Climate change vulnerability assessment summary: Xe Champhone, Ramsar site, Lao PDR

1 INTRODUCTION

The effects of climate change are projected to result in a wide range of impacts across different systems. Assessing the vulnerability of natural resource areas to climate change is important for identifying priorities for mitigation and adaptation. The complexity of wetland systems in their diversity of habitats and species, as well as ecosystem services and resources for human populations, makes prioritising vulnerable areas challenging but also a critical process for future management. To address these concerns, a climate change vulnerability assessment was completed for two sites in Lao PDR: the Xe Champhone Ramsar Site (XCP) and Beung Kiat Ngong Ramsar Site, under the CAWA project - Climate Adaptation in Wetland Areas.

The Ramsar Strategic Plan 2016 – 2024 recognizes the important role that local knowledge and customary use of wetlands can play in achieving conservation goals. With this in mind, the vulnerability assessment (VA) aims to use a combination of local knowledge and scientific data to ensure the most accurate assessment can be made, to better understand future climate pressures on the Xe Champhone wetlands and the communities that depend on them.
2 SITE SELECTION

The Xe Champhone wetlands are located 40km east of the city of Savannakhet, and were designated a Ramsar site in 2010. The wetlands are characterized by a riverine system of meandering streams, oxbows, flood plains and the Xe Champhone River, the catchment of which extends to the Annamite Mountain Range 200km north of the site. Two core zones of high conservation value have been demarcated; one located in the centre and one in the south of the Ramsar Site (Figure 2).

The wetland provides many provisioning and regulating ecosystem services to the surrounding communities and is an important habitat for species such as the Critically Endangered Siamese crocodile (*Siamensis crocodylus*), several vulnerable species of turtle, and migratory fish species.

Overall fauna species show declining populations. While the wetland maintains a diverse bird population, many species are scarce, and large mammal species have largely been extirpated, a cause for concern for current and future biodiversity of the site.

Agricultural development is the predominant land use around the wetlands, with rice cultivation the principal livelihood activity practised. Livestock production and resource collection are also important means of income and subsistence for villagers. The site has benefited from its Ramsar status; a number of fish and crocodile conservation zones have been established in and around the boundary but several habitat types remain vulnerable to conversion or encroachment.

3 VULNERABILITY ASSESSMENT

According to climate change models, the Savannakhet region is projected to see an increase in mean annual temperature of 1.7°C by 2050, and a >3°C increase in maximum temperature. Annual average rainfall is projected to increase by approximately 21%; mostly experienced as more intense rainfall rather than more rainy days. Extended and more frequent floods are forecast, as well as higher evaporation rates of water bodies in the dry season.

The community vulnerability assessments were completed with 16 villages from around the wetland. Six major habitat types within the Ramsar site were identified through field surveys, expert consultation and review of previous studies:

- Riverine habitats have high vulnerability to both baseline and climate threats. Baseline threats include erosion and sedimentation impacts within the Xe Champhone River, influenced by forest loss and land degradation, with water extraction and infrastructure affecting hydrology and connectivity. Increased frequency and duration of flooding is expected to exacerbate erosion and sedimentation impacts, and lead to the filling in of deep pools and reduced channel depth, with effects compounded by higher evaporation rates and more frequent drying.
- Oxbows have a high baseline risk; they are a critical habitat for the endangered Siamese crocodile and several threatened turtle species. The habitat experiences impacts from invasive plant species...
water hyacinth and *Mimosa pigra*, as well as agricultural encroachment and water extraction. Climate change vulnerability is moderate; while high temperature and evaporation rates will affect the habitat, they are likely be buffered by the habitat’s deep water.

- Open wetlands have a moderate baseline risk status, with threats including the expansion of rice cultivation on habitat edges and increased water extraction during dry season. High climate change vulnerability is expected due to the shallowness of the habitat and exposure to more frequent and intense heat and higher evaporation rates. This could lead to increased water temperatures and drying of smaller water bodies, conditions detrimental for species that use the habitat for seasonal breeding or refuge.

- Flooded Forest has both a moderate baseline and climate vulnerability risk. The main baseline threat is forest clearance for rice cultivation and timber extraction. It has a moderate tolerance to drought, but potential for a shift of habitat distribution with changes in both drought and flood extent. Increasing temperatures may affect reproduction in *Barringtonia spp.* a keystone species, and extended inundation may affect the regeneration of bamboo.

- Grassland has a medium baseline risk status and low climate change vulnerability. The biggest threat is high rates of modification and conversion for cultivation and grazing and regular burning to improve fodder quality. It recovers quickly from extreme events and is tolerant to drought, flood and high temperatures, but alteration of species composition may occur with changes to natural regimes.

- Reservoirs have the lowest overall habitat vulnerability. As a modified habitat type, their baseline vulnerability is less applicable but they have become an important habitat for a number of species and key resources. Water levels are generally maintained year round. Vulnerability to climate change is low as water levels are managed during times of drought.

Each village participated in surveys to determine the priority resources that villagers collect and use; eight of the top 10 were; fish, snails, frogs, bamboo shoots, eels, shrimp, wild vegetables and crickets. There were some differences in responses between genders, for example, women generally prioritised plant products higher and also included mushrooms and crabs in their top 10, whereas men did not. This is likely to reflect the greater role women have in collection of wild plants and smaller aquatic animals.

