Oracle code and description	#	Unit	Unit cost	Components					Total
				1	2	3	4	PM	
ensure better coordination (Output 2.1)	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Participatory needs assessment and planning, and associated capacity development, for direct investments in CC during project and beyond (Output 2.1)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
Consultancy for analysis of capacity development needs and design of programme of capacity development (Output 2.2)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
Capacity development workshops (including reflections on threats, review of existing regulations and customary laws etc., capacities for monitoring, development of local indicators, capacities for adapting norms) (Output 2.2)	3	workshops	4,000		12,000				12,000
	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
Consultancy to design training programme and develop materials (including review of existing extension approaches and knowledge sources) (Output 2.4)	1	Flights	200		200				200
	1	workshops	2,500		2,500				2,500
	60	Events	1,500		90,000				90,000
	30	days	500		15,000				15,000
	6	nights	100		600				600
Training events (FFS) (gene pool improvement, veterinary care, IPM, efficient irrigation, organic matter management) (Output 2.4)	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	flights	2,000		2,000				2,000

Oracle code and description	#	Unit	Unit cost	Components					Total
				1	2	3	4	PM	
	1	flights	200		200				200
Consultancy to develop methodological guidelines (Output 3.1)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
	2	workshops	2,500			5,000			5,000
Consultancy to advise on development of CC adaptation and disaster management programme (Output 3.1)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
	2	workshops	2,500			5,000			5,000
Consultancy to design training programme and develop materials (Output 3.2)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
Training events (Output 3.2)	2	events	2,500			5,000			5,000
Training materials (Output 3.2)						10,000			10,000
Consultancy to advise on strengthening of coordination mechanisms (improvement of rules of operation etc.) (Output 3.3)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
5014 consultancies				20,000	20,000	2,500	90,000	-	132,500
International capacity development consultant	50	days	500	2,500	20,000	2,500			25,000
Mid term external review/evaluation	1	evaluation	40,000				40,000		40,000
Final external evaluation	1	evaluation	50,000				50,000		50,000
Study on Integrated pest management options capable of addressing expected increases in pest problems related to CC (Output 1.4)	30	days	500	15,000					15,000
	1	workshops	2,500	2,500					2,500
5021 travel				15,702	99,060	12,390	177	-	127,328
Chief Technical Adviser	211	nights	72	1,521	12,165	1,521			15,206

Oracle code and description	#	Unit	Unit cost	Components					Total
				1	2	3	4	PM	
Chief Technical Adviser	24	flights	200	480	3,840	480			4,800
National Project Coordinator	211	nights	35	739	5,914	739			7,392
National Project Coordinator	24	flights	200	480	3,840	480			4,800
Knowledge management/participation specialist	100	nights	35	280	2,765	350	105		3,500
	12	flights	200	192	1,896	240	72		2,400
National Capacity Development Specialist	20	flights	200	400	3,200	400			4,000
National Capacity Development Specialist	300	nights	35	1,050	8,400	1,050			10,500
Provincial Project Unit	900	nights	50	4,500	36,000	4,500			45,000
Provincial Project Unit	160	nights	100	1,600	12,800	1,600			16,000
Provincial Project Unit	16	flights	200	320	2,560	320			3,200
International capacity development consultant	20	nights	100	200	1,600	200			2,000
	20	nights	35	70	560	70			700
	2	flights	2,000	400	3,200	400			4,000
	2	flights	200	40	320	40			400
Study on Integrated pest management options capable of addressing expected increases in pest problems related to CC (Output 1.4)	6	nights	100	600					600
	18	nights	35	630					630
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
5023 Training				1,000	45,500	1,000	-	-	47,500
National inception workshops	1	workshops	5,000	500	4,000	500			5,000
Local inception workshops	2	workshops	2,500	500	4,000	500			5,000
Training events on CC-resilient wetland management options	3	events	2,500		7,500				7,500
Training events (FFS) (NTFPs, ecotourism)	30	events	1,500		30,000				30,000
5024 Expendables				15,220	121,760	15,220	-	-	152,200
Central office costs	20	months	1,000	4,800	38,400	4,800			48,000
Vehicle insurance	4	cars	7,000	2,800	22,400	2,800			28,000
	48	Motor-cycles	750	300	2,400	300			3,000
Fuel				5,000	40,000	5,000			50,000
Vehicle maintenance				400	3,200	400			4,000
Local office costs	96	months	200	1,920	15,360	1,920			19,200
5025 Non-expendables				15,450	2,076,509	15,450	-	-	2,107,409

Oracle code and description	#	Unit	Unit cost	Components					Total
				1	2	3	4	PM	
Central office costs	1	office	15,000	1,500	12,000	1,500			15,000
Vehicles	2	cars	34,000	6,800	54,400	6,800			68,000
Vehicles	2	cars	25,000	5,000	40,000	5,000			50,000
Vehicles	5	Motor-cycles	1,500	750	6,000	750			7,500
Local office costs	2	offices	7,000	1,400	11,200	1,400			14,000
Purchase/distribution of resistant livestock and planting materials (Output 2.3)					190,000				190,000
Purchase/distribution of small scale irrigation equipment (Output 2.3)					190,000				190,000
Veterinary facilities (Output 2.3)					100,000				100,000
Improvement of wells (Output 2.3)					100,000				100,000
Aquaculture pilots (Output 2.3)					190,000				190,000
Value-adding facilities for NTFPs (Output 2.3)					190,000				190,000
Visitor facilities for ecotourism (Output 2.3)					192,909				192,909
Rainwater harvesting and water storage equipment (Output 2.3)					200,000				200,000
Semi-natural reservoirs (Output 2.3)					200,000				200,000
Reforestation of areas vulnerable to erosion (Output 2.3)					200,000				200,000
Physical re-opening of wetlands (Output 2.3)					200,000				200,000
GRAND TOTALS				391,158	3,503,526	448,151	150,097	224,647	4,717,579

Appendix 4. Results budget by year

Oracle code and description	#	Unit	Unit cost	Years					Total
				1	2	3	4	5	
5011 Professional salaries				283,289	283,289	283,290	283,290	283,289	1,416,447
Chief Technical Adviser	54.5	months	12,000	130,800	130,800	130,800	130,800	130,800	654,000
Knowledge management/participation specialist	58	months	2,000	23,200	23,200	23,200	23,200	23,200	116,000
National Capacity Development Specialist	54	months	2,000	21,600	21,600	21,600	21,600	21,600	108,000
Admin support (salaries)	60	months	600	7,200	7,200	7,200	7,200	7,200	36,000
Provincial Project Unit	60	months	4,630	55,560	55,560	55,560	55,560	55,560	277,800
Operations and finance assistants	72	months	3,120	44,929	44,929	44,930	44,930	44,929	224,647
5013 contracts				137,820	249,010	256,765	45,300	45,300	734,195
Communication costs - website development and web-publishing	25	products	1,200	6,000	6,000	6,000	6,000	6,000	30,000
Communication and training products (printed) - design, layout, editing, translation, printing	45	products	1,200	10,800	10,800	10,800	10,800	10,800	54,000
Gender mainstreaming consultancy	20	days	500	5,000		5,000			10,000
	5	nights	100	250		250			500
	6	nights	35	105		105			210
	1	flights	2,000	1,000		1,000			2,000
	1	flights	200	100		100			200
Interpreters for missions	200	days	150	6,000	6,000	6,000	6,000	6,000	30,000
Field costs for carrying out risk assessments					10,000				10,000
Consultancy to design pilot methodological tool (Output 1.1)	20	days	500	10,000					10,000
	8	nights	100	800					800
	7	nights	35	245					245
	1	flights	2,000	2,000					2,000
	1	Flights	200	200					200
Design of training programme and development of materials (identify potential trainers/service providers) (Output 1.2)	20	days	500	10,000					10,000
	8	nights	100	800					800
	7	nights	35	245					245
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
International consultancy to facilitate risk assessment processes and systematise results (Output 1.3)	20	days	500	10,000					10,000
	8	nights	100	800					800
	7	nights	35	245					245

Oracle code and description	#	Unit	Unit cost	Years					Total
				1	2	3	4	5	
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Study on allowable rates and locations of water extraction for irrigation (Output 1.4)	35	days	500	17,500					17,500
	8	nights	100	800					800
	20	nights	35	700					700
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Identification of spatial priorities for the re-opening of wetlands together with the definition of best technical approaches and options for sustainability (Output 1.4)	35	days	500	17,500					17,500
	8	nights	100	800					800
	20	nights	35	700					700
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Definition of acceptable off-take levels of migratory and resident fish, the timing of closed seasons and the locations of no-take areas of importance for breeding and/or grow-on; (Output 1.4)	35	days	500		17,500				17,500
	8	nights	100		800				800
	20	nights	35		700				700
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Study on spatial priorities for the improved management of the watersheds draining into the wetlands together with recommendations of corresponding technical options; (Output 1.4)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Definition of sustainable limits and locations for the grazing of cattle and buffaloes in order to minimize their damage to fragile wetland habitats; (Output 1.4)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
	1	workshops	2,500			2,500			2,500
Hydrological studies (Output 1.4)					25,000	25,000			50,000
Consultancy for development of ecotourism plans (Output 2.1)	30	days	500		15,000				15,000

Oracle code and description	#	Unit	Unit cost	Years					Total
				1	2	3	4	5	
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Consultancy for development of infrastructure specifications (Output 2.1)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
	1	workshops	2,500			2,500			2,500
Consultancy for development of protocols for reservoir outflow management (Output 2.1)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Consultancy for development of investment plans for CCA (Output 2.1)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
	1	workshops	2,500			2,500			2,500
Training events for local governments on spatial planning and financial planning addressing CCA considerations (Output 2.1)	5	events	2,000			10,000			10,000
Consultancy to review local institutions' mandates/ToRs in order to ensure better coordination (Output 2.1)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
	1	workshops	2,500			2,500			2,500
Participatory needs assessment and planning, and associated capacity development, for direct investments in CC during project and beyond (Output 2.1)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630

Oracle code and description	#	Unit	Unit cost	Years					Total
				1	2	3	4	5	
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
	1	workshops	2,500		2,500				2,500
Consultancy for analysis of capacity development needs and design of programme of capacity development (Output 2.2)	30	days	500	15,000					15,000
	6	nights	100	600					600
	18	nights	35	630					630
	1	flights	2,000	2,000					2,000
	1	flights	200	200					200
	1	workshops	2,500	2,500					2,500
Capacity development workshops (including reflections on threats, review of existing regulations and customary laws etc., capacities for monitoring, development of local indicators, capacities for adapting norms) (Output 2.2)	3	workshops	4,000		6,000	6,000			12,000
Consultancy to design training programme and develop materials (including review of existing extension approaches and knowledge sources) (Output 2.4)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	Flights	200		200				200
Training events (FFS) (gene pool improvement, veterinary care, IPM, efficient irrigation, organic matter management) (Output 2.4)	60	Events	1,500		22,500	22,500	22,500	22,500	90,000
Consultancy for design of training programme and development of materials (Output 2.4)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
Consultancy to develop methodological guidelines (Output 3.1)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
	2	workshops	2,500			5,000			5,000
Consultancy to advise on development of CC adaptation and disaster management programme (Output 3.1)	30	days	500			15,000			15,000
	6	nights	100			600			600

Oracle code and description	#	Unit	Unit cost	Years					Total
				1	2	3	4	5	
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
	2	workshops	2,500			5,000			5,000
Consultancy to design training programme and develop materials (Output 3.2)	30	days	500		15,000				15,000
	6	nights	100		600				600
	18	nights	35		630				630
	1	flights	2,000		2,000				2,000
	1	flights	200		200				200
Training events (Output 3.2)	2	events	2,500			5,000			5,000
Training materials (Output 3.2)						10,000			10,000
Consultancy to advise on strengthening of coordination mechanisms (improvement of rules of operation etc.) (Output 3.3)	30	days	500			15,000			15,000
	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
5014 consultancies				12,500	0	70,000	0	50,000	132,500
International capacity development consultant	50	days	500	12,500		12,500			25,000
Mid term external review/evaluation	1	evaluation	40,000			40,000			40,000
Final external evaluation	1	evaluation	50,000					50,000	50,000
Study on Integrated pest management options capable of addressing expected increases in pest problems related to CC (Output 1.4)	30	days	500			15,000			15,000
	1	workshops	2,500			2,500			2,500
5021 travel				26,909	23,359	30,341	23,360	23,359	127,328
Chief Technical Adviser	211	nights	72	3,041	3,041	3,042	3,041	3,041	15,206
Chief Technical Adviser	24	flights	200	960	960	960	960	960	4,800
National Project Coordinator	211	nights	35	1,478	1,478	1,479	1,479	1,478	7,392
National Project Coordinator	24	flights	200	960	960	960	960	960	4,800
Knowledge management/participation specialist	100	nights	35	700	700	700	700	700	3,500
	12	flights	200	480	480	480	480	480	2,400
National Capacity Development Specialist	20	flights	200	800	800	800	800	800	4,000
National Capacity Development Specialist	300	nights	35	2,100	2,100	2,100	2,100	2,100	10,500
Provincial Project Unit	900	nights	50	9,000	9,000	9,000	9,000	9,000	45,000
Provincial Project Unit	160	nights	100	3,200	3,200	3,200	3,200	3,200	16,000

Oracle code and description	#	Unit	Unit cost	Years					Total
				1	2	3	4	5	
Provincial Project Unit	16	flights	200	640	640	640	640	640	3,200
International capacity development consultant	20	nights	100	1,000		1,000			2,000
	20	nights	35	350		350			700
	2	flights	2,000	2,000		2,000			4,000
	2	flights	200	200		200			400
Study on Integrated pest management options capable of addressing expected increases in pest problems related to CC (Output 1.4)	6	nights	100			600			600
	18	nights	35			630			630
	1	flights	2,000			2,000			2,000
	1	flights	200			200			200
5023 Training				10,000	10,000	10,000	10,000	7,500	47,500
National inception workshops	1	workshops	5,000	5,000					5,000
Local inception workshops	2	workshops	2,500	5,000					5,000
Training events on CC-resilient wetland management options	3	events	2,500		2,500	2,500	2,500		7,500
Training events (FFS) (NTFPs, ecotourism)	30	events	1,500		7,500	7,500	7,500	7,500	30,000
5024 Expendables				30,440	30,440	30,440	30,440	30,440	152,200
Central office costs	60	months	800	9,600	9,600	9,600	9,600	9,600	48,000
Vehicle insurance	4	cars	7,000	5,600	5,600	5,600	5,600	5,600	28,000
	48	Motor-cycles	750	600	600	600	600	600	3,000
Fuel				10,000	10,000	10,000	10,000	10,000	50,000
Vehicle maintenance				800	800	800	800	800	4,000
Local office costs	120	months	160	3,840	3,840	3,840	3,840	3,840	19,200
5025 Non-expendables				154,500	0	942,909	890,000	120,000	2,107,409
Central office costs	1	office	15,000	15,000					15,000
Vehicles	2	cars	34,000	68,000					68,000
Vehicles	2	cars	25,000	50,000					50,000
Vehicles	5	Motor-cycles	1,500	7,500					7,500
Local office costs	2	offices	7,000	14,000					14,000
Purchase/distribution of resistant livestock and planting materials (Output 2.3)						100,000	90,000		190,000
Purchase/distribution of small scale irrigation equipment (Output 2.3)						100,000	90,000		190,000
Veterinary facilities (Output 2.3)							100,000		100,000
Improvement of wells (Output 2.3)						100,000			100,000

Oracle code and description	#	Unit	Unit cost	Years					Total
				1	2	3	4	5	
Aquaculture pilots (Output 2.3)						100,000	90,000		190,000
Value-adding facilities for NTFPs (Output 2.3)						100,000	90,000		190,000
Visitor facilities for ecotourism (Output 2.3)						102,909	90,000		192,909
Rainwater harvesting and water storage equipment (Output 2.3)						100,000	100,000		200,000
Semi-natural reservoirs (Output 2.3)						100,000	100,000		200,000
Reforestation of areas vulnerable to erosion (Output 2.3)						70,000	70,000	60,000	200,000
Physical re-opening of wetlands (Output 2.3)						70,000	70,000	60,000	200,000
GRAND TOTALS				655,458	596,098	1,623,745	1,282,390	559,888	4,717,579

Appendix 5. Indicative Procurement Plan

Overall project equipment	Unit price	Quantity	Total
Station wagons	34,000	2	68,000
Pickups	25,000	2	50,000
Motorcycles and helmets	1,500	5	7,500
Office equipment (various)			29,000
Subtotal			154,500
Direct Investments (Output 2.3)	Total	Estimated % procurement	Total procurement
Purchase/distribution of resistant livestock and planting materials	190,000	100	190,000
Purchase/distribution of small scale irrigation equipment	190,000	100	190,000
Veterinary facilities	100,000	100	100,000
Improvement of wells	100,000	50	50,000
Aquaculture pilots	190,000	50	95,000
Value-adding facilities for NTFPs	190,000	100	190,000
Visitor facilities for ecotourism	192,909	100	192,909
Rainwater harvesting and water storage equipment	200,000	100	200,000
Semi-natural reservoirs	200,000	50	100,000
Reforestation of areas vulnerable to erosion	200,000	25	50,000
Physical re-opening of wetlands	200,000	25	50,000
Subtotal			1,407,909
Total			1,562,409

Appendix 5. Risk Matrix

Risk description	Category	Impact	Likelihood	Mitigation actions
Continued low staffing and technical capacities in MONRE, the national Executing Partner, which is a newly established ministry and is only progressively establishing its provincial and district level structures.	Medium	Limited institutional sustainability of project outputs and impacts, and limited effectiveness of natural resource governance in the long term,	90%	Strengthening of community-based governance structures as a complement to limited Government resources and capacities. Strengthening of capacities for the ongoing delivery of capacity development in Government agencies (training of trainers), to contribute to further closing of capacity gaps post project.
Continued focus by national actors on sector-specific rather than integrated and collaborative approaches to sustainable natural resources management, climate change adaptation and rural development in general	Medium	Limited effectiveness and sustainability of CCA strategies: natural resource management and conservation may fail to address livelihood needs and so be socially unsustainable, while livelihood support activities may fail to take into account limits of environmental sustainability, fail to recognise potential of ecosystem-based adaptation and lead to maladaptation.	50%	Continued use and strengthening of established multi-sector mechanisms such as the Provincial Ramsar Committees and the District Ramsar Implementation Teams for project implementation, with linkages to River Basin Committees and Disaster Management Committees, in order to generate concrete experiences and evidence of the practicalities and benefits to be achieved through integrated and collaborative approaches.
Continued growth in pressures on wetlands eco-systems (including implications of climate change) beyond the coping limits of the currently proposed adaptation strategies,.	High	Currently proposed strategies for CCA and ecosystem management and protection may cease to be relevant or to address adequately the changing pressures.	90%	Development of capacities and mechanisms at institutional and community levels to monitor ecosystem status and pressures, and to innovate and adapt resource management and livelihood support strategies accordingly.

Appendix 6. Environmental Screening

Would the project if implemented	Yes	No	Unable to determine
1. Have significant adverse impacts on public health or safety?		x	
2. Have significant or controversial environmental effects on biophysical resources such as land, water, soil, biodiversity?		x	
3. Have adverse impacts on unique characteristics, such as wilderness, natural rivers, aquifers, prime farmlands, wetlands, floodplains, or ecologically significant areas?		x	
4. Have adverse impacts on traditional practices or agricultural systems in the area?		x	
5. Have highly uncertain and potentially significant environmental and social impacts with unique or unknown risks?		x	
6. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental and social impacts?		x	
7. Set in motion or contribute to a progressive accumulation of significant environmental and social impacts?		x	
8. Have adverse impacts (direct or indirect) on natural habitats such as wetlands, mangroves, tropical forests?		x	
9. Have adverse impacts on important national or international species (listed or proposed) or on critical species habitats?		x	
10. Have adverse impacts on local or indigenous populations residing in the area of interest?		x	
11. Contribute to introduction, continued existence, or spread of non-native invasive species or promote the introduction, growth or expansion of the range of non-native invasive species?		x	
12. Threaten national, local, tribal or indigenous peoples' requirements for use of natural resources or protection of the environment?		x	
13. Trigger or exacerbate unresolved land tenure conflicts concerning rights or alternative uses of natural resources?		x	
14. Have a disproportionate, significant adverse effect on low-income or disadvantaged populations?		x	
15. Restrict access to traditional or ceremonial sites or adversely affect the physical integrity of such religious sacred sites?		x	
16. Have adverse impacts on natural resources or properties of historic or cultural significance?		x	
17. Lead to significant impacts indicated by a national, district or local community group?		x	
18. Have the potential to be controversial because of stakeholder		x	

disagreement?			
19. Encourage migration or other population shifts?		X	
20. Increase the workload of local communities or subgroups within the communities?		X	
21. Work in opposition with ongoing socio-economic development goals or efforts?		X	
22. Require Capacity Development of affected or involved individuals and organizations? Require Capacity Development to review and update of policies, laws, regulations, or to develop partnerships?	X		

Certification:

Project Category B	Yes	No
I affirm the completion of an analysis of the potential environmental and social impacts for this project and certify it to be in Category B . The analysis included information to assess the potential negative and positive impacts and is addressed in the project design through appropriate prevention or mitigation measures.	X	

Title, name and signature of project Lead Technical Officer:

PATRICK B. DURST
SENIOR FORESTRY OFFICER

Date: 29/6/15

Patrick B Durst

Appendix 7. Terms of Reference (TORs)

1. CHIEF TECHNICAL ADVISOR

The Chief Technical Advisor (CTA) will provide technical orientation and backup to the National Project Coordinator (NPC) in order to ensure the delivery of project outputs to a high standard, in a cost effective manner, taking into account national and international best practice and research results, and in accordance with FAO, Government and GEF norms.

