Initial Environmental Examination

Project Number: 49387-002
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Lao People's Democratic Republic: Second Greater Mekong Subregion Tourism Infrastructure for Inclusive Growth Project

Champasak and Vientiane Provinces, Lao PDR

Prepared by the Ministry of Information, Culture and Tourism for the Lao People's Democratic Republic and the Asian Development Bank.

CURRENCY EQUIVALENTS

(28 September 2017)

Currency Unit	–	kip K
K1.00	=	$0.00012
$1.00	=	K8,156

ABBREVIATIONS

DOF	-	Department of Agriculture and Forestry
EA	-	environmental assessment
EIA	-	environment impact assessment
ECC	-	environmental compliance certificate
ECO	-	environmental control officer
EMP	-	environment monitoring plan
ESIA	-	environment and social impact assessment
EA	-	executing agency
GMS	-	Greater Mekong Subregion
IA	-	implementing agency
IEE	-	initial environmental examination
EO	-	environmental officer
IUCN	-	International Union for Conservation of Nature
Lao PDR	-	Lao People's Democratic Republic
LWU	-	Lao Women's Union
MOF	-	Ministry of Agriculture and Forestry
MICT	-	Ministry of Information, Culture and Tourism
MOF	-	Ministry of Finance
MONRE	-	Ministry of Natural Resources and Environment
MPWT	-	Ministry of Public Works and Transport
MRC	-	Mekong River Commission
NBSAP	-	National Biodiversity Strategy and Action Plan
NPA	-	national protected area
O&M	-	operation and maintenance
PIU	-	project implementation unit
PCU	-	project coordination unit
PPP	-	public-private partnership
REA	-	rapid environment assessment
SS	-	safeguard specialist
TSS	-	total suspended solids
UXO	-	unexploded ordnance
WREA	-	Water Resources and Environment Agency

WEIGHTS AND MEASURES

km:	kilometer
kg:	kilogram
ha:	hectare
mm:	millimeter

NOTE

In this report, "$" refers to US dollars unless otherwise stated.

I. EXECUTIVE SUMMARY

The second Greater Mekong Subregion (GMS) Tourism Infrastructure for Inclusive Growth Project (TIIG) will develop small scale infrastructure to improve tourist facilities and develop and strengthen management capacity to enhance tourism at selected locations in Lao People's Democratic Republic (PDR), Cambodia, and Viet Nam. In Lao PDR seven infrastructure subprojects will be implemented in Champasak and Vientiane Province, which are the focus of the IEE presented herein.

The seven (7) subprojects are listed below:

Champasak
• Nakasang Access Road and Port Rehabilitation • Don Det/Don Khone Access Improvements
Vientiane
• Nam Ngum Reservoir Access Improvements • Kaeng Yui Waterfall Access Improvements • Western Loop Rural Access Road and Bridge Improvements • Vang Vieng Urban Renewal • Vang Vieng Solid Waste Management Improvements

Subproject Benefits

Champasak province

Nakasang Access Road and Port Rehabilitation

The improvements to the main access road to Nakasang town and to the main tourist port to the "4000 islands" area of the Mekong river will greatly benefit tourism in the area, and access to the islands by residents. The chronic periodic flooding that blocks the road to normal traffic will end. The new concrete road surface will provide a durable surface that will greatly improve movement of local vehicles and tourist coaches. Apart from the upgraded access road, parking will be improved and a new turning circle for coaches provided at the Tourist Information Centre.

The improvements to the footpaths and embankments along the waterfront, and the improved ramps to the existing floating tourist pier will increase capacity and improve safety for tourists and residents. The realignment of the main drainage pipe away from the public shoreline area will improve significantly sanitation and aesthetics of the tourist staging area. The subproject will directly benefit 1,6450 Nakasang residents, 228 boat operators, and about 100 vendors in Nakasang market

Don Det/Don Khone Access Improvements

The upgrades to the island's small road network and footpaths to concrete paving will relieve congestion, improve traffic safety, and reduce dusty and/or muddy seasonal conditions. The new lighting will allow safer use of the different foot and bicycle paths and small roads at night thereby expanding the scope of tourist activity, while providing a safer environment for the community. The subproject will directly benefit 1,240 Don Det and 1,345 Don Khone residents.

Vientiane province

Nam Ngum Reservoir Access Improvements

Delapidated and unsafe piers and beachfront buildings will be replaced with a modern marina that can handle 50-60 boats. The ability to accommodate recreational boats and small ferries will greatly expand the tourist experience. The reconstructed vendor market stalls including public toilets will significantly improve sanitation and business opportunities for residents and tourists. The proposed circular concrete access road to NR #10 and parking lot will improve traffic management and prevent congestion caused by the current dead end situation at the recreation area. The major benefit will be functionally improved, safe, and better organized recreation facilities beside the reservoir. The subproject will benefit 1,600 people from nearby Ban Sengsavang and is expected to catalyze significant tourism related investment at the site

Kaeng Yui Waterfall Access Improvements

The upgraded access road, and improved parking at the base of the pathway leading to the waterfall will allow more tourists to visit the waterfall more comfortably and provide residents better access to markets and social services in nearby Vang Vieng Town. The increased tourist flow to the waterfall will directly benefit the homestays which have been established along the route and near the falls. The improved footpath and small suspension bridges to the falls, and improved vendor kiosks, will generate economic opportunities for local entrepreneurs and greatly improve tourist experience. The subproject will directly benefit 873 Ban Nadoung residents and an additional 2,580 persons living along the improved access road.

Western Loop Rural Access Road and Bridge Improvements

Community managed tourist destinations (i.e., caves, swimming lagoons, and cultural villages) will greatly benefit from the improved western access road. Road improvements will reduce travel time to and from Vang Vieng, increase visitor's and resident's safety and comfort, and improve residents access to markets and social services. The new bridge to be constructed across the Nam Song river as part of the subproject will relieve congestion in Vang Vieng urban core. The upgraded and expanded shoreline foot and bicycle footpath along the Nam Song river in Vang Vieng will provide a greenbelt and expanded recreation opportunities for residents and tourists. The subproject will benefit about 9,500 people living in 11 villages alongside the road and relieve urban congestion for 59,661 Vang Vieng residents.

Vang Vieng Urban Renewal

The improvements to lateral street drains, footpaths, and traffic management in the town will improve sanitation and pedestrian safety. The subproject will help prevent flooding, traffic congestion, and provide upgraded and new lateral footpaths with street lighting and landscaping to create a more pleasant urban environment. The subproject will benefit 4,051 residents (Ban Savang, Ban Vieng Keo and Ban Mueang Xong), tourists, and 143 hotels/guest houses and 126 shops/restaurants.

Vang Vieng Solid Waste Management Improvements

The upgraded solid waste management system for Vang Vieng, including the upgraded existing 9.3 ha dumpsite, will expand affordable solid waste collection services in Vang Vieng Town and surrounding villages. New garbage trucks, vaccuum trucks, and modern waste processing facilities at the upgraded landfill will improve santation and reduce greenhouse gas emissions. A materials recovery facility at the upgraded landfill will improve the safety and efficiency of solid waste recycling; and a new septage treatment facility will allow septic tank sludge to be stored and treated safely. The subproject will benefit 59,661 residents in Vang Vieng District and 143 hotels and guesthouses.

Potential Impacts

The seven subprojects are confirmed as Category B for environment pursuant to the SPS (2009).

Pre-construction phase

Negative impacts associated with the pre-construction phases are primarily associated with the social issues of land acquisition which will vary among the subproject components. At the feasibility design stage, land acquisition and resettlement (LAR) impacts are foreseen for two subprojects in Vientiane Province, namely: (a) Nam Ngum Reservoir Access Improvements, and (b) Western Loop Rural Access Road and Bridge Improvements. Out of a total of 59 affected households (AHs), 40 are at the Nam Ngum Reservoir and 19 at the Western Loop Road. 19 AHs at Nam Ngum Reservoir are severely affected due to having to relocate house and business. Amongst the total of 59 AHs there are 17 vulnerable households, out of which five are severely affected. The extent of required land acquisition and resettlement is reported separately in the Resettlement Plan prepared for Vientiane Province. The Champasak subprojects are not expected to have any land acquisition or resettlement impacts.

Vang Vieng dumpsite upgrades require an understanding of the water table depth, and groundwater quality to complete the detailed designs. Soil type and porosity at the site should also be determined before completing/selecting materials for cell lining. The separate groundwater and soils study forms part of the Environmental Compliance Audit (ECA) of the dumpsite that must be conducted. An ECA must be prepared because the dumpsite is an "*existing facility"* as defined by the SPS (2009). The terms of reference for the ECA are appended to the IEE.

The two EMPs for Champasak and Vientiane Province will need to be updated during the pre-construction phase to ensure they meet the safeguard requirements of the final detailed designs. This will involve finalization of mitigation sub-plans to manage potential impact areas such as biodiversity, erosion, sedimentation of surface waters, noise, dust and air quality, spoil disposal, traffic, and community and occupational health and safety at the project sites.

Construction Phase

The potential environmental impacts of civil works include reduced and/or blocked public access to areas, disrupted business and recreation, noise and dust caused by increased truck traffic and heavy equipment use, soil and surface water pollution caused by equipment operation and maintenance, risk of public and worker accidents, increased traffic congestion traffic accidents, land erosion and river and reservoir sedimentation, localized drainage and flooding problems, solid waste and domestic pollution from worker camps, and communicable disease and community conflict with migrant workers. The potential magnitude of construction impacts and disturbances will vary depending on the subproject component(s) and location.

The Nam Ngum subproject is located along the western shore of the Nam Ngum reservoir which was originally zoned as the Phu-En Provincial Protected Forest to protect the shoreline catchment area. The subproject area was subsequently re-zoned for tourist development by the Vientiane Provincial Tourism Development Master Plan (2011)[1]. While the Nam Ngum subproject activities are consistent with the re-zonation for tourism development, extra care is prescribed by the EMP to ensure that forest adjacent to the subproject area is not negatively affected by the subproject.

The National University of the Lao PDR was commissioned to conduct a rapid biodiversity assessment of the Phu En forest near the alignment of the loop road to be upgraded. The desk-study, forest survey, and local stakeholder surveys indicated that the forest type along

[1] Vientiane Provincial Tourism Development Master Plan, VTE No. 0411/11 March 2011.

the loop road alignment consists of regenerating mixed-deciduous forest recovering from logging and agriculture 3–15 years in the past. The regenerating forest does not support rare or endangered wildlife. The biodiversity assessment identified an action plan for the construction and operation of the upgraded loop road which has been incorporated into the EMP and Output 3 of the project.

The footpath and parking area of the Kaeng Yui Waterfall Access Improvements subproject are located outside the boundary of the Phu Ban District Conservation Area. Provincial officials indicated that there were no known sensitive wildlife species or critical habitats near the subproject area. Nonetheless, special mitigation measures are prescribed in the EMP to ensure that encroachment into the conservation area does not occur during the construction phase of the subproject components. Trees or vegetation along the boundary of the conservation area are not to be cut or disturbed and the contractors will be made aware of the need to avoid impacts. During detailed design a biodiversity survey of the Phu Ban forest near the waterfall will be conducted. The results of the survey will be used to enhance the tourist experience at the water fall. It is envisaged that photographs and descriptions of any special wildlife in the area will be presented to visitors to the waterfall on placards placed along the footpath to the waterfall.

Don Det/Don Khone Access Improvements subproject will potentially impede movement around the two islands during construction because the islands rely on the existing alignments (to be upgraded) for mobility. Construction activities should be scheduled to minimize disruption, and move equipment out of the way during specific scheduled times of the day. Construction of temporary alternate routes is not necessary given low traffic volumes.

Operation Phase

The potential impacts of completed subprojects operation will arise from (i) increased vehicle traffic along the upgraded access roads, (ii) increase solid waste and wastewater, and (iii) increase boat traffic and aquatic pollution. The increased vehicle traffic that will follow the access improvements to the subproject sites could increase risk of vehicle accidents and collisions with wildlife, and potentially increase noise and dust. Speed limits must be clearly posted and enforced along the affected roadways and be clearly lit as per the feasibility design. At all subproject sites, solid waste and wastewater disposal could become a problem if required operations and maintenance (O&M) budgeting is not provided to support the designed waste management systems. The new marina and market at Nam Ngum Reservoir will be fitted with a wastewater pump-out and storage station, waste oil depot, and required navigation and safety equipment.

Pursuant to Outputs 2 and 3 of the Project, the adoption of the Asean Tourism Standards (e.g., Clean Tourist City Standard, Green Hotel Standard, & Public Toilet Standard) and capacity development for Tourism Destination Management, respectively, will specifically manage for clean tourist sites. Solid waste collection and management will be addressed which is the single most important requirement at all subproject sites.

Climate Change

A Climate Vulnerability and Risk Assessment (CVRA) guided civil works preliminary designs and IEE preparation. The CRVA adopted climate change projections for rainfall and temperature prepared in 2016[2] for the subproject areas and modified subproject component designs such as road drainage capacity, bridge height and construction, and pier construction from national construction norms as the means to increase the resilience of the subprojects to climate change. The initial estimated marginal cost for climate change resilience of the road, pier and embankment components of the all seven subprojects is approximately 6.7 million. The project will generate greenhouse gas (GHG) from anticipated increased vehicle traffic on

[2] Hoang et al., 2016. Mekong river flow and hydrological extremes under climate change. Hydrol. Earth Sys. Sci. 20: 3027-3041.

subproject access roads, however, the increase in vehicles is not expected to exceed the 100,000CO_2e/a [3]. Moreover, the emissions of methane (CH_4) from the upgraded Vang Vieng landfill should decrease to zero or be minimal because of the gas capture and control technology that will be installed. Pursuant to Output 2 of the project the project-wide adoption of the Asean Tourism Standards (e.g., Homestay Standard, Clean Tourist City Standard, Green Hotel Standard, & Public Toilet Standard) will result in significant reductions in the carbon footprint of the subproject areas through increased energy efficiency (e.g., use of LED lighting) and reductions in GHG emissions.

The initial indicative sensitivity of the subprojects varies between Medium to High as assessed by the AWARE™ software tool due primarily to vulnerability to potential landsides and flooding. Water levels in Nam Ngum reservoir will not be an issue with climate change-induced increases in rainfall because the reservoir level can be regulated by the dam. The subprojects are being designed at the outset to be resilient to potential effects of projected future increases in rainfall intensity on flooding, and landslides as summarized below.

The factor of safety adopted for the height of the new bridge in Vang Vieng will accommodate increases in flood levels of the Nam Song river. Similarly, lateral road drains will be large enough to accommodate increased and flash stormwater runoff from increased rain intensity. Important design criteria for the upgraded access roads include; road bed grades that are high enough to reduce vulnerability to lateral flooding; sufficient cross drainage to prevent lateral ponding and flooding; road bed aggregates that shed water and are resistant to erosion; and asphalt grades and/or concrete that does not absorb water with adequate shoulder drainage from road crowns, and that are resistant to high heat.

Conclusions

The EMPs developed for each province provide impact mitigation plans, environmental monitoring plans, and specify the institutional responsibilities and capacity needs for sound environmental management of the seven subprojects. The EMPs need to be reviewed and updated at the detailed design phase to ensure that they fully address the potential impacts of the final designs.

The IEE concludes that the seven subproject's feasibility design descriptions combined with available information on the affected environments is sufficient to identify the scope of the project's potential environmental impacts. Given significant changes do not occur to the design of any subproject components, and that new sensitive environmental or social receptor data are not discovered, the subprojects will remain Category B for environment and will not require further detailed environmental impact assessment (EIA).

[3] ADB (2016) Guidelines for GHG Emissions Transport Projects

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I. INTRODUCTION

A. Background to IEE

1. The second Greater Mekong Subregion (GMS) Tourism Infrastructure for Inclusive Growth Project (TIIG) will develop small scale infrastructure to improve tourist facilities and develop and strengthen management capacity to enhance tourism at selected locations in Lao PDR, Cambodia, and Viet Nam. In Lao PDR seven subprojects have been selected for implementation in Champasak and Vientiane Province, which are addressed by the IEE presented herein.

2. The project will improve, environmental services, urban-rural transport infrastructure, strengthen capacity to implement regional tourism standards, and strengthen tourism destination management. It will help transform towns in the Greater Mekong Subregion (GMS) economic corridors into green, inclusive and competitive international tourism nodes to boost trade in services and deepen market linkages between members of the GMS and Association of Southeast Asian Nations (ASEAN). The subprojects will build on the ongoing ADB-financed GMS Tourism Infrastructure for Inclusive Growth Project (2014–2019) in Lao PDR.

3. The expected impact is sustainable, inclusive, and more balanced tourism development, as envisaged in the *ASEAN Tourism Strategic Plan 2016–2025.* The expected outcome is increased tourism competitiveness in project areas. Outputs include: (i) urban-rural access infrastructure and urban environmental services improved, (ii) capacity to implement ASEAN tourism standards strengthened, and (iii) institutional arrangements for tourism destination management and infrastructure operations and maintenance (O&M) is strengthened.

4. The subprojects in Vientiane and Champasak are listed below.

Table 1. Lao PDR subprojects

Champasak
• Nakasang Access Road and Port Rehabilitation • Don Det/Don Khone Access Improvements
Vientiane
• Nam Ngum Reservoir Access Improvements • Kaeng Yui Waterfall Access Improvements • Western Loop Rural Access Road and Bridge Improvements • Vang Vieng Urban Renewal • Vang Vieng Solid Waste Management Improvements

B. Assessment Context

5. The project is classified as category B for environment pursuant to ADB's 2009 *Safeguard Policy Statement*[4] and recent Good Practice Sourcebook.[5] A Category B project will have potential adverse impacts that are less adverse than those of a Category A project, are site-specific, largely reversible, and can be mitigated with an environmental management plan (EMP) as described in the Good Practice Sourcebook.[6]

[4] ADB. 2009. Safeguard Policy Statement. Manila.
[5] ADB. 2012. Environmental Safeguards, A Good Practice Sourcebook, Draft. Manila.
[6] Footnote 3, pg. 18, para 82.

6. The IEE was prepared for the subprojects at feasibility design stage, using available data and information on sensitive ecological and cultural receptors that exist at the different subproject sites. Detailed subproject designs will follow project approval. The IEE and EMPs prepared for the subprojects will be updated where necessary to meet the final detailed designs of the subprojects.

1. Impact Footprints

7. Most of the subproject components are improvements to existing infrastructure at established tourist sites, thus, the potential adverse environmental impacts will be marginal and are intended to improve the environment condition of existing tourist sites. The new impact footprints arise only from the new section of access road at Nam Ngum reservoir, and the Western Loop Rural Access Road's new bridge linking Vang Vieng town with the west bank of the Nam Song River.

C. Structure of the report

8. The IEE and the separate subproject EMPs follow the formats as set out in Appendix 1 of the SPS (2009). The IEE was conducted and the results presented by individual subproject by province to minimize redundancy of background information. The structure of the EMPs follows from and is consistent with the parent IEE.

II. POLICY, LEGAL, AND REGULATORY FRAMEWORK

A. National Environmental Laws, Strategies, and Policies

9. The national framework for the governance of environmental matters in Lao PDR includes a comprehensive set of environmental and natural resources related laws and regulations. Several government agencies are involved in environmental management.

10. In 2011, the Ministry of Natural Resources and the Environment (MONRE) was created by merging the Water Resource and Environment Administration (WREA) with departments of the National Land Management Authority (NLMA) and portfolios of other ministries including the Geology Department, and the Forest Conservation and Divisions within the Ministry of Agriculture and Forestry (MAF). The policies, laws relevant to environmental protection are listed below.

1. Laws

- Law on Environmental Protection as Amended No. 29/NA (2012)
- Law on Industry No. 01/99/NA (1999)
- Law on Hygiene, Prevention and Health Promotion No.01/NA (2001)
- Law on Water and Water Resources (1996)
- Law on Land (2003)
- Law on Roads No.203/PSD (2016)
- Law on Forestry (2007)
- Law on Cultural, Historical and Natural Heritage (2005)
- Law on Fisheries (2010)
- Law on Wildlife and Aquatic Ecology (2007)

2. Strategies, Plans, Policy

- The 7th National Social and Economic Development Plan (NSEDP) (2011-2015)
- Decree on Preservation of Cultural, Historical and Natural Heritage (1997)
- Decree on the Protection Forest (2010)
- National Forestry Strategy to 2020 (FS2020)

- National Biodiversity Strategy to 2020 & Action Plan to 2010 (NBSAP)
- Gibbon Conservation Action Plan 2011-2020
- Urban Master Plan (2001) No. 58/PM
- National Water Resources Strategy and Action Plan [draft]
- Strategy on Climate Change (2010)
- National Adaptation Programme of Action to Climate Change (NAPA) (2009)
- Strategic Plan on Disaster Risk Management in Lao PDR (2020, 2010) and Action Plan (2003-2005)
- Ministerial Instruction on the Process of Initial Environment Examination (IEE) of the Investment Projects and Activities No.8029/MONRE (2013)
- Ministerial Instruction on Environmental and Social Impact Assessment (ESIA) Process of the Investment Projects and Activities No.8030/MONRE (2013)
- Manual of Environmental Impact Assessment Procedures for Road Projects in the Lao PDR (1997).
- Regulation and Guidelines for the Environmental Assessment of Road Projects (1999), MPWT.
- Environmental Impact Assessment for Industry and Processing Handicraft Order No. 1222/MIH (2005)
- Regulation on EIA for Road Projects (2004)
- Decree on Compensation and Resettlement of People Affected by Development Projects (2006) and
- Technical Guideline on Compensation and Resettlement of People Affected by Development Projects (2013)

3. International Agreements

11. The Lao Government is party to international multilateral environmental agreements. Agreements pertaining to the project are listed below.