Community members were asked to recount recent climatic events and impacts. Flood was reported to occur an average of every three years, most recently in 2017. The most cited impact was rice crop damage from flooding. Other impacts include: loss of land, shelter and forage for livestock, increased livestock disease, infrastructure damage, erosion, decreased fish catch, lack of water resources, and expansion of invasive species. The most frequently reported coping strategy was to undertake irrigated rice cultivation in the dry season.

Five species were selected for the vulnerability assessment based on their flagship status, conservation status, economic importance and whether the species had been previously assessed:

- The Siamese crocodile (*Crocodylus siamensis*) is an IUCN Red List critically endangered species and both a keystone species and flagship species for the site. It has a small fragmented population, and specialized habitat and nesting requirements, preferring oxbow habitats. Climate change is expected to have a high impact on reproduction, with temperature effects on egg development and sex determination, and altered flood seasonality affecting nesting sites. Expansion of invasive species and increasing water extraction are likely to affect the quality and connectivity of crocodile habitats.

- The Wallago catfish (*Wallago attu*) requires a large connected habitat area, that can be impacted by infrastructure, and the population is declining due to overfishing. The species has high climate change vulnerability due to projected loss of deep pool refuges from increased temperatures, evaporation and sedimentation, and the fragmentation of migration routes.

- The Blunt-headed Burrowing Frog (*Glyphoglossus molossus*) is IUCN Red Listed as ‘Near threatened’. It is at risk of over-exploitation and its abundance is strongly seasonal, it is affected by climatic extremes, and its population is declining. Forest loss around the wetlands is a concern as it is largely restricted to breeding within small forested ponds.

- Bleeker’s sheatfish (*Micronema bleekeri*) is a priority economic species, with locally declining populations due to overfishing. The species is adaptable to climate change impacts, but is at risk from the loss of critical floodplain and deep pool habitats from hydrological changes, increased temperatures, evapotranspiration and sedimentation.

- Pa Nok (*Osteochilus melanopleurus*) is a fish species with a wide distribution range throughout the Mekong Basin, but is decreasing in the Xe Champhone area. Baseline threats include habitat
degradation and overfishing. Its climate change vulnerability is moderate due to habitat degradation and dis-connectivity from drought and hydrological changes. The species depends on floodwaters for moving into areas of inundated vegetation for feeding, but its breeding is opportunistic and is expected to be less affected than species linked to seasonal cues.

- Turtle species of the site, such as Yellow-headed temple turtle (*Heosemys annandalii*), Asiatic soft shell turtle (*Amyda cartilaginea*), and Mekong snail eating turtle (*Malayemys subtrijuga*), while not assessed here, as they were previously assessed under other projects, are identified to face both high baseline threats from hunting and habitat loss, and climate change vulnerability due to effects of altered rainfall patterns and temperatures on reproductive success.

4 CONCLUSIONS AND ADAPTATION PLANNING

Riverine, open wetland and oxbow habitats are priority habitats for conservation and adaptation management, along with addressing key issues identified for other habitat types, such as land clearing, agricultural encroachment, erosion/sedimentation, invasive species and water extraction.

The Siamese crocodile and turtle species were assessed as the highest priority for protection and climate adaptation due to both baseline threats and climatic impacts identified. Additional key considerations for species adaptation concern addressing hunting and overharvesting threats and specific climate change impacts on species breeding, and migrations/movements.

Recommendations for habitat and species conservation and adaptation focus on:

- Increasing community awareness, training and participation in management
- Expanding conservation/core zones, including protection of nesting and refuge areas
- Improving regulation and enforcement, through wider patrolling programs
- Effective habitat and species management, i.e. habitat restoration, invasive species control

Recommended livelihood adaptation measures should target:

- Improving productivity and sustainability of agricultural systems (rice and livestock)
- Management of erosion, sedimentation and salinization, through restoration
- Reducing resource pressure through aquaculture, alternative crops, local handicrafts
- Reducing livelihood impacts of invasive species through control programs
- Supporting improved security and quality of water sources, by diversifying storage options

Effective capacity development is critical for positive climate change adaptation and long-term sustainability of wetland management. Programs need to be tailored for effective learning and ongoing support and monitoring is critical. Capacity development and community ownership of adaptation should be guiding the process. Increased awareness of Ramsar, and site and core zone boundaries is important for effective implementation of regulations and community perceptions. Update of boundaries also needs to be reconsidered with recommendations of additional priority habitat areas for inclusion, along with designation of buffer zones.

Policy and regulation will play a key role in effective long-term implementation, with land use planning critical for zoning and enforcement of activities within these areas and within Ramsar boundaries. Land use planning for all villages should coincide with adaptation and management planning for the site.

It is important to consider the potential conflicts of developing solutions and competing vulnerabilities, i.e. ecological water to support habitats and species versus access to water to support increased agricultural production. Finding solutions that balance the benefits to communities while supporting wetland biodiversity is critical for sustainability. Support for key livelihoods of communities surrounding the wetland, such as agricultural production, is paramount and recommendations to improve efficiencies and reduce losses to climate change need to be addressed, in parallel with supporting habitats, species and the critical ecosystems services provided by the wetlands.