- 1) Advise the NPC and, through him/her, other members of the project team and project partners, on all technical aspects of the project, with inputs where necessary from short term international or national specialist consultants and from national, regional and/or global institutions with the requisite expertise
- 2) Advise the NPC on needs for external technical support, including the selection of candidates and the oversight and quality checking of their inputs.
- 3) Support the NPC in maintaining communication and coordination with other institutions in order to identify and realize opportunities for complementarity and synergies, including monitoring and oversight of cofinancing commitments
- 4) Advise the NPC on the development and implementation of sustainability/exit strategies for the project in order to ensure that its impacts are sustained, further developed and replicated after the withdrawal of LDCF support.
- 5) Oversee, and report to FAO country office on, the efficient and transparent execution of LDCF funds, handled by all project partners
- 6) Support the NPC in the preparation of required reports on project progress and execution to Government, FAO and GEF.

2. NATIONAL PROJECT COORDINATOR (NPC)

The NPC will be in overall charge of the project. Acting on the advice of the CTA, in accordance with Government, FAO and LDCF priorities and norms, with the provisions of agreed project work plans and the recommendations of the Project Steering Committee, the NPC will:

- 1) Plan and coordinate project activities and ensure the efficient and timely delivery of project outputs
- 2) Supervise and orient other technical and administrative members of the PMU at central and local levels
- 3) Oversee the establishment and application of mechanisms to ensure and monitor the efficient and transparent execution of project funds
- 4) Promote coordination and collaboration between diverse project partners at local, regional and national levels in order to realize opportunities for complementarity and synergies
- 5) Monitor and ensure accordance between project activities and Government policy directions.
- 6) Prepare project implementation plans and annual work plans of the project, in consultation with key stakeholders among participating line agencies and local government units

3. KNOWLEDGE MANAGEMENT (KM) AND PARTICIPATION SPECIALIST

- 1) Establish a project monitoring and evaluation (M&E) system to support project operations and oversee its execution
- 2) Assist the NPC and other team members in executing the project monitoring and evaluation (M&E) system, incorporating inputs from project partners
- 3) Ensure that project indicators are measured in a timely and consistent manner in accordance with "SMART" principles, including the measurement during the first year of the project of the baseline values still pending in the results framework
- 4) With the advice and support of relevant specialists, prepare the knowledge management and communication plan for the project and coordinate the implementation of the same

- 5) In collaboration and consultation with project partners at all levels, prepare and oversee the implementation of a stakeholder participation plan that will develop further and operationalize the provisions presented in the Project Document, and will ensure that the needs and priorities of stakeholders at all levels are adequately considered in project management decisions
- 6) Ensure that the recommendations of the gender mainstreaming consultant are adequately implemented in the project's strategies, work plans, participation plan and monitoring and evaluation system.

4. NATIONAL CAPACITY DEVELOPMENT (CD) SPECIALIST

- 1) Develop a capacity development strategy for the project, incorporating the results of the Capacity Building Needs Analysis carried out during project preparation as well as best practice recommendations generated by FAO and others, including provisions for effective definition of CD needs, efficient selection of candidates, definition of CD methodologies and provisions for post-training follow-up and monitoring
- 2) Advise and train selected members of national institutions on CD approaches, in order to maximize replication and sustainability ("training of trainers")
- 3) In discussion with the project's KM specialist, develop indicators of capacities and of the effectiveness of CD strategies, for incorporation into the project's M&E system.
- 4) Oversee and advise other PMU members, national and international consultants and Government actores on the preparation of training materials, and the design of training methodologies, relevant to the different technical areas to be covered by the project.

APPENDIX 8. Gender analysis and strategies

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
Promotion of resistant crop varieties	<ul style="list-style-type: none"> - Women have important roles as seed keepers, planters, harvesters of crops and in feeding the family. - Women are key persons in selecting crops to be cultivated season-to-season - Women's are familiar with rice varieties and quality of rice 	<ul style="list-style-type: none"> - Male-dominated selection of varieties could ignore preferences and expertise of women, thereby increasing domestic workloads and marginalizing their status as seed-keepers) 	<ul style="list-style-type: none"> - If women are adequately involved in selection, resistant crop varieties could reduce their workload by minimizing the risk of crop failure and the consequent implications of that for women's workloads - Opportunities to favour varieties identified by women (because women have stronger knowledge and experience of rice varieties); 	<ul style="list-style-type: none"> - Recognise and promote women's roles as seed keepers - Involve women in crop selection processes to ensure varieties meet their needs; - Support local women led seed banks, which can be a platform to exchange/provide knowledge (local and technical from outside) on CC and collect and exchange resistant varieties of seeds. - Provide opportunities to target women through extension services and increase access to resources (seeds)
Small scale, targeted and efficient irrigation systems	<ul style="list-style-type: none"> - Men are more involved in making decisions about irrigation and in the physical aspects of construction - Women are involved in maintaining small infrastructures and irrigation at small scale (gardening); 	<ul style="list-style-type: none"> - Pressure for women to participate in the maintenance of irrigation infrastructure and in irrigated crop cultivation could lead to increases in their workload and reductions in the time available to them for other activities with potential to further their economic status 	<ul style="list-style-type: none"> - Improved small scale irrigation could support the development of home gardens compatible with domestic routines, opening up economic opportunities for women; - Increased access for women to extension services that 	<ul style="list-style-type: none"> - Involve women in design and selection of irrigation options; - Engage women in local level planning processes that will increase their roles in decision-making and management of irrigation interventions

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
		(such as commerce)	could lead to improved technical knowledge of crops and production techniques; improved networking opportunities; and increased social mobility with increased economic activities.	<ul style="list-style-type: none"> - Assess the change in work load brought by this activity through preliminary consultations
Integrated pest management	<ul style="list-style-type: none"> - Pest management during cultivation is mainly the role of men - Post-harvest pest management (e.g. weevils and beetles) is largely the responsibility of women - Increased pest activity due to CC, and the subsequent loss of production could lead to women having to spend more time in search for alternative sources of food for daily household consumption. It could also lead to loss of income from decreased production 		<ul style="list-style-type: none"> - Improved post harvest pest management could reduce the work load of women and guarantee an improved income from crop product selling 	<ul style="list-style-type: none"> - Increasing the role for women in decision-making - Pest management training specific to women;
Smaller and more heat resistant livestock varieties	<ul style="list-style-type: none"> - Smaller livestock and poultry are primarily the responsibility of women and children. This includes feeding, healthcare and sale of animals or products. - Money from the sale of livestock is kept by women to pay for tuition fees and saved for family emergency (money is the 	<ul style="list-style-type: none"> - If women are pressured to carry out small livestock rearing on a larger higher scale it could increase their workload. 	<ul style="list-style-type: none"> - Income generated from this activity would be higher increasing the power of women and increasing their leading role as decision-makers in the household 	<ul style="list-style-type: none"> - Involve women in the selection of smaller, more heat resistant livestock varieties processes to ensure these meet the needs according to their expertise - Promote the increased participation of men in rearing of small livestock to

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
	<p>responsibility of women: the belief is that if men handle the money, they will misspend it on socializing, buying beer etc)</p> <ul style="list-style-type: none"> - Decision-making happens at household level 			<ul style="list-style-type: none"> - ease workload of women;
Improved husbandry and veterinary care of (large) livestock	<ul style="list-style-type: none"> - Primarily the responsibility of men, especially bigger livestock such as buffalo and cows - Men look after and take care of the animals, day-to-day and for healthcare, sale, etc - Decision-making happens at household level 	<ul style="list-style-type: none"> - Disproportionate increases in the economic status of men, resulting in marginalization of women 	<ul style="list-style-type: none"> - Increased availability of animal products for household consumption, reducing women's workload in obtaining food 	<ul style="list-style-type: none"> - Support women's involvement in the planning of family livelihood strategies in order to optimize the balance of productive activities with differentiated implications for men and women (e.g. large vs. small livestock)
Production and collection of fodder for livestock	<ul style="list-style-type: none"> - Men collect the straw; women sometimes help with tying the straw and loading up on tractors - Men also preserve the straw for use in the dry season - Women are occasionally involved in the harvest of the grass and storage in rice bags for transportation (men can also load tractors) - Decision-making happens at household level 	<ul style="list-style-type: none"> - Potential increases in women's workload, without corresponding economic or power benefits (given men's directly the women in terms of power balance or income generation and could have an impact on the availability of time for them to get involved in their other key activities 	<ul style="list-style-type: none"> - Increased availability of animal products for household consumption, reducing women's workload in obtaining food 	<ul style="list-style-type: none"> - Involve men in fodder production in order to reduce women's work loads
Protection of wells and other water sources for livestock	<ul style="list-style-type: none"> - Construction of walls around the wells, other protection infrastructure, maintenance and cleaning are handled by men. 	<ul style="list-style-type: none"> - Increased focus on livestock use of wells could marginalize women's access to water for domestic use 	<ul style="list-style-type: none"> - Improved protection of wells could facilitate safe water collection by women and therefore enable them to get 	<ul style="list-style-type: none"> - Differentiate wells for livestock and wells for domestic use - Initiate water source

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
	<ul style="list-style-type: none"> - Cleaning of wells requires men to climb into well shafts to remove soil and unclean water, which are drawn out in containers by men etc. - Women run the pumps and take water for domestic use (watering vegetable gardens, cooking, drinking) 		involved in other income generating activities.	conservation activities through local committees with at least 30% women members and ensure women representation in the governance of the committees
Aquaculture	<ul style="list-style-type: none"> - Family ponds are the joint responsibility of men and women, although women's involvement is mostly in the preparation of the fish, for example, in the wet season men catch fish and women cook. - In the dry season, after rice harvest, water is drained from the ponds; women divide the fish, for immediate family consumption, for processing to make fermented fish paste (which is consumed in the household and also sold) and fish for sale. - Women keep the money from the sale - Decisions about draining the ponds are determined family by family based on the weather usually before Lao New Year so that some of the income goes toward celebrations 	<ul style="list-style-type: none"> - Pressure to participate in aquaculture could increase the workload for women 	<ul style="list-style-type: none"> - Increased availability of protein for household consumption, reducing women's workload in obtaining food from other sources - Increased opportunities to generate economic benefits for women through the sale of fish and derivatives. 	<ul style="list-style-type: none"> - Involve and train women in production, design, processing and marketing of aquaculture products - Develop access and links to markets that specifically benefit women
Fish conservation zones	<ul style="list-style-type: none"> - Men go fishing with boats and gear 	<ul style="list-style-type: none"> - -The creation of fish 	<ul style="list-style-type: none"> - Improved and sustained 	<ul style="list-style-type: none"> - Provide alternative

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
	<p>(nets) in the large wetlands or open water bodies</p> <ul style="list-style-type: none"> - Women fish for invertebrates and other aquatic animals or fish in water holes, from the river/wetlands banks - Women are in charge for selling the product of fisheries to the local market - Women are in charge for processing the product (processing is done at HH level, rarely jointly with neighboring HH) - Women keep the money from sale and invest it in HH needs - Gear belongs to HH as a whole - Women are in charge for maintaining and repairing fishing gear (except boats) 	<p>conservation zones could temporarily limit women's access to small aquatic products and therefore decrease their income generation power in the HH</p>	<p>quantities of fish could result in an improved capacity to generate income through selling and processing</p> <ul style="list-style-type: none"> - The creation of fish conservation zones could result in improved management of other aquatic products, targeted by women's fisheries, thereby contributing to the long term sustainability of the benefits accruing to them 	<p>livelihood during the early stages of fish conservation zones to compensate for possible loss of income</p> <ul style="list-style-type: none"> - Involve women in decision-making on fish conservation zones
Ecotourism	<ul style="list-style-type: none"> - Work is divided; men are tour guides and act as porters for large groups, elders interact with tourists and talk about life in the villages or stories from old people. - Heads of tourism groups are usually men; they keep track of tourists in the areas (how many people came, where did they stay last, how much money was received, and Make sure everyone in the community is involved and benefits from tourism) 	<ul style="list-style-type: none"> - As the activity is still perceived as largely male-oriented, its development could result in increases in imbalances of power and resources between men and women - Pressure for women to participate in ecotourism activities at community level could increase their workloads directly and indirectly, without corresponding benefits 	<ul style="list-style-type: none"> - Potential for women to benefit indirectly from ecotourism through related activities such as sustainable farming, handicraft, art, education, etc.). 	<ul style="list-style-type: none"> - Sharing of lessons learned from women's groups regarding weaving and other handicrafts; - Training for women to take on technical and leadership roles in natural resources management and ecotourism; - Training for women on homestays; women tour guides and porters; promote organic/green tourism –

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
	<ul style="list-style-type: none"> - Women's participation in the development of sustainable tourism industry at the local level is very diverse from running accommodation services and shops, providing food, working with handicraft (weaving mats and hats), art and also in traditional cultural activities (eg. blessing ceremonies – baxis) - Men make sticky rice baskets - Despite the key role of women in “backstopping” the activity it is still seen as a man's activity 			<p>organic vegetables, food preparation etc.</p>
Value-adding of existing local/wetland products	<ul style="list-style-type: none"> - Women are primarily responsible for collection of Malva nuts, bamboo and snails - Men help with transportation and loading tractors - No formal or informal governance mechanisms to address gender aspects 	<ul style="list-style-type: none"> - Pressure to participate in product processing could increase the workload of women 	<ul style="list-style-type: none"> - Increased income opportunities for women through more selective choice and harvesting of NTFPs, to make them more sustainable, and improvements in processing 	<ul style="list-style-type: none"> - Support NTFP value chain improvement with focus on women and vulnerable groups as key stakeholders. - Support women's capacities to analyses compatibility of value-adding with existing workloads
Community ponds and filtration systems, and rainwater harvesting systems (jars, roofs)	<ul style="list-style-type: none"> - Community ponds are primarily handled by men, as is the maintenance of ponds, digging ponds and keeping water in ponds during dry season. - Men construct rainwater harvesting systems - Women collect the water with jars, 	<ul style="list-style-type: none"> - Inadequate location or design could increase women's workload in water collection. 	<ul style="list-style-type: none"> - Will reduce the stress of water collection, which is mainly a women task and therefore lighten their workload 	<ul style="list-style-type: none"> - Involve women in decisions on where/how many infrastructures needs to be put. Women are likely to have a better knowledge than men on water harvesting issues.

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
	<ul style="list-style-type: none"> etc, for use in the family - Women are likely to have most responsibility for helping with filtration systems in their village and rainwater storage for use in the dry season - Water collection is governed household by household and by the community 			
CC-proofing of infrastructure (increase in flow capacity of bridges, strengthening of bridge abutments, creation of semi-natural reservoirs dimensioning of spillways of dams and weirs)	<ul style="list-style-type: none"> - The labour force is largely male, but women support by providing food or water during the construction 	<ul style="list-style-type: none"> - Increased workload for women in providing food and water during construction, without corresponding economic or power benefits from employment 	<ul style="list-style-type: none"> - None 	<ul style="list-style-type: none"> - None
Securing of pump houses	<ul style="list-style-type: none"> - Men – village guards who monitor in the day and night time. Volunteers from each family usually boys and young men. - Welding and fixing roofs handled by men. 	None	None	None
Reforestation of watersheds	<ul style="list-style-type: none"> - Both men and women are involved in protecting watersheds and reforestation - Women plant trees; men do the physical work of digging holes; use expertise in identifying species to 	<ul style="list-style-type: none"> - Increased workload of women 	<ul style="list-style-type: none"> - Opportunity to participate in land use design 	<ul style="list-style-type: none"> - Involve women in design and implementation of the activity in order to empower them and ensure that the activities are compatible with their priorities and

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
	plant			workloads.
Management/elimination of invasive species	<ul style="list-style-type: none"> - Men are responsible for elimination of mimosa (by tractor) - This is a physical activity that involves cutting and clearing land and destruction of species is hard work – roots can be difficult to get rid of and men have the physical strength - Golden Apple Snail is mostly handled by men since it requires burning of land. 	None	None	None
Physical re-opening of wetlands	<ul style="list-style-type: none"> - Men remove the vegetation as this is more physical - Governed by the community 	<ul style="list-style-type: none"> - Possible negative impacts on wetland components (e.g. NTFPs) on which women specifically depend if these are not adequately taken into account in planning of the re-opening 	<ul style="list-style-type: none"> - Possible positive impacts on the status of wetland components on which women particularly depend 	<ul style="list-style-type: none"> - Involve women in decision making on where and which wetlands are critical for reopening (from a livelihood point of view)
Protection of nesting sites and habitats for fauna	<ul style="list-style-type: none"> - Men are also in charge especially as fishermen and as part of law enforcement (patrolling teams); eg crocodile nests are protected by men and village security, in case poachers are in the site, they are more afraid of men than women; occasional gun use, sometimes involves spending the night in or near the site 	None	None	None

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
Controlled burning	- Activity led by men	None	None	None
Re-vegetation and physical barriers to stabilize river banks	- Women generally plant trees and protect the watersheds; men do the physical work of digging and setting up physical barriers;	- Increase in women's workloads	None	- Village women's group can provide support or lead re-vegetation of riverbanks -
Management of dams to ensure ecological flow maintained downstream	- Further analysis is required of gender aspects of decision-making processes and criteria for flow management	- Possible negative impacts on women's livelihoods if flow management fails to take into account watershed components (e.g. snails, NTFPs) on which they depend	- Possible positive impacts if dam management ensures an adequate balance between ecological flow to maintain wetland elements on which women depend and irrigation potential to maintain agriculture on which they depend	- Support involvement of women in analysis and decision-making regarding flow management
Appropriate siting and design of bridges, roads and canals	- Further analysis required of gender aspects of decision-making processes and criteria for flow management	- Inappropriate siting may locally affect wetland components on which women particularly depend	- Appropriate siting may specifically benefit wetland components on which women particularly depend	- Support involvement of women in analysis and decision-making regarding flow management
Strengthening of spatial planning capacities	- Primarily men, women are sometimes consulted – discussions carried out with both men and women. Governance mechanisms depend on community; land is demarcated by the community and then in subsequent years use is decided by the family. Rice cultivated outside of planned areas, for example, goes toward community fund.	- Inappropriate land use planning may negatively impact wetland components on which women particularly depend	- Appropriate land use planning may positively impact wetland components on which women particularly depend	Ensure the participation of women in the LUP activities

Strategy	Gender considerations	Possible negative gender implications of CCA strategies	Potential positive gender implications of CCA strategies	Strategies for optimizing gender implications
	<ul style="list-style-type: none"> - Women have as good knowledge as men of the village land use and can participate actively in LUP activities 			
Strengthened community-level governance	<ul style="list-style-type: none"> - Women are included in community level governance usually through Women's Unions at village level. - The village headmen and elders are usually men. - Men have more governance power. - Women are encouraged to be involved in the training, but traditionally these have been primarily attended by men. - Village clusters are comprised of men 	<ul style="list-style-type: none"> - Strengthening of governance without gender considerations may exacerbate power imbalances, disproportionately restricting women's access to natural resources while failing adequately to control activities that negatively affect their interests 	<ul style="list-style-type: none"> - With adequate female participation, strengthened governance can help to ensure that women's interests are protected (e.g. prevention of overexploitation of resources on which they particularly depend) 	<ul style="list-style-type: none"> - Co-management of community group meetings: ensure women's participation in meetings and management decisions
Strengthened technical capacities (producers, and local, provincial and national government)	<ul style="list-style-type: none"> - Men and women have the technical knowledge – efforts are made to include women in workshops and in sharing experience. 	<ul style="list-style-type: none"> - Strengthening of technical capacities without adequate inclusion of women may exacerbate power imbalances by giving men greater access to opportunities than women 	<ul style="list-style-type: none"> - Strengthening of women's capacities has the potential to give them access to productive options capable of increasing their economic status and of ensuring the sustainability of the activities on which they depend 	<ul style="list-style-type: none"> - Include women in workshops and trainings - Increase the role of women in decision making
Support to development of investment plans	<ul style="list-style-type: none"> - Depends on composition of relevant Government departments – usually men 	<ul style="list-style-type: none"> - Investment without adequate consideration of gender aspects may exacerbate power imbalances by giving men greater access to opportunities than women 	<ul style="list-style-type: none"> - Increasing women's access to investment funding can enable them to improve their economic status 	<ul style="list-style-type: none"> - Support improved participation of communities and increased participation of women in the formulation of investment plans and access to resources.