- World Heritage Convention (WHC) March 20, 1987
- Framework Convention on Climate Change (FCCC), 4 January 1995
- Agreement on The Cooperation for The Sustainable Development of The Mekong River Basin (Mekong Agreement), April 5, 1995
- Convention on Biological Diversity (CBD), September 20, 1996
- Montreal Protocol on Substances that Deplete the Ozone Layer, August 21, 1998
- Kyoto Protocol to United Nations Framework Convention on Climate Change (1998)
- Persistent Organic Pollutants (POPs), March 5, 2002
- ASEAN Agreement on Transboundary Haze Pollution, June 10, 2002
- International Plant Protection Convention (1997)

4. Environmental Standards & Criteria

12. National standards and criteria exist for drinking water quality, surface and groundwater quality, soil quality for agriculture, air quality and noise level standards, and wastewater discharge standards for BOD, NH_3-N, TSS, and pH. Specific standards are also available for certain chemical use by factories. The existing standards are found in the National Environmental Standard Order No. 2734/PMU-WREA (2009)

B. National Forest Management Types

13. Some subproject components are located adjacent to forested areas. The three primary forest types or categories with respect to forest preservation and development are defined below[7].

[7] From Law of Forests (2007)

1. Protection Forests

14. Protection forests are forests classified for the function of environmental protection defined by water resources, river banks, road sides, preventing soil erosion, protecting soil quality, strategic areas for national defense, and protection from natural disasters.

a. Activity Restrictions

15. Protected forests are further stratified into *total protected zones* and *controlled use zones.* The *total protected zone* is usually steep sloped, contains water resources including forests along rivers, roads and other areas with high risk of environmental degradation. These areas must be protected from activities such as crop rotation, cutting, or burning, tree removal, housing construction, extraction of soil, stones, or mining

16. The *controlled use zone* is the forest area without a perceived high risk of environment impacts. These areas must be protected like the total protection zone, but people can use wood and forest products according to the management plan. For example, Article 5 of the Forestry Law would apply which indirectly encourages the utilization of forests for research, tourism and recreational purposes.

2. Conservation or Reserved Forests[8]

17. Conservation forests are forests classified for the purposes of conserving nature, preserving plant and animal species, forest ecosystems and other valuable sites of natural, historical, cultural, tourism, environmental, educational and scientific research experiments. Conservation forests exist at the national, provincial, district and village levels.

a. Activity Restrictions

18. Like protected forests, conservation forests are divided into zones defined by *total protection zones, controlled use zones, corridor zones and buffer zones.* The *total protection zone* is the forest area that is main habitat, feeding and breeding place for various wild animals and it is the place of diverse and dense vegetation. In this zone, it is strictly prohibited to conduct any forestry activity, to harvest any forest products, including unauthorized entry in this zone. Examples are core zones of national parks or nature reserves.

19. The c*ontrolled use zone* is the forest area adjacent or close to the total protection zone. These areas must be protected like the *total protection zone,* but people can use wood and forest products according to the local management plan.

20. The *corridor zones* are managed areas for preserving tracts of forest to provide passage for animals between two conservation forests or between a conservation forest and another category of forest to preserve existing biodiversity and to increase the general wildlife population. In this zone, it is prohibited to cut trees, conduct forestry activities or any other activity that may obstruct or destroy the passage for the animals. The *buffer zones* are managed areas for preventing any encroachment and destruction in the conservation forest.

3. Production Forests

[8] Conservation forests commonly referred as reserved forests during discussions with agencies and village heads

21. Production forests are natural forests and planted forests that are actively utilized for wood production, and for wood and forestry product-related livelihoods to satisfy the requirements of national socio-economic development and people's living.

22. Two other managed forest categories which reflect the overall goal of the Government of forest restoration through community based forest management are *Regeneration Forests* and *Degraded Forests*[9].

4. Regeneration Forest

23. Regeneration forest is young fallow forest classified to regeneration and maintenance so that it increases in maturity toward a stage of natural equilibrium.

5. Degraded Forests

24. Degraded forest has been heavily damaged to the extent that land is barren without trees. The forest is classified for tree planting and/or allocation to individuals and organizations for tree planting, permanent agriculture and livestock production, or for other purposes.

C. National Environmental Assessment Procedure & Directives

25. Pursuant to the Environmental Protection Law (2012), development projects and operations that have the potential to affect the environment shall require environmental assessment in accordance with the regulations of MONRE (previously WREA).[10] MONRE is responsible for environmental management and monitoring, and the issuance of an Environmental Compliance Certificate (ECC) as per the Ministerial Instructions on the Process of IEE of the Investment Projects and Activities No.8029/MONRE (2013) and on ESIA Process of the Investment Projects and Activities No.8030/MONRE (2013).

26. The Project Owner in Lao PDR is the Ministry of Information Culture and Tourism (MICT). The MICT is required to conduct the initial environmental assessment (IEE) in accordance with the MONRE Directive. The provincial department of MONRE (DONRE) screens the project to determine whether the project is categorized as Group 1 or Group 2. Group 1 projects require an IEE and Group 2 projects an Environment and Social Impact Assessment (ESIA). For Group 2 projects, the project owner prepares a Scoping Report and Terms of Reference to be reviewed and approved by MONRE. Group 1 projects are approved at the provincial level (DONRE) and Group 2 projects at the national level (MONRE).

27. The technical and procedural aspects of above regulations and directives were recently combined into the UNDP-UNEP supported and MONRE-sponsored Environmental Impact Assessment Guidelines for Lao PDR (2012), which has been followed by the *draft* IEE guidelines (2013).[11] The 2012 EIA and 2013 draft IEE guidelines support the recently promulgated Decree of Environmental Impact Assessment (2010). The IEE requirements of the ADB SPS (2009) satisfy the IEE guidelines for Lao PDR

28. The Lao PDR's environmental assessment process does not dictate a formal timeline for the approval process for a project IEE/EIA, only the series of process steps. MONRE confirmed that there is not a formal timeline for the preparation and approval of an IEE or EIA, but that the normal timeline for the approval of an IEE or EIA as well as a RP and IPP after documents submission to MONRE is approximately 45 days. The environmental assessment process is completed after detailed engineering design. Environmental Compliance Certificates (ECC) for subprojects should be obtained prior to construction contract award.

[9] From NAFRI, 2007
[10] WREA now incorporated in the new MONRE
[11] MONRE 2012, 2013

D. ADB Safeguard Policy

29. The ADB Safeguard Policy Statement and Sourcebook (ADB 2009, 2012) clarifies the rationale, scope and content of an EA and is supported by technical guidelines (e.g., Environmental Assessment Guidelines 2003). Projects are initially screened using a Rapid Environmental Assessment (REA) Checklist to determine the level of assessment that is required. Projects that cause significant or major environmental impacts that are irreversible, diverse or unprecedented and/or affect an area larger than the sites or facilities subject to physical works are classified as Category A, an Environmental Impact Assessment (EIA) is required; Projects which have potential adverse impacts that are less adverse than those of category A, which are site-specific, largely reversible, and for which mitigation measures can be designed more readily than for category A projects are classified as Category B (an Initial Environmental Examination (IEE) is required); and Projects that are likely to have minimal or no negative environmental impacts are classified as Category C, environmental implications need to be reviewed.

III. SUBPROJECT DESCRIPTIONS

30. The subproject descriptions summarized in Table 1 are presented below. Subproject components that share similar activities or are in the same area are combined to minimize redundancy.

A. Champasak Province Subprojects

1. Nakasang Access Road and Port Rehabilitation

31. Nakasang port is about 5 km north of the Lao PDR–Cambodia border and a key entry point to the "4,000 islands" tourism area. In 2016, there were 5,760 boat trips with 138,833 passengers. Forecasts suggest ferry trips could reach 9,144 in 2026 with 220,401 passengers.[12]

32. The port and access road are linked to National Road 13, but in poor condition and susceptible to flooding. Drainage and sanitation arrangements are also inadequate and unsustainable. The subproject (illustrated in Figures 1–3) will address these issues by (i) reconstructing the 3.5 km access road with concrete paving (6 m carriageway) and side drains, including a turning area for buses; (ii) reinforce 45 m of riverbank protection with concrete; (iii) improve footpaths and ramps to floating river pontoons to provide safer passenger access; and (iv) divert the main drainage outlet (1,000 mm diameter) 15 m downriver, (v) reconstruct the 60m riverside path (3m wide). The subproject will directly benefit 1,6450 Nakasang residents, 228 boat operators, and about 100 vendors in Nakasang market. Table 2 summarizes the subproject components.

[12] ADB Second GMS Tourism Infrastructure for Inclusive Growth Project. Tourism Demand Analysis & Forecasts: Cambodia, Laos, & Viet Nam

Figure 1. Aerial view of Nakasang subproject

Figure 2. Subproject components in Nakasang town

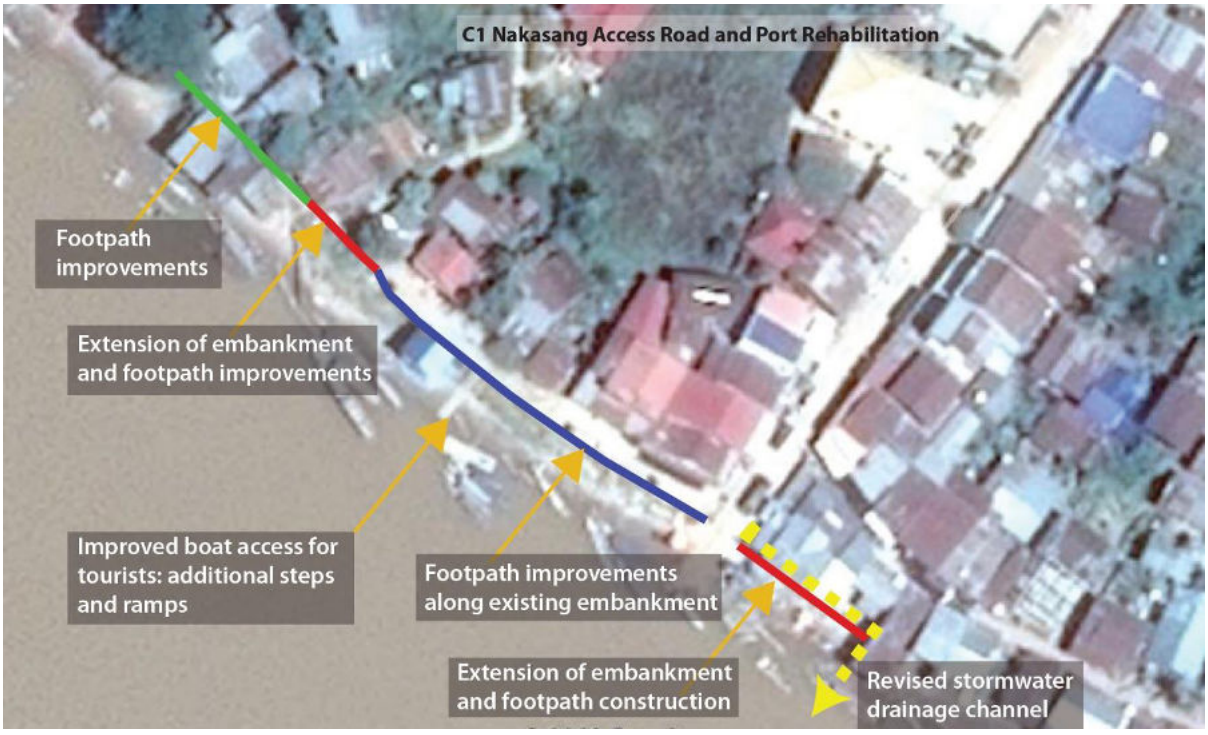


Figure 3. Visitor centre just north of the waterfront (Fig 2)

Table 2. Components of Nakasang and Don/Det Khone subprojects

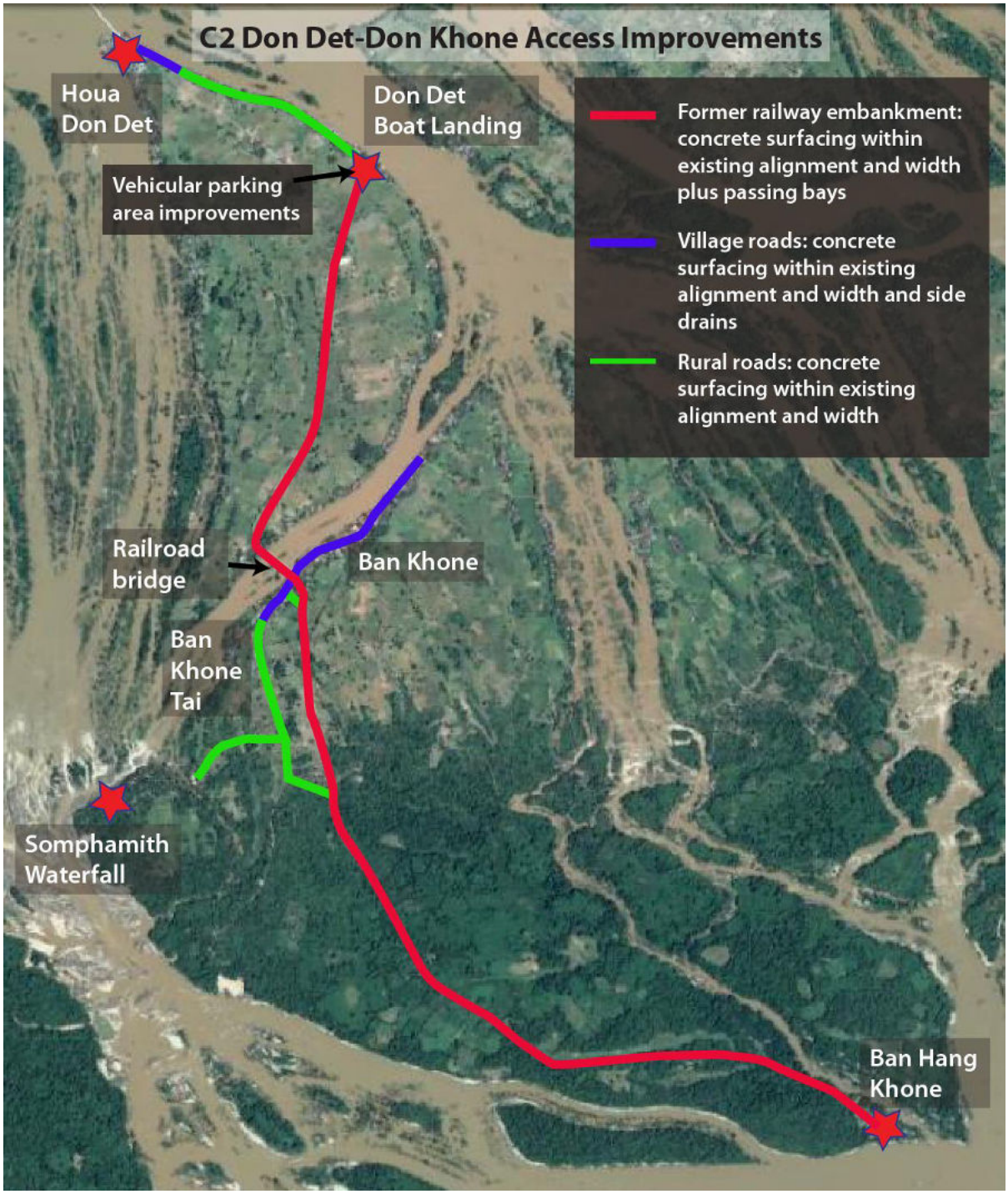
Nakasang Access Road and Port Rehabilitation	• Reconstruct 3.5 km X 6m access road with concrete & side drains including a turning area for buses; • Reinforce 45 m of existing riverbank protection with concrete; • Improve footpaths and ramps to pontoon pier for safer passenger access; • Divert main drainage outlet (1,000 mm diameter) 15 m downriver; and • Reconstruct 60m X 3m riverside path
Don Det/Don Khone Access Improvements	• Pave 11 km X 3 m access roads and passing bays with concrete; • Pave 780 m^2 vehicle parking area serving island ferry ports; • Improve cycle track/footpaths with gravel; and • Install public lighting and safety rails on old railway bridge linking Don Det and Don Khone islands

2. Don Det/Don Khone Access Improvements

33. Don Det and Don Khone Islands are part of the 4,000 islands, located 145 km south of Pakse. In 2016 there were 203,055 visitors and this could increase to 322,355 in 2026.

34. The island's narrow gravel/dirt roads are dusty during the dry season and become muddy, unsanitary tracks in the rainy season (Figure 4). The subproject will improve the situation by (i) paving the main 11 km network of 3 m wide access roads and passing bays with concrete; (ii) pave the 780 m^2 vehicle parking area that serves the island ferry ports; (iii) improve 1.5m wide cycle track/footpaths with gravel; and (iv) install public lighting and safety rails on the old railway bridge linking Don Det and Don Khone islands. The subproject which is summarized in Table 2 will directly benefit 1,240 Don Det and 1,345 Don Khone residents and improve visitor access and experience.

Figure 4. Components of Don Det /Don Khone subproject



B. Vientiane Province Subprojects

1. Nam Ngum Reservoir Access Improvements

35. Nam Ngum Reservoir recreation area (7.5ha) is in Keo Udom District, Vientiane Province, 90 km north of Vientiane Capital. An existing road connects the site to national road 10. Visitor arrivals reached 51,701 in 2016, but this is far below capacity. The site is significantly underused and lacking safe, attractive public facilities, quality tourism services, parking, and proper waste management and sanitation. The subproject will benefit 1,600

people living in nearby Ban Sengsavang and is expected to catalyze significant tourism related investment at the site. Figures 5 & 6 show the subproject area.

36. The subproject will address the access and sanitation issues as follows: (i) improving the existing public marina to safely accommodate 50-60 local tour boats and launch areas for small recreational boats and ferries; (ii) construct a 6m wide concrete loop road linked to National Road 10, with 1 m footpaths, and 1,200 m^2 parking area; (iii) redevelop unsanitary and poorly constructed market stalls into a new 3,200 m^2 public market that incorporates traditional Lao architectural design; (iv) install septic tanks in all public buildings and a wastewater pump-out station/holding tank at the marina; (v) replace abandoned, unsafe public buildings and piers with new public green space; and (iv) renovate the tourist information center. The subproject will supply 6-12 passenger electric vehicles for transfers from the parking area to the marina, to be operated under a private management contract. Table 3 summarizes the subproject components.

37. The direct beneficiaries of the subproject will be the market stall operators, hotels, and boat and water recreation equipment rentals which will stem from the increased numbers of domestic and international tourists that will come to the area because of improved recreation and sanitation. Employment opportunities for residents will increase, and the overall socioeconomy of the Nam Ngum reservoir area will be strengthened.

Figure 5. Aerial view of Nam Ngum reservoir and subproject

Figure 6. Tourist pier area from Fig 5.

Table 3. Components of Nam Ngum subproject

- Improve existing marina to safely accommodate 50-60 local tour boats and small recreational vessels, e.g. kayaks and sailboats;
- Construct 5.9km X 6m wide loop road to National Road 10 to DBST paving, with 1 m footpaths, and 1,200 m^2 parking area;
- Redevelop unsanitary and poorly market stalls into new 3,200 m^2 public market incorporating traditional Lao architectural design;
- Install septic tanks in all public buildings and a wastewater pump-out station/holding tank at marina;
- Replace unsafe public buildings and piers with new public green space; Renovate the tourist information center; and
- Provide 2-3 electric vehicles for tourist transfers from parking area to marina that will be operated by private management contract.

2. Kaeng Yui Waterfall Access Improvements

38. The Kaeng Yui Waterfall (Figure 7) is 6 km east of Vang Vieng town. It is accessed via a dirt road linked to National Highway 13 and managed by Ban Nadoung, which also operates homestay facilities. Visitor numbers rose from 23,940 in 2015 to 32,050 in 2016 and could reach 53,994 in 2026.

39. Key risks to tourism growth and management are poor access and the lack of facilities at the waterfall. To overcome these constraints the subproject will: (i) upgrade the 6-km access road to the waterfall with concrete pavement, with a 6m carriageway and drainage; (ii) level and pave the 875 m^2 parking area with gravel; (iii) improve kiosks in the waterfall market area; and (v) improve 300m footpaths, including rehabilitation of steps, small suspension bridges, and signage. The subproject will directly benefit 873 persons in Ban Naduang and

an additional 2,580 persons living along the improved access road as well as improving visitor access and experience. The subproject components are summarized in Table 4.

Figure 7. Kaeng Yui Waterfall subproject near Vang Vieng

Table 4. Components of Kaeng Yui waterfall access improvements

- Upgrade 6 km X 6m road access to waterfall with concrete and drainage;
- Level and pave the 875 m^2 parking area with gravel;
- Improve surfacing & drainage in waterfall market area; and
- Improve 300m footpath, including rehabilitation of steps, small suspension bridges, and signage.

