**Figures and Tables:**

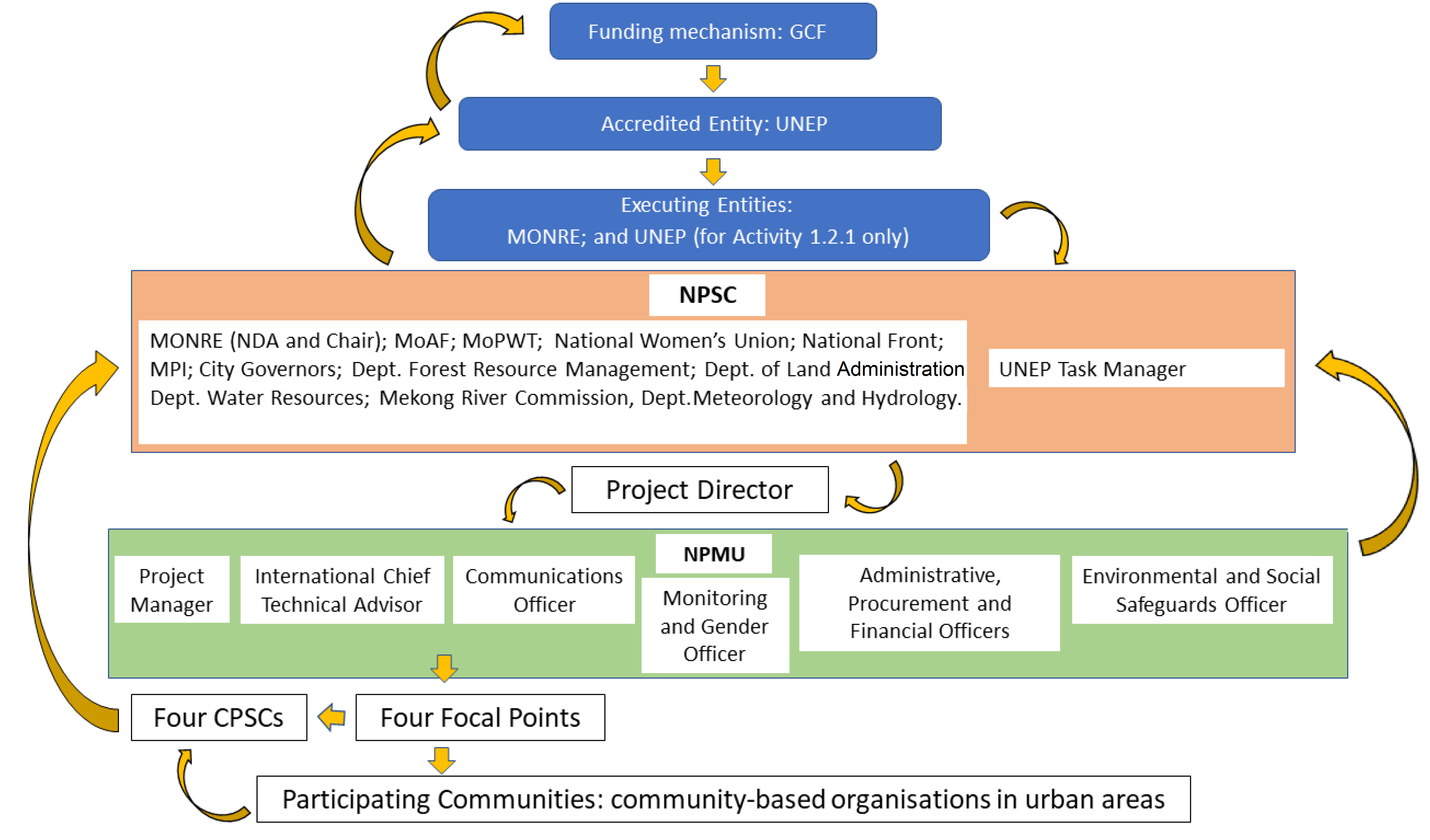


Figure 1. Project management structure.