APPENDIX 9. Key project stakeholders

Stakeholder name	Related departments	Location/magnitude	Potential involvement in the project	Expected impact from the Project
MoNRE	DEQP NDMCCO DWR DLUP	+ National level	<ul style="list-style-type: none"> - Overall coordination of activities through a National focal point; - Involved in the project steering committee as main secretariat; - Support component 1 and 2 on adaptation options to wetlands, natural habitats (advice, comment) - Support the component 3 of the project by ensuring lessons learned and tools are shared and mainstreamed through the communication mechanism between Province and Central level 	<p>++</p> <ul style="list-style-type: none"> - The results/lessons learned from the project as well as the tools developed will support the improvement of National or Provincial Policies and strategies. - Trainings to selected Central Ministries representatives will also enhance central capacities. - The project will support the achievement of current objectives under the Ramsar convention - The project will enable to replication in other Province at national level
MAF	DLF DI Department of crops? NAFRI	+ National level	<ul style="list-style-type: none"> - Involved in the project steering committee. - Support component 1 and 2 on adaptation options to agriculture, livestock and fisheries, irrigation (advice, comment) - Support the component 3 of the project by ensuring lessons learned and tools are shared and mainstreamed through the communication mechanism between Province and Central level 	<p>++</p> <ul style="list-style-type: none"> - The results/lessons learned from the project as well as the tools developed will support the improvement of National or Provincial Policies and strategies. - Trainings to selected Central Ministries representatives will also enhance central capacities. - The project will support the achievement of current objectives under the National Agricultural plans - The project will enable to replication in other Province at national level
MEM		+ National level	<ul style="list-style-type: none"> - Involved in the project steering committee 	<p>-/+</p> <ul style="list-style-type: none"> - Negatively if adaptation measures on hydrology are not compatible with MEM plans
MPI		+ National level	<ul style="list-style-type: none"> - Involved in the project steering committee - Coordinating role in approving investments in the natural resource sector, such as plantations and infrastructure. 	<p>+</p>
Ramsar National committee		++ National, Provincial and district levels	<ul style="list-style-type: none"> - Provide guidance and comments on plans, report to the Ramsar convention secretariat. - Could constitute a governance body for the project at Province level (if including missing departments like DRM department, LNMC). 	<p>++</p> <ul style="list-style-type: none"> - Improvement in term of management of the Ramsar site is under their responsibility. - Capacity strengthening on wetlands adaptation to CC - Improved coordination and effectiveness of the committee through a cross sector project

Stakeholder name	Related departments	Location/magnitude	Potential involvement in the project	Expected impact from the Project
DR Committee		++ National, Provincial and district levels	<ul style="list-style-type: none"> - Provide guidance and comments on DRM plans, - Provincial DR committee can disseminate information to central level DR committee and to district level, - Could constitute a complementary governance body for the project at Province level 	<p>implementation</p> <ul style="list-style-type: none"> - Dissemination of information from the project (tools, lessons learned, planning) could feed in the resolutions and guidelines of the Ramsar convention at international level <p>++</p> <ul style="list-style-type: none"> - Improved capacity to integrate understand and replicate Disseminate the information in other districts - Improved capacities to build early warning information, to plan and decrease the disaster risk at local level
PoNRE	Water sector Environment sector Forest sector Meteorology sector Land management/control sector	++Provincial level with strong influence on district level	<ul style="list-style-type: none"> - Key organization to receive, support and carry out local trainings on CC, wetlands management and DRM; - Support the implementation of the vulnerability assessment tool and support and coordinate the development of adaptation plan/measures on wetlands, hydrology and natural habitats - Validate/approve planning and work plans and budgets 	<p>+++</p> <ul style="list-style-type: none"> - Improved understanding of CC related issues and capacity to plan adaptation measures; - Improved capacity to train technical staffs and district officials - Improved information sharing (horizontal and vertical related to cross sectoral issues (CC, DR, wetlands) - Improved management of Ramsar sites;
PAFO	Livestock and fisheries sector Irrigation sector Agriculture and crops Extension	++Provincial level with strong influence on district level	<ul style="list-style-type: none"> - Key organization to receive, support and carry out local trainings on CC, wetlands management and DRM; - Support the implementation of the vulnerability assessment tool and support and coordinate the development of adaptation plan/measures on agriculture, livestock, fisheries - Validate/approve planning and work plans and budgets 	<p>+++</p> <ul style="list-style-type: none"> - Improved understanding of CC related issues and capacity to plan adaptation measures; - Improved capacity to train technical staffs and district officials - Improved information sharing (horizontal and vertical) related to cross sectoral issues (CC, DR, wetlands) - Improved agricultural production/food security in the target districts;
LWU		+ National/ Provincial and district levels	<ul style="list-style-type: none"> - Support gender specific trainings and act as a communication platform for women in communities 	<ul style="list-style-type: none"> - Strengthened capacities on climate change adaptation, livelihoods option with a focus on gender
DoNRE	Water sector Environment sector	++District level with	<ul style="list-style-type: none"> - Key organization to receive, support and carry out local trainings on CC, wetlands 	<p>++++</p> <ul style="list-style-type: none"> - Improved capacities to plan and implement adaptation

Stakeholder name	Related departments	Location/magnitude	Potential involvement in the project	Expected impact from the Project
DAFO	Forest sector Meteorology sector	strong influence on village level	management and DRM; - Co-Lead the implementation of the VA tool - Disseminate information at community level and develop their own trainings -	measures; - Strengthened role of District in local management - Improved capacity to disseminate CC related information to the community level - Improved management of Ramsar sites;
	Livestock and fisheries sector Irrigation sector Agriculture and crops Extension	++District level with strong influence on village level	- Key organization to receive, support and carry out local trainings on CC, wetlands management and DRM; - Co-Lead the implementation of the VA tool - Disseminate information at community level and develop their own trainings - Monitor the work on the ground	++++ - Improved capacities to plan and implement adaptation measures; - Strengthened role of District in local management - Improved capacity to disseminate CC related information to the community level - Improved agriculture production - Improved resilience of agriculture and agriculture related infrastructure to climate change;
Cluster Village	Head + 10 Nai ban + 2 representatives of each village group	+++	- Key organization to disseminate information on CC to communities - Collect regularly the concerns achievements and challenges related to the project implementation form the communities and disseminate to district and province - Monitor the work on the ground	++++ - Positive impact through livelihood improvement and improved resilience to climate change impacts and disaster risks - Enhanced capacity to plan and implement measures, and increased sustainability of impacts
Community governance group	Head man + 15 villagers	+++	- Key stakeholders for activities implementation - Involvement in planning and/or discussing, approving planning - Involvement in monitoring activities impacts and outcomes of the project	- Positive impact through livelihood improvement and improved resilience to climate change impacts and disaster risks - Enhanced capacity to plan and implement measures, and increased sustainability of impacts

Appendix 10. Xe Champhone Vulnerability Assessment

To update the existing information, the IUCN team, jointly with MoNRE conducted a 2 weeks survey on livelihood in 14 target villages in the Xe Champhone Ramsar site and surrounding. Villages were selected due to their various contexts in term of livelihood options, location and surrounding habitats, population etc...

Name of village	Reason for selection
Ban Tansoum	Village inside Ramsar site, crocodile conservation project, close to the main natural wetlands areas, large agricultural lands using irrigation from the wetland
Ban Laonat	Village inside Ramsar site
Ban Kadan	Village inside Ramsar site, close to large natural ponds and wetlands
Ban Houamuang	Village inside Ramsar site, close to large man-made reservoir with water gate and fish conservation zone
Ban Sakhounnue	Find 2 villages close to Nong sui using the reservoir for irrigation and fishing
Ban Donmoung	Village close to the Champhone river (erosion profile, tourism, and bridge building ongoing)
Ban Nanongphum and Donyeng and Dongboun	Remote villages close to the Xe champhone river and oxbows lakes
Ban nakathang	Village isolated in a dry zone, very poor, depending mainly on rice production, ethnic minority
Ban Taleo	Village with lands inside the Ramsar site, rice production, forest, headman very active and local water management initiatives
Ban Dondeng	Village inside Ramsar site, forests wetlands and touristic attraction (turtle lake)
Ban kenkok dong	Large village, well connected to the roads, district capital, lot of wetlands and paddy fields

In each village, the team worked with a group of around 20 ppl, gathering village head man and representative of village governance groups, elders, women, fishers and farmers. The project was presented, discussed for 15 mn (Q and A) and then the team would split into 2 groups to carry out 2 different exercises.

The first exercise was to rank the main source of livelihood in term of importance for food and/or income and to give information on who was involved in this activity, the current trend for the activity for the past 10 years and the current coping strategies to overcome threats and difficulties on each livelihood source.

The workshop also included a participatory mapping of the village to identify the location for production of crops or harvesting of natural resources. The map was also used to map natural disasters occurring in the village such as floods and erosion.

Main infrastructures in the village were also mapped and then visited with village and district representatives to describe them and through a form, discuss date of building, maintenance, responsibility for management and all related costs.

The assessment always ended in a more open-ended discussion to allow stakeholders to express their views or return to earlier points in more details.

At the end of the workshop the team would give a brief summary of the key findings to cross check with the group that it was consistent with the information expressed.

Appendix 11. Climatic and hydrological data for the target wetlands

Table 6. Average temperatures in Savannakhet and rainfall in Xe Champhone, 1975-2012

Variable	Unit	Average during 1975-2010	Change during 1975-2010
Temperature			
Average temperature in SVK	°c	25.6	1.90
Average maximum temperature in SVK	°c	29.2	1.40
Average minimum temperature in SVK	°c	20.2	3.10
Average temperature in March in SVK	°c	25.5	3.20
Average temperature in April in SVK	°c	27.6	1.80
Average temperature in May in SVK	°c	28.4	1.80
Rainfall			
Rainfall in Keng Kok	mm	1,478.50	-200.00
Rainfall in Keng Kok in June	mm	228.7	-96.00
Rainfall in Keng Kok in July	mm	274.3	32.00
Rainfall in Keng Kok in August	mm	344.8	-190.00
Rainfall in Keng Kok in September	mm	247.9	-60.00

Source: estimated by research team based on data provided by Savannakhet PAFO

277. The hydrology and ecology of the southern part of the wetlands differ from the north. The southern section has more forest cover and still retains natural wetland ecosystems, including original bamboo forest, particularly around Kout Mak Pheo, the most important habitat for crocodiles in the area.

278. Most of the wetland has brown-grey sandy soil. It is not considered productive land and some villages suffer from soil salinity (e.g. Ban Naka Thang and Ban Ta Leo) and groundwater salinity (e.g. Ban Kham Tao). Due to the underlying geology of the Khorat Plateau, extending from northeast Thailand into central and southern Lao PDR, to the catchment soils have a propensity to be saline (Wiszniewski and Lertsirivorakul, 2007, cited in IUCN, 2011). This confirms Claridge's (1996) assessment that irrigation in the Khorat Plateau may have salinisation and alkalinisation impacts on wetlands in these areas. Soil erosion along the river is considerable, while the slow flow allows sand to pile up along the mainstream of the river. However, there is evidence of only slight flows of soil run-off into the reservoirs, marshes and oxbows.

Hydrological characteristics of BKN

279. The BKN catchment is split into a smaller northern section, just draining the immediate slopes around the wetland, and a larger southern portion. The northern section of BKN appears to be extremely complicated hydrologically. The estimated area of the catchment is about 46 km², with most of the run-off coming from short seasonal streams running from the eastern slopes of the Xe Pian hills, and some run-off coming from the flat lands to the north. It is difficult to distinguish where amongst the complex streams in this flat area to the north the flow is southwards into the wetland, or westwards into Houay Tomo.

280. The southern catchment feeds into the Houay Tauang river, which is a tributary of the Xe Khampho river: this catchment, which is therefore part of the Xe Khampho catchment, has a total area of 442.57 km². Some characteristics of this catchment area are shown in Table 7 (Meynell, 2013) Estimates of the total volume of rainfall on the catchment in wet and dry seasons are shown below in Table 8.

Table 7. Characteristics of the catchment of the Houay Tauang flowing into the southern part of Beung Kiat Ngong

Ecological zone type	Area (km ²)	Landuse	Area (km ²)	Protected area
Floodplain, wetland, lake	2.0	Paddy	24.18	PA = 393.02 Km ²
Low elevation dry broadleaf	2.55	Swamp/wetland	8.95	KBA = 378.90

Ecological zone type	Area (km ²)	Landuse	Area (km ²)	Protected area Km ²
Mid-elevation dry broadleaf	438.02	Water body	1.5	
		Forest	407.94	
Altitude (masl)	Area Km ²	Slope	Area Km ²	Stream order
101 – 200	160.99	0 - 2%	137.79	1 = 61.9 km
201 – 300	174.90	2.1 – 5%	54.06	2 = 12.03 km
301 – 400	68.14	5.1 – 8%	39.38	
401 – 500	23.51	8.1 – 15%	62.37	
501 – 600	8.86	15 – 30%	87.62	
601 – 700	3.95	30 – 60%	57.41	
701 – 800	1.93	>60%	3.78	
801 – 900	0.16			

Table 8. Estimates of total volume of rainfall falling on Beung Kiat Ngong

Section		Catchment area (km ²)	Current rainfall (mm)	Volume of rainfall (mm ³)
Northern section	Wet season	46	1,578	72.6
	Dry season		463	21.2
Houay Tauang	Wet season	443	1,578	699.1
	Dry season		463	205.1
Total for BKN	Wet season	489		771.7
	Dry season			226.3
Total rainfall				998.0

281. Effectively most of the rainfall in the dry season will be evaporated, and the graph of drought months shows that during potential evapotranspiration PET is likely to increase during the dry season. This will put extra pressure upon the water in the wetlands, which under conditions of climate change may tend to shrink more than they do at the moment. This is counterbalanced by more water from runoff in the wet season, so the extent of the wetland area would tend to increase in size by about 8% (the percent increase in rainfall volume in the wet season).

282. The situation is further complicated by the fact that there may be backwater effects coming from the Xe Khampho river and preventing the outflow of water from BKN when the water levels in the Xe Pian and Xe Khampho rivers are very high (late in the wet season). By contrast it may be that flooding in the northern part of BKN may be more dependent upon local rainfall – there is an indication of this in the reports of local people of two distinct major floods in 1978 (in the southern part) and 1979 (in the northern part).

Appendix 12. Biodiversity in the target wetlands

Xe Champhone

283. The Ramsar Information Sheet (RIS) for Xe Champhone (WREA, 2011) lists a number of species including the following threatened species:

Scientific name	Lao name	English name	IUCN Red List (IUCN, 2010)	CITES
<i>Crocodylus siamensis</i>	Khae	Siamese crocodile	Critically Endangered	Appendix I
<i>Amyda cartilaginea</i>	Pafa ong	Asiatic soft-shell turtle	Vulnerable	Appendix II
<i>Heosemys grandis</i>	Tao kwai	Giant Asian pond turtle	Vulnerable	Appendix II
<i>Indotestudo elongata</i>	Tao phek	Elongated tortoise	Endangered	-

284. Certainly, the species of highest conservation concern in the area is the critically endangered Siamese crocodile (*Crocodylus siamensis*). These wetlands have the largest population of this species in Lao PDR (approximately 100 animals). Crocodiles are found in many scattered lakes and marshes around Xe Champhone including Kout Mak Pheo, Kout Xe Lat, Kout Mae Hang, Kout Ko Ke and Kout Pi Noy.

285. The wetlands support a number of reptile and amphibian species, including the Vulnerable Asiatic soft-shell turtle (*Amyda cartilaginea*). Villagers estimate that there are about 200 of these turtles living in a pond at Ban Done Deng in the eastern part of the wetlands. The Endangered elongated tortoise (*Indotestudo elongata*) and reticulated pythons, although rare, are reported from several locations. The wetland is also home to other turtle species and water snakes, as well as aquatic animals, such as snails, and amphibian species, particularly frogs, which are often eaten by local people.

286. Among the birds reported in several key locations are the Vulnerable wood snipe (*Gallinago nemoricola*), spot-billed duck (*Anas poecilorhyncha*), white-breasted waterhen (*Amaurornis phoenicurus*), common myna (*Acridotheres tristis*), large-billed crow (*Corvus macrorhynchos*), red-billed blue magpie (*Urocissa erythrorhyncha*), several species of kingfishers including black-capped kingfisher (*Hylicyon pileata*), blue-eared kingfisher (*Alcedo meninting*), and common kingfisher (*Alcedo atthis*) and several heron species, including Chinese pond heron (*Ardea baccha*) and grey heron (*Ardea cinirea*). A large population of rhesus macaques (*Macaca mulatta*) is also found at Ban Dong Muang, in the northeast of the wetland, living in a small patch of traditionally protected mixed evergreen forest.

287. Among the key fish species reported and observed in the area during field work for this study are the Philippine catfish (*Clarias batrachus*), snakehead fish species (*Channa* spp.) including striped snakehead (*Channa striata*), bronze featherback (*Notopterus notopterus*), black sharkminnow (*Labeo chrysophekadion*), Bleeker's sheatfish (*Micronema bleekeri*), Pa Yon (Lao name) (*Pangasius siamensis*), and goby species (*Glossogobius* sp.). The Near Threatened butter catfish (*Ompok bimaculatus*) is also reported at the wetlands.

288. The floral data available for the Xe Champhone wetland are poor. With reference to Claridge (1996), the Xe Champhone RIS (WREA, 2011) and this case study, the main vegetation types are mixed evergreen forest, mixed deciduous forest, bamboo, shrubs, bushes and grasses. Tall plants found in the wetlands include sedges (*Cyperus* sp.), vegetable ferns (*Diplazium esculentum*), water lettuces (*Pista* sp.) and floating ferns (*Salvinia* sp.). The wetlands are also substantially encroached by agricultural development and invasive species, such as giant mimosa (*Mimosa pigra*) and water hyacinth (*Eichhornia crassipes*).

Beung Kiat Ngong

Species

289. This section focuses on the main species found in the wetlands that are important contributions to the livelihoods of the communities surrounding the wetlands.

Flora

290. In 2009 a survey of medicinal plants found in the wetlands and surrounding forests identified more than 240 species (180 genera and 80 families of vascular plants) used by traditional healers in the area. One of the most important economically important trees in the forests around BKN is the Malva nut tree, *Scaphium macropodum*. This is a masting species, flowering and fruiting in large quantities on a three to four year cycle. The nuts contain a bassorine gum, which though not soluble in water, swells up to form a gel, which is then used for a variety of medicines against diarrhoea, sore throats, coughs, inflammation and urinary complaints.

291. Of the wetland plants that have been mentioned in the habitat discussion:

- **Grasses** that form the floating mats and seasonally inundated grassland. The main species mentioned is *Imperata cylindrica* or similar.
- Of the **shrubs**, *Sesbania sesban* is a wetland species with a yellow flower that is collected as vegetable in many parts of the Mekong region. It grows in the depressions where the water tends to be too deep for the grasses. Though perennial it is a nitrogen fixing plant with an annual growth pattern similar to graminoids, leaving bare stems after the flood water go down, which then sprout again. The stems are also used for fibre, baskets and fish traps in other parts of the Mekong.
- The villagers of Nong Mak Ek and Thopsok both mention tall weeds for mat making, locally known as *Kha* and *Pheu*
- **Sedges** – *Scirpus grossus* is a stout, erect, coarse plant with a tufted, robust and strongly 3-angled stem reaching about 1.5-2.5 m tall. It is strongly tillering with long stolons ending in small tubers. It can be an invasive in commercial rice fields, but also has some economic value. It serves as a good herbage when ploughed in as green manure. In India and Malaysia, the tubers are a good source of starch, where it is also used in traditional medicine. In Philippines and Malaysia it is harvested for mat-making and string. (Plantwise, 2014)
- **Wetland trees** include *Xanthophyllum flavescens*, (Khok seng) which grows on the edges of the wetlands and swamp forest. The leaves are very popular as vegetable or salad. *Barringtonia* spp. include a number of typical flooded forest tree species in this genus.