3. Western Loop Rural Access Road and Bridge Improvements

40. The subproject area is west of Vang Vieng Town (Figures 8 & 9) and includes a 26km scenic loop road with karst mountains, caves, rivers and natural springs, many of which are community managed. Tourist arrivals are rising, but only at 2 sites closest to town. In 2016 tourist arrivals totaled about 80,000 which could reach 130,000 in 2026 if road and bridge access to the area is improved.[13]

[13] Footnote 11

Figure 8. Loop road west of Vang Vieng to be upgraded

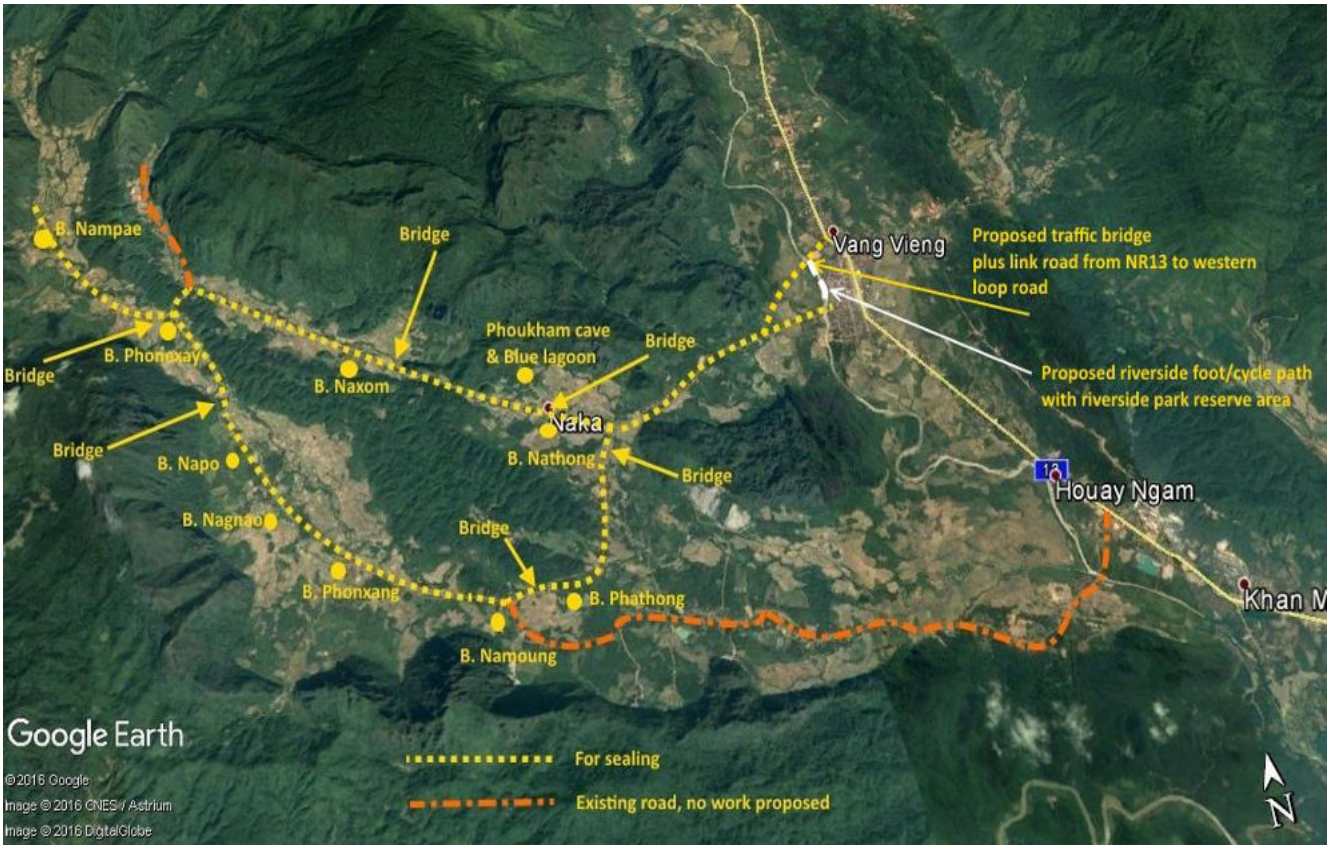


Figure 9. New bridge and section of loop road south of Vang Vieng.

41. The Western Loop Road subproject[14] will: (i) upgrade the 26-km loop road of western loop road to DBST paving with 6m carriageway and drainage in village areas; (ii) construct a new 2-lane 80m road bridge across the Song River south of Vang Vieng town centre (Figure 9) with 2.0km concrete feeder road connecting it to the Western Loop Road and a major street in Vang Vieng town; and (iii) provide bio-engineered river bank protection and improve the 1,100-m footpath/cycle track between the new bridge and Huay Yae village. The subproject will benefit about 9,500 people living in 11 villages alongside the road and relieve urban congestion for 59,661 Vang Vieng residents[15]. The subproject components are summarized in Table 5.

42. The subproject will enable larger tourist vehicles (coaches) and more tourists to cross the Nam Song river to access the various tourist destinations along the Western Loop Road which will directly benefit all tourist site operators. The new walking and bike path along the western shore of Nam Song river will expand the scope local touring and use of the river which will benefit bicycle and kayak rental operations. Overall, the subproject will result in more tourists coming to the area.

Table 5. Components of Western Loop Rural Access Road and Bridge Improvements

- Upgrade 26 km X 6m loop road west of Vang Vieng in DBST pavement with drainage in village areas;
- Construct new 2-lane 80m road bridge across the Song River (Fig 9) with 2.9 km concrete feeder road connecting it to western loop road NR#10; and
- Provide bio-engineered river bank protection and improve the 1,100-m footpath/cycle track extending north from Huay Yae village along western shore of Song river.

4. Vang Vieng Urban Renewal

43. The subproject includes most streets and lanes in Vang Vieng central and southern precincts (Figure 10). The area has the largest concentration of commercial space and tourists, which are expected to rise from 183,000 in 2016 to 312,565 in 2026. Currently, the area is congested, not pedestrian friendly, and lacks parking and adequate drainage.

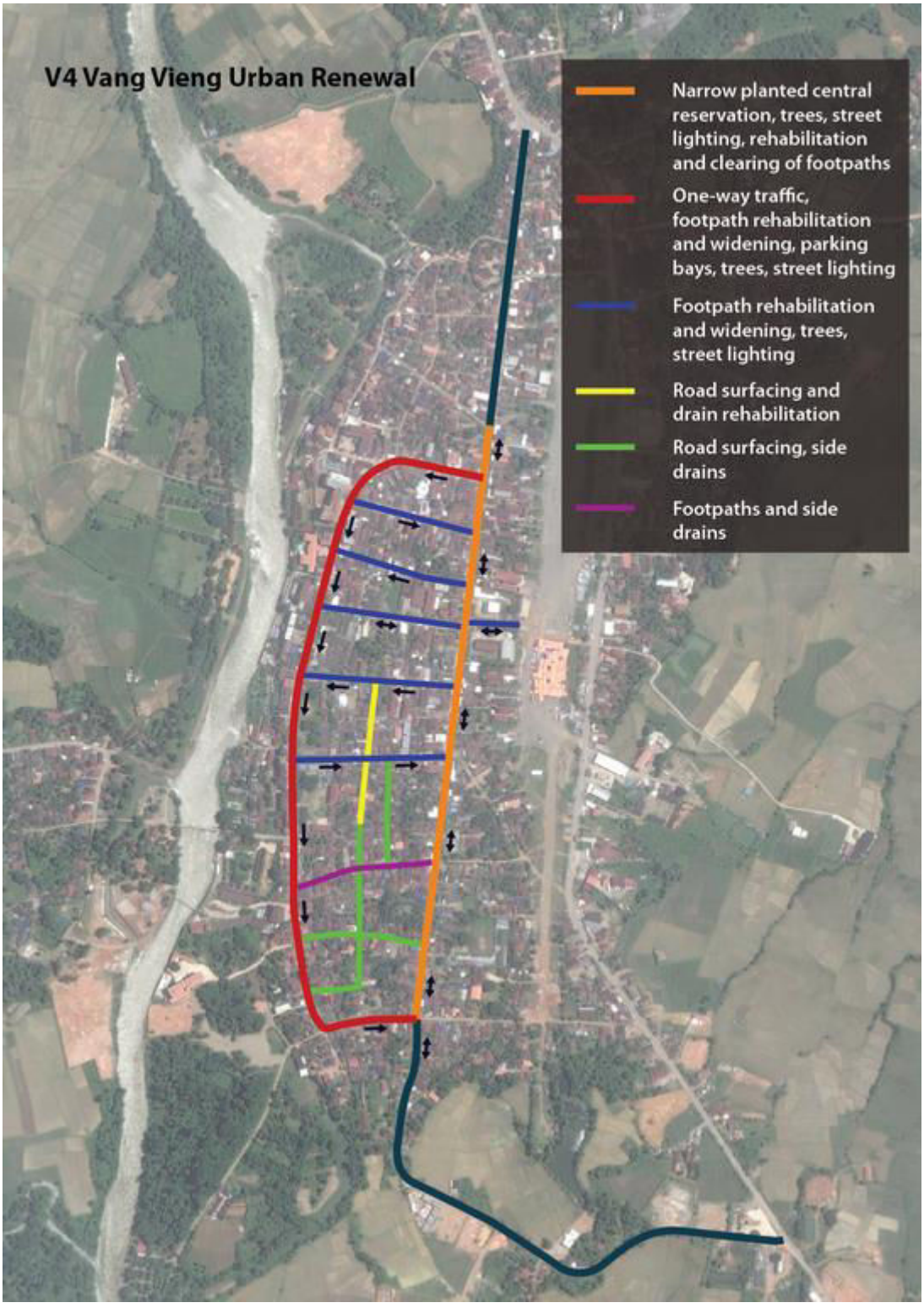
44. The subproject, summarized in Table 6, will: (i) rehabilitate 4.0 km of footpaths with suitable surfaces, street lighting, seating and soft landscaping; (ii) install traffic calming measures in streets with high concentrations of tourists; (iii) improve traffic management, including one-way traffic flows and shared surface concepts (1.5 km); and (iv) resurface and improve drains in residential areas (0.98 km). The subproject will benefit 4,051 residents (Ban Savang, Ban Vieng Keo and Ban Mueang Xong), tourists, and 143 hotels/guest houses and 126 shops/restaurants.

Table 6. Components of urban renewal in Vang Vieng

- Rehabilitate 4.0 km of footpaths with better surfaces, street lighting, seating and soft landscaping;
- Install traffic calming measures in streets with high concentrations of tourists;
- Improve traffic management including one-way traffic flow and shared surface concepts (1.5 km); and
- Resurface and improve drains in residential areas (0.98 km).

[14] Traffic projections under preparation at time of writing
[15] Footnote 11

Figure 10. Components of Vang Vieng urban renewal



5. Vang Vieng Solid Waste Management Improvements

45. Forecasts for Vang Vieng indicate visitor arrivals could increase to more than 230,000 in 2020, while the urban population increases by 1.2 % per year to 59,878 in the same year. The existing arrangements for solid waste management are unable to meet rising demand created by rapid urban growth and tourism. Consequently, approximately 20% (1,359) of Vang

Vieng's 4,800 households have access to reliable waste collection services. The insufficient overall capacity for solid waste management causes public health hazards for residents and visitors. The subproject will address this issue by developing a managed landfill 10 km south of the town on public land (9.3 ha) that is already being used as an open dumpsite (Figure 11). Subproject components will include: (i) preparatory earthworks and installation of a perimeter runoff interceptor drainage system; (ii) construction of an impermeable liner, leachate collection/treatment system, and a landfill gas recovery system; (iii) construct a small materials recovery facility for waste separation and recycling; (iv) medical waste treatment area; (v) septage treatment facility (0.5ha); and (vi) site office, toilets, and fencing. The landfill access road (1 km) will be paved with concrete (6m carriageway and verges) to accommodate collection trucks and other vehicles. On-site equipment will include 3 new 10 cubic meter collection trucks, bulldozer, and two vacuum trucks to support septage collection. Sanitation and waste management awareness programs will be supported under output 3 capacity building programs. The subproject is summarized in Table 8. The subproject will benefit 59,661 residents in Vang Vieng District and 143 hotels and guesthouses.

Figure 11. Location of Vang Vieng dumpsite to be upgraded

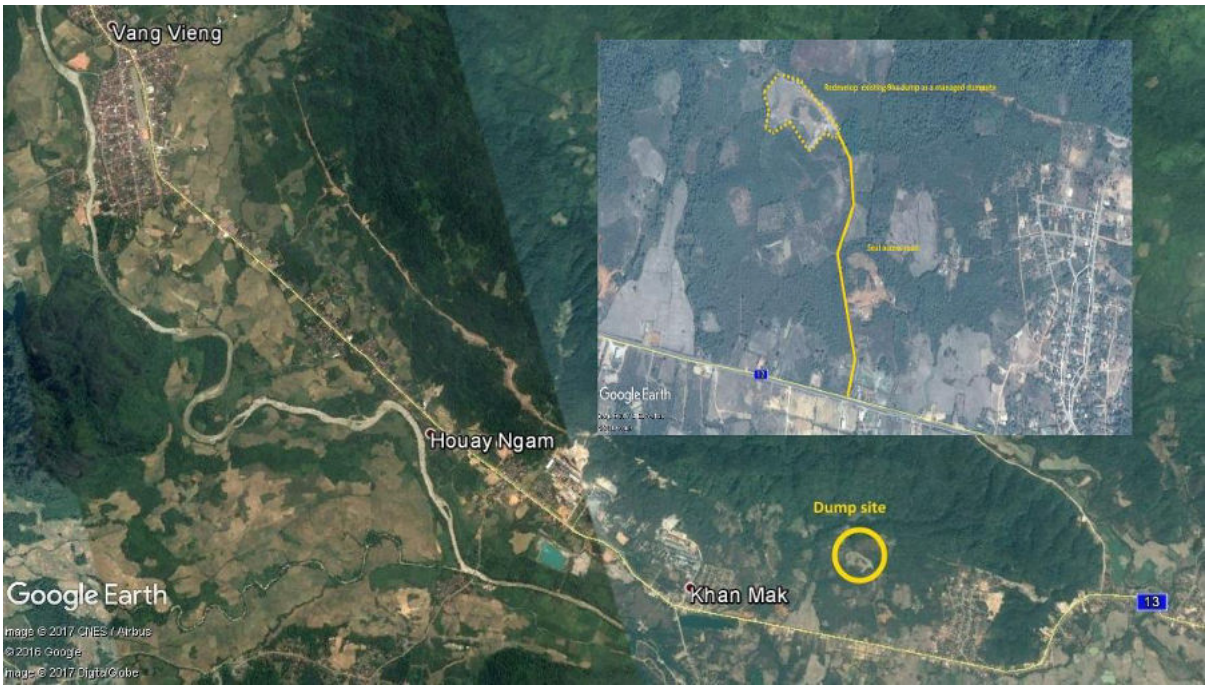


Table 7. Components of Vang Vieng Solid Waste Management Improvements

<u>Upgraded landfill</u> • Preparatory earthworks and installation of a perimeter runoff interceptor drainage system; • Construction of an impermeable line cells, leachate collection/treatment system, and a landfill gas (CH_4) recovery system; • Construction of small materials recovery facility (MRF) for waste separation and recycling; • Construction of a medical waste treatment area; • Construction of 0.5ha septage treatment facility (STF); <u>Support facilities</u> • Site office, toilets, and fencing • 3 new 10 m^3 collection trucks, bulldozer, and 2 vacuum trucks for septage collection • Access road (0.8 km X 6m) will be paved with concrete for collection trucks and other vehicles. • Sanitation and waste management awareness programs under Output 3 capacity building programs

IV. DESCRIPTION OF ENVIRONMENT

46. The description of the environments affected by the subprojects in Lao PDR is structured by the two provinces in which the seven subprojects are located. Sub-chapters A and B consist of the affected environments of Champasak province and Vientiane province, respectively. The concluding sub-chapter C presents photographs of the different subproject sites in Champasak and Vientiane provinces.

47. The environmental baseline information provided for the two provinces was obtained primarily from existing reports and available data provided by the provincial environment agencies including the DONREs, and Fisheries sections of the Provincial Departments of Agriculture and Forestry (PAFOs). Discussions with national counterpart agencies in Vientiane also provided additional information where relevant. In addition to applying available data/information, and intelligence obtained in meetings with provincial and national agencies, each subproject site was visited to inspect the specific environments that will be affected by the subproject components. Baseline water quality sampled were obtained for Nam Ngum reservoir and Nam Song river in Vang Vieng.

48. The description of affected environments is defined by natural features, and land use, and cultural features. While focus is on the seven subproject site areas, regional information is included where necessary. The potentially affected social, economic, and demographic features of the subprojects are provided in detail in the parallel social impact reporting.

49. Lao PDR is 236,800 km^2 and situated in the centre of the South East Asian peninsula between 13°54' and 22°30'N and between 100°05' and 106°38'E. The landlocked country which extends approximately 1,000 km at its longest length in a northwest to southeast direction is bordered by Cambodia in the south, Thailand and Myanmar in the west, the Peoples Republic of China (PRC) in the north, and Viet Nam to the east. Champasak Province and Vientiane Province are 2 of 17 provinces forming Lao PDR. Champasak is the southern-most province whereas Vientiane Province is a north central province.

A. Champasak Province Environment

50. The Nakasang Access Road and Port Rehabilitation subproject and the Don Det/Don Khone Access Improvements subproject in Kong District, are in Champasak province. The province covers an area of 15,415 km^{2}and is bound in the north by Salavan Province, Sekong and Attapeu provinces to the east, Cambodia to the south and Thailand to the west. The subproject areas are on the flat flood plains of the Mekong river and Siphandone (4,000) islands.

51. The area influenced[16] by the 2 subprojects in Champasak province is described as follows. The Nakasang Access Road and Port Rehabilitation subproject is on the eastern shore of the Mekong river just north of the two Mekong islands on which the Don Det/Don Khone Access Improvements subproject will occur. The influence of both subprojects will be restricted to Nakasang town and Don Det/Don Khone islands and the impact of the subprojects on the future residential and tourism enterprise community. There are no facilities of influence associated with the two subprojects. The direct impact of increased tourist activity on solid waste production in Nakasang town and on Don Det/Don Khone islands will need to be managed as part of the destination management planning for the subprojects. Solid waste pollution is currently increasing at the tourist port area in Nakasang town.

52. The Nakasang Access Road and Port Rehabilitation subproject is situated just north of the Don Det/Don Khone Access Improvements subproject. Both subprojects are on the shore or close to the Mekong river. The northern boundary of the Nakasang subproject which is defined by the start of the access road into Nakasang town is situated at 14º,01',22" N and

[16] SPS (2009), Appendix 1, para 6

105°,56',19E. The southern end of the subproject demarcated by the pontoon pier in Nakasang town is at 14°,00',03" N and 105°,55',11" E.

53. The land area influenced by the Nakasang subproject is comprised of agricultural lands and scattered plantation forest through which the access road to Nakasang town traverses. The primary agricultural crops are rice and vegetables. In Nakasang the area influenced consists of residential areas, and small business and markets. The subproject will also influence the short western shoreline of the Mekong river in Nakasang at the tourist pier. Land use of the subproject area is dominated by agriculture, urban livelihoods, fishing and boat transportation in the Mekong river, and tourism service.

54. The northern boundary of the Don Det/Don Khone Access Improvements subproject is situated at the northern tip of Don Det Island at Houa Don Det village at 13°,56',15N and 105°,56',54" E. The southern boundary is located at the southern tip of the adjacent Don Khone Island at Ban Hang Khone at 13°,51',80" N and 105°,54',46" E.

55. The area influenced by the Don Det/Don Khone subproject extends the area influenced in Nakasang. The two subproject islands are dominated with plantation/scrub forest, some agriculture land. The Mekong supports fishing and boat transportation livelihoods. Tourism services are the dominant activity on the islands which consist of water creation in the Mekong, walking tours, and spectacular vistas of the unique cataract in the Mekong river on western and eastern sides of Don Khone island.

1. Climate

56. The local climate is dominated by the monsoon regime with a southwest monsoon (humid, hot) from late March to October and the northeast monsoon (dry and cooler) from November to early March. The climate of the area is humid with average temperature at around 28°C and minimum temperature of 23.2°C and highest temperature at 32.2°C. Average annual rainfall is 889mm and average number of days of rain is 107 per year. Annual average evaporation rate is 1,285mm. Annual humidity rate is 70%. A more detailed climate change risk and vulnerability assessment (CRVA) is included at the end of the impacts and mitigation chapter.

2. Topography

57. As indicated above the subproject areas in Champasak lie in the relatively flat areas within the Mekong flood plains between 103m and 115m above sea level (masl).

3. Water resources

58. The dominant and most important water resource in the area is the Mekong river into which the nearest major tributary - the Xedon River flows. Most of the local people rely on the Mekong as the sole source of water for cleaning and disposal of solid and liquid wastes. Bottled drinking water is used especially by tourists. Consequently, the waters of Siphandone channels of the Mekong river as the river breaks up and surrounds the reported 4000 islands in the river commonly show signs of river pollution (foam development and solid waste flotsam), while local health authorities report a variety of health hazards caused by faecal contamination and vector borne diseases resulting from general lack of sanitation coupled with the high (and increasing population density).

59. Contrastingly, the EIA for Don Sahong Hydro Power Project (HPP) reports the Mekong river at the subproject area to be clean and unpolluted. The water quality data for the Mekong River at Pakse generally falls within acceptable limits for both drinking water and ambient surface water quality.

4. Community Fisheries

60. Fishing is one of the main sources of income to the community in the subproject area. During the rainy season, many types of fish (Table 8) are caught and sold at Pakse market through middlemen. Pakse market are usually flooded with a variety of fish from the region with prices ranging from 25,000 Kip/kg to 100,000 Kip/kg depending on the type of fish. Several tones are caught daily. The most common fish species caught are *Cirrihinus microlopis, Bengana behri, Hemibagrus wyckiodes, Micronema spp, Cf. barbatula* and *Henichorychus lobatus.* In the rainy season, many fish species are caught with the traditional method using bamboo fish traps (Figure 12A). None of the fishes in Table 8 are protected or of particular conservation significance.