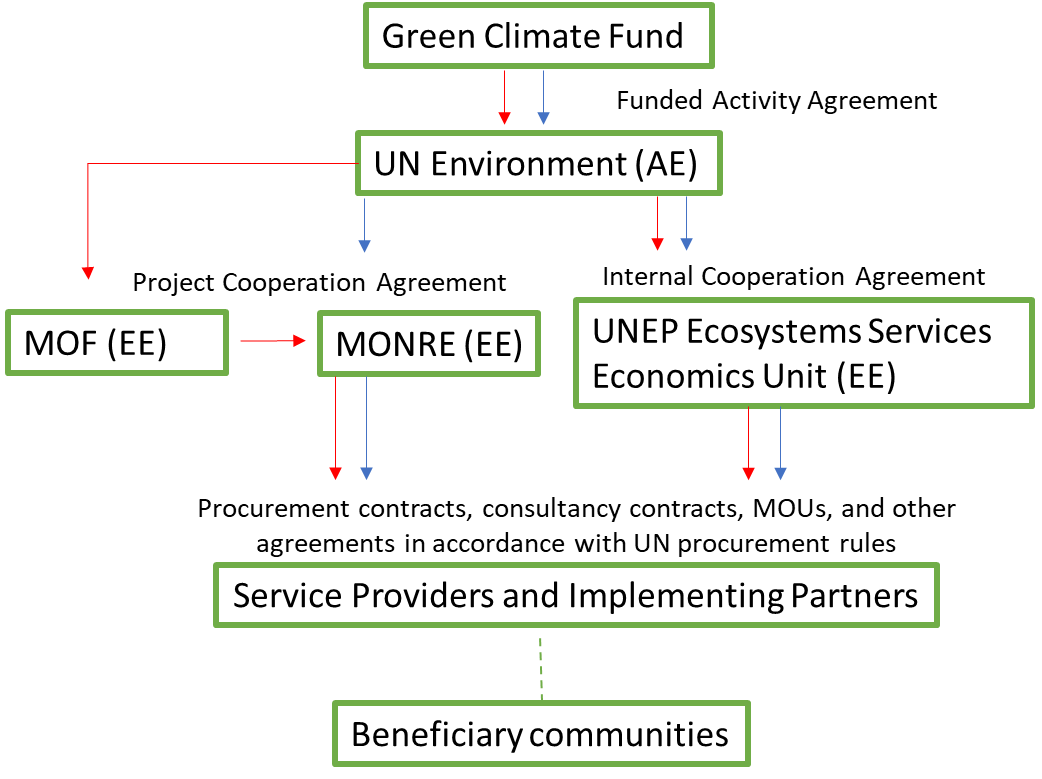
****

Figure 2. Flow of funds and contractual arrangements for project implementation. The red arrows indicate the flow of funds while the blue lines show the contractual arrangements, including the types of contracts, between the relevant parties.

Table 1. Examples Studies Valuing Ecosystem Services in Laos

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Author** | **Ecosystem services valued** | **Values** | **Methods employed** |
| 2005 | [Rosales et al.](https://www.cbd.int/financial/values/lao-economicreturn-iucn.pdf) | Watershed protection benefits  Downstream fisheries, irrigation and micro-hydropower, and flood control benefits | US$0.85 million a year or US$ 3 /ha  US$26.60 million or US$92.3 per hectare | Market prices, participatory environmental valuation, willingness to pay, production, and other approaches |
| 2004 | [Gerrard](https://iwlearn.net/files/pdfs/Gerrard%202004_Integrating%20wetland%20ecosystem%20into%20urban%20planning.pdf) | Flood protection and wastewater treatment services | US$2.87 million a year or US$1,436/ha | Market prices, examining damages avoided during floods, and replacement costs of wastewater purification services, and production |
| 2010 | [ADB](https://www.adb.org/sites/default/files/linked-documents/40253-02-reg-oth-05.pdf) | Watershed protection  Water quality regulation  Soil erosion control | US$681/ha/year  US$718ha/year  US$380ha/year |  |
| 2015 | USAID | Wastewater treatment  Species consumed | $1.7 million  $2.5 million / year | Replacement cost, market prices, market substitutes |

**Endnotes:**

1. For further information, see Annex 2: Feasibility Study, Section 4. The CAWA project focuses ecosystem-based adaptation to support the capacity of wetlands to buffer livelihoods against the impacts of climate change. Although the project focus is on rural resilience, many approaches on development of hydrological and vulnerability assessments and restoration approaches are applicable to the wetland and streams for the current project.