292. **Invasive species:** The giant mimosa, *Mimosa pigra* is not yet widely established in BKN, but patches of this invasive alien species have been observed in Ban Sanot, at Ban Phommaleu and in the Ban Phalay area. *M. pigra* is well adapted to colonize disturbed seasonal wetlands, and can quickly form an almost monoculture-like cover. Its spines and chemical irritants discourage animals from eating it. The species tends to be most prevalent in agricultural margins and in areas recently cleared for agriculture. Several other exotic wetland plants are present, including Water-hyacinth, *Eichhornia crassipes* and Water-lettuce, *Pistia stratiotes*. None was found to be particularly prevalent (Timmins, 2014).

Fish

293. The fish species living in the BKN wetlands can be grouped into those that remain in the wetlands throughout the year and those that move into the wetlands in the wet season for spawning and feeding. 43 species have been recorded in the wet season, with 20 species remaining during the dry season.

294. Generally the resident species (“black fish”) inhabit relatively clear-water swamps and plains year round and make limited lateral migrations. The waters they inhabit are tea-coloured due to chemicals dissolved from floodplain vegetation, the decomposition of which increases acidity and depletes oxygen, stresses to which black fish are adapted. Most species are specifically adapted to such conditions, and can breathe air, are able to move overland in search of fresh waterbodies, and some, such as the climbing perch, can survive out of water for long periods. Black fish are mostly carnivorous and detritus feeders, and include the Channidae (Snakeheads), Clariidae, Bagridae (*Mystus* spp.) and Anabantidae.

295. The fish that move into the wetlands in the wet season (“white fish”), are mainly associated with the main channels and streams, and exhibit strong lateral and longitudinal migrations, including into floodplains. They will move into the wetlands from the main channels of the Sekong, Xe Pian and Xe

Kampho rivers as the waters rise in the early wet season (from May), remaining there to feed and reproduce, until the waters begin to recede (from November). The white fish includes many cyprinids, but also the featherback *Notopterus notopterus* and the puffer fish *Tetraodon* spp.

296. The main species of eel living in Beung Kiat Ngong is the swamp eel, *Monopterus albus*. They are differentiated from other fish species because of their seasonal dormancy behavior and their importance as a fishery in Beung Kiat Ngong. When ranked for their importance as a wetland product in community consultations, eels came second after fish.

297. Adult eels inhabit streams, ponds, canals, drains, rice fields, in both clear and turbid water. They are nocturnal, carnivorous and facultative air-breathers. At the start of the dry season when there is a decline in water level, they dig tubular burrows in banks or on the bottom. Although breathing is slowed down, the fish remains active and flees if disturbed. They emerge from their burrows at the beginning of the wet season as the water level starts to rise.

Molluscs

298. Shells or snails are ranked the third most important wetland product by the communities of BKN. There are believed to be two native species of large operculate snails collected – the large apple snail *Pila polita*, and another large apple snail (probably *P. pesmei* or *P. ampullaceal*), recorded in Nong Kasay, which appears to be less common (Timmins, 2014). The third large snail species which is now widespread in many areas of the BKN wetlands is the South American invasive, the Golden apple snail (*Pomacea canaliculata*), which was first reported in about 2008. In contrast to *Pomacea*, *P. polita* appears to require permanent wetland, and has been found in the main BKN marsh, the Nong Pakau complex and Nong Kasay.

Frogs

299. Community consultations indicate that all villages collect frogs, and they are ranked overall as the fourth most important wetland product and in two villages, Nong Mak Ek and Kele, they are ranked second to fish in importance.

Turtles

300. Most of the community discussions highlighted the importance of turtles, which ranked 6th amongst the most important wetland products, and indicated that collection of turtles was still continuing, despite their declining numbers. Timmins (2014) considers that because of the extent and complexity of the BKN wetlands several species of turtle are still likely to persist, of which Yellow-headed Temple Turtle *Hieremys annandalii* would be the most significant. The turtles thought to exist in BKN wetlands include:

- Malayan snail-eating turtle, *Malaemys subtrijuga* (IUCN Redlist Vulnerable). Known as the “ricefield turtle”, this species is favoured for its meat and is also used in traditional medicine.
- Yellow headed temple turtle, *Hieremys annandalii* (IUCN Redlist Endangered).
- Elongated tortoise, *Indotestudo elongata* (IUCN Redlist Endangered). This is a terrestrial species characteristic of Deciduous Dipterocarp Forest and highly deciduous Semi-evergreen Forest. It is unlikely to survive in significant numbers and might already have been extirpated.

301. Populations of all species are very likely to be highly depleted. Nevertheless, the BKN wetlands still have considerable national and regional significance for aquatic turtles, particularly *H. annandalii* which is large and easily exploited and depleted, and has a relatively small global range.

Birds in BKN

302. BKN is considered to be an important site for bird feeding and nesting, as part of the Xe Pian NPA. It is particularly important for small and medium-sized water birds, and for seed eating birds that depend upon the grasses in the wetland. Large water birds that have been known to occur here in the past, such as Sarus Cranes, the Grey Heron, the Spot-billed Pelican and the Greater Adjutant, no longer visit the wetlands, and a number of other bird species are considered to be at “real risk of local extinction” (IUCN, 2011). Recent surveys confirm the steady decline in bird numbers in BKN since the previous surveys in 2008 (Timmins, 2014). The birds that were recorded recently include: Cotton Pygmy-goose, Buttonquail, Stork-billed Kingfisher, Green Bee-eater, White-breasted Waterhen, Eurasian Marsh Harrier, Pied Harrier, Black-crowned Night Heron and weavers. The Asian Open-bill

stork appears to be increasing in numbers, and this is of interest because it is the main predator of the invasive Golden Apple snails (Timmins, 2014).

303. Birds ranked eleventh in the list of important wetland products and were only listed for Nong Mak Ek, Kiat Ngong and Kele. They are also important as one of the ecotourism attractions.

Mammals in BKN

304. A number of large mammals of conservation significance may have existed in these wetlands, but are already known to be extirpated. Four species of otter should occur in these wetlands, but the lack of signs of otters would indicate that these are rare. Two species of cat – Jungle Cat (*Felis chaus*) and the Endangered Fishing Cat (*Prionailurus viverrinus*) are thought to occur in the corridor between Xe Pian NPA and Dong Hua Sao NPA. The most common signs of mammals are from wild pigs, muntjacs, squirrels (*Callosciurus finlaysonii williamsoni* and *Tamiops* spp), Northern tree shrew; Small Asian mongoose and Siamese Hare (IUCN, 2011). Hunting pressure and the illegal wildlife trade results in major pressure upon both mammals and birds.

Habitats¹

305. The wetland habitats in and around the BKN Ramsar site have developed in a series of basins in the low lying plain, sandwiched between the Bolevan Plateau and the hills of Xe Pian NPA. Lava flows from the ancient volcanic activity on the Bolevan have created a system of basins formed by natural dykes and dams. These basins have filled up with alluvial sediments and peat formation, and small areas of permanent wetland remain with open water at the centres of these basins. The Bung Gnai-Kiat Ngong (BGKN) in the northern part of the Ramsar site is the largest area of permanent marsh. The Ban Phapho basin is not much smaller but has now almost totally filled, and has therefore been converted largely to paddy.

306. In contrast to the larger basins, many small but often steep-sided basins have larger proportions of permanent wetland. These small basins are often tree-covered and have open water rather than marsh vegetation. A complex network of streams may connect all the larger basins. Precise drainage patterns are not at all obvious and are often convoluted, although drainage is roughly north to south. Some of the small basins are either isolated or are connected to the rest of the system only at very high water levels. Some larger basins may also be relatively isolated.

307. Wetland types vary considerably in the Pathoumphone wetlands. Seasonal wetlands predominate in total area, but their ratios to permanent wetlands are hard to estimate, and may vary from year to year. The full wetland extent is hard to visualize because of forest cover, as are patterns of connectivity between the wetlands. No accurate map yet exists. Most basins appear to interconnect, rather than to be connected by drainage channels per se.

308. The different wetland habitat types that can be distinguished are:

- **Perennial ponds** - Areas of relatively permanent open water with aquatic plants seem rather limited in the large basins, especially within the main BGKN marsh. There are three main types of permanent ponds – open water with various aquatic herbs (both floating and submerged); open water below shrubs and bushes (and, in smaller basins, trees), and floating vegetation mats.
- **Seasonal ponds** - During the wet season, open-water habitats become relatively common throughout the edges, although patches are often small. These have abundant ephemeral floating and aquatic herbs, as well as species with above-ground structures presumably dying back during the dry season. More deeply, but not permanently, inundated regions hold lotus (*Nelumbo nucifera*), for example around the southern edge of the permanent main BGKN marsh.
- **Small seasonal and perennial streams** –There are a number of small seasonal and perennial streams which flow into the wetland from the surrounding hills, and interconnecting streams between the basins flowing in a generally north to south direction.

¹This section of the report has been drawn from the recent biodiversity survey of Beung Kiat Ngong for IUCN by Timmins and Duckworth (Timmins, 2014)

- **Peat marshes** – Peat marshes have formed from decaying vegetation under acidic and anaerobic conditions in some areas, particularly in the northern part of the wetland. There are about 400ha of high quality peat lands in the northern part, and about 1,000ha of lower quality seasonal semi-peat lands in the southern part. Between 2006 and 2009, commercial extraction removed up to 650m³ of peat per day for making natural fertilizer. This has left a number of open pools up to 2m deep. Peat extraction in BKN ceased after 2009.
- **Freshwater marshes** - Lengthier inundation probably favours sedges over grasses, apparently giving the deeper areas a greater sedge component. However, extensive sedge beds seem relatively scarce: the most extensive seen were on the south-west edge of the main BGKN marsh. In this latter region a tall robust sedge, typically known as ‘purr’ in Lao (possibly *Scirpus grossus*¹), predominates.
- **Seasonally flooded grassland** - In large open basins, the predominant ‘natural’ cover appears to depend highly on seasonality, with soil type and disturbance regime also probably significant. Where inundation and soil water logging are not prolonged, the predominant cover appears to be various grass species. In places such as the north-east of the main BGKN marsh, one species of grass forms almost a monoculture over about a tenth of the total marsh.
- **Floating vegetation mats** - The extent of floating mats is hard to estimate: in most areas they are not readily distinguishable from areas of graminoids rooted into the wetland bed. They probably occupy 20-30% of the main BGKN marsh. Mats are typically difficult to reach, so their composition is uncertain. Mat vegetation in the main BGKN marsh seems predominantly graminoid-based, with *Imperata cylindrica* prevailing. Very few, if any, shrubs grow in the mat itself, although, apparently rooted in the wetland bed, they are common but sparse in a zone around the mats. Some mats in the Pathoumphone wetlands do have shrubs, with dense shrub and small tree growth (probably involving willows *Salix*); for example Nong Pakham and much of central Nong Boua had what appeared to be most likely a floating mat composed of a dense mix of shrubs, aroids, sedges (but not ‘purr’) and ferns.
- **Shrubland** - In other parts of the main BGKN marsh the community is richer with a mix of grasses, sedges and herbs. A shrub (probably *Sesbania*) often occurs in quite extensive clumps, possibly in association with ground depressions with longer inundation.
- **Swamp forests** - Larger basins typically have small clumps of taller vegetation, varying in composition, but including various tree and shrub species. Commonly the shrubs are overgrown with vines, ferns and a large aroid. These areas probably indicate deeper ground depressions, corresponding to elements of swamp forest, especially around the basin edges. In the main BGKN marsh, they tend to occur on edges furthest from frequent human use (such as paddies, grazing land and villages). The swamp forest areas on the edge are in general larger and taller, with trees rather than the smaller bush-like trees and shrubs within the marsh. Bruselaceous trees, such as *Barringtonia*, are conspicuous in such swamp forest edges. These swamp forest areas are generally small patches less than a hectare in size, typically bounding the wetland edge in direct contact with remnant ‘dry-land’ forest. All swamp forest is probably disturbed, primarily through timber removal and clearance of adjacent areas for agriculture. As usual under a swamp forest canopy, plant growth is relatively sparse.
- **Rice paddies** - Google Earth images suggest that paddies already comprise perhaps 30-40% of total cover in these large basins. However, the main BKN basin retains a larger extent of more natural cover, with paddies covering only about a tenth of it, mainly along the western and northern edge, and probably receiving shorter inundation than is typical in areas of more natural cover (Timmins, 2014). Established paddies are almost confined to basins, with mostly alluvial soils (rather than organic ‘peat’ soils). ‘Dryland’ agriculture including plantations is increasing at the expense of forest. The shallow soils, perhaps minerally rich, seem not to hinder seasonal agriculture significantly.

309. Surrounding dry-land habitats, generally degraded, would originally have consisted of two broad forest categories. The lava flows themselves support predominantly deciduous communities, variously named by different classification systems (e.g. Mixed Deciduous Forest; Nearly-Deciduous Forest;

¹ Based on observations of a structurally similar sedge in the Xe Champhone wetlands (Timmins 2014)

nearly fully deciduous Semi-Evergreen Forest). Aerial imagery graphically shows such forests concentrated in the most recent lava flow's footprint: presumably the young, relatively shallow, soils have low water retention.

310. In contrast, the hills of the Xe Pian NPA hold mostly Semi-evergreen Forest with a relatively low deciduous component. There, soils are older, deeper and retain much more water. Where the hill bedrock is close to or exposed on the surface, such as Phou Asa, communities are also predominantly deciduous. Seemingly older lava flows, to both the north and east, have transitional or predominantly Semi-Evergreen Forest. This presumably reflects more developed soils, of greater age. The very valuable NTFP tree *Scaphium macropodum*, from which Malva nuts (*mak chong*) are gathered, occurs in these forest areas.

Appendix 13. Socioeconomic and land use characteristics in Beung Kiat Ngong wetlands

Land use

311. As indicated above, the coverage of rice fields in the BKN Ramsar site is between 30 and 40%, with only about 10% in the northern section of BGKN (Timmins, 2014). The rest of the site is the natural wetland area. Rice fields are generally used for a single rain-fed crop, apart from 30ha of irrigated rice in Pha Lai and 10ha each in PhaPho and Phak Kha. After harvesting, the fields are left for grazing animals, and dung collection from the fields was mentioned (and observed) in PhaPho village, where farmers can get 5,000 Lao Kip (around USD0.63) for one sack of dung.

312. Rain-fed rice covers a total of 1,387ha and irrigated rice 50ha, among the eight communities surveyed. This is about 50% of the total wetland area: it does not take into account the rice fields belonging to the communities outside of the Ramsar site boundaries, but roughly confirms the estimates mentioned above. There are about 540ha of gardens (possibly an overestimate), 5ha of graveyards and 3ha of sacred forests, and 11ha of reforested area in Kele. Fish conservation zones are recognized in Kele and Kiat Ngong.

313. The BKN baseline report (IUCN, 2011) shows that there were a total of 323ha of rice fields in the wetland area and about 4.5ha of gardens according to field measurements in 2009.

Population and poverty levels

314. There are eight main villages surrounding the BKN wetlands. Population figures gathered through village consultations indicate that there are 9,523 people living around BKN, in 1,422 households and 1,660 families. The proportion of women is low at 43.5%, but this overall average is influenced by the particularly low values of 25% in Phommaleu and 35% in Nong Mak Ek. The average number of people per household is 6.7, with 5.7 people per family. The main labour force consists of 3,061, people of whom 1,413 are women (46%). The secondary labour force consists of 2,151 of whom 1,107 are women (51%).

315. According to the IUCN Baseline report (IUCN, 2011) around 11,500 people in the eight core villages and several outer villages are heavily reliant upon the wetlands.

316. A wealth ranking exercise was carried out in consultation with the villagers. When aggregated across all the villages, just under 7% of households were considered to be poor, 64% were considered to be medium wealthy and 29% considered to be rich. There was considerable variation in the reported levels wealth of these villages¹: for example, Nong Mak Ek appeared to have the highest proportion of poor households (39%), compared to PhaPho which had no poor households; while PhaPho village had the highest proportion of rich households (65%), compared to Nong Mak Ek and Phommaleu, which had only 3.5 and 4.3% respectively. The others ranged between 10 and 40% of rich households.

Key livelihood activities

317. The key livelihood activities identified during the consultations showed considerable variation in the level of detail provided by each village. The activities listed were: agriculture (it is probably safe to assume that this includes most families), business (a relatively low proportion in each village), teachers, students (including school children), village health volunteers, medicine bags, pharmaceutical shops, village tourist groups, homestay services, elephant rides, forest trekking, boat services, community services, Pha Khouane services, cooking services, massage services, handicraft services and rice mills. This inventory shows how significant the tourism services are for livelihoods in Ban Kiat Ngong, while the only other village really to benefit from tourism is Ban Phapho.

Facilities

318. All villages have a primary school, with secondary schools in PhaPho, Pha Lai and Kiat Ngong. None of the villages mentioned a health centre. All villages had at least one temple, with PhaKha having two. There was quite a lot of variation in the numbers of latrines, dug and pumped wells. In Kiat Ngong there were 10 biogas plants, though one of these was recorded as having broken.

¹ This may be due in part to the differences in the ways that different villages defined wealth categories.

Livestock

319. Livestock, especially buffalos, cattle and elephants play an important part in the ecology of the wetlands, particularly as large wild herbivores no longer exist in BKN. The village consultations gave estimates of the numbers of livestock in each village. There are a total of 991 buffalos, 2,611 cows, 13 elephants (of which only one remains in PhaPho and all the rest in Kiat Ngong), 1,559 pigs and 8,814 poultry. Kiat Ngong has the largest number of buffalos and PhaPho the largest number of cattle. This perhaps reflects the main difference between cattle and buffalos – the buffalos go into the areas with floating grass mats, e.g. around the main marsh areas in the north, whereas cattle feed around the edges and rarely go into the water, as in the farmland around PhaPho.

320. The elephant population consists of 10 females out of 12 in Kiat Ngong, and the herd is declining despite the demand for elephant tourism, because the owners do not wish to breed their animals. Around Kiat Ngong village, elephants are released to graze in the grasslands overnight.

321. Since an IUCN survey of livestock numbers in 2008, the number of grazing units of animals using the wetlands has fallen slightly from 4,752 to 4,228 in 2014. In analyzing this further, there has been a decrease in the numbers of buffalo by 34%, and 38% in the numbers of elephants, but an increase of 13.5% in the numbers of cattle. In some villages such as PhaPho and Nong Mak Ek, there have been overall increases, but slight decreases in the grazing units in all of the other villages. Some additional animals may be grazed in the wetlands from other non-core villages – the 2008 report indicates a total of 1,174 grazing units using the wetlands, making a total of 5,430.

Wetland areas

322. In Kiat Ngong village, the total village area was reported as 3,752 ha of which 2,573 ha were considered to be wetland, while in PhaLai the village area was 5,252 ha of which 270 ha were wetland. Other villages had only relatively small areas of wetland within their village boundaries.

323. The estimates of open water remaining in the dry season were usually between 1 and 5ha near most of the villages, except for 100ha around PhaPho and 900ha around Kiat Nong village. Estimates of marsh, forest areas and streams with rapids and riffles were mixed. Fish conservation zones were mentioned in PhaPho, Thopsok and PhaKha.

324. In discussions, the villagers did not distinguish the different wetland habitats very clearly, mentioning generally grass mats, floating vegetation, open water and forest. The key species mentioned include fish (particularly snakehead and walking catfish) and eels, frogs and snails, and birds such as ducks.

Use of wetland products

325. . Overall the ranking for the importance ranking of wetland products in each village was as follows (the top 6 wetland products were considered for climate change vulnerability assessment):

1. **Fish**
2. **Eels**
3. **Shells – Snails**
4. **Frogs**
5. **Wild vegetables**
6. **Turtles**
7. Shrimps
8. Mushrooms
9. Bamboo shoots
10. Kha and Pheu (tall weeds for mat making)
11. Birds
12. Crickets

326. There was some variation between the villagers, but all noted the importance of fish and eels, while snails and frogs were consistently ranked in 3rd and 4th position. Turtles varied considerably with only Pha Lai not including them and others ranking them quite low down, while others ranked them at 4th or 5th position. This would indicate that they are still found throughout the wetland,

though rare but valued. In Kele and Phommaleu, the communities noted that there were declines in wetland products, especially fish, due to overfishing and use of electric fishing.