Table 8: Common Fishes found in Khong District (from Don Sahong HPP)

Lao PDR Name	Scientific Name	Common Name
Dry Season Upstream Migration – 4 Months December to April		
	Cyprinidae	
ปาปຽน	*Scaphogenus bandanesis*	Pa Pien 9
ปาปຽน	*Scaphogenus steinegri*	Pa Pien 13
ปาผอม	*Cirrihinus microlopis*	Pa Pawn
ปาแยง	*Cirrihinus nolitrrella*	Pa Geng
ปาหว้าสิง	*Labeo erythropterus*	Pa Wa Soong
ปาหว้าໜ้ານໍ	*Bengana behri*	Pa Wa Na Noor
ปาสะลี	*Erythopterus melangira*	Pa Sree
ปาปากนุด	*Hysibarbus sp.*	Pa Pak Nout
ปาสะอิอ	*Numerous Small Cyprinids*	Pa Saew
Wet Season Upstream Migration – 3 Months – mid-May to mid-July		
	Pangasidae	
ปาเผี้ย	*Cf. barbatula*	Pa Phia
ปาเปาะ/กิ	*Pangasius conchophilus*	Pa Por / Gae
ปาบึง	*Pangasius larnaudii*	Pa Beung
ปาຊ้อยหางเหຼືองๆ	*Pangasius krempfi*	Pa Sooai Hang Leuang
ปาหนู	*Heicophagus waandersii*	Pa Noo
ปายอม	*Pangasius macronema*	Pa Nyawn
ๆๆปายอมหางกิม	*Pangasius pleurotaenia*	Pa Nyawn Tawng Khom
	Bagnidae	
ปากิด	*Hemibagrus filamentosous*	Pa Kot
ปาเคิง	*Hemibagrus wyckiodes*	Pa Kung
	Siluridae	
ปาคิบ	*Belodonthicthys dinema*	Pa Khop
ปานางแดง	*Hemisilurus mekongensis*	Pa Nang Deng
ปานาง	*Micronema spp*	Pa Nang
ปาปีกาใหย่	*Kryptopterus spp.*	Pa Peekgai 1 & 2
ปาปีกาใหย่	*Ompok hypothalamus*	Pa Peekgai 3
ปาเซือม	*Ompok bimaculatus*	Pa Seum

Lao PDR Name	Scientific Name	Common Name
	Sisoridae	
ปาแข้ใหย่	*Bagarius yarrelli*	Pa Khe Yai
ปาแข้น้อย	*Bagarius*	Pa Khe Noi
	Cyprinidae	
ปาใน	*Cyprinus carpio*	Pa Nai
Downstream Migration - 6 Months – June to December		
	Cyprinidae	
ปาส้อยหัวแห฼ม	*Henichorychus lobatus*	Pba Soi Hua Lem
ปาส้อยหัวโป	*Henichorynchus siamensis*	Pba Soi Hua Bo
ปาลางกົม	*Labiobarbus spp.*	Pba Lang Khon
ปาแตบ	*Paralabuca spp.*	Pba Dtep
ปาก฽ง	*Lobocheilus melanotaenia*	Pba Kiang
ปาตอกต้อย	*Crossocheilus sp*	Pba Tok Toi
ปาเอิน	*Probarbus jullieni*	Pba Eun

Figure 12. Fishing in the subproject area


Figure 12A: Children harvesting fish from fish traps at Hang Khone island

Figure 12B: Large fish species sold at Pakse market

Figure 12C: Fish species sold in Nakasang market

5. Agriculture

61. In addition to fishing, agriculture is another major source of income for the community in the subproject area. Much of the local land area of Nakasang and along the access road,

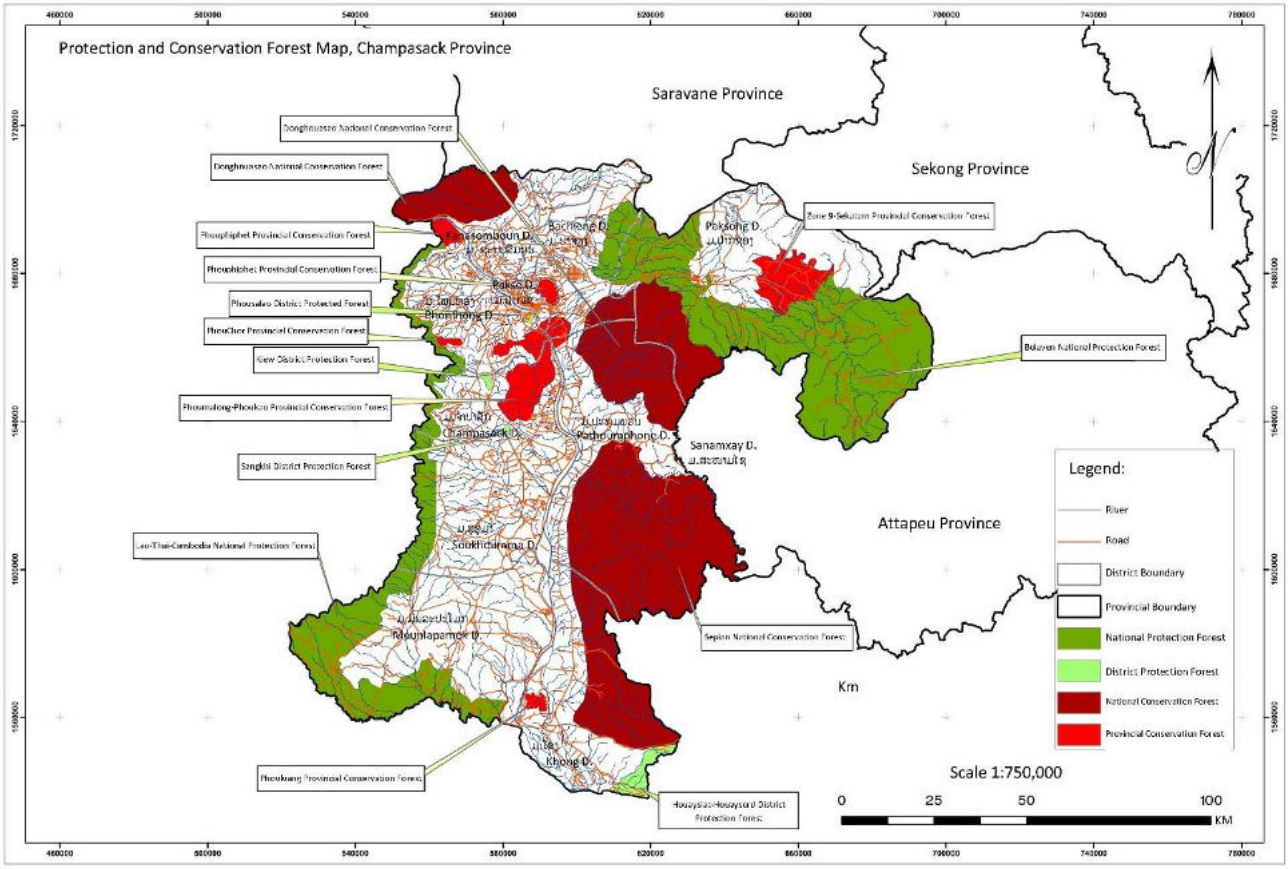
and on Don Det – Don Khone is rice paddy. Khone island is the biggest rice production area within the subproject area. Rice growing occurs primarily during the wet season and only the glutinous variety. Rice yields are averaged at around 3-5 tones / ha.

6. Forest Resources

62. In Champasak there are three national conservation forests (Dong Houa Sao, Xepian, and Phou Xieng Thong), and two national protected forests (Phouphieng Bolevens, Lao-Thai-Cambodian protected forest). There are also five provincial conservation forests, namely Phou Phiphed, Phou Chor, Phou Malong-Phou Khao, Phoulouang and Zone 9 Xekatam, and four district protected forests namely Phou Saloua, Kiew, Sangkhi, and Houay Siat-Houay Sord (Figure 13).

63. However, the subprojects areas do not lie within any of the conservation or protected forests. The closest is the protected forest of Houay Siat-Houay Sord which lies about 10 km to the east and the Xepian National Conservation Forest, about 12 km to the north-east.

Figure 13. Champasak conservation and protected areas



7. Biodiversity

64. The Mekong river and tributaries are rich in species diversity. More than 481 fish species out of 924 species in the Lower Mekong Basin have been identified in the Lao PDR as reported by Mekong River Commission (MRC). At least 35 major species have been identified within the Siphadone area (
Table 8). Other aquatic animals including mussels, snails, turtles, frogs, shrimps and crabs are also commonly consumed in the area. The only species of conservation significance near the project area is the endangered Irawaddy dolphin (*Oracaella brevirostris*) which occupies the Mekong river south of Don Khone Island and the subproject area. However, the subproject

will not affect the river habitats of this species. The only shoreline subproject work is at Nakasang town which is located well upstream of the range of the dolphin, and north of the large rapids of the Mekong river which form a natural physical barrier to migration of any aquatic animals above Don Khone Island. The analysis of biodiversity values of the two subproject areas with IBAT software supports the absence of protected areas (Appendix A). The Siphandon island archipelago and cataracts of the Mekong river identified by IBAT is the nearest unique landform that will not be affected by both subprojects.

8. Provincial Heritage

65. There are 60 cultural sites (29 temples) and 40 historical heritage sites in the province. Three heritage sites are within the subproject area which are French colonial infrastructures as identified by the Provincial Information Culture and Tourism Department. The main cultural/historical heritage within the province is the Vat Phu World Heritage Site which lies some 100 km north of the subprojects.

B. Vientiane Province Environment

66. The following 5 subprojects are in located Vientiane province:

- Nam Ngum Reservoir Access Improvements
- Kaeng Yui Waterfall Access Improvements
- Western Loop Rural Access Road and Bridge Improvements
- Vang Vieng Urban Renewal
- Vang Vieng Solid Waste Management Improvements

67. Vientiane Province lies directly north of Vientiane Capital. The province covers an area of 15,927 km^2. It shares its borders with Xayaboury Province to the west, Luang Prabang Province to the north, Xieng Khouang Province to the northeast, Borikhamxay Province to the east and Vientiane Capital and Loei Province in Thailand to the south.

68. The topography varies from the relatively flat narrow strip of the Vientiane plain in the south between NR13N and NR10 to the mountainous terrains of Vang Vieng and Kasy Districts to the north with elevations ranging from 200m to 1,761m. The areas influenced[17] by the 5 subprojects in Vientiane are summarized as follows.

Nam Ngum Reservoir Access Improvements

69. The Nam Ngum Reservoir Access Improvements subproject is the southern-most subproject in Lao PDR located between 18^o,31',40"N and 102^o,33'.00"E which is the existing access road and future parking area, and 18^o,30',15"N and 102^o,35',53"E which demarcates the southern end of the loop access road to be upgraded. The recreation area at the reservoir shore is located in between these north-south boundaries. The immediate impact of the subproject is restricted to the recreational area of the reservoir, and from the new and upgraded sections of the loop road connecting to NR10. The subproject will upgrade a 2km section of dirt road and footpath as part of the 5.9km loop road to be upgraded (Table 3).

70. There are no external facilities associated with the subproject. The temporal targeted impact of the subproject will be manifest as increased tourist facility development, and then likely the residential community in vicinity of reservoir resulting from the improved infrastructure. The local socioeconomy will be strengthened accordingly. The resultant impact of increased solid waste production at the recreational area of the reservoir will need to be managed as part of the destination management planning of the subproject.

[17] Footnote 16

71. The land area influenced by the Nam Ngum subproject is comprised of almost 100% provincial forested land (see below) that surrounds the strip of recreational shoreline area of the reservoir where the main subproject activities are located. The principal land use is tourism recreation associated with the reservoir and some NTFP harvesting. No agriculture of scale other than home gardens is practiced. The reservoir is used for recreation and livelihood fishing as well as hydroelectric power generation.

Kaeng Yui Waterfall Access Improvements

72. Due north from the Nam Ngum subproject is the Kaeng Yui Waterfall Access improvements subproject which is the northern-most subproject in Vientiane province. The subproject is bound in the north by the footpath and market/parking area at water fall at 18º,57',12"N and 102º,29',34"E. The access road to the water fall to be upgraded extends southwest from the market/parking area to 18º,55',47"N and 102º,27',07"E at Vang Vieng town.

73. Similar to Nam Ngum subproject the immediate impact of the infrastructure work at the Kaeng Yui waterfall area will be restricted to the upgraded facilities defined by new parking lot, and improved vendor kiosks, and footpath up to the cascade. The other impact area will be the improved access road from Vang Vieng including roadside drainage in Ban Naduang village. The targeted impact of the subproject will be increased tourist visitation to the waterfall and associated increased small-scale commercial tourist development and increased income of Ban Naduang residents whom manage the tourist site. The potential future impact on solid waste production at the site and in Ban Naduang village will need to be managed as part of the destination management planning of the subproject. There are no facilities associated with the subproject.

74. The area affected by the Kaeng Yui Waterfall subproject is mostly agriculture land comprised of rice paddy and vegetables, along with scattered plantation forest located along the access road to the waterfall that will be upgraded by the subproject. Homesteads exist along the access road which passes through the village of Ban Naduang. At the northeast end of subproject, the Kaeng Yui waterfall, the footpath to the waterfall, and vendor kiosks at the beginning of the footpath are located on the fringe of district conservation forest (see below). Land use at the waterfall area is restricted to tourism services defined by food and souvenir kiosks.

Western Loop Rural Access Road and Bridge Improvements

75. This east-west oriented subproject extends west from Vang Vieng town. The western reach of the loop road is located at Ban Nampae village at 18º,58',08"V and 102º,19',21"E. The eastern end of the subproject is formed by the new road that will be constructed west from NR#13 to the new bridge across the Nam Song river to form the north-eastern bypass of the Vang Vieng town to allow larger tourist vehicles to access the western loop road and the various tourist sites along the road. The beginning of the new bypass road from NR#13 is at 18º,55',59"N and 102º,26',27"E.

76. The full impact of the completed upgrades to the loop road and in particular the new bridge over the Song river south of Vang Vieng will be realized over time by steadily increased visitation at the various tourist sites along the road. Following the increase in tourists will be increased development and income from the existing sites and likely the development of new tourist sites. The potential impact on solid waste production at the sites and along the loop road will need to be managed as part of the destination management planning of the subproject.

77. Similar to the access road to the Kaeng Yui waterfall, the 26km western loop road traverses predominantly rice paddy and vegetable growing lands along with scattered plantation forest. The new section of road extending to the Nam Song river is 100%

agricultural land. The new bridge will cross the Nam Song river with the new approach road extending through scrub agriculture land to NR13. Thus, the dominant land use of the subproject influenced area is agricultural with tourism services delivered at the established tourist sites to which the loop road provides access.

Vang Vieng Urban Renewal

78. The urban renewal subproject in north-south oriented Vang Vieng town will occur inside town boundaries between 18º,55',54"N and 102º,27',16"E. The area affected by the subproject is urban to peri-urban. Residential and business establishments comprise the subproject area of influence. The other area influenced by the subproject are the tourist attractions and services offered by the town which are centred on the Nam Song river. The river provides extensive kayaking, canoeing and swimming opportunities as well as cycling along the riverbanks. The immediate spatial area of impact of the subproject will be defined by the upgraded streets and drainage. Similar, to the western loop road upgrades, the targeted future impact of the subproject is increased tourism and a strengthened socicoeconomy of Vang Vieng town.

Vang Vieng Solid Waste Management Improvements

79. The existing Vang Vieng dumpsite where the upgraded managed landfill will be constructed is located at 18º,52',04"N and 102º,30',15"E. The short access road from the dump that will be upgraded extends south to NR#13 at 18º,51',37"N and 102º,30,12"E. The area influenced by the subproject is comprised of scattered agriculture land and scrub forest. The nearest settlement is more than 1 km to the east. Unlike the other subprojects in Vientiane, the targeted future impact of the upgraded managed landfill is remote to the site, and defined by a cleaner and healthier urban Vang Vieng environment which should be manifest indirectly in increased tourism to the town and vicinity.

1. Climate

80. Mean annual temperature is about 26.6ºC with a mean maximum of 31.6 º C and mean minimum of 21.5 ºC. The monsoon-influenced climate produces average annual rainfall of around 1,936mm with higher averages in specific areas. Within the Nam Ngum reservoir area, the recorded mean annual in the last 10 years is 2,434mm. The mean rainfall from May to September generally exceed 280mm and the peak in July and August at over 500mm. The dry season is particularly pronounced with average December to February rainfall below 18 mm. Rainfall varies significantly from year to year. Table 9 shows total rainfall for 2007-2016 recorded at the Nam Ngum Dam. The years 2003 and 2093 were particularly dry.

Table 9. Total Rainfall (mm) registered at Nam Ngum 1 Dam from 2007-2016

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2007	0.0	25.5	0.0	44.0	307.5	254.8	220.2	416.3	545.8	203.8	2.7	0.0	2,020.4
2008	19.5	57.0	93.0	150.3	462.8	640.0	601.2	361.5	432.6	177.3	109.3	0.0	3,104.3
2009	0.0	4.8	4.8	53.0	395.3	422.5	417.0	348.3	233.3	173.5	0.0	0.0	2,052.4
2010	132.0	0.0	0.0	136.3	185.8	427.5	643.8	831.5	691.5	35.7	0.0	8.3	3,092.2
2011	0.0	27.8	110.3	54.0	435.8	532.8	786.8	1,119.5	629.8	70.0	15.8	0.0	3,782.3
2012	1.0	9.7	41.5	188.3	341.8	387.7	534.5	98.2	180.5	77.3	50.8	0.0	1,911.2
2013	0.0	19.0	70.5	29.0	156.1	363.7	363.7	619.3	337.3	33.3	0.8	32.5	2,025.0
2014	0.0	0.0	20.3	81.5	162.3	372.5	510.1	423.1	393.3	12.6	58.7	0.0	2,034.3
2015	39.9	18.8	17.3	3.9	216.0	76.6	635.4	691.3	310.6	262.7	0.0	54.9	2,327.3
2016	70.0	0.0	2.3	35.8	179.5	428.4	398.3	302.1	422.0	117.8	42.0	0.0	1,998.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Mean	26.2	16.3	36.0	77.6	284.3	390.7	511.1	521.1	417.7	116.4	28.0	9.6	2,434.7

Source Station: Nam Ngum 1 Hydropower Station

2. Topography, Geology, and Soils

81. Vang Vieng town lies northwest of Nam Ngum reservoir in the Nam Song valley at an elevation of around 240 masl with mountainous area to the east and west reaching over 1,520 masl. Whereas the Nam Ngum subproject area along the reservoir perimeter is around 215 masl.

82. Based on the National Geographic Department's geological map (2008), the Vang Vieng subproject areas comprises Quartenary fluvial sand, silts and clays in the Nam Song valley interspersed with Lower Permian marine limestone karsts. The Nam Ngum area comprises of mainly Lower Cretaceous sandstone and siltstone.

3. Water resources

83. The main water body within the Vang Vieng subproject area is the Nam Song. Originating in Phoukeo, the 80-km river flows through Vang Vieng District for most of its length (36 km) and discharges into the Nam Ngum reservoir some 40 km to the southeast of Vang Vieng town via a diversion weir. The river's catchment area covers 180,434 ha with more than 70% of this area within Vang Vieng District. The river provides livelihoods for farming, fishing, tourism and water supply. The water quality of Nam Song is a concern due to the increasing population and industrial and tourism developments.

84. The Nam Ngum subproject is on the western shore of the Nam Ngum reservoir less than 1 km south of the hydropower dam. The reservoir has an area of 450 km^2 at full supply level. The declining electricity generation in the last two decades has instigated projects for the diversion of the Nam Song (1996) and Nam Leuk (2000) to boost the capacity of the reservoir. The reservoir is home to a fish production industry.

a. Water quality

85. The water quality of the Nam Song river and Nam Ngum reservoir at the subproject sites (Figures 14 & 15) was sampled in 2017.

Figure 14. Water sampling locations in Nam Song river, Vang Vieng

Figure 15. Water sampling locations in Nam Ngum reservoir

86. In general, water quality of Nam Song and Nam Ngum Reservoir is good when compared to National Standard of Lao PDR No.81/Gov. The Nam Song river experiences higher turbidity, total nitrogen and faecal coliform than Nam Ngum reservoir (Table 10). Nam Song river has been intensively used for recreational activities and it also receives both surface runoff and household's wastewater from Vang Vieng town. It is noted that Nam Ngum Reservoir has high faecal coliform at sampling site 2 where there are many restaurants and shops in vicinity of this area (Table 11).