2. This includes existing management practices such as no-take areas for fishing during spawning season and local farming practices that are compatible with ecosystem protection (minimal use of pesticides, no use of weed killers, etc.). These will be relevant to the development of management plans.
3. which are located predominantly on the Mekong River, on the border of Thailand.
4. Flooding leads to reduced access to clean water and sanitation, which increases the risk of people being affected by waterborne diseases such as shigella, cholera, hepatitis A and typhoid fever. For example, in 2015 there were 1,096 reported cases of skin infections and 36 reported cases of diarrhoea as a result of flooding in Vientiane alone (World Health Organisation. Lao People’s Democratic Republic. 2015).
5. Based on modelled flood impacts. World Bank, 2018. As cited in Post-Disaster Needs Assessment: 2018 Floods, Lao PDR. Available at: https://www.gfdrr.org/en/publication/post-disaster-needs-assessment-2018-floods-lao-pdr. Accessed on: 30 April 2019
6. Equivalent to 2.1% of the country’s projected 2018 GDP and 10.2% of the government’s total budget for 2018. Recovery needs were estimated at US$520 million, with the highest impacts identified in the transport, agriculture and waterways sectors. The collapse of a dam wall coupled with heavy rainfall in Attapeu province caused ~10% of the total damages countrywide (Post-Disaster Needs Assessment: 2018 Floods, Lao PDR. Available at: https://www.gfdrr.org/en/publication/post-disaster-needs-assessment-2018-floods-lao-pdr. Accessed on: 30 April 2019).
7. Village-level consultations were conducted in project areas from March 28 – April 6. The report is included in Annex 12. Environmental and Social Action Plan.
9. MONRE, 2013. Lao PDR Second National Communication to the UNFCCC
10. The climate change models used in the development of this Funding Proposal are discussed further in the paragraphs below and in Annex 2: Feasibility Study, Section 2.
11. Extreme rainfall events that cause urban flooding are expected to become as much as five times more intense. Given the magnitude of this plausible scenario, a precautionary approach is advisable whereby major investments in adaptation are made now to avert such climate change-induced damages in the future.
12. This is partly because of the impervious nature of many urban and peri-urban surfaces (e.g. roads, rooves of buildings, pavements and parking lots). But it is largely because of the intensity of the rainfall in many parts of Laos. During intense rainstorms, rainwater accumulates rapidly in streets, agricultural fields, and inundates infrastructure, often reaching up to the second storeys of houses and buildings over vast areas within a particular city. It then often takes several weeks for the water to subside so that repairs can be made to infrastructure and economic activity in a particular urban area can start up again. The hidden costs of such floods are thus considerable.
13. Pluvial flooding occurs when intense rainfall events exceed the infiltration capacity of the local substrate, resulting in localised intense runoff of rainfall. Such flooding is typically highly localised and is likely to occur frequently and as a result of a single rainfall event. For further details on types of floods in Laotian cities, see Section 2 of Annex 2: Feasibility Study.
14. The impacts of climate change in the target cities were determined by a UNEP-DHI study that was commissioned specifically for the proposed project and conducted through CTCN. This study is summarised in Annex 2: Feasibility Study and provided in full as Annex 13
15. i.e. the events that currently cause flooding in urban and peri-urban areas.
16. The annual urban growth rate is ~4% and the urban population of Laos is expected to more than double between 2010 and 2030.
17. Including limited coordination, strategic spatial planning or investment in infrastructure, as well as insufficient consideration by government urban planners of the effects of climate change on urban areas.
18. in the absence of urban planning frameworks that recognise the value of these areas and ensure that they are protected from inappropriate development.
19. Ecosystem-based Adaptation (EbA) is broadly defined as the sustainable use of biodiversity and ecosystem services to help people adapt and to strengthen societal resilience against the adverse effects of climate change. In the context of the proposed project, urban EbA refers to the use of ecosystems in urban areas in Laos to reduce climate change-induced flooding and to mitigate the impacts of flooding.
20. Details of policies are provided in Section E.5 and in Annex 2: Feasibility Study, Section 3.5.
21. In general, cities and towns in Laos have poor drainage networks that contributes to frequent flooding after rainstorms. Drainage systems are typically silted with soil from unpaved roads and are polluted from poor sanitation services. ADB. 2012. Urban Development Sector Assessment, Strategy, and Roadmap.