Appendix 14. Ecosystem functions and services in Xe Champhone

Types of services	Wetland types			
	Rivers and streams	Forests and grasslands	Man-made lakes/rice fields	Oxbows, natural lakes and marshes
Key locations:	<i>Xe Champhone River</i>	<i>Southern part of the wetland with some areas of forest, including original bamboo forest (scattered and flooded annually)</i>	<i>Ang Soui and Buk lakes, previously oxbows but a dyke built (1.5 m high) for irrigation and water supply system</i>	<i>Oxbows, marshes and lakes mainly found in the southern part of the wetland (e.g. Kout Ka Dan, Kout Xe Lat, Kout Mak Pheo, Kout Pi Noy, Kout Ko Ke)</i>
Provisioning (food production, fruits, grain, fibre, fuel wood, genetic materials)	High importance <i>Fish, other aquatic animals and plants in wet season. Productivity is lower in the dry season.</i>	Low importance <i>Only some fibre, fuel wood and other products, e.g. bamboo shoots, are harvested from forests by some people, as far from villages. Some grassland areas used for livestock grazing.</i>	Very high importance <i>Fisheries in these sites are productive throughout the year (although less in recent years).</i>	Medium importance <i>Some villagers surrounding these wetlands fish and collect other aquatic animals and plants in the dry season.</i>
Regulating (climate and water regulation, recharge, water purification and treatment)	High importance <i>Recharging groundwater, maintaining wells and other water bodies in the wet season (but low in the dry season).</i>	High importance <i>Carbon sequestration and maintaining water sources by recharging groundwater. Where there is forest, the soil in those wetlands remains wet, as observed in the southern wetland (e.g. Kout Pi Noy), while other areas dry out in dry season.</i>	Very high importance <i>Maintaining water sources in the area for recharge, discharge and water purification throughout the year. Local farmers drain water from Ang Soui to Xe Champhone River to provide water for dry crop cultivation.</i>	Medium importance <i>Maintaining water sources in the surrounding areas for groundwater recharge and discharge in dry season.</i>
Cultural (spiritual, recreation, aesthetic and education)	Low importance <i>Research on fisheries e.g. fish migration and breeding</i>	Low importance <i>Potential for education for university students, e.g. research on its functions.</i>	Low importance <i>Some potential for recreation (e.g. attractive for tourists) and education purposes.</i>	High importance <i>Many of these wetlands are sacred, e.g. crocodile sites, and respected by local villagers. The Turtle Pond also attracts tourists.</i>
Supporting (habitat for biodiversity, sediment retention and nutrient cycling)	Low – Medium importance <i>Fish Habitat for fish, incl. Spawning grounds, and nutrient cycling, because of meanders (but only in wet season).</i>	Low – Medium importance <i>Retaining sediment in the adjacent oxbows, fish spawning grounds and nutrient cycling in wet season.</i>	High importance <i>Supporting habitat for many fish and bird species throughout the year. Fish living in these lakes migrate to tributaries for breeding in the wet season (although, dykes block migration of some fish species in the early wet season).</i>	High importance <i>Habitat and sanctuary for some fish and other aquatic animals in the dry season (e.g. crocodiles and turtles) and habitat for fish spawning and nutrient cycling during the wet season.</i>

Appendix 15. Vulnerable infrastructure in the target wetlands and surroundings

Xe Champhone

Bridges

327. Eighteen bridges were located in the 13 villages surveyed in Xe Champhone. Of these 13 were of girder structure, four of which were built in 1975 and have a poor to very poor condition. One was built in 1997, with poor condition, and one on in 2002. The rest (7) were completed in 2012 and generally are in an excellent condition. There is one large incomplete girder bridge started in 2013 which is the one of two to cross the Xe Champhone river. All other bridges cross side streams and tributaries coming into the main river. Six of these are on the right bank and are in poor or very poor condition, and eight are on the left bank, of which 4 are in excellent condition, three are in poor condition and one is very poor. There are three truss bridges, two being built in 1975 and one in 2012 – all are considered to be in poor condition with extensive rust, although the most recent appears to be structurally sound. There is one beam bridge used only for pedestrians and motor cycles, built in 1997 which appears to be in good condition.

328. The bridges in the villages surveyed in Xe Champhone fall into three main groups according to stream width:

- **Stream width < 10m:** there are 7 bridges, 4 constructed in 1975, and then the others in 1997, 2002 and 2012. These tend to be metal truss bridges with I-beam girders with a single span. One is only 2 m wide which takes only cycles and motor cycle traffic (i.e. has a carrying capacity of 3 tonnes and the rest are 4-6m wide with a carrying capacity of 8 tonnes. All the older bridges have had restoration works between 1997 and 2007. For three of these bridges it is noted that the streams clearly expand in the wet season, with wetland areas around them when the stream is not confined by the abutments.
- **Stream width 10-30m:** there are 6 bridges, 3 built in 2012 and two in 1975, and 1 in 1992. All are 6m wide with 4 of them having a capacity of 8 tonnes and 2 of 25 tonnes. 3 are of metal girder construction and 3 of reinforced concrete with a concrete deck. 4 have single spans and 2 have double spans. The 3 bridges constructed in 2012, replaced bridges that were washed away in the floods of 2011. All of the other earlier bridges have been restored in the past 20 years, usually replacing the decking. Four of the six bridges have wetland areas surrounding them when the stream overflows.
- **Stream width 30-100m:** there are 4 bridges – one built in 1975 (a 3-span), one built in 1997 (50m single span, metal I-beam), one in 2012 and one under construction in 2013 (100m long with 5 spans). All these bridges have a carrying capacity of 25 tonnes. The earliest bridge to be built crosses the Xe Champhone river, joining Xe Champhone and Xonnabury districts. This was undercut to some extent by the bank erosion from the floods in 2011, especially on the right bank. One of the bridges is associated with Soui Lake dam and is in good condition. Another bridge (the Houaymakee bridge) is the longest of four bridges joining Kengkok and Tansoum villages; this is in very poor condition.

Dams

329. There are two dams with associated water management structures in the 13 villages surveyed in Xe Champhone - the Khoa Hong La Bai Bak dam constructed in 1978 which is 18m long, 6m high and 4m wide. This is a gravity concrete dam with a road across the top and four screw water gates that control the water. It is considered to be in poor condition, with some gaps in the road and leaks in the sluice gates. The other is the Hoamoung dam or weir, which is 80m long, 1.5m high and 4 m wide, constructed of reinforced concrete with a road along the top. This has no active water control structures, and is considered to be in good condition.

Canals

330. There are two canals in the 13 villages surveyed in Xe Champhone. One is an earth unlined irrigation canal, 1km long by 1.5m wide which serves the rice paddies of Tansoum village. This was built in 2000 and is owned and managed by a farmers group. The second is a 200m x 0.6m cement lined canal near Tansoum village from Koutjiew Lake. This was built in 2012 by DAFO and is

managed by a community farmers group. Both canals are linked to pump no 6 which supplies the water.

Pumps

331. In the 13 villages surveyed in Xe Champhone there are 8 pumps, one of which is in poor condition and no longer used due to sand siltation. These are all electric pumps usually sited on a floating raft pump house taking water from the Xe Champhone river. Often two pumps are located on each floating raft, and each has a capacity of 37 or 75 kw. They are all community owned or managed. There is no clear picture of the quantity of water abstracted, but they generally are operated for 6-12 hours per day depending upon the demand.

Wells

332. There are 7 wells recorded in the 13 villages surveyed in Xe Champhone. These are located in Kadan village, Nakateng village, two in Dondeng village, a natural spring in Taleo village, Leonard village, and Nakateng temple. These wells have depths which range from 4-10m apart from the spring which is only 0.3m deep. All have electric pumps apart from the spring where the water is collected by bucket. Many people from nearby villages use this spring because it is the only one from which the water is potable. The other wells are used for washing and bathing, and washing dishes and clothes.

Beung Kiat Ngong

Bridges

333. There are 6 bridges in the 8 villages surveyed in BKN, of which one is as yet unfinished. Four are of beam type construction and appear to be in good to excellent condition. The one girder bridge is in poor condition with damaged wooden deck. It is noted that the Kele stream bridge has a low height above the stream, and could be vulnerable to high flows and materials washed downstream.

Culverts

334. There are 10 culverts in the 8 villages surveyed in Beung Kiat Ngong, mostly concrete pipes underneath the road, though there is one ford near Phalai village. It is noted that this may be impassable during high water, except for large trucks. In general the condition is reported as good.

Dams

335. There are two weirs around BKN – Phalai dam and Phapho dam in the 8 villages surveyed in Beung Kiat Ngong. There is no road across these weirs and no active water control structures. The condition has not been assessed.

Canals

336. In the 8 villages surveyed in BKN, there are two irrigation canals both located near Phalai village.

Wells

337. There are 5 wells in the 8 villages surveyed in Beung Kiat Ngong – in Kiat Ngong village, Phakkha, Phalai, and two in Thopsok villages. The well in Kiat Ngong is a natural spring, the ones in Phakkha and Thopsok are tube wells with a cement casing. The other well in Thopsok is a dug well with no concrete casing. Three of the wells are privately owned and managed.

Appendix 16. Summary of climate change projections covering Lao PDR

Regional CC projections

338. The regional projections for the Mekong basin as a whole indicate an **increase in temperature of about 0.8°C** by 2030, with the greatest increases in temperature occurring in the colder parts of the Upper Mekong catchment.

339. **Potential evapotranspiration is likely to increase** by 2030 in all months and catchments, averaging about 0.03m across the basin or a change of 2%.

340. **Rainfall is predicted to increase** by 2030, with most likely increases in rainfall across the basin is about 0.2m or 13.5%. There will be considerable variation across different catchments with range of increases from 0.05m to 0.3m. Most of increases will occur in wet season (May to October) and especially in south of basin, while dry season rainfall is projected to increase in north of basin, but decrease in south by about 0.13m. Increases in Mekong river flow suggest an annual mean flow increase of 4-13% for wet season and between 10 and 30% in the dry season.

National CC projections

341. Projections at the national level for Lao PDR show that by 2050, the **minimum and mean temperatures are predicted to increase by up to 2°C** relative to the mean value for 1982-2002, and **maximum temperatures are predicted to increase by up to 5°C** (range of increase is 3-6°C). The south remains the hottest part of the country, but the increases in annual maximum temperatures will be greatest in the north.

342. **Rainfall is generally expected to increase**, but with considerable variation seasonally; it is expected to increase at the very start of the wet season in April and at the end of the wet season in October, but there may be decreases in May, so that there may be **delays in the start of the main wet season**, with possibility of a false start to wet season in April. The range of April rainfall values in 2020 and 2050 is similar to those experienced in the 1980s, but the mean projected values always remain less than the maximum values observed in the 1940s: for example in Sayaboury province, the April rainfall is projected to increase from an average of 76mm in 1982-2002 to 105mm in 2050.

343. Rainfall in May is generally 2-3 times higher than in April, and with a similar spatial distribution, being wetter in the north, especially in lower north and upper central parts. The changes projected are a **small decline in May rainfall in the north, and a small increase in the south**: for example in Sayaboury province, the May rainfall is projected to decrease from 211mm in 1982-2002 to 199 mm in 2050.

344. There is a large variation in October rainfall across the country, with lower rainfall in the north and central areas, and higher rainfall in the south. **October rainfall is projected to increase** by 2050 across the country with higher increases in the south and east and lower increase in the northwest parts. In Sayaboury province the October rainfall in 1982 – 2002 was 102mm, and this is projected to rise to 122mm in 2050.

345. Climate variability will remain a major challenge for Lao farmers. Evidence that extreme events are driven by changes in extreme values of temperature, e.g. fewer cold nights and more hot nights, and incidence of heavy and very heavy rainfall appears to be increasing. Incidence of tropical storms and typhoons is highly variable and influenced by El Nino-Southern Oscillation, but the number and intensity of storm events has increased. This trend is likely to continue in Lao PDR.

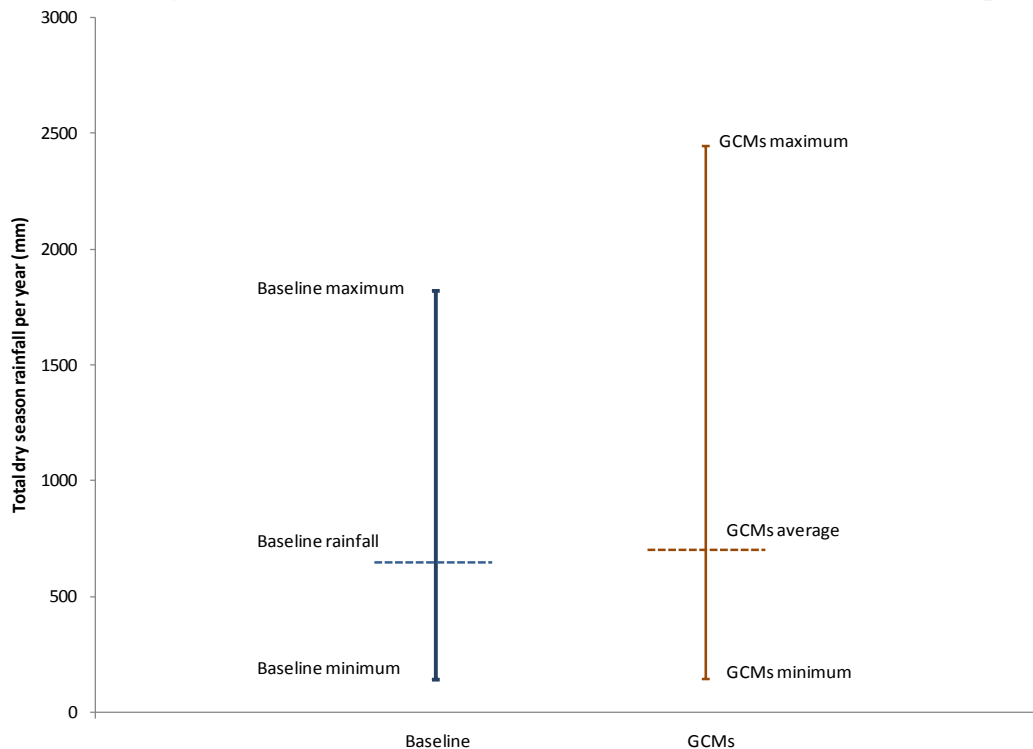
CC projections for the target areas

1) Xe Champhone (XC)

346. By 2050 Savannakhet, the province within which Xe Champhone is located, is projected to experience an **increase of 1.7°C in mean annual temperature**, with a maximum increase of +2.25 deg C in mid-July and smallest increase of +1.2°C in early December. Increased temperatures are expected to result in **increases in the rate of evapo-transpiration especially in the dry season**. For rainfall, Savannakhet is expected to experience approximately **21% increase in average annual rainfall** (412 mm) from the baseline 1,984 mm (645 mm in dry season and 1,339 mm in wet season). The greatest increases are expected at the end of the dry season (+30 in April and +70 mm in May). Increases in dry season rainfall are proportionately more significant (+59%) compared to wet season increases (+2%). It is expected that the increase in rainfall will occur as **more intense rainfall, rather than more rainy days**. Although **wet years will be wetter, dry years are not predicted to become drier**, and there should be no significant changes to the timing of the rain (e.g. the arrival of the wet season).

347. Although the local climate record shows declining rainfall in recent decades, with climate change an **approximate 14% increase in the annual average rainfall of up to 255mm** is predicted for Xe Champhone (under scenario A2), with the greatest increase expected in May. This increase for May could be as high as 30% in wet years. The increase in rainfall will manifest as **more intense rainfall, rather than more rainy days**. **Increases in local rainfall may have only a minor impact on flooding** at Xe Champhone, but **may affect rain-fed agriculture and water supply**. Although **wet years will be wetter, dry years are unlikely to become drier, and no significant changes to the timing of the rain** (e.g. the arrival of the wet season) are expected. Figure 4 below shows the baseline and predicted dry season rainfall for the combined Global Circulation Models (GCMs) for the period of 2045-2069, demonstrating that drought conditions at Xe Champhone are unlikely to worsen in the long term.

Figure 4. Average, maximum and minimum total dry season rainfall at Xe Champhone



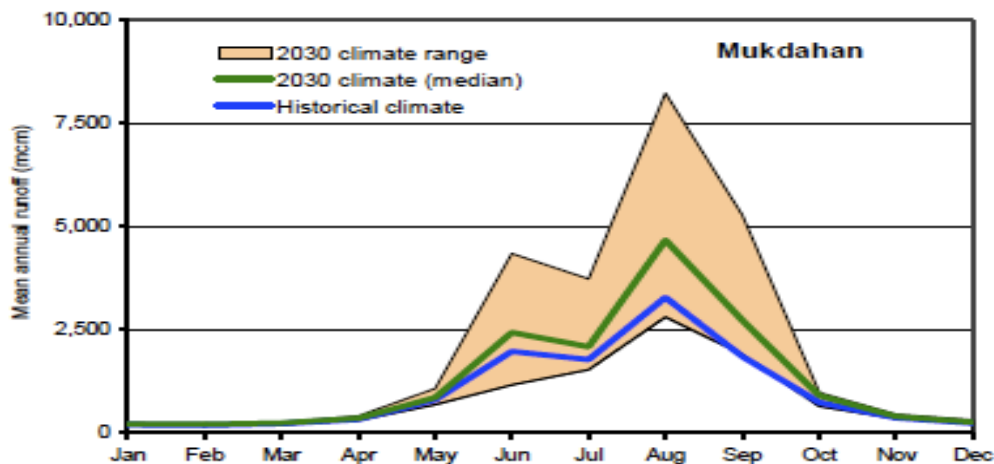
Source: ICEM 2011b.

Hydrology

348. The most significant impacts of climate change are expected for the flow regime, since an increase in rainfall (potentially up to 530mm/year) in the three the major upstream tributaries that feed the wetland may lead to **dramatic changes in wet season flooding**. In addition, **annual and dry season runoff by 2030, based on data from the Mukdahan station, is expected to increase** (see Figure 5).

349. Increased temperatures and longer dry seasons may be expected to **exacerbate problems with groundwater levels and salinity** in Xe Champhone. At Xe Champhone, evaporation is so far quite stable; the years with annual evaporation rates higher than 1,500 mm were 1973, 1977 and 1978 (data provided by PWREO, Provincial Water Resources and Environment Office). In hotter and longer dry periods, water evaporation from the soil is high, which contributes to the lowering of groundwater. When the water escapes from the soil, it leaves salt on the ground, contributing to salinity in fields in the area.

Figure 5. Historical (1951-2000) and future (2030) monthly runoff for Mukdahan sub-basin (Xe Champhone wetland)



(Source: Eastham et al. 2008)

Extreme events affecting XC

350. As mentioned, the Xe Champhone Wetland already experiences regular droughts and floods, which are among the most severe in Lao PDR. Extreme flooding events have been recorded in 1978, 1984 and 1985, while serious drought years were 1988, 2007 and 2009 (PWREO data). Since the preparation of the MRC case study on climate change and Xe Champhone wetlands another major flood occurred in July 2011 which caused significant damage to bridges and roads in the area, requiring their replacement in a number of situations in 2012.

351. Because of the physical characteristics of the wetland and the associated Xe Champhone River, with many meanders and only a slight slope between the upper and lower streams, **the river is growing ever shallower and wider**. This means that **it overflows more easily and has slower flows when it receives backwater**. The **construction of Ang Soui Lake and irrigation schemes further slows down the flow**, while those villages located near the reservoir suffer more from floods than the villages downstream. Further, it **takes a longer time for the water level to drop down after the wet season**. **A heavy flood event now lasts more than 15 days, which is longer than before**. Severe floods can also result in the river cutting through new areas, thus forming a new river channel. Some newly cut off sections in the last decade have been observed. The floods in the area, due to instable sandy-grey river banks, also erode the sands and increase runoff to the river basin, again making the Xe Champhone River wider and shallower.