Table 10. Water quality of Nam Song at Vang Vieng

Parameter	Unit	Location 1	Location 2	Location 3	Location 4	National standard no. 81/gov, dated 21 February 2017
Turbidity	NTU	15	15	16	16	20*
Total Nitrogen	mg/L N	1.3	0.6	0.6	0.6	<200***
Zinc	mg/L Zn	ND	ND	ND	ND	1.0**
Lead	mg/L Pb	ND	ND	ND	ND	0.01**
Iron	mg/L Fe	0.905	1.05	0.701	0.940	1.0*
Faecal coliform	MPN/100 ml	240	350	540	540	4,000**
Colour/Turbid	-	Colorless/ clear	Colorless/ clear	Colorless/ clear	Colorless/ clear	N'
Sediment	-	Yellow	Yellow	Yellow	Yellow	NA

Note: Tested from samples taken 27th July 2017

Table 11. Water quality of Reservoir at Nam Ngum

Parameter	Unit	Location 1	Location 2	Location 3	Location 4	National standard no. 81/gov, dated 21 February 2017
Turbidity	NTU	1.6	1.6	1.6	1.6	20*
Total Nitrogen	mg/L N	1.82	1.30	1.10	1.10	<200***
Zinc	mg/L Zn	ND	ND	ND	ND	1.0**
Lead	mg/L Pb	ND	ND	ND	ND	0.01**
Iron	mg/L Fe	<LOQ	<LOQ	<LOQ	0.05	1.0*
Faecal coliform	MPN/10 0 ml	130	1,100	49	7.8	4,000**
Colour/Turbidity	-	Colorless/cl ear	Colorless/cl ear	Colorless/cl ear	Colorless/cl ear	N'
Sediment	-	Brown	Yellow	Yellow	Yellow	NA

Note: Tested from samples taken 26th July 2017

* - Groundwater-drinking water quality
** - Surface water quality
*** - Wastewater effluent (general industrial wastewater discharge)
N' - Natural water but the temperature change is not more than ±3^{O}C
NA - Data not available

4. Aquatic ecosystems

87. Lao PDR has maintained relatively diverse aquatic ecosystems defined by rivers, streams, ponds, small lakes, and reservoirs. The aquatic ecosystems are subject to a variety of human activities such aquaculture, fishing, the creation of rice paddy, and the construction of dams and irrigation weirs. In upland rural areas, aquatic resources are important sources of protein in the local diet, dominated by fin fish, and shellfish including mollusks, and crustaceans. Aquatic insects, amphibians, and reptiles that inhabit the water bodies add to the overall biodiversity. Threats to aquatic ecosystems include over fishing, the use of damaging fishing techniques such as blasting and poisoning, upstream use of pesticides, release of pollutants and the introduction of exotic fish species for aquaculture.

5. Community Fisheries

88. Community-managed fisheries have been established throughout Lao PDR.[18] Common fish species of the Nam Song and Nam Ngum reservoir are listed in **Error! Reference source not found.** and Table 13.

[18] Fisheries Section of MAF, Vientiane, 2013

Table 12. Common Fishes of Nam Ngum Reservoir Fisheries[19]

Lao PDR Name	Scientific Name	Common Name
ปาฝา	*Pelochelys cantorii*	Soft shell turtle
ปาโด	*Channa micropeltes*	Giant Snakehead
ปาเดิง	*Mystus wyckioides*	Redtail catfish
ปาปาก	*Hypsibabusvernayi*	Silver barb carp
ปาข้างปาน	*Hampala dispar*	Pa Sood Noi
ปานกเค้า	*Osteochilus melanopleurus*	Pa Nok Khao
ปาอี่ไท	*Osteochilus schlegeli*	Ee Thai
ปาคูน	*Wallago leeri*	Pa Khoun
ปาแดง	*Irrhinus molitorelle*	Mud carp
ปานาง	*Micronema bleekeri*	Pa Nang
ปาแก้อ	*Clupeichthys goniognothus*	Sumatran river sprat
ปาซิวเค้า	*Rasbora paviei*	Pa Siew Khao
ปาสะโทง	*Xenentodon cancila*	Pa Sathong
ปาเผื้ย	*Morulus chrysophekadion*	Sailfin shark
ปายอน	*Pangasius macronema*	Long barbells Pangasiud catfish
ปาก่า	*Pristolepis fasciata*	Pa Ka
ปากะเดิด	*Trichogaster trichopterus*	Pa Kadert
ปากะจิน	*Cyprinus carpio*	Pa Nai
ปาไน	*Cyprinus carpio*	Common-carp
ปานิน	*Oreochromis niloticus*	Nile tilapia

Table 13: Common Fishes of Nam Song Fisheries[20]

Lao PDR Name	Scientific Name	Common Name
ปาเดิง	*Mystus wyckioides*	Redtail catfish
ปาแข้	*Bagarlus bagarius*	Groonch
ปาก๊ด	*Mystus nemurus*	Long whiskers catfish
ปาหลาด	*Mastacembeius armatus*	Tiretrack spiny eel
ปาปาก	*Barbodes gonlonotus*	Pa Pak
ปาจาด	*Deauratus*	Pa Chat
ปาคิลาม	*Labiobarbus siamensis*	Pa Khilarm
ปาคิง	*Hemibagrus wyckioides*	Asian red-tail catfish
ปามูด		
ปามัน	*Gyrinocheilus pennocki*	Pa Mun
ปาหางแดง	*Tor sinensis*	Pa Daeng

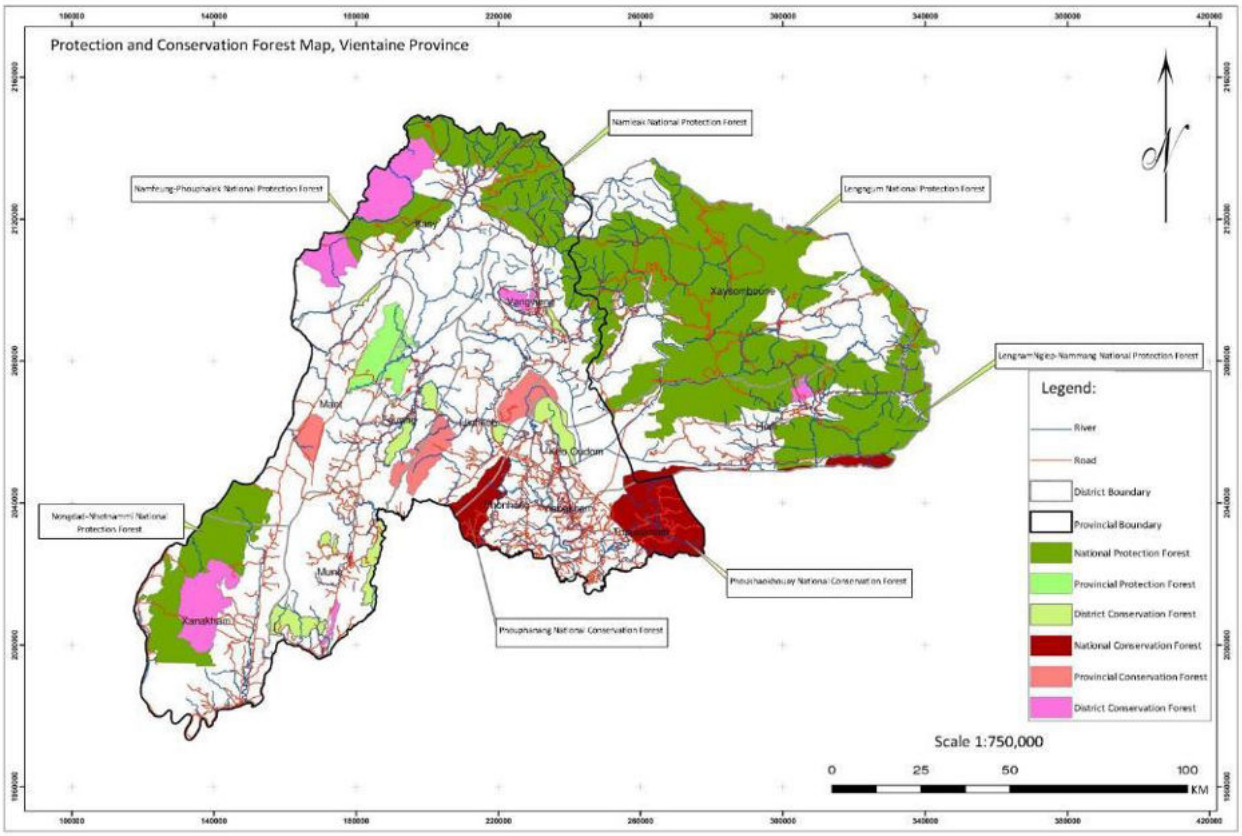
6. Forest & Land Resources

a. Forest Resources

89. Vientiane Province has 10 conservation forest areas totaling 185,443 hectares comprising 5 provincial level conservation forest (166,680 ha) and 5 district level conservation forests (18,763 ha) (Figure 16).

[19] From PAFO, Vientiane Province, 2017
[20] From PAFA, Vientiane Province, 2017

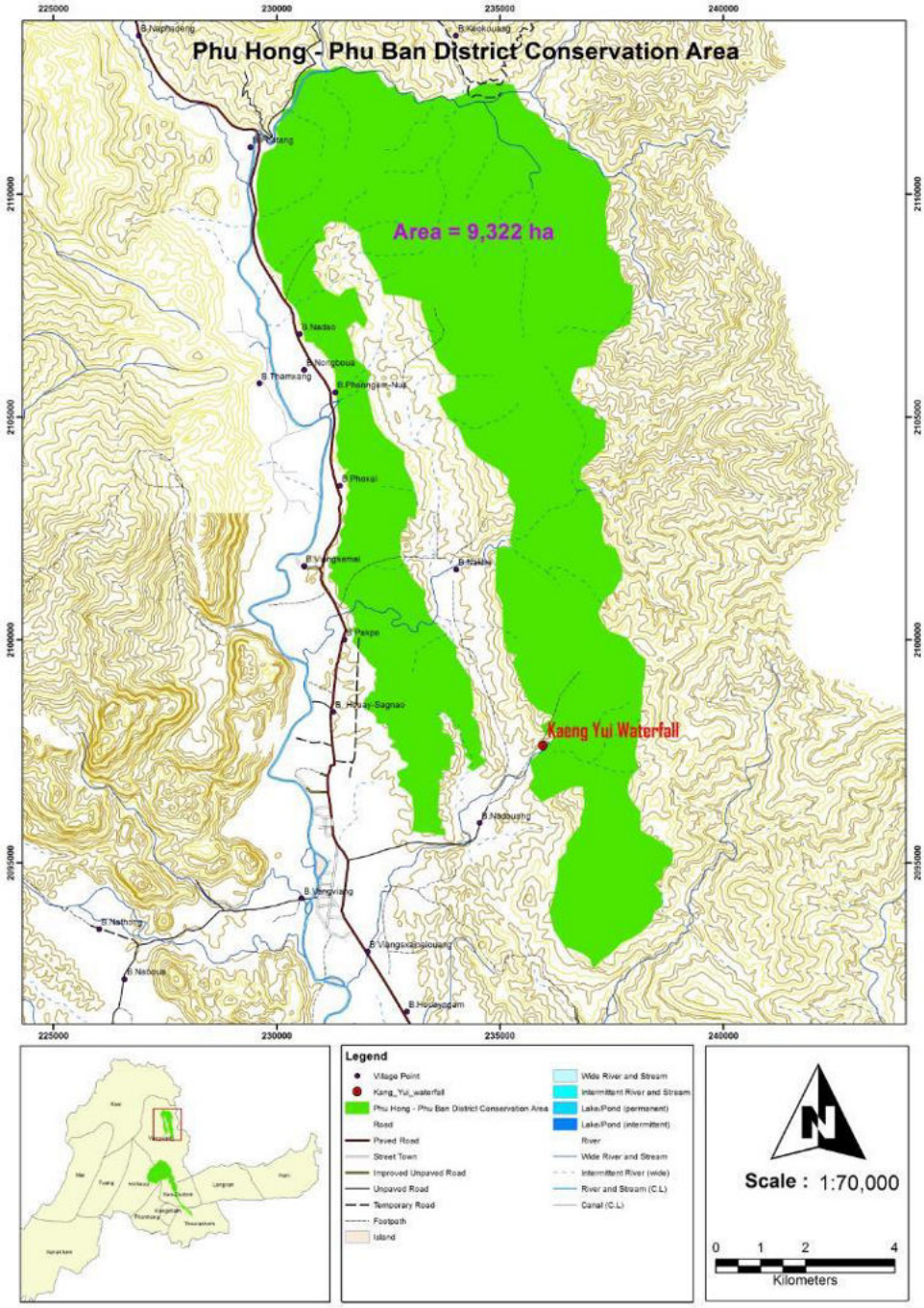
Figure 16. Conservation and protected forests of Vientiane province



90. The nearest conservation forest to the three subprojects in Vang Vieng district is Phu Hong-Phu Ban District Conservation Area which has the total area of 9,322ha. Conversely, the Kaeng Yui waterfall access improvement subproject borders Phu Hong – Phu Ban District Conservation Forest area to the south (Figure 17). However, the subproject will improve existing roads and foot paths and not create new corridor impact footprints. Nonetheless, special mitigation measures will be prescribed in environmental management plan for the subproject to ensure the conservation forest is protected.

91. The Phu Hong – Phu Ban Conservation District Forest is in an area under the jurisdiction of 4 villages of Ban Phatang, Ban Nakeo, Ban Vangpho and Ban Nadao. Apart from Phu Hong-Phu Ban District Conservation Area, there is no other protected or conservation forest near all three proposed subprojects in Vang Vieng District.

Figure 17. Phu Hong – Phu Ban District Conservation Forest



92. The Nam Ngum subproject area in Keo Oudom district is partially located in the Phu En Provincial Protected Forest which extends along the western shoreline of the Nam Ngum reservoir (Figure 18). The area is 1,282 ha and covers 6 villages. There is a conservation forest of Phu Meud, a provincial conservation forest to the north of the dam.

93. The Nam Ngum subproject proposes to upgrade a 2-km dirt road and walking path to a new road segment along the shoreline, which will connect the tourism service area to the existing road in the southern part of the subproject area (also to be paved by the project), creating a circular link to road NA#10 (Figure 19). The new 2km road segment would create a new corridor footprint through the Phu-En Provincial Protection Forest. Other sections of the link road would be upgrades to existing road footprints.

Figure 18. Phu En Provincial Protected Forest

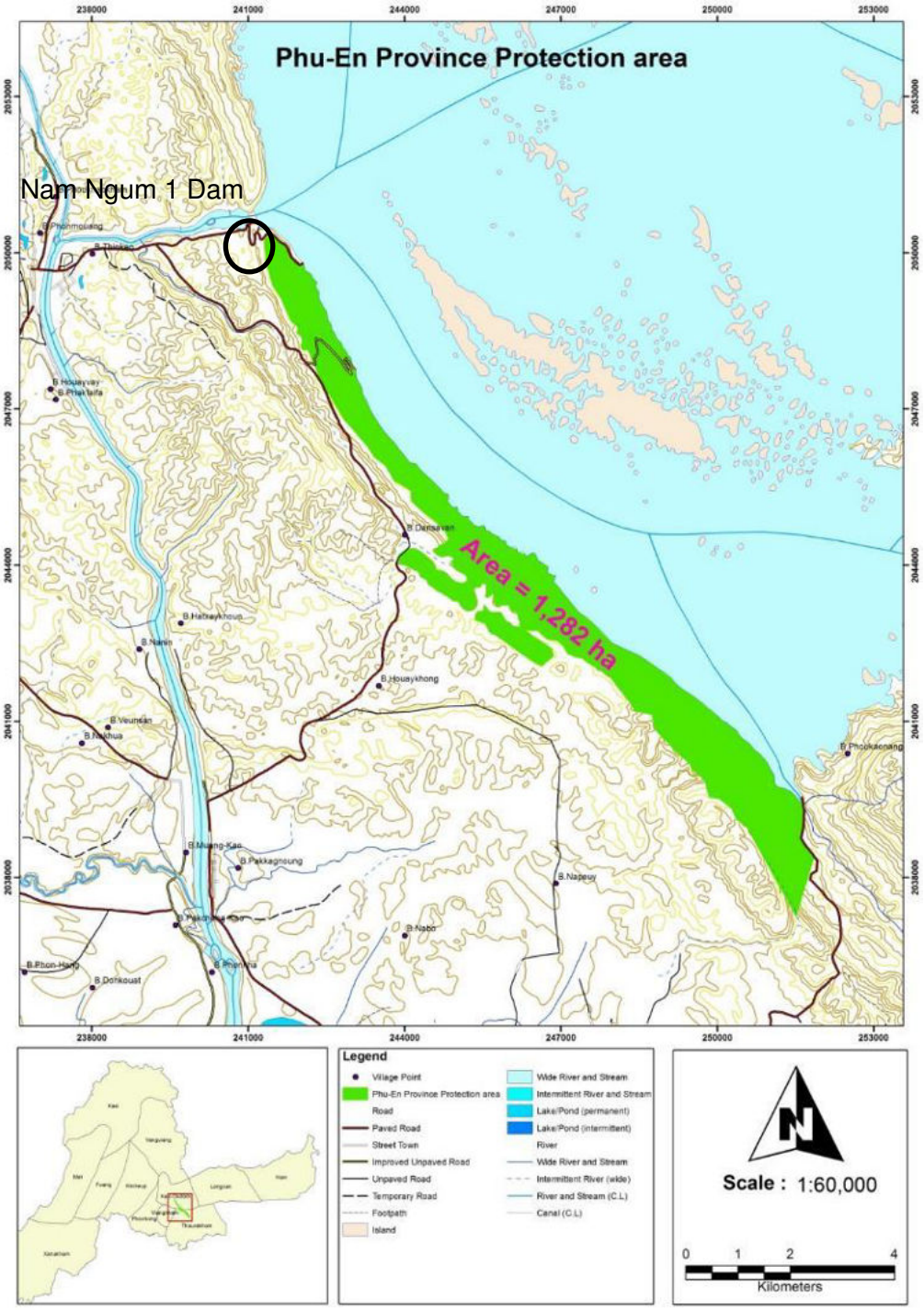
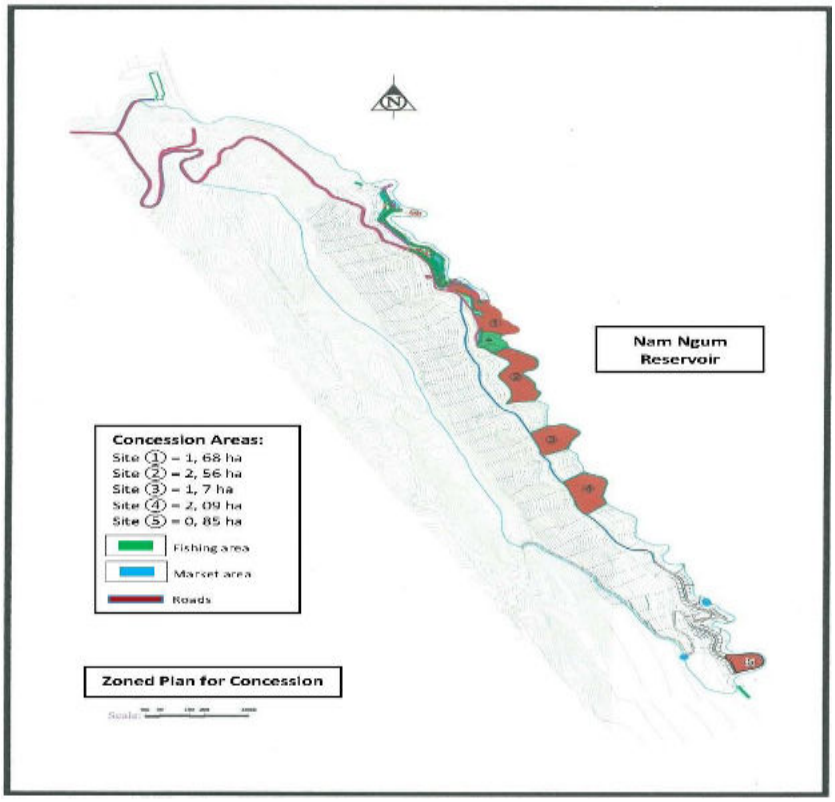


Figure 19. Proposed new road segment (red) along Nam Ngum reservoir

94. The application of the IBAT tool did not identify the Phu-En protected forest or the Phu Hong-Phu Ban conservation forests (Appendix A), or any other protected area within 20km of the subproject sites.

95. The Provincial Tourism Development Master Plan has identified concessional tourism development activities for the subproject area which includes the 2km section of new road. Figure 20 outlines the different areas along the alignment of the new road section.

Figure 20. Concessional activity areas of Nam Ngum reservoir



From Provincial Tourism Development Master Plan, (VTE No. 0411/11 March 2011)

b. Land Resources

96. Land use in Vang Vieng subproject area is dominated by residential areas and paddy fields, though minor upland cultivation area still can be observed along the access road to Kaeng Yui waterfall. Land along Nam Song river is densely occupied by hotels and guesthouses to accommodate tourists, especially the shoreline on the east side of the river. The east side of river has been subjected to some infilling for hotel development in the city center which has extended north along the river.

97. According to a discussion with the Vang Vieng District Tourism Office during site visits on 22 May 2017, the area along west bank of the Nam Song river could be developed to support urban development in the future. Currently, an international investor has signed MOU with the province to carry out feasibility studies for real estate development in the area.

7. Biodiversity

98. Both Vang Vieng and Nam Ngum subproject areas are urbanized with existing tourism developments. Provincial forestry and DoNRE personnel that were met during the site visits indicated that there are no known rare or endangered species occurring in these areas, cited common animal groups are present such as: squirrels, junglefowl and other birds, lizards, snakes and occasionally deer. Aquatic species in the Nam Ngum reservoir and Nam Song include varieties of fish as listed in **Error! Reference source not found.**12 and 13.

8. Provincial Heritage

99. Vientiane province has 11 cultural heritage sites (Three-color Buddha and Ma La Stupa (circa 1590AD) in Toulakhom District; Viengkham temple (circa 1350AD) and Buddha's footprint in Viengkham district; Buddha cave (circa 928AD), Wat Gnat Temple, and Koneke Stupa (circa 1600AD) in Phonhong District; Wat Pa Na Nin, Wat Pha Baht Sun Pa Tong, and Wat Gnai Pa Hoat as well as five historical heritage sites (King Fa Gnum's City Moat, Ancient boat, King Anouvong's Cave, Long Chaeng Fog Mountain, and Meuang Meun Ancient Temple).

9. Demographics

100. Vientiane Province has a total population of 444,916 (as of end 2016) in 11 districts, 433 villages with a population density of 28/km^2. The Lao ethnic group are the majority at 65.08% of the population followed by the Hmong at 18.03% and the Khmu at 16.64%. Vang Vieng District's economic growth has continued with district income totaling 1,077.7 billion Kips (US$134.7 million) in 2015-16 equivalent to a GDP per capita of 18.7 million Kips (US$2,337.50), with 287.8 billion Kips from agriculture and forestry, 235.1 billion Kips from industry and handicrafts and 554.8 billion Kips from the service sector.