22. For further details, the Theory of Change is included in Annex 2. Feasibility Study.
23. Early warning systems serve an important role in integrated flood risk management systems. This is being developed in the country through institutions such as the National Disaster Management Office and the Department of Meteorology and Hydrology. Development partners support these initiatives through the World Bank Integrated Water Resources Management Project Phase I where hydrological and meteorological monitoring systems are supported and the Lao PDR Southeast Asia Disaster Risk Management Project which supports hydrometeorological services and response in Muang Xay. While critically important, direct interventions in the development of flood early warning systems is outside the project scope. The project, through the ICFMS, will coordinate with disaster risk management institutions.
24. Hey, D.L. and Philippi, N.S., 1995. Flood reduction through wetland restoration: the Upper Mississippi River Basin as a case history. Restoration Ecology, 3(1), pp.4-17.
25. Bernhardt, E.S. and Palmer, M.A., 2007. Restoring streams in an urbanizing world. Freshwater Biology, 52(4), pp.738-751.
26. The barriers are described in further detail in Annex 2: Feasibility Study, Section 6.
27. ‘End-of-pipe’ suggests that you solve the problem downstream in the catchment, rather than preventing it from becoming a problem by using integrated, distributed solutions.
28. The extensive site selection process considered vulnerability of target communities to floods, through a vulnerability assessment process and stakeholder consultations.
29. including land use planning and flood risk planning
30. Through the Socio-Economic Development Plans of the Ministry of Planning and Investment, and building on lessons learned from the GIZ-funded project “Land management and decentralised planning I & II”
31. Options for the knowledge exchange trip include Bangkok, Manila, and Guwahati, India. Considerations for selecting the city will include similarity of institutional contexts, relevance of their flood management strategies and urban EbA interventions to the Laotian setting, and potential for sustaining linkages across institutions.
32. The project design adopts similar approaches as the Mekong Integrated Water Resources Management Project (M-IWRMP), which is a transboundary cooperation for river basin management between Laos and Thailand. That project has had successful outcomes in peer to peer learning.
33. Such as the Asia Pacific Climate Change Adaptation Forum, ASEAN working group sessions, and other appropriate venues.
34. Approaches in Mekong countries, including Lao PDR, are outlined in ADB. 2015. Investing in Natural Capital for a Sustainable Future in the Greater Mekong Subregion. Manila, Philippines.
35. Floodplains are the areas adjacent to a river that are flooded.
36. Floodlines are geographical demarcations of the floodplain for a flood with a particular return interval. For example, a 1-in-100-year floodline demarcates the floodplain of the 1-in-100-year flood.
37. Options include the Civil Engineering Department of the NUoL or the Public Works and Transport Institute within MPWT.
38. This structure is adapted from the Land Allocation Committees in the GIZ project Land Management and Decentralized Planning.
39. for further information about the relevant policies, see Annex 2: Feasibility Study.
40. Further details on site selection are provided in Annex 2: Feasibility Study, Section 10.
41. Maps of the wetland and streams are provided in Annex 2: Feasibility Study, Section 10.
42. Similar arrangements are expected for the Community Stream Management Committees under Activity 2.2.2.
43. Indigenous plant species that occur naturally along streambanks in and around each city will be identified in consultation with local ecologists. A wide range of these species will be used, since diversity increases ecosystem resilience, as well as focusing on species that are climate-resilient e.g. heat tolerant and well-suited to withstand flooding and reduce erosion.
44. such as the ADB-funded Pakse Urban Environment Improvement Project.
45. The EE will be required to comply with UNEP rules, policies and procedures on procurement.
46. The PCA will determine requirements for the disbursement and management of funds to the EE, as well as establish agreed upon supervisory roles.
47. The PMU will have a target of 30% female representation.
48. with ad hoc meetings held wherever necessary
49. This role will be part-time and financed by the GoL.
50. such as government departments, NGOs and civil society groups
51. Recruitment of all project personnel will be guided by gender equality and non-discrimination principles, with a target of 50% female representation.