352. With reference to the climate change predictions for the area, **although drought is currently a serious problem in the area, it is unlikely to become more severe**. However, drought will remain

a problem for years to come, especially as temperatures are expected to increase. Xe Champone will likely experience more run-off and slightly increased rainfall in the dry season, as well as the wet season. **Increased rainfall and run-off in the basin is expected to increase the frequency, intensity and length of floods.**

Implications

353. Whilst the increases in average temperatures projected for climate change by 2050 show increases of up to about 0.7 deg C, it is the changes in rainfall patterns both with Xe Champone and the catchment of the river that will affect the infrastructure most.

2) Beung Kiat Ngong (BKN)

354. By 2050, Champassak, the province in which BKN is located, is projected to experience a **2.2°C increase in mean annual temperature throughout the year.** During the dry season (November-March) and in May increases in temperature are predicted to reach +1.5-2.0°C, while during April and the wet season (June-October) increases in temperature can reach up to 2.5-2.9°C. **Increased temperatures are expected to result in increases in the evaporation rate.** Mean maximum temperatures between January to mid-March projected to increase from about 32°C to 37°C with daily maxima between 36°C and 42°C. From March to early May the mean maxima lie between 36 and 38°C and daily maxima up to 44°C. Between May to October the mean maximum temperatures range about 34°C – up to 4° C hotter than at present.

355. Champassak baseline rainfall (1985-2005) is 2036 mm (463mm in dry season, 1573mm in wet season). This is predicted to increase to 2241mm (518 in dry season, 1723 mm in wet season). This is an overall increase of +10% (+11% in dry season,+9.5% in wet season). Distribution during the year shows slight reduction in January (-12%), February (-11%), March and April (-7%) but significant increase in May, and significant increases (between 5 – 15%) throughout the wet season from June to October, and December shows marked increase of 35%. **Minimum rainfall in very dry years in June/July/August will only increase slightly, i.e. risk of drought years will not be significantly reduced.**

356. Predictions of the start of the monsoon (measured by when monthly rainfall exceeds 200 mm) is likely to decrease in April from current 12% of years to 8% of years. In May, the likelihood of start of monsoon will increase from 60% of years to 76% of years, and in June will decrease from 28% to 16% of years. This would indicate **greater regularity of monsoon starting in May.**

357. With CC **the incidence of storms is likely to increase** from 3 to 4 events per year (storms are defined as daily events of more than 100mm in a day). **The intensity of storms is likely to increase.** The largest storms will increase from 120 mm in a day to 142 mm in a day, an increase of 8.5%. Drought months when precipitation is less than half of PET does not occur between May to September show increases in February, March and April and November. Change in water availability, shows a slight decrease of 2.5% in June/July.

358. Current total rainfall each year in BKN itself is 2,041mm (463mm in the dry season, 1,578mm in the wet season). This is predicted to increase to 2,216mm (493mm in the dry season and 1,723mm in the wet season), an overall increase of +8.6% (+6.5% in the dry season and +9.2% in the wet season). Distribution during the year shows slight reduction in January February, March and April but significant increase in May, and significant increases (between 5 – 15%) throughout the wet season from June to October. Decreases of -11 and -12% in February and January, -7% in April. December shows marked increase of 35% in December (increasing from 5 to 7 mm).

359. Figure 8 shows the ranges of monthly rainfalls with the normal range of 50% of years falling in the median boxes. The total precipitation ranges in June, July and August i.e. the months when droughts during the rice growing season may occur are shown:

- In June rainfall ranges from 120 mm to 440 mm with mean at 300 mm currently changing to 130 mm to 450 mm with mean at 320 mm.
- In July rainfall ranges from 130 mm to 600 mm with mean at 370 mm changing to 140 mm to 630 mm with mean at 400 mm.

- In August ranges from 220 mm to 630 mm with mean at 380 mm changing to 240 mm to 680 mm with mean at 410mm.

360. This means that minimum rainfall years in June/July/August will only increase slightly, i.e. risk of drought years will not be significantly reduced.

361. Comfort zone estimates show the dry season more or less within comfort zone, and the wet season partially exceeded (Figure 9). This means that the projected dry season rainfall is more or less within the current range expected, and in the wet season there will generally be more rainfall than previously expected.

Figure 6. Typical mean monthly precipitation in BKN under baseline and CC scenarios

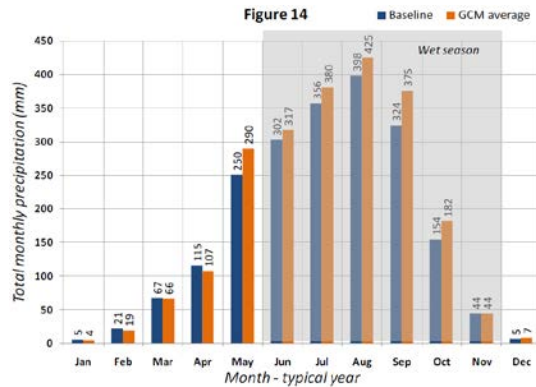


Figure 7. Percentage changes in monthly precipitation between baseline and CC scenarios in BKN

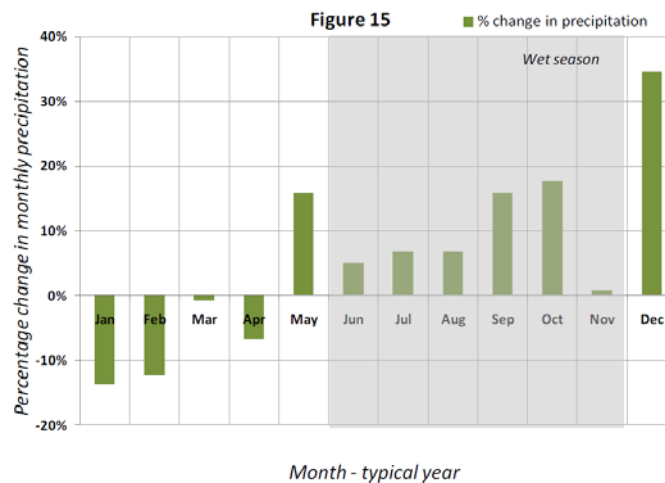


Figure 8. Comparison of ranges of monthly rainfalls between baseline and CC projections in BKN

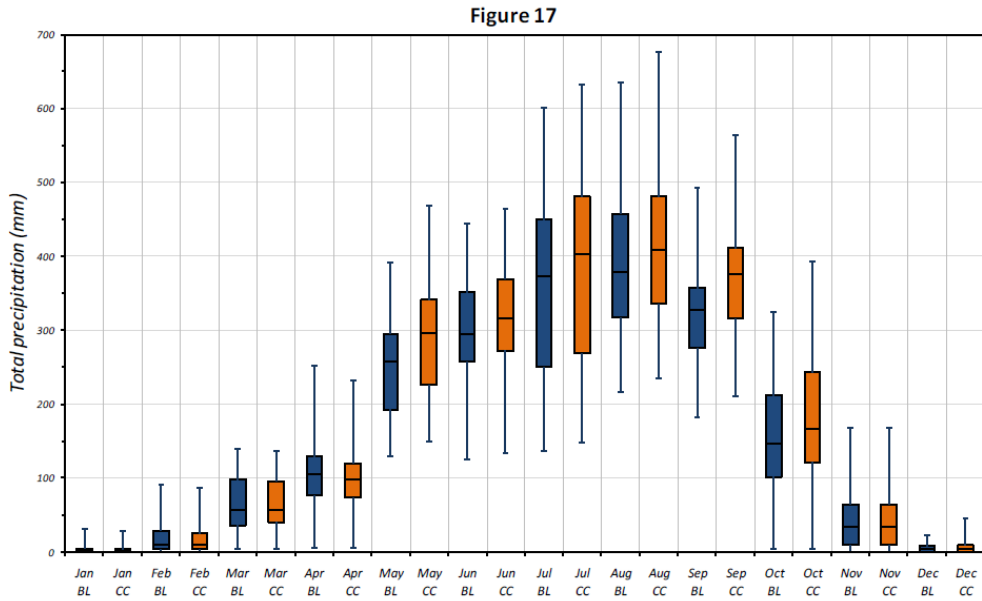


Figure 9. Rainfall comfort zones for wet and dry season (left) and for whole year (right) (BKN)

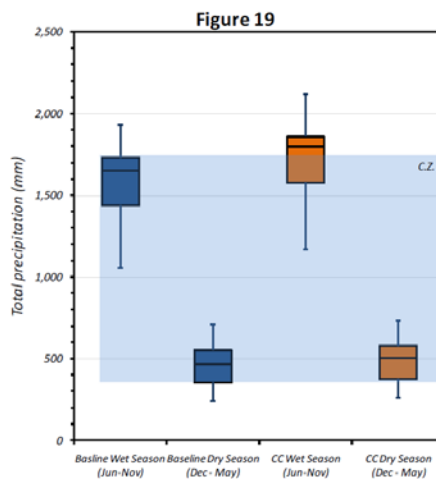
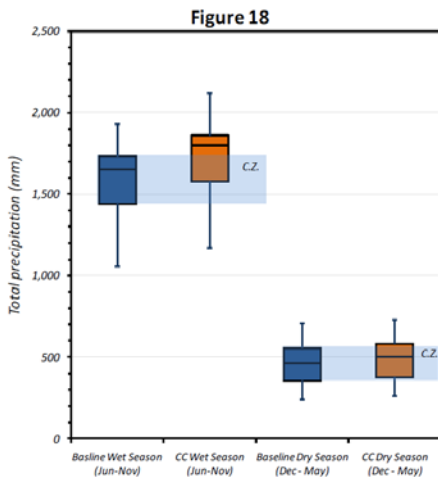


Figure 10. Projected changes in daily maximum temperatures in Champassak province
Figure 1

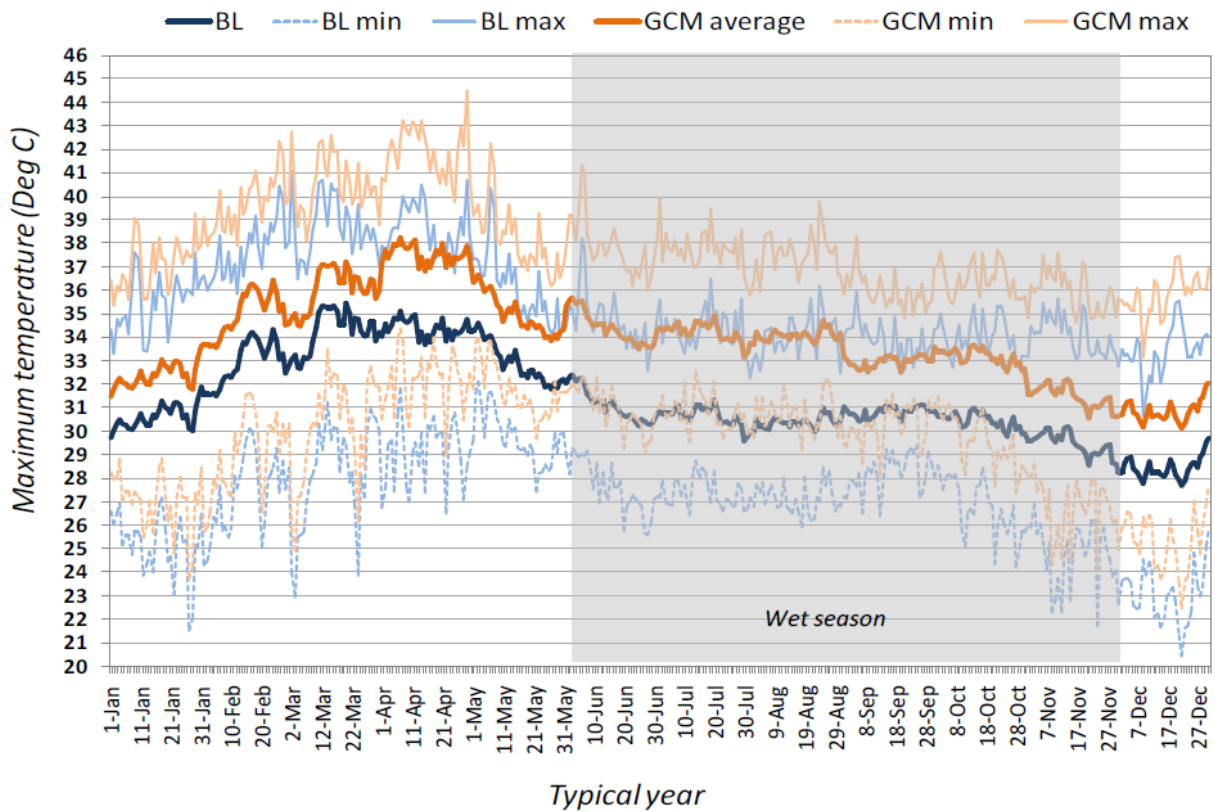


Figure 11. Proportion of the year of exceedance of maximum daily temperature in Champassak province

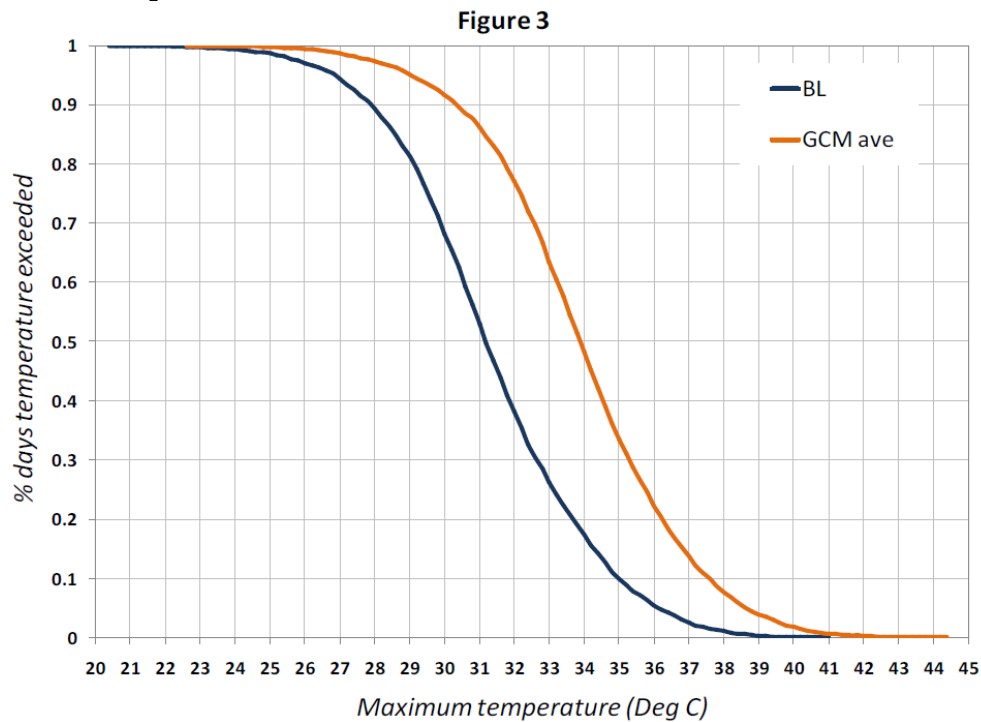
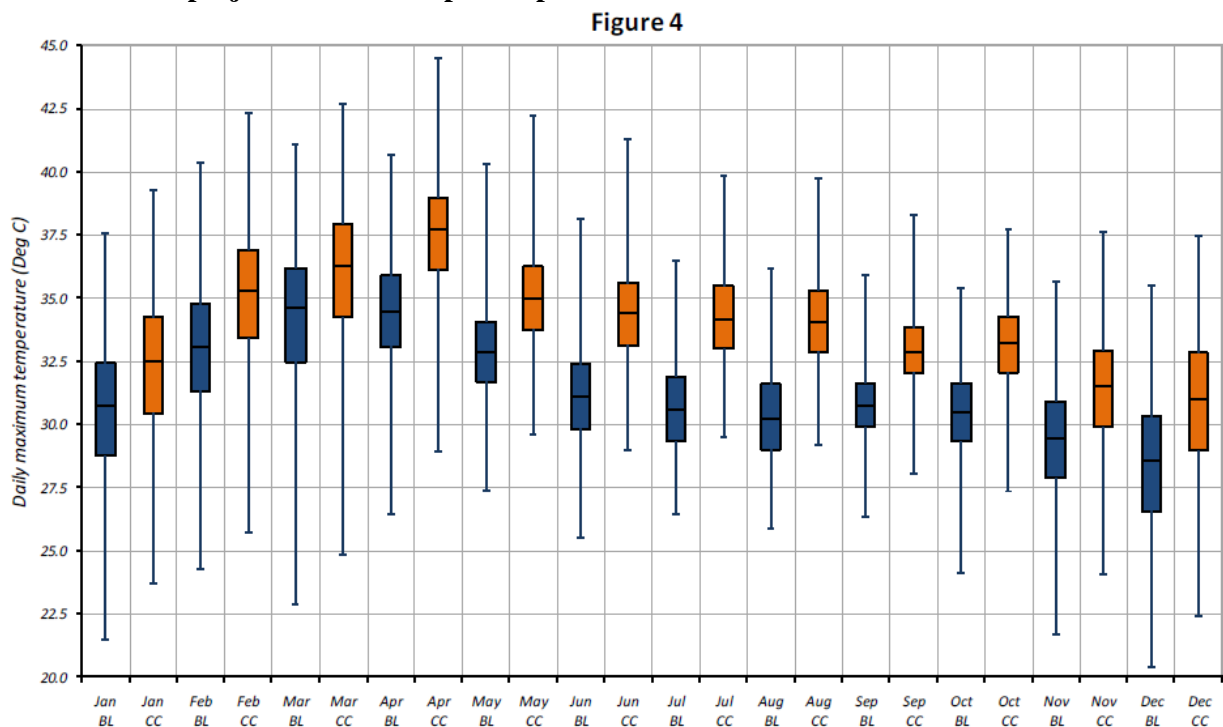


Figure 12. Comparison of ranges of daily maximum temperature between current baseline and CC projections in Champassak province



Storms, droughts and extreme events affecting BKN

362. It is generally considered that **storms and extreme events are likely to increase in frequency and intensity with climate change**. Figure 13 shows a ranking of the maximum daily precipitation in the year. This is taken as an indicator for storm events, when the rainfall in one day ranges between 50 mm to 150 mm per day.

363. Storms as measured by daily events of more than 100 mm in a day, currently occur 3 times per year. With CC this is likely to increase to 4 times per year. The intensity of storms is likely to increase. The largest storms will increase from 120 mm in a day to 142 mm in a day, an increase of 8.5%.

364. Figure 14 is an indication of the dryness in each month when precipitation is less than half of Potential Evapotranspiration (PET). During the wet season between May to September, as is to be expected, the rainfall is always more than the PET, but in February, March and April and November **the probability that rainfall will be less than half of the PET tends to increase**, i.e. these months will be drier. Note that this figure does not make predictions about drought during the rainy season, which is when the rice farmers recognize drought. This is best measured by the length of a period of consecutive days without rain during June, July and August.

Figure 13. Ranking of annual maximum rainfall events in BKN

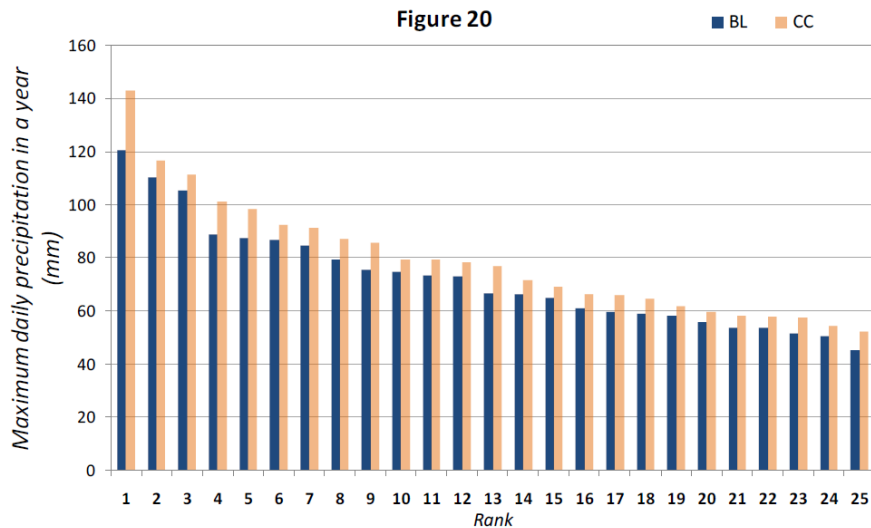
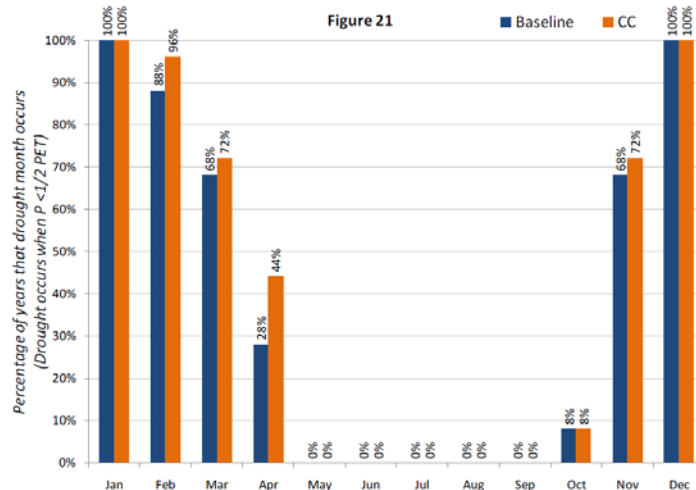


Figure 14. Percentage of years when drought occurs in the month in BKN



Community perceptions of climate change in BKN

Current climate and hydrology

365. During village consultations, a series of discussions were held about the past climate and historic extreme events. The overall picture of the climate is that the hottest months are April and May, and the wettest months are July and August. According to the people in PhaLai, strong winds tend to occur in May lasting about 2 hours (according to the people in Ke Le) and lightning in August/September. In Phapho, forest fires are said to occur every year.