C. Additional Features of Seven Subproject Sites

1. Vientiane Province Subprojects

a. Kaeng Yui Waterfall Access Improvements

101. **Error! Reference source not found.** shows the current access road and the proposed parking area.

Figure 21. Access road, footpath, and parking at Tad Keng Yui

Figure 21A: Access Road to Tad Keng Yui

Figure 21B: Section of walking path over a stream

Figure 21C: Proposed parking area for tourist buses at Tad Keng Yui

b. Vang Vieng Solid Waste Management Improvements

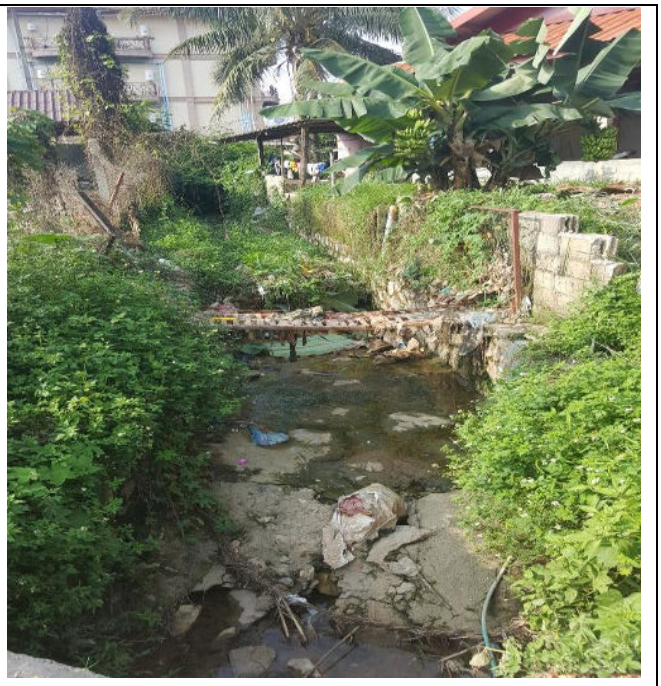
102. The existing Vang Vieng dumpsite to be upgraded is shown in Figure 22.

Figure 22. Existing dumpsite at Vang Vieng

c. Vang Vieng Urban Renewal

103. Example storm water drains in Vang Vieng town to be upgraded are in Figure 23.

Figure 23. Example urban drains to be upgraded in Vang Vieng



d. Western Loop Rural Access Road and Bridge Improvements

104. **Error! Reference source not found.** shows the locations for the proposed link road and bridge on the east side of the Nam Song river.

Figure 24. Location of link road to bridge

Figure 24a: Location of proposed new link road to new southern bridge across Nam Song

Figure 24b: Proposed location for southern road bridge to link road. Looking west across Nam Song

Figure 24c: Example section of western link road to be upgraded.

2. Features of Champasak subprojects

a. Nakasang Access Road and Port Rehabilitation

105. The town access road to be upgraded, drain pipe to be extended, and boat ramp for upgrading are shown in Figure 25.

Figure 25. Components of Nakasang subproject

	Figure 25a: Section of Nakasang access road to be upgraded
	Figure 25b: Nakasang grey water drainage discharge into the Mekong to be extended

	Figure 25c: Existing floating pier & ramp to be improved.
	Figure 25d: Turning road at rear of tourist information centre to be upgraded.

V. PUBLIC CONSULTATION

106. Stakeholder consultations were conducted in line with the requirements of meaningful consultation as stipulated by the SPS (2009). The consultation strategy embodied the principles of transparency, participation, and inclusiveness to ensure that affected and marginalized groups such as women, and the poor, were given equal opportunities to participate in the design of the project. The stakeholder consultations on environment issues in Nakasang and Vang Vieng were conducted via the following two avenues of inquiry and data collection:

1. As part of the household and village leader interviews conducted by the social development team with provincial agencies and other stakeholders conducted by social development team; and
2. Separate interviews of provincial and national environmental management agencies conducted by the international environmental specialist.

A. Identification of Stakeholders

107. Stakeholders were identified and engaged in a participatory manner. Stakeholder communication to date has focused on institutional stakeholders, affected communities, and persons directly affected by proposed subproject interventions. Project stakeholders include:

- Institutional stakeholders including the (i) project Executing Agencies (EAs) and Implementing Units (IUs) (ii) provincial and national agencies, and chambers of commerce;
- Mass organizations such as the Lao Women's Union (LWU) provided input for the design of the various subproject interventions, and which might participate in implementation of measures and interventions;
- Communities living along the subproject areas who will benefit or adversely affected, and who have an interest in the identification and implementation of measures to avoid or minimize negative impacts; and
- Vulnerable and/or marginalized groups who have an interest in the identification and implementation of measures that support and promote their involvement and participation in the project.

B. Discussion Guide

108. Five questions (Error! Reference source not found.**)** were posed to stakeholders to guide discussions. To help orient the discussions of environmental issues and concerns of subprojects a list of environmental components (
Table 15: Example environmental components to guide stakeholder discussions.

• drinking water quality & availability • surface water quality and quantity • groundwater quality & quantity • air quality • climate • land and soil quality • Rivers, réservoirs, • trees, other vegetation, • terrestrial resources e.g., minerals, salt beds, geology	• terrestrial & aquatic animals, e.g., fish, birds, small mammals ecological protected areas (e.g., national parks, wildlife sanctuaries), • land uses (e.g., agriculture, fisheries, forestry, navigation, aquaculture, commercial, other), • public safety, • public movement & access • physical cultural values (e.g., pagodas, cemeteries, monuments)

C. Summary of Public Consultation

109. A summary of the concerns and issues that were identified during the stakeholder consultations for the two subprojects in Champasak province and five subprojects in Vientiane province are summarized in Tables 16 and 17. Tables 16 and 17 summarizes the key issues and concerns that were raised at the public consultation meetings held at the 7 subproject sites and how the project will respond to these issues and concerns. The original discussions of concerns and issues as recorded at the meetings are reproduced in Appendices B and C along with the list of consultation meeting participants. The results of the social impact assessments for the Champasak subprojects are reported in the Poverty and Social Analysis which has been prepared separately.

110. The stakeholder consultations showed overall positive support for the project. The follow-up stakeholder consultations that may be required during detailed design phase will begin with a review of the issues and mitigations initially identified by the stakeholders.

) was introduced to the stakeholders ahead of the question and answer period. Stakeholders were encouraged to add their own components of environment to the discussions.

Table 14. Guiding Questions for Stakeholder Consultations

1. What will be the benefits of the subproject?

   Please list benefits of project.

2. Do you have any environmental concerns with the subproject?

   Please list environmental concerns of project.

3. Do you any have environmental concerns with the **construction activities** of the subproject?

   Please list environmental concerns of construction phase activities.

4. Do you have environmental concerns with the **completed operation phase** of the completed subproject?

   Please list environmental concerns of the operation of completed subproject.

5. Do you think the subproject design or operation should be changed to prevent negative environmental, or community impacts?

   Please list changes to subproject that you think will prevent or reduce negative environmental, or community impacts?

Table 15: Example environmental components to guide stakeholder discussions.

• drinking water quality & availability • surface water quality and quantity • groundwater quality & quantity • air quality • climate • land and soil quality • Rivers, réservoirs,	• terrestrial & aquatic animals, e.g., fish, birds, small mammals ecological protected areas (e.g., national parks, wildlife sanctuaries), • land uses (e.g., agriculture, fisheries, forestry, navigation, aquaculture, commercial, other),

• trees, other vegetation, • terrestrial resources e.g., minerals, salt beds, geology	• public safety, • public movement & access • physical cultural values (e.g., pagodas, cemeteries, monuments)

D. Summary of Public Consultation

109. A summary of the concerns and issues that were identified during the stakeholder consultations for the two subprojects in Champasak province and five subprojects in Vientiane province are summarized in Tables 16 and 17. Tables 16 and 17 summarizes the key issues and concerns that were raised at the public consultation meetings held at the 7 subproject sites and how the project will respond to these issues and concerns. The original discussions of concerns and issues as recorded at the meetings are reproduced in Appendices B and C along with the list of consultation meeting participants. The results of the social impact assessments for the Champasak subprojects are reported in the Poverty and Social Analysis which has been prepared separately.

110. The stakeholder consultations showed overall positive support for the project. The follow-up stakeholder consultations that may be required during detailed design phase will begin with a review of the issues and mitigations initially identified by the stakeholders.

Table 16. Summary of key views of stakeholders of Champasak subprojects

Phase	Summary of Benefits and Concerns (August 30 – September 2, 2017)			
	Nakasang Access Road and Port Rehabilitation		Don Det/Don Khone Access Improvements	
	Issues /concerns	Project response/action	Issues /concerns	Project response/action
Benefits of subproject identified	- Improvements to the parking area at information centre and port area - Upgraded road will improve transportation to the town and port area - The improved infrastructure will increase the local income from agricultural production and tourist service industry - The local economy will be strengthened from the increased tourism and infrastructure - Upgraded road will reduce traffic issues on the road - The number of tourists to the area will increase. - The upgraded road will improve access to Nakasang by a greater range of vehicles - The strengthened tourism from the improved infrastructure directly supports goals and objectives of the district socio-economic plan.		- The improved island infrastructure will increase travel within and between the villages - The number of tourists visiting the islands will increase. - Income of local residents will increase and economic development on islands will increase. - The subproject will improve the visual beauty of the island and villages - More facilities will be available to support the villagers - Don Det – Don Khone will become a focal point of future development	
	Issues /concerns	**Project response/action**	**Issues /concerns**	**Project response/action**
Pre-construction project design &, impact assessment	- Additional public consultation is required during final design period. - Information on the government policy(s) underlying project rationale and design are needed. - Concern that selection of contractor will not be transparent. - Concerned that temporary worker camps will be close to settlements. Borrow pits must also be isolated and signed clearly for public avoidance. - Consider impact on natural environments. - Concerned that contractor selected will not have sufficient experience for the	- Information & public disclosure conducted will continue in detailed design phase which will include follow-up consultations - The rationale and underlying policies of the government and ADB for the project is summarized in IEE, and detailed more fully in separate Project Administration Manual (PAM) Documents are available to the public for review. These documents are and will continue to be available to the public. - Contractors will be recruited following ADB international procedures for which tendering process is transparent by design	- Strongly concerned about coordination among the different related parties (e.g., contractors, local government, tourist groups, residents, local business) during the assessment and detail design period. - Concern on un-clear responsibility of each sectors to community. - Concerned other external contractors will come to area to take advantage of subproject work. - Concern that selection of contractor(s) will not be transparent. - Concerned that temporary worker camps will be close to settlements. Borrow pits must also be isolated and signed clearly for public avoidance.	- The Project Management & Construction Supervision Consultant (PMSC) in conjunction with the PMU will ensure all stakeholders are informed of the project schedule and activities during the detailed design phase and before the construction phase is initiated. - In support of the above the Project Administration Manual details the responsibilities of the different parties. This information is available to all parties. - The open and formal bidding process self-governs against other local contractors trying to take advantage of the infrastructure work. Only the firms awarded the contract packages can do work on the subproject.

Phase	Summary of Benefits and Concerns (August 30 – September 2, 2017)			
	Nakasang Access Road and Port Rehabilitation		Don Det/Don Khone Access Improvements	
	Issues /concerns	Project response/action	Issues /concerns	Project response/action
	port improvement component of subproject. - Concerned that the impacts of the final project designs will be ignored.	- Worker camps and borrow pits will not be located near settlements. Both will be temporary, and will be restored to vegetated unused state when subproject is finished. - The potential environmental and social impacts of all subproject components are assessed by the IEE and separate assessment of the required land acquisition and possible resettlement. - As part of the transparent tendering process each bidding contractor must document experience with small port & pier projects as well as experience with the other subproject components. - The IEE and more importantly the environmental management plan (EMP) for the entire Nakasang subproject will be updated to reflect any changes to the subproject design at detailed and final design. The is a required of the ADB and government.	- Want good environmental management to be prioritized during the detail design phase. - Concerned about wastewater being discharged directly to water course (Mekong river)	- Contractors will be recruited following ADB international procedures for which tendering process is transparent by design - Worker camps and borrow pits will not be located near settlements. Both will be temporary, and will be restored to vegetated unused state when subproject is finished. - The IEE prescribes and is supported by project environmental management plan (EMP). The EMP follows international and national standards to protect the natural and social environments for project impacts. Importantly the EMP is updated to meet the final detailed designs of the subproject components. The EMP specifies that construction wastewater of any kind should not be discharged to the Mekong river or any other surface water course without treatment.

Phase	Summary of Benefits and Concerns (August 30 – September 2, 2017)			
	Nakasang Access Road and Port Rehabilitation		Don Det/Don Khone Access Improvements	
	Issues /concerns	Project response/action	Issues /concerns	Project response/action
Construction phase	- Concern that the borrow pits for road works will not be managed properly. - Concerned that the contractors will not care about the local community, and will not be responsive to local authority. - Consulting with local people is needed for construction plans and activities.	- The EMP includes specific mitigation subplans for the opening, operation, and decommissioning of borrow pits. - The IEE and construction bidding documents and final contract documents will specify performance measures to assess performance of contractors in relation to the EMP and construction. - The public consultation and information disclosure process that was initiated will continue during the construction phase which is formalized with the grievance redress mechanism.	- Contractor should follow the impact mitigation measures. - Initial public outreach on the project policy, activities, with contractor, should be conducted with local community. - Consider improving the existing detour before construction commences. - Consider having a short construction period.	- Contractors will develop and include CEMPs for construction packages in their bidding documents, and implement according to performance criteria that are identified in IEE and the tenders. - The information disclosure and public consultations on all underlying project policy and subproject technical design will be continued during the pre-construction phase. - Existing access to Nakasang town and port will continue during construction phase with the assistance of detours to maintain traffic flow where necessary. - Subprojects by design will be cost effective and thus implemented as fast as possible over shortest construction period possible.
Operation phase	- Concerned that operation of completed subproject components will not be monitored to ensure design specifications met. - Concern that the village will not participate in the solid waste management of the market. - Concern that the long-term maintenance of the completed subprojects will occur. - Meeting thinks villagers should be trained to assist with road maintenance.	- The EMP and project completion reporting prescribes subproject monitoring to ensure compliance with operational requirements. The project also specifies required O&M budgeting to support required maintenance of subprojects. - Following from above, prescribed solid waste management will be monitored with allocated O&M budget. - The potential scope of village management and maintenance of	- Provide a practicable operation and maintenance plan for village participation - Identify specific responsibilities of all related units into the maintenance plan - Providing training to the villagers for waste collection and management.	- The tourist destination and capacity development plans of the TIIG integrate and empower the community into management of the operation of the completed tourist infrastructure. Responsible parties are identified by the tourist destination plans. - Individual tourist site solid waste collection and management is part of the tourism destination management planning. Training on all aspects of destination management will occur including

Phase	Summary of Benefits and Concerns (August 30 – September 2, 2017)			
	Nakasang Access Road and Port Rehabilitation		Don Det/Don Khone Access Improvements	
	Issues /concerns	Project response/action	Issues /concerns	Project response/action
		upgraded the Nakasang access road is included in the project capacity development plan		management of solid waste produced by tourists.
Other suggestions	- Consider clearing all the related obstacle along the river bank and port before construction commences. - Allow the local community to participate in management of the market	- Removal of all shoreline and in-river obstacles to pier access and boat traffic in/out of updated pier is part of the preparations for implementation of subproject. - Further to above the market will be self-managed as much as possible by market merchants and the community	- Propose to have more development plans for riverbank protection - Consider improving the residential accessibility - Concerned that project will backfill the village pond with borrow material.	- The 45m stretch riverbank above and below the new pontoon pier in Nakasang will be strengthened and developed as part of the subproject. - A key of objective of subproject infrastructure is to improve access of residents and tourists to the tourist and urban facilities - Filling village ponds or low-lying flood-prone areas is not part of the subproject. Flood amelioration is restricted to drainage for the upgraded access road, parking area, and riverfront area at pier.

Table 17. Summary of key views of stakeholders of Vientiane subprojects

Phase	Summary of Benefits and Concerns August 26 – 28th					
	Nam Ngum Reservoir Access Improvements		**Kaeng Yui Waterfall Access Improvements**		**Western Loop Rural Access Road and Bridge Improvements**	
	Issues /concerns	**Project response/action**	**Issues /concerns**	**Project response/action**	**Issues /concerns**	**Project response/action**
Benefits for local people	- Increase the local income and tourists number. - Opportunity for setting up the night market and other small business. - Create new tourist sites. - Address waste issues and inappropriate zoning - Comfortable travelling and convenient parking for vehicles.		- Increase number of tourists / attractive sites - Increase income for family and village - Provincial public gathering site - Opportunity for setting up small business - Comfortable travelling and convenient parking		- Improve the road condition and access to sightseeing places - Increasing the local income and small business numbers - Comfortable travelling and convenient parking - Support the tour service development and increase tourist numbers	
	Issues /concerns	**Project response/action**	**Issues /concerns**	**Project response/action**	**Issues /concerns**	**Project response/action**

Pre-construction project design &, impact assessment	- Project public information policy - Select appropriate machinery storage and camp area - Proper detail design - Location of detours	- The underlying policies of the government and ADB for subproject summarized in IEE, and detailed in Project Administration Manual (PAM). Documents are available to the public for review. - The EMP for the subproject specifies location(s) and allowable activities for worker camps and areas for equipment storage away from residential and public areas. - The feasibility design is followed by detailed design subproject which among many environmental and social safeguards specifies requirement for construction of pedestrian and vehicle detours around all construction site areas. Detailed design applies all social and environment issues to final engineering designs.	- Project public information policy - - Community participation - - Proper detail design - - Use local workers - - Select good contractor	- The underlying policies of the government and ADB for subproject summarized in IEE, and detailed in Project Administration Manual (PAM). Documents are available to the public for review. - The information disclosure, and stakeholder consultations of feasibility design stage will continue in detailed design stage. The grievance redress mechanism (GRM) will allow formal submission of issues or complaints of affected stakeholders. - The feasibility design is followed by detailed design subproject which among many environmental and social safeguards specifies requirement for construction of pedestrian and vehicle detours around all construction site areas. Detailed design applies all social and environment issues to final engineering designs. - Contractors will be recruited following ADB	- Project public information policy - Select good contractor - Provide community water supply - Waste disposal area selection - Detours selection - Proper detailed design	- The underlying policies of the government and ADB for subproject summarized in IEE, and detailed in Project Administration Manual (PAM). Documents are available to the public for review. - Contractors will be recruited following ADB international competitive bidding procedures are transparent by design ensuring experienced contractors. - Existing surface and groundwater supplies along loop road will not be disturbed & will be protected. Scope of subproject excludes creation of new water supplies. - The EMP for subproject specifies requirement for DONRE-approved locations of disposal of construction and worker waste. - The feasibility design is followed by detailed design subproject which among many environmental and social safeguards specifies requirement for

				international competitive bidding procedures are transparent by design, and specifies use of local workers		construction of pedestrian and vehicle detours around all construction site areas. Detailed design applies all social and environment issues to final engineering designs.

Constructio n phase	- Use local worker - Minimize access disruption - Implement impact mitigation measures - Follow construction standards - Good coordination between all stakeholders - Proper steep slope construction - Water drainage - Truck traffic	- ADB bidding procedures require use of local workers, and specifies use of best international (e.g., IFC/EHS) and national construction practice and standards. - The EMP for subproject defines mitigation measures to: a) ensure no or minimal local access disruption to recreation area and loop road; b) construction traffic management to prevent accidents; c) ensure adequate drainage at constructions sites to prevent ponding and flooding. - The stakeholder consultation and information disclosure process that was initiated will continue during the construction phase to provide transparent coordination among all stakeholders. - The loop road upgrades and shoreline recreational infrastructure will integrate steep slope construction methods where necessary to	- Surface and groundwater contamination - Vibration and dust pollution - Safety issues - Truck traffic - Document and agreement for material sourcing and use - Contractor environmental management	- The EMP identifies mitigation subplans to prevent or minimize pollution of Kaeng Yui river, & surface waters crossing access road, and well water from construction works. - Subproject will not cause significant vibration because no blasting is foreseen. The EMP prescribes impact mitigation subplans to prevent or minimize dust with wetting agents (e.g., water $CaCl_2$), and managing for safe construction traffic. - The EMP specifies requirement for DONRE-approved sources of aggregates for construction use. - All contractors will be required to prepare contractor EMPs (CEMP) for all construction packages based on subproject EMP which will be included in bidding documents.	- Use local workers - - Dust and vibration pollution - - Safety issue and truck traffic - - Flooding - - Camp and construction waste - - Project safeguards policy - - Community participation - - Sediment flows to rice field - - Damage to property - - Construction standards followed - - Borrow pit selection	- ADB bidding procedures require use of local workers. Application of best international (e.g., IFC/EHS) and national construction practice and standards will be required. - The EMP which follows ADB SPS (2009) identifies mitigation subplans to prevent or minimize: a) dust (vibration not an issue); b) manage construction and local traffic safety and congestion; c) prevent or contain local flooding and ponding at construction sites; d) to manage properly construction and worker waste; e) control or contain soil erosion to prevent sedimentation of surface waters & lowland rice paddy; and f) effect overall protection of commercial and private property close to construction areas. - Existing or new borrow pits will be selected in consultation with, and approved by DONRE -

		protect infrastructure from slides from current rainfall events, and from projected increased rainfall from climate change.				
Operation phase	- Operation and maintenance plan - Community investment promotion - Operations training - Wastewater discharge monitored	- Required budget for sustainable O&M of subproject is defined by project. The destination management plan for subproject identifies community training & capacity development for the operation & maintenance of the upgraded tourist facilities & infrastructure. - The EMP for subproject specifies monitoring of O&M of new septic tank wastewater system at reservoir recreational area.	- Road accidents - Additional funds for development - Waste disposal - Maintenance plan - Borrow pit backfill	- The EMP specifies post-construction operation monitoring of: a) traffic accidents along completed access road; b) solid waste collection and disposal at Vang Vieng landfill; and c) septic tank sludge removal. - The EMP includes mitigation subplan for the start, operation, and decommissioning of borrow pits which specifies complete restoration of borrow pits as per DONRE requirements.	- Borrow pit backfill - Road accident - Community training on operation and maintenance - Local investment promotion	- The EMP includes mitigation subplan for the start, operation, and decommissioning of borrow pits which specifies complete restoration of borrow pits as per DONRE requirements. - The EMP specifies post-construction monitoring of traffic accidents along upgraded western loop road.
Other suggestions	- Allow opportunities for local people to develop businesses	- A goal of the sub-project is to enable tourist business development along recreational area of Nam Ngum reservoir	- None		- Awareness program on mitigation measure. - Must follow detailed design	- As part of the information disclosure and stakeholder consultation program the EMP and mitigation plan for subproject will be available to all stakeholders. - The detailed designs of the subproject will be followed by the government and contractors as monitoring by the ADB.