52. The PM will be accountable to Government of Laos and UNEP.
53. CEIC data. Available at: https://www.ceicdata.com/en/indicator/laos/external-debt--of-nominal-gdp. Accessed on 2 May 2019.
54. During flood events, these communities are affected by the halting of economic and social activity as well as reduced mobility for weeks at a time in flooded neighbourhoods while reconstruction and recovery is undertaken.
55. The GoL has committed US$1.5 million in co-financing.
56. ADB. 2016. Nature-based Solutions for Building Resilience in Towns and Cities: Case Studies from the Greater Mekong Sub-region. Accessed from: https://www.greatermekong.org/sites/default/files/nature-based-solutions.pdf#overlay-context=nature-based-solutions-building-resilience-towns-and-cities-case-studies-greater-mekong-subregion. Accessed on 15 May 2019.
57. JICA. 2011. The Project for Urban Development Master Plan Study in Vientiane Capital. Available at: http://open\_jicareport.jica.go.jp/pdf/12023693\_01.pdf. Accessed 13 May 2019.
58. ADB. 2015. Building Resilience in Kaysone Pomvihane, Lao PDR, Volume 7 of the Resource Kit for Building Resilience and Sustainability in Mekong Towns, Prepared by ICEM – International Centre for Environmental Management for the Asian Development Bank and Nordic Development Fund. Manila (TA 8186).
59. ADB. 2015. Building Resilience in Kaysone Pomvihane, Lao PDR, Volume 7 of the Resource Kit for Building Resilience and Sustainability in Mekong Towns, Prepared by ICEM – International Centre for Environmental Management for the Asian Development Bank and Nordic Development Fund. Manila (TA 8186).
60. Personal communication. 2018. ADB Project Manager and international consultants.
61. This regional project covers four Least Developed Countries, with a budget of US$ 468,000 for EbA interventions in Laos’ regions of Oudomxay and Phongsaly.
62. The barriers are stated in Section B.1 of this SAP proposal and described in detail in Annex 2: Feasibility Study, Section 6.
63. such as universities, schools, and government offices
64. The economic, social and environmental co-benefits that will result from project interventions are discussed in further detail in Section E.3 of this SAP Proposal.
65. including other relevant planning frameworks that have performance targets
66. The implementation of the ICFMS and their regular updating will be ensured through the process of mainstreaming the ICFMS into relevant policy and planning frameworks.
67. GCF resources from the project will not be provided to the EPF to enable this upscaling. The EPF is a potential source of sustainable financing, particularly for watershed protection-related activities. It is in the process of seeking accreditation with the GCF and obtains financing from the ADB and World Bank.
68. These financial resources are channelled to beneficiaries in Laos and invested in the form of an endowment fund to generate interest for financing the operation costs of the EPF. Case Study Report: Environmental Protection Fund in Lao PDR. UNDP. Available at: http://www.asia-pacific.undp.org/content/dam/rbap/docs/Research%20&%20Publications/environment\_energy/ncf/APRC-EE-2012-NCF-CaseStudy-Lao.pdf. Accessed on 12 February 2019.
69. The project’s gender targets as well as the associated gender-disaggregated indicators are presented in Annex 4: Gender Assessment.
70. Direct beneficiaries have been defined as those individuals living in villages directly adjacent to project interventions that will benefit from flood reduction.
71. These projects are discussed in Annex 2: Feasibility Study.
72. the capacity building process is discussed in Section B.2.
73. The process for updating national policies is described in Section B2.
74. Among government decision-makers this will be facilitated in part through the setting of adaptation targets as part of the NAP process.
75. United States Environmental Protection Agency. 2017. Available at: https://www.epa.gov/green-infrastructure/benefits-green-infrastructure. Accessed on: 14 November 2017
76. Many urban residents in Laos rely on fishing urban streams to supplement their livelihoods. Wetland and stream restoration activities will increase the habitat for aquatic biodiversity.
77. Small-scale farmers in urban areas preferentially plant a high-value rice variant that is not resilient to the impacts of inundation. A reduction in flood impacts will allow small-scale farmers to continue their practices rather than growing flood-resilient varieties that are less desirable in the local market.
78. United States Environmental Protection Agency. 2017. Available at: https://www.epa.gov/green-infrastructure/benefits-green-infrastructure. Accessed on: 14 May 2019.