366. The small streams entering the wetlands tend to flow during the wet season – in Phommaleu and Thopsok, the Houay Nong Lak and Houay Kout Pao flow into the wetland from the north respectively. In the wet season the latter stream is recorded to be too high for people to cross easily. In Phakkha, the streams drain Phou Asa and Phou Phaema and flow towards the Pha Moud river. The out-flowing streams mentioned by villagers from Nong Mak Ek include Houay Leng Kharm, H. Ta Kouane, H. Sisalio, Vang Kae and Vang Imoune.

Historic extreme events

367. In terms of extreme events, discussions raised memories in all villages of the big flood in 1978 which lasted for 15 days in Phakkha. Floods in other years affected individual villages usually in July and August. Only in 2013 were floods mentioned in three villages, Phommaleu, Kele and Phakkha occurring in September. In addition, in Phalai, floods occurred in 2002 and 2008, and in Phommaleu in 1988, 1991 and 2011. In Thopsok they occurred in 1987 and 1996, and in Phakkha they occurred in 2000 lasting for 30 days and 2010 lasting for 10 days.

368. The flooding causes damage to the rice fields, and houses and tends to reduce the yields of rice. In Phommaleu with flooding occurring in 1984, 88, 91, 2011 and 2013, the people indicated a 40% lower rice yield. In Phakkha the people mentioned the issue of shortage of fodder for livestock during flooding.

369. Droughts tend to be remembered as occurring in June/July, i.e. during the early wet season, when not enough rainfall occurs for rice farming. Droughts were remembered in 1984 in Phapho and Phakkha, in 2008 in Pha Lai and Phakkha, and in 2013 in Kele and Phakkha. Other individual drought years were remembered in Kele in 1988 and in Phommaleu in 1993, in Phalai in 2003, and in Phakkha in 2009. From this discussion, Phakkha would appear to be the most drought prone of the communities.

370. The impacts of drought were that in 1984 no rice was planted, because there was not enough water, and in other years rice seedlings died and livestock suffered with some deaths. In 1993 in Phommaleu the response was to dig a well 15 m deep to reach the ground water.

371. Whilst no typhoons occurred, a number of villages mentioned strong winds occurring in 1988 in Phommaleu, Kaelae and Phakkha, and again in Kaelae in 2000 and 2010, and in Phakkha in 2009. Strong winds are remembered as being associated with high temperatures and occur in April/May/June, and in August. In Kele the strong winds caused damage to houses and electric posts.

372. Hailstorms were remembered only once in Phommaleu in 1996. Lightning storms seemed to be remembered in more recent years, especially in Phalai, Phommaleu, Kele and Phakkha, but without any particular pattern. In Phommaleu cows were killed by the lightning, and a buffalo was killed in Kele. There was electricity cut out and damage to electric equipment and TVs.

373. Animal disease – foot and mouth disease – was recorded in February and March (i.e. dry season) in Phapho and Phommaleu in 2009.

Perceptions of climate change

374. During discussions with the communities about the history of extreme events they noted that there was a trend towards lower water levels in the dry season and more water in the rainy seasons. They felt that this would lead towards a decline in the fish populations and to yield losses due to both drought and floods.

Changes in vegetation

375. Marsh vegetation is likely to be very dynamic, through various factors, notably fire, livestock grazing and timber removal. Consultations with local people (Timmins, 2014) indicate:

- An increase in tall sedge ('purr' in Lao). In most wetlands, this was said to have been scarce and almost absent in the main BGKN marsh about 20 years ago.
- The main BGKN marsh reportedly had much more open water around 20 years ago, when *Imperata cylindrica*, was apparently scarce. This suggests that floating mat vegetation was also then scarce.
- *Salvinia* ('chok') was then reportedly much more common; in 2013–2014 only sporadic small dense patches were found, amongst other vegetation in the seasonally inundated edge.
- Bush and tree cover had also reportedly decreased, especially in the main BGKN marsh.

376. However, this timeline may be inaccurate, because Salter (1989) described, 25 years ago, essentially the same habitat mix for the main BGKN marsh as now: "Margin adjacent to forest now dry (but seasonally flooded) grassland up to 500+ m wide. Very heavily grazed by cattle and water buffalo and also by domestic elephants. Central area appears permanently saturated and supports dense growth of tall (1 m) sedges and patches of low (<2 m) shrubs. Open water limited to small patches <0.1 ha in size with water lettuce [*Pistia*] and other floating aquatics".

377. The loss of tree and bush cover is almost certainly attributable to human activities. Several local people considered that trees and shrubs surrounding deeper depressions might be cut to reach the wetland products in these more permanent wetlands. When cut, the trees and shrubs are placed in the water to create 'substrate and structure' in order to attract fish and other aquatic animals.

378. Other damage is likely to arise from activities including fodder collection, timber and other wood removal, trampling by livestock (especially by elephants), and fire. Similarly, the fringing forest, that until recently dominated the edges of even the open wetlands, is being rapidly degraded and lost by a combination of timber removal and agricultural clearance, primarily for non-rice crops.

379. Livestock use of the wetlands can change the vegetation structure. Livestock, especially buffaloes, using the marsh have reportedly decreased substantially as local economies move from subsistence- to market-based systems. Buffaloes can modify and maintain various marsh characteristics, including species composition via selective grazing and browsing, and if there are fewer animals remaining, then the species composition is also likely to change.

380. The larger basins' open nature reflects three interacting factors: fire, large ungulates and people. Without these, swamp forest would predominate in all seasonally inundated areas (including those that might dry only in very rare dry years). Even without people, herbivores and fire would maintain many large basins as open seasonal wetlands. But the three factors also tend to remove seasonal tall cover of grasses, sedges and *Sesbania*. This latter factor is particularly significant because in the late dry season when the wet area is at its lowest the cover available for wetland animals is also most limited.

Appendix 17. Project strategies to address climate change in the target wetlands

Xe Champhone

Table 1. Habitats and species

Target	Adaptation/management measures	Adaptation benefits	Project strategies
Habitats			
Deep pools and river beds (Xe Champhone):	Re-plantation in the watershed and on the banks of rivers	Reduce sedimentation by limiting upstream erosion of river banks (CC-related changes in runoff rates will increase erosion and sedimentation)	<ul style="list-style-type: none"> - Direct investment in tree planting and/or nurseries - Support spatial planning to prioritise tree planting - Provide technical advice on tree planting - Advocacy for Government investment in tree planting through raising awareness of CC and importance of wetlands
	Conservation of riparian forests and flooded forests	Filter sedimentation coming from the floodplain to reduce sediment buildup.	<ul style="list-style-type: none"> - Support local governance mechanisms - Support local territorial land use planning - Advocacy for Government investment in enforcement through raising awareness of CC and importance of wetlands
Open wetlands (oxbows, lakes, ponds) (Xe Champhone)	Conservation of the natural state of existing wetlands	Increase resilience to threats	<ul style="list-style-type: none"> - Support local governance mechanisms - Support local territorial land use planning
	Management of invasive species	Maintain spatial configuration and internal connectivity of wetlands affected by closure by invasive plant species	<ul style="list-style-type: none"> - Provide technical advice on invasive species management - Direct investment in managing/eliminating invasive species (by project and/or cofinancers?)
	Regulation on water extraction	Maintain water levels to protect hydrological and ecological functioning of wetlands	<ul style="list-style-type: none"> - Support local governance mechanisms and development of norms - Technical studies to recommend allowable water extraction rates and locations
	Re-opening of critical wetlands	Ensure the maintenance of ecosystem services, preservation of flows and limitation of obstacle to natural flow.	<ul style="list-style-type: none"> - Direct investment in re-opening of wetlands (by project and/or cofinancers?) - Technical studies to identify spatial priorities for re-opening, best technical approaches and options for sustainability
Flooded and riparian forests	Re plantation of flooded and riparian forests	Restoration and maintenance of forests affected by overextraction and hydrological changes, to preserve their roles as CC buffers	<ul style="list-style-type: none"> - Direct investment in tree planting and/or nurseries (by project and/or cofinancers?) - Support spatial planning to prioritise tree planting - Provide technical advice on tree planting - Advocacy for Government investment in tree planting through raising awareness of CC and importance of wetlands
	Regulation and designation as conservation forests		<ul style="list-style-type: none"> - Support local governance mechanisms - Support local territorial land use planning

Target	Adaptation/management measures	Adaptation benefits	Project strategies	
Species				
Water birds:	Improved management of wetlands including reopening of closed wetlands	Maintenance of habitat and breeding areas affected by shrinkage and closing of wetlands	<ul style="list-style-type: none"> - Direct investment in re-opening and management of wetlands (by project and/or cofinancers?) - Technical studies to identify spatial priorities for re-opening and management, best technical approaches and options for sustainability 	
	Improvement and enforcement of local regulation on hunting	Reduction of direct anthropic threats from hunting, which may become more severe due to changed demographic and access conditions under CC		<ul style="list-style-type: none"> - Support local governance mechanisms - Technical studies to define acceptable off-take levels, closed seasons and no-take areas - Advocacy for Government investment in enforcement through raising awareness of CC and livelihood importance of wetland BD (e.g. ecotourism)
Migratory (white) fish	Maintenance of key areas for connections between the river and the wetlands	Maintenance of migration routes affected by closure due to sedimentation, invasive species and hydrological changes	<ul style="list-style-type: none"> - Direct investment in re-opening of wetlands (by project and/or cofinancers?) - Technical studies to identify spatial priorities for re-opening, best technical approaches and options for sustainability 	
	Improved management of fisheries	Reduction of direct anthropic threats from fishing, which may become more severe due to changed demographic and access conditions under CC		<ul style="list-style-type: none"> - Support local governance mechanisms - Technical studies to define acceptable off-take levels, closed seasons and no-take areas - Advocacy for Government investment in enforcement through raising awareness of CC and livelihood importance of wetland fisheries
	Improved management of the river watershed to ensure suitable flow	Maintenance of habitat conditions		<ul style="list-style-type: none"> - Advocacy for Government investment in improved management of the river watershed through raising awareness of CC and livelihood importance of wetland fisheries - Technical studies to guide improved management of the river watershed (technical options and spatial priorities)
Resident (black) fish	Maintenance of key wetlands and re-opening of wetlands	Maintenance of habitat conditions, affected by degradation/closing of wetlands (through encroachment, invasion by <i>Mimosa picra</i>)	<ul style="list-style-type: none"> - Direct investment in re-opening of wetlands (by project and/or cofinancers?) - Technical studies to identify spatial priorities for re-opening, best technical approaches and options for sustainability 	
	Improved management of fisheries	Reduction of direct anthropic threats from fishing, which may become more severe due to changed demographic and access conditions under CC		<ul style="list-style-type: none"> - Support local governance mechanisms - Technical studies to define acceptable off-take levels, closed seasons and no-take areas - Advocacy for Government investment in enforcement through raising awareness of CC and livelihood importance of wetland fisheries
Crocodiles	Conservation of key wetlands for crocodile and of connections between those,	Maintenance of habitat and connectivity (crocodiles are vulnerable to change in rain pattern and shrinkage and closure of wetlands	<ul style="list-style-type: none"> - Support to local governance mechanisms - Support to spatial planning of wetlands - Technical studies to recommend technical approaches to conservation and spatial priorities 	

Target	Adaptation/management measures	Adaptation benefits	Project strategies
	Restoration of related to CC connections and wetlands if necessary		<ul style="list-style-type: none"> - Direct investment in wetland restoration (by project and/or cofinancers?) - Technical studies to identify spatial priorities for restoration, best technical approaches and options for sustainability

Table 2. Livelihood vulnerability to climate change in Champhone District

Main livelihood activities	Sensitivity	Adaptive capacity	Vulnerability	Adaptation strategies
Crop farming	<p>High</p> <p>The crop farming depends significantly on climatic conditions, e.g. rainfall, flooding, temperatures, which will all affect rice farming. Increasing flood events and increased temperature will have a significant impact on rice production mainly for rain season rice (non irrigated rice).</p>	<p>Medium</p> <p>The current coping strategy is the increase of dry season rice production through the use of individual or community irrigation systems (e.g using tractor pumps). People also reported using new varieties with shorter cycle or flood resistant. However, irrigation systems cost money and not all people can access them in addition an increased irrigation can have important impact on the wetlands and therefore on other sources of livelihoods (fish, aquatic products...).</p>	Medium-High	<ul style="list-style-type: none"> • Introduce new crop varieties (flood resistant, short cycle ...) • Support semi-natural reservoirs (artificial wetlands) able to stock some water during floods • Develop small scale, targeted and efficient irrigation system during the dry season compatible with the preservation of wetlands and ensure an improved regulation on water use during dry season
Livestock production	<p>High</p> <p>Livestock production, particularly large animals, depends significantly on wetland ecosystem services, especially on grassland and water quality. Continued flooding, drought and increasing temperatures will affect these services, and in turn livestock feed and health.</p> <p>The development of dry season rice and the increase of <i>Mimosa picra</i> could also lead to a decrease in pasture availability for the livestock.</p> <p>In the past flood had an important impact on livestock causing numerous loss in animals.</p>	<p>Medium</p> <p>Livestock producers are able to cope with climate change to some certain level. They can vaccinate their livestock, and change to livestock types which need less food and water, e.g. goats instead of cows. An increased rearing of goats and poultry in the site has been reported by some communities as a coping strategy.</p> <p>No fodder storage has been reported to cope with the lack of food in case of flood or drought.</p>	Medium	<ul style="list-style-type: none"> • Support the introduction of smaller/more-heat resistant cattle varieties (goats). • Develop fodder storage system to ensure fodder availability during drought/floods.
Fisheries	<p>High</p> <p>Climate change may have both positive and</p>	<p>Medium</p> <p>Villagers/fishers are able to cope with climate</p>	Medium	<ul style="list-style-type: none"> • Improve and enforce fish conservation zones and

Main livelihood activities	Sensitivity	Adaptive capacity	Vulnerability	Adaptation strategies
	negative effects on fish populations, reducing some pond habitat but potentially providing more habitat in wet season. Fish populations in Champhone District have declined significantly during the last decade, according to local perceptions but this is likely more linked to overfishing than to the impact of CC.	change to some certain level. For example, they build ponds to produce some fish species and can breed and release fish into water bodies. According to findings from this study, some Households begun to build ponds for fish farming but aquaculture has been reported as costly and not accessible for all HH. Fish conservation zones have also been developed but they are small and lack enforcement.		<p>restore/manage key wetlands for fish spawning and refuge.</p> <ul style="list-style-type: none"> • Introduce environmental friendly aquaculture using local species and semi natural ponds and infrastructures
NTFPs collection	High Increasing temperature and continued flooding and droughts may affect productivity of wild vegetables including bamboo shoots and mushrooms, as well as populations of wild animals. Hunting and NTFP collection has declined significantly during last decade, due to there being fewer resources, this is more likely linked to an overharvesting.	Medium Villagers are able to adapt to declining NTFPs and wildlife in some ways. They can raise other livestock, grow vegetables, etc, both of which are increasingly observed in Champhone District. However, declines in NTFPs may more seriously affect the poorest members of the community, who rely on NTFPs more and have less capacity to adapt.	Medium	<ul style="list-style-type: none"> • Improve the management of wetlands and ensure improvement and enforcement of regulation on NTFP collection.
Gardening	High The vegetable gardening depends significantly on climatic conditions, e.g. rainfall, flooding, temperatures. Increasing flood events and increased temperature will have a significant impact on vegetable production mainly during rainy season production.	Medium Villagers are able to cope with climate change to certain level by adapting the vegetables varieties they grow and developing small scale infrastructure for irrigation and/or protection of gardens.	Medium	<ul style="list-style-type: none"> • Introduce new vegetable varieties (flood resistant, short cycle, drought resistant ...) • Develop small scale, targeted and efficient irrigation system during the dry season compatible with the preservation of wetlands and ensure an improved regulation on water use during dry season
Drinking water (safe water)	Medium/High Increased drought combined with soil salinity will lead to a decrease water quality for drinking.	Medium Wealthier household and in urban areas have access to bottled water. The adaptive capacity of poorest HH is low since they usually are in more remote areas and have less income so less capacity to access bottled water.	Medium	<ul style="list-style-type: none"> • Develop community ponds with filtration systems to collect and purify water stored from floods/rain. Provide rain harvesting facilities for each HH (jars) and support the improvement of roofs.