Table 17b. Summary of key views of stakeholders of Vientiane subprojects

Phase	Summary of Benefits and Concerns August 26 – 28th			
	Vang Vieng Urban Renewal		Vang Vieng Solid Waste Management Improvements	
	Issues /concerns	**Project response/action**	**Issues /concerns**	**Project response/action**
Benefits for local people	- Reduction of waste, sludge, odor pollution - Convenient to travel and make the town cleaner - Improve the drainage system and create beautiful views in the town - Good environmental condition and more pedestrian friendly - Improved drainage system for town		- Improve the current waste management and collection service - Reduction the odor, pollution and insects in the village and school. - Better for villager's health nearby the landfill area. - Solving the illegal waste dropping. - Landfill site improvement will make the town cleaner	
	Issues /concerns	**Project response/action**	**Issues /concerns**	**Project response/action**

Pre-construction project design &, impact assessment	- Project public information policy - Waste disposal area selection - Proper detailed design - Opportunities for local business - Community participation	- The underlying policies of the government and ADB for subproject summarized in IEE, and detailed in Project Administration Manual (PAM). Documents are available to the public for review. - The information disclosure, and stakeholder consultations of feasibility design stage will continue in detailed design stage. The grievance redress mechanism (GRM) will allow formal submission of issues or complaints of affected stakeholders. - The detailed design of subproject integrates IEE environmental safeguards & specifies requirement for waste management for all construction site areas disposal sites approved by DONRE. - A goal of the sub-project is to enable tourist business development in Vang Vieng.	- Proper detail design Apply lessons from current / other systems - Community cooperation and participation in environmental management - - - Provide O&M manual	- The detailed design of upgraded managed landfill will follow international standards (e.g., IFC/EHS) for landfills. - The information disclosure, and stakeholder consultations of feasibility design stage will continue in detailed design stage which will enable continued public involvement with the environmental management of subproject. The grievance redress mechanism (GRM) will allow formal submission of issues or complaints of affected stakeholders. - The upgraded managed landfill will require and include an extensive capacity development and training program for UDAA staff which will include a comprehensive O&M manual. - The waste collection and tipping fees will need to be worked out at detailed design as part of the sustainability of the managed landfill.

Phase	Summary of Benefits and Concerns August 26 – 28th			
	Vang Vieng Urban Renewal		Vang Vieng Solid Waste Management Improvements	
	Issues /concerns	Project response/action	Issues /concerns	Project response/action
Construction phase	- Inform construction schedules - Damage to property - Safety issue - Waste disposal - Truck traffic - Apply lessons from other places - Construction period - Dust pollution.	- The EMP identifies mitigation subplans to a) manage construction and local traffic safety and congestion; b) prevent or minimize dust; c) to manage properly construction and worker waste; and d) effect overall protection of Vang Vieng commercial and private property close to construction areas. - As part of the continued information disclosure process all construction schedules & expected entire construction period will be made public to Vang Vieng residents. -	- Documentation and agreement with local authorities - Use of subcontractor - Truck traffic - Follow the detailed design - Proper construction methods and standards	- The feasibility and detailed design requires and will obtain agreement with local authorities on all design & management aspects of upgraded landfill. - Use of construction subcontractors will be specified by bidding documents of ADB bidding process. Bidding documents will specify application of international (e.g., IFC/EHS) and national best construction practices for modern managed landfills. - The EMP specifies many different mitigation subplans including safe management of construction truck traffic along landfill access & approach roads.

Phase	Summary of Benefits and Concerns August 26 – 28th			
	Vang Vieng Urban Renewal		Vang Vieng Solid Waste Management Improvements	
	Issues /concerns	Project response/action	Issues /concerns	Project response/action
Operation phase	- Operation and maintenance plan - Community training - Local investment promotion	- A specific budget required for O&M of the new and upgraded infrastructure in Vang Vieng will be specified. A detailed O&M plan will support the budget. - The tourism destination program includes training on community involvement in use & maintenance of the upgraded tourist infrastructures. - Promotion and incentive development for local tourist promotion and investment forms part of the tourist destination management.	- Insect and odor prevention - Operation and maintenance plan - Equipment and vehicle for operation, and equipment O&M.	- The design of the upgraded managed landfill includes measures such as cell coverage, and garbage truck coverage to minimize odor and insect problems. - As indicated above the upgraded managed landfill will include a comprehensive O&M plan and budget for UDAA which will follow extensive training on landfill management. - The O&M plan and budget will include the new vehicles and equipment to be supplied with the upgraded landfill.
Other suggestions	- None	-	- None	-

VI. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATIONS

A. Subproject Benefits

111. The benefits of the subprojects in Champasak and Vientiane provinces are summarized below which reflect the output of the stakeholder consultations.

1. Champasak province

a. Nakasang Access Road and Port Rehabilitation

112. The improvements to the main access road from NR#10 to Nakasang town and to the main tourist port to the "4000 islands" area of the Mekong river the will greatly benefit tourism in the area, and access to the islands by residents. The access road traverses mostly rice paddy with low areas prone to flooding. The new concrete road surface will provide a durable surface that will greatly improve movement of local vehicles and tourist coaches. The upgraded access road will be on an embankment, and lateral and cross drainage will enable stormwater runoff off the road, reducing risk of road flooding and year-round access. Apart from the upgraded access road will be improved parking and a new turning circle for coaches at the Tourist Information Centre.

113. The improvements to the footpaths and embankments along the waterfront, and the improved ramps to the existing floating tourist pier will increase the capacity and improve safety for tourists and residents. The realignment of the main drainage pipe away from the public shoreline area will improve significantly sanitation and aesthetics of the tourist staging area. The subproject will directly benefit 1,6450 Nakasang residents, 228 boat operators, and about 100 vendors in Nakasang market.

b. Don Det/Don Khone Access Improvements

114. The upgrades to the island's small road network and footpaths to concrete paving will relieve congestion, improve traffic safety, and reduce dusty and/or muddy seasonal conditions. The new lighting will allow safer use of the different foot and bicycle paths and small roads at night thereby expanding the scope of tourist activity. The subproject will directly benefit 1,240 Don Det and 1,345 Don Khone residents.

2. Vientiane province

a. Nam Ngum Reservoir Access Improvements

115. The major benefit will be functionally improved, safe, and better organized recreation facilities beside the reservoir. Dilapidated and unsafe piers and beachfront buildings will be replaced with a modern marina that can handle 50-60 boats. The ability to accommodate small recreational boats and ferries will greatly expand the tourist expereince. The reconstructed vendor market stalls including public toilets will significantly improve sanitation and business opportunities for residents. The proposed circular concrete access road to NR #10 and parking lot will improve traffic management and prevent congestion caused by the current dead end situation at the recreation area. The subproject will benefit 1,600 people from nearby Ban Sengsavang and is expected to catalyze significant tourism related investment at the site.

b. Kaeng Yui Waterfall Access Improvements

116. The upgraded access road, and improved parking at the base of the pathway leading to the water fall will allow more tourists to visit the waterfall more comfortably and provide residents better access to markets and social services in nearby Vang Vieng Town. The increased tourist flow to the waterfall will directly benefit the homestays which have been

established along the route and near the falls. The improved footpath and small suspension bridges to the falls, and improved vendor kiosks, will generate economic opportunities for local entrepreneurs and greatly improve tourist's experience. The subproject will directly benefit 873 Ban Nadoung residents and an additional 2,580 persons living along the improved access road.

c. Western Loop Rural Access Road and Bridge Improvements

117. Community managed tourist destinations (i.e., caves, swimming lagoons, and cultural villages) will greatly benefit from the improved western access road. Road improvements will reduce travel time to and from Vang Vieng, increase visitor's and resident's safety and comfort, and improve residents access to markets and social services. A new bridge across the Nam Song river will relieve congestion in Vang Vieng urban core. The upgraded and expanded shoreline foot and bicycle footpath along the Nam Song river in Vang Vieng will provide a greenbelt and expanded recreation opportunities for residents and tourists. The subproject will directly benefit about 9,500 people in 11 villages alongside the improved 26 km access road and relieve urban congestion for about 60,000 Vang Vieng residents.

d. Vang Vieng Urban Renewal

118. The improvements to lateral street drains, footpaths, and traffic management in the town will improve sanitation and pedestrian safety. The subproject will help prevent flooding, traffic congestion, and provide upgraded and new lateral footpaths with street lighting and landscaping to create a more pleasant urban environment. It will directly benefit 3,849 residents (Ban Savang, Ban Vieng Keo and Ban Mueang Xong), tourists, and 143 hotels/guest houses and 126 shops/restaurants. The economic potential for tourist growth is under preparation for the town. Rough estimates can be obtained from the PPTA tourism and activity forecasts[21]

e. Vang Vieng Solid Waste Management Improvements

119. The upgraded solid waste management system for Vang Vieng, including the upgraded existing dumpsite, will expand affordable solid waste collection services in Vang Vieng Town and surrounding villages. It will assist the district authorities implement the sub-decree on Solid Waste Management (April 1999). New garbage trucks, vaccuum trucks, and modern waste processing facilities at the upgraded landfill will improve santation and reduce greenhouse gas emissions. The current collection system is inadequate for the increasing amount of solid waste that is being produced in the town and vicinity. Garbage piles along streets and in alleys are becoming more noticeable. At the dumpsite the randomly dispersed piles of garbage are not sufficiently contained resulting in much wind blow outside the dump property. The adhoc waste recycling by waste pickers is not efficient resulting in pickers not realizing the full poential income from recycled materials that would become more attractive to buyers if sufficient amounts of different materials were stockpiled A materials recovery facility at the upgraded landfill will improve the safety and efficiency of solid waste recycling; and a new septage treatment facility will allow septic tank sludge to be stored and treated safely. Currently not all septage from urban tanks is being collected and not all septage that is collected is being disposed of at the dumpsite due to insufficient collection trucks and treatment facilities, and a lack of regulation and training. The subproject will expand collection services from 1,359 to 3,840 households. Overall, the subproject will benefit about approximately 60,000 residents and 300 businesses directly and indirectly.

B. Subproject Impacts and Mitigation

120. The assessment of potential impacts of the seven subprojects in Lao PDR is structured around the three main phases of implementation defined by *Pre-construction Phase, Construction Phase*, and *Operation Phase*.

[21] Footnote 11

1. Pre-construction phase

121. The pre-construction phase begins with the completion of the detailed, final designs of the subprojects. The final subproject designs, amongst tourism infrastructure and engineering needs, will consider social and environment impacts, and requirements for subproject resilience to climate change. The sensitive social and environmental receptors and the climate change resilience measures identified by this IEE will be reviewed as part of the detailed design to ensure potential impacts are not missed - in particular if the subproject locations or designs are changed significantly at detailed design. The biodiversity study of the Phu Hong-Phu Ban conservation forest at the Kaeng Yui waterfall will be conducted by the PMCES. The subproject EMPs will be updated accordingly.

122. Negative impacts associated with the pre-construction phases of the sub-projects primarily concern land acquisition and resettlement. At the feasibility design stage, land acquisition and resettlement (LAR) impacts are foreseen for two subprojects in Vientiane Province, namely: (a) Nam Ngum Reservoir Access Improvements, and (b) Western Loop Rural Access Road and Bridge Improvements. Out of a total of 59 affected households (AHs), 40 are at the Nam Ngum Reservoir and 19 at the Western Loop Road. 19 AHs at Nam Ngum Reservoir are severely affected due to having to relocate house and business. Amongst the total of 59 AHs there are 17 vulnerable households, out of which five are severely affected.

a. Groundwater analyses

123. The upgrade of Vang Vieng dumpsite requires an understanding of the depth of the water table, and groundwater quality to complete the design for the renovation. Soil type and porosity at the site should also be determined to complete the design and selection of liner materials for the landfill cells. A draft TOR for the groundwater study is provided in Appendix D.

b. UXO screening & removal

124. All planned excavation sites in subproject areas should be screened by the military for unexploded UXO. Suspected UXO should be removed accordingly by the military. This activity must be done before the construction phase begins. A UXO clearance certificate should be obtained prior to construction package award.

c. Updating IEE and EMPs

125. The IEE and two subproject EMPs for Champasak and Vientiane Province will need to be updated during the pre-construction phase to ensure they address any changes made during final detailed designs of the subprojects. This will involve finalization of mitigation sub-plans to manage potential impact areas such erosion, sedimentation of surface waters, noise, dust and air quality, spoil disposal, traffic, and worker and public safety at the project sites.

126. Key impact mitigation measures of the pre-construction phase are:

1) Initiation of required land acquisition and compensation for each subproject;
2) Continuation of information disclosure, and re-introduction of the Grievance Redress Mechanism (GRM)
3) Completion of TOR for groundwater study;
3) Completion of detailed designs of the subprojects; and
4) Updating the IEE and the subproject EMPs.

2. Construction Phase

127. To prevent redundant assessment and reporting of the common potential impacts and mitigations of similar subproject components or affected environments are addressed together. This allows clearer definition and assessment of important subproject-specific impacts that require specific mitigation measures.

a. Common potential impacts of Champasak and Vientiane subprojects

Roads/footpaths & parking

All seven subprojects

128. The disturbances and short-term impacts associated with the civil works of road construction are relatively large. Potential environmental impacts of construction of new and upgrading of roads, footpaths and small car parks are reduced and/or blocked public access, disrupted business and recreation, noise, dust and air pollution caused by increased truck traffic and heavy equipment use, soil and adjacent surface water pollution caused by equipment operation and maintenance, public and worker risk of accidents, increased traffic accidents, land erosion and surface water sedimentation, drainage and flooding problems, solid and domestic waste from worker camps, social issues and community problems caused by migrant workers.

129. The potential construction impacts and disturbances will vary depending on the magnitude of the subproject component(s) and location and timing of implementation as influenced by site sensitivity (i.e., ecological value & protection level). For example, the potential ecological impacts of upgrading the Nakasang access road and western link road of Vang Vieng will not be as great as the road construction through the conservation forest along Nam Ngum reservoir. The former two roads traverse established rice paddy, agriculture, and scrub forest and are upgrades to existing roads, whereas the 2-km road section at Nam Ngum traverses former protected forest and is a partially new corridor not solely an upgrade to an existing road section. The affected forest has subsequently been zoned for tourism development. Similarly, the construction dust and noise created from the road and drainage works in Vang Vieng town will be a much greater disturbance to local people than the dust and noise created from the upgrades to the access roads to Kaeng Yui Waterfall and the Vang Vieng landfill where the population is much lower and less dense.

i. Common mitigation measures

130. Measures to mitigate and manage potential common impacts associated with the construction phase of the road works are summarized below. The regulations on construction in Lao PDR are not well developed. The construction guidelines developed by the MOF[22], and when necessary appropriate regulations or guidelines of the IFC/World Bank Environment, Health, and Safety Guidelines (2007) should be followed.

131. The common mitigation measures below will be applied as appropriate in the two EMPs for the subprojects in Champasak and Vientiane. These generic construction mitigation measures are decidedly comprehensive at the feasibility design stage of the subprojects to ensure that a mitigation measure for the impact of a final road design feature is not overlooked during the detailed design stage. The contractors will be required to include these measures in their site-specific construction EMPs (CEMPs) which will be submitted to the project management and construction supervision consultant (PMSC) and the PMUs for review and approval prior to construction. Monitoring will be carried out by the PMSC during the construction period.

[22] (MOF, 2009) School Construction Guidelines

132. **Air pollution control**. Contractors shall include all necessary measures to prevent or minimize air pollution and dust development by implementing the following air quality control measures. Most of these generic measures are applicable to all construction sites and construction activities as good practice, and are also described in the World Bank Group's EHS guidelines.

(i) Build access and hauling roads at sufficient distances from residential areas, in particular, from local schools and hospitals.
(ii) Assign haulage routes and schedules to avoid transport occurring in the central areas, traffic intensive areas or residential areas. For the areas with high-demand on environmental quality, transport should be arranged at night.
(iii) Spray water or other wetting agents such as calcium chloride ($CaCl_2$) regularly on unpaved haul roads and access roads (at least once a day) to suppress dust; and erect hoarding around dusty activities.
(iv) Cover material stockpiles with dust shrouds or tarpaulin. For the earthwork management for backfill, measures will include surface press and periodical spraying and covering. The extra earth or dreg should be cleared from the project site in time to avoid long term stockpiling.
(v) Minimize the storage time of construction and demolition wastes on site by regularly removing them off site.
(vi) Site asphalt mixing and concrete batching stations at least 300 m downwind of the nearest air quality protection target.
(vii) Equip asphalt, hot mix and batching plants with fabric filters and/or wet scrubbers to reduce the level of dust emissions.
(viii) Install wheel washing equipment or conduct wheel washing manually at each exit of the works area to prevent trucks from carrying muddy or dusty substance onto public roads.
(ix) Keep construction vehicles and machinery in good working order, regularly service and turn off engines when not in use.
(x) Vehicles with an open load-carrying case, which transport potentially dust-producing materials, shall have proper fitting sides and tail boards. Dust-prone materials shall not be loaded to a level higher than the side and tail boards, and shall always be covered with a strong tarpaulin.
(xi) In periods of high wind, dust-generating operations shall not be permitted within 200 m of residential areas. Special precautions need to be applied in the vicinity of sensitive receptors such as schools, kindergartens and hospitals.
(xii) To avoid odor impacts caused by shoreline sediment dredging for pier or bridge foundations, transport dredged sediment in closed tank wagons to contain odor and prevent scattering along the way.
(xiii) Unauthorized burning of construction and demolition waste material and refuse be prohibited.

133. **Construction noise**. Contractors will be required to implement the following mitigation measures for construction activities to meet Lao PDR and IFC/WHO recommended environmental noise standards and to protect sensitive receptors. Some measures are generic and are applicable to all construction sites and activities. They represent good practice and are effective measures and are in line with IFC's EHS guidelines.

(i) During daytime construction, the contractor will ensure that: (1) noise levels from equipment and machinery conform to the IFC EHS Standards, and properly maintain machinery to minimize noise; (2) equipment with high noise and high vibration are not used near village or township areas and only low noise machinery or the equipment with sound insulation is employed; (3) sites for concrete-mixing plants and similar activities will be located at least 300 m away from the nearest noise protection target; and (4) temporary noise barriers or hoardings will be installed around the equipment to shield residences when there are residences within 20 m of the noise source.

(ii) No construction is allowed between the night time hours of 22:00 to 06:00.
(iii) Regularly monitor noise levels at construction site boundaries. If noise standards are exceeded by more than 3 dB, equipment and construction conditions shall be checked, and mitigation measures shall be implemented to rectify the situation.
(iv) Provide the construction workers with suitable hearing protection (ear muffs) according to the worker health and safety requirements of Lao PDR.
(v) Control the speed of bulldozer, excavator, crusher and other transport vehicles travelling on site, adopt noise reduction measures on equipment, step up equipment repair and maintenance to keep them in good working condition.
(vi) Limit the speed of vehicles travelling on site (less than 8 km/h), forbid the use of horns unless absolutely necessary, minimize the use of whistles.
(vii) Maintain continual communication with the villages and communities near the construction sites, and avoid noisy construction activities during school examination periods.

134. **Surface water pollution**. The contractors will implement the following measures to prevent water pollution:

(i) Portable toilets and small package wastewater treatment plants will be provided on construction sites and construction camps for the workers and canteens. If there are nearby public sewers, interim storage tanks and pipelines will be installed to convey wastewater to those sewers.
(ii) Sedimentation tanks will be installed on construction sites to treat process water (e.g. concrete batching for bridge construction) and muddy runoff with high concentrations of suspended solids. If necessary, flocculants such as polyacryl amide will be used to facilitate sedimentation.
(iii) Construction machinery will be repaired and washed at special repairing shops. No onsite machine repair and washing shall be allowed.
(iv) Material stockpiles will be protected against wind and runoff waters which might transport them to surface waters.
(v) Dedicated fuel storage areas must be established away from public areas and marked clearly.
(vi) Storage of bulk fuel should be on covered concrete pads away from the public and worker camp, and 300m from surface waters. Fuel storage areas and tanks must be clearly marked, protected, and lighted. Contractors should be required to have an emergency plan to handle fuel and oil spillage.
(vii) Mitigation of water quality impacts during bridge and pier construction will be based on water quality monitoring results.
(viii) Berms and/or silt curtains should be constructed around all excavation/trench sites and along all surface waters to prevent soil erosion and surface water sedimentation.