79. Further details on how project outputs will be delivered in a gender-sensitive manner are presented in Annex 4: Gender Assessment.
80. In Paksan, the National Women’s Union is already promoting household vegetable gardens to supplement women’s income when rice fields are flooded.
81. The impacts of climate change in Laos, as well as the associated damages, are described in detail in Section B.1.
82. World Bank, 2018. As cited in Post-Disaster Needs Assessment: 2018 Floods, Lao PDR. Available at: https://www.gfdrr.org/en/publication/post-disaster-needs-assessment-2018-floods-lao-pdr. Accessed on: 30 April 2019
83. For further information about flood impacts on communities, see the stakeholder consultation report in Annex 12.
84. The damages that result from climate change-induced flooding will be exacerbated by Laos’ rapid rates of urbanisation; the expansion of hard infrastructure areas will increase the total area of impervious surfaces, which greatly reduces infiltration into soils and drainage into groundwater.
85. Laos NAPA, 2009.
86. United Nations Statistics Division. January 2019.
87. Human Development Index, 2017. Available at: https://en.wikipedia.org/wiki/List\_of\_countries\_by\_Human\_Development\_Index
88. including US$15 million from floods and landslides and US$5 million from droughts annually. WRI, 2014. Climate change in the Lower Mekong Basin: An analysis of economic values at risk. Available at: http://mekongarcc.net/sites/default/files/usaid\_marcc\_values\_at\_risk\_report\_with\_exesum-revised.pdf
89. Overall, climate change impacts on agriculture are predicted to cost US$1 billion. Reduced labour productivity, as a result of inter alia increased temperatures, across all sectors is expected to cost US$4.75 billion.
90. External public debt reached 54% of the country’s Gross Domestic Product (GDP) in 2018. (CEIC data. Available at: https://www.ceicdata.com/en/indicator/laos/external-debt--of-nominal-gdp. Accessed on 2 May 2019.)
91. Further details on the implementation arrangements are presented in Section B.3 of this Sap proposal.
92. For example, the NCCS outlines the need for climate proofing urban development plans and infrastructure; the project will contribute to achieving such goals through implementation of urban EbA interventions. (NCSS).
93. The NAP project is envisioned to be co-located in the Department of Climate Change in MONRE. Efficiencies in delivery, standardization of project management processes, as well as substantive input of the proposed GCF project to the NAP process are envisioned.
94. Such as the INDC and NAPA development teams.
95. Bali Strategic Plan for Technology Support and Capacity building. 2004. Governing Council of the United Nations Environmental Programme. Available at: https://aarhusclearinghouse.unece.org/resources/bali-strategic-plan-for-technology-support-andcapacity-building [accessed 22.11.2017].
96. Specific initiatives that it has led relating to this topic are described in Section E.2.
97. a division of MONRE with an advisory role to the ministry and direct responsibility for managing disasters and climate change across the country
98. organisations included UNDP, UN-Habitat, IUCN, and GIZ
99. During this mission, discussions were only possible with representatives from Laos’ capital city, Vientiane. Input on the other target cities was provided by central government, donors and NGOs.
100. Vientiane, Paksan, Savannakhet, Pakse, Luang Prabang and Thakhek
101. including land use around the wetland, and opportunities for improving its flood storage capacity
102. These estimates are conservative as they make no assumption of the increased frequency and severity of flood impacts due to climate change, which would result in greater flood losses in the absence of mitigation measures. The additional benefits provided by EbA interventions and the indirect avoided costs due to flood losses are also not included in the estimates. Note that the calculations for the reduced flood damages used in the economic modeling do not directly correspond to the EbA interventions proposed in this project. Measuring flood retention and abatement from restoration is challenging and site-specific. More information is indicated in the activity descriptions under Component 2.
103. Further details on relevant past and ongoing projects and initiatives in Laos are presented in Annex 2: Feasibility Study.
104. Further details on the CAWA project are presented in Section 4.1.2 of Annex 2: Feasibility Study.
105. FAO. 2014. Project Document. Climate change Adaptation in Wetland Areas (CAWA) in Lao PDR.
106. https://www.thegef.org/project/sustainable-forest-and-land-management-dry-dipterocarp-forest-ecosystems-southern-lao-pdr
107. which concluded in 2017.