Main livelihood activities	Sensitivity	Adaptive capacity	Vulnerability	Adaptation strategies
Employment outside the villages	High It is likely that the impact of climate change and other non Climate related pressure on existing livelihood will result on an increased migration for work (temporary or permanent)	This livelihood option is already a coping strategy to decreased livelihoods at site level	-	<ul style="list-style-type: none"> Develop alternative livelihoods at site level to increase local employment opportunities
Tourism services	Low The tourism industry is relatively undeveloped, though between 7,000 and 8,000 tourists visit each year. The trend is increasing, with so far few impacts from a changing environment. Climate change may impact on the natural areas that form some attractions in the area, e.g. closing of open wetlands.	Low Tourism sites in Champhone District are natural, historical and cultural sites. Cultural and historical sites may be less threatened than the natural attractions of the wetlands. Local efforts could be made to help prevent/reverse closing over of key open wetland sites.	Low	<ul style="list-style-type: none"> Develop an ecotourism action plan to ensure a comprehensive and sustainable approach in term of tourism development.
Trade	Medium Rice, fish and NTFPs are important export products from Champhone District. Climate change will likely lead to reduced rice production, fisheries and NTFP collection, thus affecting trade.	Medium Increasing irrigated rice production as well as increasing fish production and growing vegetables can maintain or increase exports. If traded resources are affected by climate change then it will have an indirect impact on trade.	Medium	<ul style="list-style-type: none"> Ensure the preservation and adaptation of natural resource and agricultural resource in the site to maintain trade, develop processed products to increase the value of trade/value chain

Table 3. Infrastructure in Xe Champhone

Type of infrastructure	Main climate change threats	Vulnerability assessment	Priorities for adaptation	Structural and design adaptation approaches	Impacts of vulnerable infrastructure upon wetland hydrological function
Bridges – stream width < 10m	Increased frequency and intensity of storms	Mostly medium vulnerability, but two have high vulnerability	<ul style="list-style-type: none"> Khoa dam bridge Hoaysai bridge 	<ul style="list-style-type: none"> Redesign to raise capacity to pass increased flash floods and storm flows 	<ul style="list-style-type: none"> Bridge structure should not impede increased flows, or make flooding risk higher
Bridges – stream width 10 – 30 m	Increased frequency and intensity of storms	4 medium vulnerability, 2 high vulnerability	<ul style="list-style-type: none"> Kalang bridge Kang Teleonoi bridge 	<ul style="list-style-type: none"> Strengthening of abutments to counter erosion pressures on foundations 	
Bridges – stream width	Increased frequency and intensity of storms	1 low vulnerability, 2 medium vulnerability,	<ul style="list-style-type: none"> Existing Champhone bridge 	<ul style="list-style-type: none"> Levelling and strengthening the junctions between the bridge 	

Type of infrastructure	Main climate change threats	Vulnerability assessment	Priorities for adaptation	Structural and design adaptation approaches	Impacts of vulnerable infrastructure upon wetland hydrological function
30 – 100 m	Increased flash flooding	and 1 highly vulnerable		and the pavement on each side of the bridge	
Dams and weirs	Increased temperature and evaporation in dry season Increased frequency and intensity of storms Increased flash floods	2 dams/weirs both highly vulnerable - in dry season there may be insufficient water to flow down the river and weir blocks flow	<ul style="list-style-type: none"> • Khoa Hong La Bai Bak dam may be more vulnerable because of water gate structures. • Hoamoung dam is just a small weir which can be overtopped easily and safely when river levels rise 	<ul style="list-style-type: none"> • Ensure spillways are adequately sized to take projected increased flows without damage to structure or increased flooding • Maintain condition of structure and strengthen weak points e.g. launching aprons and foundations 	<ul style="list-style-type: none"> • Ensure some diversion around dam or weir at times of very low flows, so that the river downstream does not dry up completely
Canals	Increased temperature and evapotranspiration, increase demand and seepage through unlined canals Increased flooding	Loss of water through unlined canals more vulnerable than 200m of lined canal	<ul style="list-style-type: none"> • 1000 m of unlined canal at Tansoum village 	<ul style="list-style-type: none"> • Regular maintenance and removal of silt • Lining of unlined canals • Redesign or restructure channels crossing streams that may be at risk from increased flows or flash floods 	<ul style="list-style-type: none"> • Ensure that the canal does not block natural drainage to the wetlands • Provide channel or pipes over, or siphons under natural stream channels to ensure cross drainage
Pumps	Increased temperature and evapotranspiration, increase demand Increased flash floods	Increased demand for water may draw down reservoirs and rivers more quickly, using up water for wetlands Floods may wash away floating housing of pumps	<ul style="list-style-type: none"> • Two pumps at Douamoung village and at Hoaymakmee are considered to be highly vulnerable 	<ul style="list-style-type: none"> • Ensure that floating pump houses are well secured and protected against flash floods 	<ul style="list-style-type: none"> • Manage the demand for water in the dry season to ensure that adequate water reaches the wetland
Wells	Increased temperature and evapotranspiration falling ground water levels, dry up wells Increased floods may contaminate wells	Six wells and one spring considered to have increased vulnerability	<ul style="list-style-type: none"> • Protection of natural spring should be high priority 	<ul style="list-style-type: none"> • Maintain structures and protect against flood water flowing into the well and contaminating the water • Dig wells deeper to reach more secure water levels 	<ul style="list-style-type: none"> • Manage the demand for water during the dry season to reduce the risk of drying out of wells • Protection of water sources for springs through planting and shading
Erosion sites	Increased risk of flooding Increased frequency and	Three highly eroding sites on the Xe Champhone river	<ul style="list-style-type: none"> • All are priority sites for protection 	<ul style="list-style-type: none"> • Bioengineering provision for river protection works, e.g. revegetation and tree planting 	<ul style="list-style-type: none"> • River bank erosion in flood plain rivers e.g. Xe Champhone is a naturally occurring process,

Type of infrastructure	Main climate change threats	Vulnerability assessment	Priorities for adaptation	Structural and design adaptation approaches	Impacts of vulnerable infrastructure upon wetland hydrological function
	intensity of storms Flash floods			<p>on river banks that may erode in the future</p> <ul style="list-style-type: none"> • Soft engineering measures to delay rapidly eroding river banks • Groynes, rip-rap protection for situations where erosion threatens houses and property 	<p>which may have to be accepted as a risk – develop mechanisms for compensation for losses</p> <ul style="list-style-type: none"> • Prohibit the building of houses, rice stores and roads in places where river bank erosion is a problem

Beung Kiat Ngong

Table 4. Habitats and species

Wetland components	Main climate threats	Vulnerability	Potential adaptation measures
Overall wetland habitats of BKN	Increase of temperature and reduced rainfall in dry season, leading to contraction of wetted area in dry season, but to some extent compensated for by increased rainfall and inundation in wet season. Peatland if it dries out in dry season may release acid sulphate soils. Climate change may lead to some minor redistribution of habitats within wetland area	M	<ul style="list-style-type: none"> • Ensure adequate flow and distribution of water • Protect water sources and courses with riparian vegetation • Prevent encroachment and tree cutting • Manage grazing sustainably
Sedges	Resilient plant species, with vegetative reproduction, that can easily adjust to increased drying out in the dry season and wetting in the wet season	L	<ul style="list-style-type: none"> • Maintain flows to marsh habitats
<i>Sesbania sesban</i>	Wide ranges of tolerance to heat, inundation and drought. Additional pressure from collection if other wetland plants are stressed due to climate change	L	<ul style="list-style-type: none"> • Maintain flows to shrublands
<i>Mimosa pigra</i>	Very tolerant invasive species, observed on the edges of the wetland. Climate change is likely to increase its invasiveness over other shrub species.	L	<ul style="list-style-type: none"> • Monitor spread and eradicate regularly
<i>Barringtonia acutangula</i>	Flooded forest tree very resilient to prolonged flooding growing at the edges of deeper parts of the wetland. Able to withstand periods of increased temperatures and drought. Increased temperatures may inhibit flowering and fruiting in wet season.	M	<ul style="list-style-type: none"> • Prevent cutting and lopping • Collect seeds and seedlings for replanting in appropriate locations
Black fish	Resilient to poor water quality and increased temperatures. Will benefit from increased inundated area due to spread of fish population and access to food sources	L	<ul style="list-style-type: none"> • Maintain habitats and open water • Maintain fish conservation zones and enforce rules • Establish rules for late dry season fishing in open water bodies
White fish	During their time in the wetlands in the wet season, they will benefit from increased flooded area and access to breeding sites and food sources. Their higher vulnerability results from their higher sensitivity to poor water quality and temperature, and unknown stresses in the main river during the dry season	M	<ul style="list-style-type: none"> • Ensure no barriers to migration into the wetland from the Xe Khampho, e.g. irrigation dams • Maintain spawning habitats
Eels	As with black fish, eels are highly resilient and can move overland to avoid adverse conditions. They can survive drought by burying themselves in the mud, and growing strongly when conditions improve. They will benefit from increase in inundated area in the wet season	L	<ul style="list-style-type: none"> • Maintain habitats and open water • Maintain fish conservation zones and enforce rules • Establish rules for late dry season fishing in open water bodies
Snails	Both native and golden apple snails are tolerant of higher temperatures, and can aestivate in the mud or bottom of pools during the dry season. They will be able to take advantage of the increased distribution of eggs and hatchlings during the inundation period in the wet season. Unlikely that the competitiveness of Golden Apple snail will be increased by climate change	L	<ul style="list-style-type: none"> • Maintain habitats • Consider strategies for controlling populations of Golden Apple Snail • Protect natural predators of snails – Open-bill stork

Frogs	Lower rainfall in the dry season and contraction of suitable habitats. Increased access for collection during the dry season, will increase pressure upon the frog species	M	<ul style="list-style-type: none"> • Maintain habitats and open water
Turtles	High temperatures during the breeding season may skew the gender balance in the populations of turtles with only females being hatched. The irregular rainfall in the dry season and shrinkage of wetted areas will increase access and hunting pressure	VH	<ul style="list-style-type: none"> • Establish regulations for turtle hunting • Protect nesting habitats and improve shading to keep temperatures down

Table 5. Livelihood vulnerability to climate change in Beung Kiat Ngong

Livelihood activities	Main climate threats	Vulnerability	Potential adaptation measures
Rainfed rice	Increased temperatures will reduce yield of rainfed rice. Floods and storms before harvest may destroy the crops. May increase pests such as Golden Apple Snail, and rice borers	H	<ul style="list-style-type: none"> • Temperature and flood resistant varieties • Manage water efficiently during periods of low rainfall in rainy season • Research on cultivation techniques
Irrigated rice	Increased temperatures will reduce yield of irrigated rice. Water availability in mid-dry season may be problematic	H	<ul style="list-style-type: none"> • Temperature and low water requirement varieties • Manage water distribution efficiently with minimum wastage • Research on cultivation techniques
Fishing	Black fish throughout the year and white fish during wet season have low vulnerability and may benefit from higher floods. But decreased size of pools and ponds in dry season may increase access and catching pressure on black fish resources	L	<ul style="list-style-type: none"> • Maintain fish conservation zones with rules • Maintain and protect open water refuges for blackfish during late dry season • Monitor catches and apply regulations as necessary to maintain stocks at a sustainable level
Drinking water	Increased temperature and drier dry seasons will reduce availability of drinking water at end of dry season. Increased populations and cattle will add further pressure upon dry season water resources	H	<ul style="list-style-type: none"> • Protect water sources, springs with riparian vegetation • Maintain structures around wells and cover • Encourage groundwater recharge • Manage water use efficiently in times of drought
Livestock	Increased temperatures and lack of suitable fodder during the dry season will decrease productivity and reproductive health of livestock, and may increase susceptibility to disease. Fodder availability after flood events may also be a problem	H	<ul style="list-style-type: none"> • Grow and collect fodder crops for livestock, especially in dry season • Protect water sources for livestock especially in dry season • Improve husbandry and veterinary care
Malva nuts	Flowering of Malva nuts likely to be affected by high temperatures in January and February, and lower rainfall in these months. Increase in temperature at end	H	<ul style="list-style-type: none"> • Prevent destructive harvesting of Malva nuts. E.g. cutting of trees

Livelihood activities	Main climate threats	Vulnerability	Potential adaptation measures
	of dry season may affect fruiting. Climate change effects upon pollinating bees may also be a problem		<ul style="list-style-type: none"> • Collect seeds and seedlings and develop nursery techniques • Identify suitable locations for replanting

Table 6. Addressing non-climate threats compounded by climate change to increase resilience

Non-climate change threats to wetlands	Trends and pressures	Implications with climate change	Potential adaptation measures that address these threats compounded by climate change
Peat extraction for fertilizer - Peat formation is recognized as a carbon sink. Its removal releases carbon dioxide back into circulation, adding to greenhouse gases	Now largely stopped since peat extraction was banned in 2008. The peat extraction changed the character of this north eastern part of BKN from one form of wetland (swamp or bog) to another (open water ponds). Since the peat resource remains, the threat of reopening extraction will continue.	Climate change should not influence any decisions to reopen peat extraction, because it was used as a natural soil conditioner/fertilizer. However, there should be a greater awareness amongst decision makers of the need to retain the peat resources in place as a carbon sink	<ul style="list-style-type: none"> • Maintain ban on peat extraction
Unsustainable harvest of aquatic resources such as fish and wildlife, and of NTFPs such as Malva nuts	Increased populations in the local communities and harvesting by people from outside is expected. This will increase the pressure on the wetland resources, reducing the biodiversity and viability of populations, making the wetlands as a whole less resilient. A less resilient wetland will not function as effectively in its ecosystem services, including carbon sequestration.	It is likely that CC will make the agriculture based livelihoods more vulnerable, which in turn may increase the dependence of local communities upon wetland resources. Increased harvesting of these products will become even more unsustainable. When combined with the impacts of climate change on the natural resources themselves, the pressures on these wetlands will be compounded	<ul style="list-style-type: none"> • Establishing conservation zones and community agreements on sustainable use of wetland products • Managing the harvesting of wetland products by outsiders • Encourage value added processing and marketing to wetland products
Changes in numbers of cattle and buffalo	It appears that there is an increase in cattle and decrease in buffalo numbers. Cattle tend to feed around the edges of the wetland rather than inside the floating grasslands. Pressure will be put on the edge vegetation, and the ecological contributions of large herbivores in the grasslands will be reduced	The edges of the wetland area will experience the most climate change stress – drying out more quickly and with potential for higher floods. The vegetation at the habitat edges is where changes will be observed, and the cattle grazing pressure will be highest at the edges of the BKN wetland, so there may be a synergistic effect. Lack of	<ul style="list-style-type: none"> • Establishing sustainable limits on the numbers of cattle and buffalo grazing • Consider establishing restricted grazing zones if appropriate • Encourage forage feeding of cattle during the dry season, including cultivation of forage crops • Enhance groundwater recharge to wells

Non-climate change threats to wetlands	Trends and pressures	Implications with climate change	Potential adaptation measures that address these threats compounded by climate change
Agricultural practices	More intensive use of fertilizers and agricultural chemicals, leading to build up contaminants Increase in irrigated agriculture for dry season rice production	grazing pressure within the wet grasslands may change species composition and increase the risk of fire in dry season Potential chemical stress on some species, may be made worse by climate stress Dry season irrigation will create a demand for water at a time when there is already water stress and shortages increased by climate change	and protection of livestock drinking sources <ul style="list-style-type: none">• Use of drought and/or flooding resistant crop varieties• Carefully consider the water availability and allocation when developing dry season rice irrigation• Integrated pest control measures that limit the use of agricultural chemicals
Tree-cutting	General trend to reduce the structure of flooded forest habitat	Increases storm pressure on remaining trees	<ul style="list-style-type: none">• Reach community agreements to limit tree cutting• Collection of seeds and seedlings for replanting and protection of young trees in degraded forest areas
Illegal encroachment of forest and wetland areas	Encroachment for agriculture on wetland areas	With climate change, more land may be exposed during the dry season and become suitable for agriculture, leading to further increases in trend	<ul style="list-style-type: none">• Clearly demarcate forest and wetland areas and enforce penalties on encroachment
Fire	Fire in grassland and shrubland during the dry season – often started on purpose e.g. for hunting, is a natural process and may be beneficial for the wetland ecosystem, but not if fire coverage is comprehensive.	Increasing temperatures and evapotranspiration in the dry season will tend to dry out the grassland vegetation to a greater extent, increasing the risk of fire. Climate change may make fire more of a threat to the ecosystem than benefiting it.	<ul style="list-style-type: none">• Controlled burning to reduce risk of widespread fires
Escapes of invasive and non-native fish species, such as Tilapia from aquaculture ponds Invasion by alien species.	Tilapia is already found in the BKN ecosystem, so further escapes are unlikely to make this problem worse Two invasives are currently becoming a problem – Golden Apple Snail and Mimosa pigra. The snail is already increasing in its invasion beginning to supplant the native	Tilapia is probably marginally more vulnerable than the black fish species to the stresses of climate change, so climate change is unlikely to make this threat worse Golden Apple snail and Pila are probably as resilient as each other to climate change, but the Golden apple snail is more aggressive and despite predation by Open Bill storks, is	<ul style="list-style-type: none">• Promote use of native species for aquaculture. e.g. snake head• Monitoring of invasion by Mimosa pigra and active removal and regular eradication before BKN is overrun by these plants

Non-climate change threats to wetlands	Trends and pressures	Implications with climate change	Potential adaptation measures that address these threats compounded by climate change
	Pila species. Mimosa pigra has been observed on the edges of the wetland	spreading widely. It may be spread even more by increased floods. Mimosa pigra has a low vulnerability to climate change and is likely to take advantage of floods to spread rapidly over the next few years into the BKN wetlands taking over shrubland habitats	<ul style="list-style-type: none"> • Raise awareness and protect bird and turtle species that are natural predators of Golden Apple snail
Social and environmental impacts of tourism on the wetland areas and communities	Tourism makes a recognized livelihood contribution, especially in Kiat Ngong. Degradation of the wetland and ongoing loss of biodiversity will reduce its attraction for tourists	Climate change may cause long term changes variations in the habitat and vegetation, but not as significant as other pressures	<ul style="list-style-type: none"> • Raise awareness and protect key species, especially birds, that tourists come to see • Monitor the impacts of tourism e.g. disturbance, degradation of habitats along paths, litter etc, and take appropriate action to manage
Upgrading of existing roads and infrastructure	Existing infrastructure in BKN consists of dirt roads around the wetland, which are in poor state in the wet season. Culverts and bridges are small. There is no major irrigation scheme	Any road upgrading should ensure adequate cross drainage and correct sizing of bridges and culverts to ensure adequate passage of flash floods, that will get worse under climate change	<ul style="list-style-type: none"> • Ensure adequate cross drainage across existing and new or upgraded roads • Ensure that culverts and bridges are of adequate size to cope with flash floods • Design and construction of irrigation canals and small dams to consider water requirements of the wetlands, especially during the dry season • Protection of water sources, such as springs and streams leading into the wetlands, e.g. through protecting or replanting riparian vegetation
Construction of hydropower projects in the catchments.	There are hydropower projects planned and under construction on the Xe Pian river and on the Sekong, but not in the immediate catchment of the BKN	Unlikely to have a compounding effect with climate change on BKN	<ul style="list-style-type: none"> • Monitor water resource use developments in the catchments and ensure that wetland water requirements expected with climate change are considered and agreed

Table 7. Vulnerabilities of the different infrastructure in Beung Kiat Ngong

Type of infrastructure	Main climate change threats	Vulnerability assessment	Priorities for adaptation	Structural and design adaptation approaches	Impacts of vulnerable infrastructure upon wetlands hydrological function
Bridges	Increased frequency and intensity of storms Increased flash flooding	1 Medium vulnerability 4 Highly vulnerable 1 very highly vulnerable	Existing bridge Nonglak highly vulnerable Unfinished Nonglak bridge needs to be completed Kele stream bridge is also a priority	<ul style="list-style-type: none"> Redesign to raise capacity to pass increased flash floods and storm flows Strengthening of abutments to counter erosion pressures on foundations Levelling and strengthening the junctions between the bridge and the pavement on each side of the bridge 	<ul style="list-style-type: none"> Bridge structure should not impede increased flows, or make flooding risk higher
Culverts	Increased potential for flooding, Increased frequency and intensity for storms Increased flash flooding	All are considered to be important. Least vulnerable one is the ford at Phalai	If culverts are undersized or in wrong place, they can change the hydrology of flows between areas of wetland All need to be cleaned regularly	<ul style="list-style-type: none"> Protection of supporting road embankment around the culverts from erosion by floods and flash floods Clear the culverts from vegetation and trash at end of dry season 	<ul style="list-style-type: none"> Ensure that there is adequate cross drainage through culverts Increase size of culvert or add additional pipes
Dams and weirs	Increased temperature and evaporation in dry season Increased frequency and intensity of storms Increased flash floods	2 dams/weirs both highly vulnerable – in dry season there may be insufficient water to flow down the river and weir blocks flow	Phalai and Phapho dams are small weirs which can be overtopped easily and safely when river levels rise	<ul style="list-style-type: none"> Ensure spillways are adequately sized to take projected increased flows without damage to structure or increased flooding Maintain condition of structure and strengthen weak points e.g. launching aprons and foundations 	<ul style="list-style-type: none"> Ensure some diversion around dam or weir at times of very low flows, so that the river downstream does not dry up completely
Canals	Increased temperature and evapotranspiration, increase demand and seepage through unlined canals Increased flooding	Unlined canal at Phalai more vulnerable than lined canal at Phalai	Unlined canal at Phalai	<ul style="list-style-type: none"> Regular maintenance and removal of silt Lining of unlined canals Redesign or restructure channels crossing streams that may be at risk from increased flows or flash floods 	<ul style="list-style-type: none"> Ensure that the canal does not block natural drainage to the wetlands Provide channel or pipes over, or siphons under natural stream channels to ensure cross drainage
Wells	Increased temperature and evapotranspiration	Dug wells have higher vulnerability than tube	Natural spring has highest priority for	<ul style="list-style-type: none"> Maintain structures and protect against flood water flowing into 	<ul style="list-style-type: none"> Manage the demand for water during the dry season to reduce

Type of infrastructure	Main climate change threats	Vulnerability assessment	Priorities for adaptation	Structural and design adaptation approaches	Impacts of vulnerable infrastructure upon wetlands hydrological function
Erosion sites	<p>falling ground water levels, dry up wells Increased floods may contaminate wells</p> <p>Increased risk of flooding Increased frequency and intensity of storms Flash floods</p>	<p>wells. Spring highly vulnerable to drying up</p> <p>One site in Phalai where the riverbank is eroding towards two houses</p>	<p>protection Dug wells may also have high priority</p> <p>One priority site for protection</p>	<p>the well and contaminating the water</p> <ul style="list-style-type: none"> • Dig wells deeper to reach more secure water levels • Bioengineering provision for river protection works, e.g. revegetation and tree planting on river banks that may erode in the future • Soft engineering measures to delay rapidly eroding river banks • Groynes, rip-rap protection for situations where erosion threatens houses and property 	<p>the risk of drying out of wells</p> <ul style="list-style-type: none"> • Protection of water sources for springs through planting and shading • River bank erosion in flood plain rivers is a naturally occurring process, which may have to be accepted as a risk – develop mechanisms for compensation for losses • Prohibit the building of houses, rice stores and roads in places where river bank erosion is a problem