135. **Earthworks & soil erosion mitigation**. The contractors will implement the following measures related to earthwork management:

(i) Present and past land use should be reviewed to assess whether excavated soils are contaminated spoil. Contaminated spoil should be disposed at a nearby landfill or a location approved by DONRE.
(ii) Confirm location of the borrow pit and temporary spoil storage and final disposal sites, securing permits from relevant DONREs.
(iii) Develop borrow pit and spoil disposal site management and restoration plan, to be approved by responsible authority; obtain permit for the clearance of excavated earthworks.
(iv) Construct intercepting ditches and drains to prevent runoff entering construction sites, and diverting runoff from sites to existing drainage.
(v) Construct hoardings and sedimentation ponds to contain soil loss and runoff from the construction sites.

(vi) Limit construction and material handling during periods of rains and high winds.
(vii) Stabilize all cut slopes, embankments, and other erosion-prone working areas while works are going on.
(viii) Stockpiles shall be short-termed, placed in sheltered and guarded areas near the actual construction sites, covered with clean tarpaulins, and sprayed with water during dry and windy weather conditions.
(ix) All earthwork disturbance areas shall be stabilized with thatch cover within 30 days after earthworks have ceased at the sites.
(x) Immediately restore, level and plant landscape on temporary occupied land upon completion of construction works.
(xi) Implement all soil erosion protection measures as defined in the soil and water conservation reports.

136. **Ecological impacts**. The contractors will implement the following measures to prevent ecological impact during construction:

(i) Preserve existing vegetation where no construction activity is planned.
(ii) Protect existing trees and grassland during construction; where a tree has to be removed or an area of grassland disturbed, replant trees and re-vegetate the area after construction.
(iii) Remove trees or shrubs only as the last resort if they impinge directly on the permanent works or necessary temporary works.
(iv) Prior to commencement of construction, tag and conspicuously mark all the trees to be preserved to prevent damage to these trees by construction workers.
(v) Construction workers are prohibited from capturing any wildlife in the project areas.
(vi) Vegetate slopes to prevent erosion and plant native trees along road alignments.

137. **Occupational health and safety**. The construction industry is considered to be a hazardous for which many potentially hazardous operations conducted. The civil works contractors will implement adequate precautions to protect the health and safety of construction workers and the public. Contractors will manage occupational health and safety risks by applying the following measures:

(i) To prevent or minimize injury of construction workers and the public, directives of the Lao PDR National Occupational Safety & Health (OSH) Programme (2010) that the Ministry of Labour and Social Welfare (MLSW) established with the OSH model program developed by the International Labour Organization (ILO). The IFC/World Bank Environment, Health, and Safety Guidelines (2007) that govern the safe and orderly operation of civil works should be added as supplementary guidance if needed.
(ii) Care must be taken to ensure that sites for all earthworks (e.g., excavations, trenches) and dredging that are suspected to have unexploded ordnance (UXO) are surveyed by the military prior to construction. If such ordnance is detected clearing work will need to be commissioned prior to undertaking civil works.
(iii) Construction site sanitation: (1) Each contractor shall provide adequate and functional systems for sanitary conditions, toilet facilities, waste management, labor dormitories and cooking facilities. Effectively clean and disinfect the site. During site formation, spray with phenolated water for disinfection. Disinfect toilets and refuse piles and timely remove solid waste; (2) Exterminate rodents on site at least once every 3 months, and exterminate mosquitoes and flies at least twice each year; (3) Provide public toilets in accordance with the requirements of labor management and sanitation departments in the living areas on construction site, and appoint designated staff responsible for cleaning and disinfection; (4) Work camp wastewater shall be discharged into the municipal sewer system or treated on-site with portable system.
(iv) Occupational safety: (1) Provide safety hats and safety shoes to all construction workers; (2) Provide safety goggles and respiratory masks to workers doing

asphalt road paving and tunnel blasting; (3) Provide ear plugs to workers working near noisy PME.

(v) Food safety: Inspect and supervise food hygiene in canteen on site regularly. Canteen workers must have valid health permits. Once food poisoning is discovered, implement effective control measures immediately to prevent it from spreading.

(vi) Disease prevention, health services: (1) All contracted labor shall undergo a medical examination which should form the basis of an (obligatory) health/accident insurance and welfare provisions to be included in the work contracts. The contractors shall maintain records of health and welfare conditions for each person contractually engaged; (2) Establish health clinic at location where workers are concentrated, which should be equipped with common medical supplies and medication for simple treatment and emergency treatment for accidents; (3) Specify (by the PMUs and contractors) the person(s) responsible for health and epidemic prevention responsible for the education and propaganda on food hygiene and disease prevention to raise the awareness of workers.

(vii) Social conflict prevention: No major social risks and/or vulnerabilities are anticipated as a result of the project. The project construction workers will be engaged locally. Civil works contracts will stipulate priorities to (1) employ local people for works, (2) ensure equal opportunities for women and men, (3) pay equal wages for work of equal value, and to pay women's wages directly to them; and (4) not employ child or forced labor.

138. **Community health and safety**. Temporary traffic diversions, continual generation of noise and dust on hauling routes, and general hindrance to local accesses and services are common impacts associated with construction works within or nearby local settlements. The project may also contribute to road accidents through the use of heavy machinery on existing roads, temporarily blocking pavements for pedestrians etc. The potential impacts on community health and safety will be mitigated through a number of activities defined in the EMPs. The contractors will implement the following measures:

(i) Temporary Traffic management: A traffic control and operation plan will be prepared together with the local traffic police prior to any construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings with an emphasis on ensuring public safety through clear signs, controls and planning in advance.

(ii) Information disclosure: Residents and businesses will be informed in advance through media of the construction activities, given the dates and duration of expected traffic disruption.

(iii) Construction sites: Clearly marked signs will be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials, excavations etc. and raising awareness on safety issues. Heavy machinery will not be used after day light and all such equipment will be returned to its overnight storage area/position before night. All sites will be made secure, discouraging access by members of the public through appropriate fencing whenever appropriate. Open excavations should be fenced, and trenches covered where public walkways or vehicles must cross.

Subproject-specific sensitivity

139. The construction of the 2-km road section of the loop road through land adjacent to the Phu-En Protection Forest, even though zoned for tourism activities in the Provincial Tourism Development Master Plan, will require special mitigation measures to minimize the impact footprint of the new road section. For example, the total alignment of the road section should be as narrow as possible with minimal to no shoulder area. Only emergency vehicle stopping should be allowed on the minimal shoulder when road section is in operation. All

construction vehicles and equipment should be located and operated within the new road alignment. No adjacent parking areas should be constructed for equipment or paving aggregate stockpiling. All vehicles and equipment should not be serviced along the 2km section, and not be left inside the 2km zone overnight.

140. To confirm the upgrades to the entire 5.9km loop road will not encroach on critical wildlife habitat, or affect rare of endangered species a rapid biodiversity survey of the forest near the loop road alignment was conducted by the National University of Lao PDR. The results of the desk-study, forest survey, and local stakeholder surveys found the forest in the subproject's area of influence is regenerating mixed deciduous forest recovering from past logging and agriculture. The forest does not support rare or endangered animals or plants. Four rare tree species were found more than 1 km from the road alignment. The assessment report is summarized in Appendix G including an action plan, which has been incorporated into the EMP and Output 3 of the project.

141. Extra effort for impact mitigation also applies to the access road upgrades to the Kaeng Yui Waterfall. While the access road is adjacent but outside the Phu Hong – Phu Ban Conservation Forest, extra care to not encroach into the conservation forest is required. The road upgrading activities should not, and do not need to extend into the forest. Temporary vehicle and equipment parking should also not occur in the forest. The completed upgraded alignment should not penetrate the conservation forest. Similar to the Phu-En forest but during detailed design stage, a biodiversity survey of the Phu Hong-Phu Ban forest near the waterfall will be conducted. The results of the survey will be used to enhance the tourist experience at the water fall. It is envisaged that photographs and descriptions of any special wildlife in the area will be presented to visitors to the waterfall on placards placed along the footpath to the waterfall.

142. The upgrading of foot & cycle paths, improvements to the existing island road network for Don Det/Don Khone Access Improvements subproject will potentially hinder use of these roads for tourists and residents. Construction should be sequenced to avoid road closure and scheduled to move equipment out of the way to not block these routes during specific scheduled times of the day.

Piers, embankment, and bridge

143. The construction and upgrades to the piers, embankments and bridges in the three subprojects: 1) Nakasang Access Road and Port Rehabilitation, 2) Nam Ngum Reservoir Access Improvements; and 3) Western Loop Rural Access Road and Bridge Improvements share common construction impacts on surface waters, i.e. Mekong and Nam Song river, and the Nam Ngum reservoir. The issues concern destruction or damage to the aquatic environment, and degraded water quality from pollution and sedimentation, and disruption of boat traffic and fishing or aquaculture.

144. The three subprojects are similar with respect to the potential magnitude of potential impacts on the aquatic environment, and the sensitivity of the affected aquatic environments. Thus, the mitigation measures listed for roads/footpaths, and parking lots apply as appropriate, along with the following specific mitigation measures:

- In-water silt curtains should be placed to isolate as much as possible the civil works activities of the piers at Nam Ngum reservoir and Nakasang town to restrict suspension and re-settlement of bottom sediment to immediate work area.
- Shoreline berms should be placed between work areas on the embankment to be upgraded at Nakasang town, and all other shoreline works such as the drainage pipe to be re-routed at Nakasang village to prevent or minimize soil erosion and sedimentation. Support piles should be avoided if possible for the bridge across Nam Song river
- No vehicles or heavy equipment should be operated in the water if possible.

- All construction materials, machinery fluids (gas, oil), and construction waste must be kept away from the water.
- The civil work areas in the water and along shorelines must be clearly marked to warn the public, boaters, and fisherman of the construction activities.

Landfill

145. The landfill upgrade of the Vang Vieng Solid Waste Management Improvements subproject will involve civil works activities like road construction, but also build a managed dumpsite including special features such as a materials recovery facility and septage treatment facility. The key environmental impact issues during the construction phase and operation phase is groundwater quality, production of methane (CH_4), and leachate. The ECA for the existing dumpsite along with the groundwater quality and soils investigation will provide valuable insight into the detailed design requirements of the upgraded managed landfill. The ECA will also confirm the observed absence of human settlements near the dumpsite and the absence of surface waters. The impact mitigations listed above for road construction apply as appropriate, with the addition of the following key mitigations:

- The ECA and groundwater and soils investigation in Appendix E should be implemented.
- Using the results of the groundwater investigation, excavations of cells should be careful not to penetrate the water table.
- By design, a modern liner should be installed under each landfill cell including the medical waste and septage treatment cells.
- The gas capture technology should be suitable for the type of waste to be deposited in the landfill.
- The capacity of the peripheral surface runoff drainage network to be installed should be sufficient for extreme rainfall projections.
- The leachate capture and disposal design whether by treatment or simple distribution on top of newly deposited/covered waste should meet the production capacity of the landfill.

3. Operation Phase

a. Solid waste management

146. Posted speed limits along the access road to the upgraded landfill in Vang Vieng must be enforced to prevent accidents, and sufficient annual O&M budgets should be provided to maintain all /vacuum trucks and all other vehicles in good working order to reduce air pollution and occupational hazards. Wetting agents (such as water and calcium chloride) should be periodically applied to access roads and landfill areas to control dust and wind-blown debris.

147. The above mitigation should support the comprehensive IFC EHS guidelines (2007) for solid waste and hazardous (hospital) management. The guidelines address the full cycle of solid waste management starting with waste prevention & minimization, collection & transport, recycling and reuse, treatment, storage and disposal, and monitoring. The EMP will further elaborate the requirements of the IFC guidelines.

148. Groundwater quality from the monitoring bore holes installed at landfill sites for the groundwater quality investigation should be monitored regularly to ensure local groundwater is not contaminated by the landfill cells or leachate stream. The MRF and working conditions of any waste pickers at the landfill site needs to be reviewed regularly to ensure that the original equipment, and the working conditions of the pickers are safe. Methane production should be monitored to determine how well the gas capture technology is working.

149. Output 3 of the Project which is focused on capacity development of local agencies for Tourism Destination Management will contribute greatly to solid waste management at all

subproject sites. Solid waste collection and management at the tourist sites remains a significant O&M component that requires strengthening and support.

b. New and upgraded piers and embankments

150. The new and upgraded piers aside the Mekong river and Nam Ngum reservoir, as part of the Nam Ngum Reservoir Access Improvements and Nakasang Access Road and Port Rehabilitation require enforced speed limits for boats to be posted near the pier areas to reduce risk of collisions from increased boat traffic. Boat use of the ports should follow well defined arrival-departure schedules that distinguish tourist traffic from commercial traffic. Rules of no contaminated bilge water/sewage/oil discharge or solid waste discharge from all tourist boats should be put in place and enforced.

c. New and upgraded roads, all subprojects

151. Speed limits for all roads should be enforced and pedestrian cross-walks installed in appropriate areas.

C. Induced and Cumulative Impacts

152. A potential induced spatial or temporal cumulative impact of the increased tourism development at the subproject sites is increased consumption of natural resources, and pollution from solid waste and poorly managed septic systems. Don Det / Don Khone may be most susceptible to solid waste pollution given they are islands without modern landfills.

D. Climate Change

153. A Climate Vulnerability and Risk Assessment (CVRA) was prepared separately. Below are excerpts of the CVRA, climate change adaptations measures, and initial estimates of the projects greenhouse gas emissions (GHG).

1. Projections

154. The recent assessment of climate change in Lao PDR[23] using the 4.5 and 8.5 Representative Concentration Pathways (RCP) for GHG emission scenarios with the Coupled Model Intercomparison Project-5 indicated that mean daily temperature will increase by 1.9 – 2.4 ^{o}C and annual rainfall will increase by 5% by 2036 – 2065. Projected increases in rainfall are greater for rainy season. The 2016 study applied the climate projections to estimate changes in extreme flows in the Mekong river. An assessment of climate change in Khammouane province[24] which is situated north of Champasak province produced an annual increase in precipitation in 2050 of 11% with decreased precipitation during dry season. That study showed maximum daily temperatures would increase by 2^{o}C. Frequency of extreme weather events is expected to increase. Being landlocked, sea level rise is not an issue

1. Greenhouse gas emissions

155. The project investments will lead to GHG emissions from vehicles on project roads and emissions boats using the improved piers. Methane (CH_4) emissions from the upgraded Vang Vieng landfill should be zero to minimal because of the gas capture and control technology that will be installed. The project construction phase is unlikely to produce large GHG emissions because of the investment scale and diversion of existing construction equipment.

156. The GHG emissions from project roads was established based on the guidance

[23] Hoang et al., 2016. Mekong river flow and hydrological extremes under climate change. Hydrol. Earth Sys. Sci. 20: 3027-3041.

[24] USAID, 2014. USAID Mekong Adaptation and Resilience to Climate Change, Vulnerability Assessment Report, Khammouane province, 33pgs.

provided in the ADB Environment Safeguards - a Good Practice Sourcebook (2012). If the traffic expressed as passenger car units per day (PCU/day) is below the numbers indicated in Table 18 in a representative year, the emissions in that year are unlikely to exceed the 100,000 tons CO^2e threshold.

Table 18. Maximum Number of PCU per Km to Trigger 100,000CO2e/a

Length of Road. (km)	PCU/day	Length of Road. (km)	PCU/day
10	76,000	50	23,000
20	57,000	60	19,000
30	38,000	70	16,000
35	33,000	90	13,000
40	28,000	100	11,000

Source: ADB Environment Safeguards - a Good Practice Sourcebook (2012)

157. The total length of the new roads is estimated less than 3km, for the other 37 km upgrades are proposed to existing roads. Traffic flows in 2030 are expected to be below 50,000 PCU/day, which produces well under the 100,000 tons/a GHG threshold.

158. Output 2 of the project which is comprised of the project-wide adoption of the Asean Tourism Standards (e.g., Homestay Standard, Clean Tourist City Standard, Green Hotel Standard, & Public Toilet Standard) will contribute to the reductions in the carbon footprint of the subproject areas through increased energy efficiency (e.g., use of LED lighting) and reductions in GHG emissions.

2. Climate Risk and Vulnerability

159. The indicative sensitivity of the 7 subprojects in Champasak and Vientiane to climate change was classified as “MEDIUM” using AWARE™ software tool. The software combines geographic information on current site-specific climate, climate hazards from topography, elevation and distance to the ocean, and the latest climate change projections for each area. The sensitivity of the seven subprojects is due primarily to sensitivity to local landslip and flooding.

3. Climate Proofing Project Infrastructure

160. The preliminary, and later detailed designs, will be resilient to the impacts of present-day climate extremes defined primarily by rainfall intensity and wind on flooding and erosion. Most of the subproject components are vulnerable to the projected changes in climate, and justify climate proofing.

161. The sensitive attributes of the components are, for example; (1) pier and shoreline embankment height and foundations, (2) drainage capacity; and (3) road bed grade, and pavement type. By example these design factors must be resilient to climate change for the individual components to be sustainable without premature, major retrofits. Provided below are initial design measures and estimated marginal costs for climate proofing. These measures are further described in the CVRA.

a. Shoreline embankments and pier developments

162. The concrete shoreline embankment along the Mekong river at Nakasang will require an estimated extra $1,800. The new pier and marina development on Nam Ngum reservoir will require an estimated extra $400,000.

b. Upgraded access roads and drainage

163. The additional cost to make the upgraded access roads and footpaths of the subprojects resilient to climate change stems primarily from the use of concrete, by road bed

height & lateral slope design, and drainage capacity. The estimated incremental cost for the road components of Nakasang subproject is 1.4 million. For Don Det/Don Khone subproject the incremental cost for the all road and footpath components is 1.34 million. An extra 1.13 million is estimated for the loop road at Nam Ngum. The village drains and upgraded road for Kaeng Yui waterfall subproject will cost an estimated extra cost of 1.19 million. The estimated incremental cost to make the upgraded road and new bridge components for the Western Loop Road subproject, and the upgraded access road to the Vang Vieng landfill resilient to climate change is approximately $970,000. and $90,000., respectively. The street and drainage upgrades in Vang Vieng town will cost an estimated $14,000 additional cost.

VII. INFORMATION DISCLOSURE AND PUBLIC GRIEVANCE MECHANISM

164. As described above the subproject components were introduced to affected stakeholders as part of the joint social-environment surveys and consultations. Verbal and visual presentations of the subprojects were provided to key stakeholders ahead of the facilitated consultation discussions.

165. The formal disclosure of information in the Lao language to affected persons and stakeholders that occurred during the development of the IEE is meant to form the beginning of continued information disclosure and stakeholder involvement as the project is implemented. As part of the project's stakeholder communication strategy, regular information exchange meetings with stakeholders is required throughout subproject design, implementation, and operations.

166. The IEE must be easily available to the stakeholders in written form and translated into Lao when updated. The IEE will be available on provincial DICT web sites, DICT offices, and at subproject sites/villages. Similarly, all project reporting with specific reference to stakeholder consultation minutes, environmental monitoring, and reports on EMP implementation released by the EA/PSC should be available at the same offices and web sites. The IEE will also be available on the ADB web site. At the start of the detailed design of the subprojects the public consultation and information disclosure process initiated during feasibility design will continue. This will enable affected stakeholders to get an update on progress and any significant changes in design or location. After detailed design, the updated IEE and EMPs will be disclosed on the DICT and ADB websites and made available to other stakeholders on request. After implementation of subprojects begins, all environmental and EMP reporting submitted by the EA/PSC will also be available on the ADB web site.

167. A well-defined grievance redress and resolution mechanism will be implemented to address any affected stakeholder's grievances and complaints regarding environment, land acquisition, compensation and resettlement in a timely and satisfactory manner. Given the project's joint approach to consultation of the same mechanism will be used for issues of environmental impact or disturbance at any stage of the implementation of all subprojects. All stakeholders will be made fully aware of their rights, and the detailed procedures for filing grievances and an appeal process will be published through an effective public information campaign. The grievance redress mechanism and appeal procedures will also be explained in a project information booklet (PIB) that will be distributed to all stakeholders.

168. Stakeholders or persons affected by the subprojects are entitled to lodge complaints regarding any environmental issue or any aspect of the land acquisition and resettlement requirements such as, entitlements, rates and payment and procedures for resettlement and approved income restoration programs. Stakeholder complaints can be made verbally or in written form.

169. A Grievance Committee will be organized in villages comprising local leaders designated for such tasks. The designate officials shall exercise all efforts to settle affected stakeholder issues at the village level through appropriate community consultation. All

meetings shall be recorded by the grievance committee and copies shall be provided to affected stakeholders. A copy of the minutes of meetings and actions undertaken shall be provided to the DICT, IAs, DONREs, and ADB upon request.

170. The procedures for grievance redress are set out below. The procedure described below applies to both social and environmental issues and is consistent with the legal process for resolution of disputes in Lao PDR, and exemplifies the desired collaboration among the different levels of government as recently described by Decision 7536/MONRE (2012). The PMU will have overall responsibility of ensuring the GRM is active and successful at the subproject level. Individual affected persons will be able to enter the GRM at a construction site by simply using the telephone hotline that is clearly posted at each construction site. Conversely, an affected person can contact the PMU directly at the PMU office, or annexes established at the subproject areas. The EA with assistance from the PMU is responsible to ensure that the government grievance system is successfully applied, and if needed, modified to integrate with the context of the individual subprojects.

i) Stage 1: Complaints from affected stakeholders for the first time shall be lodged verbally or in written form with the village head or commune leader. The complaints shall be discussed with the affected stakeholder and the designated Head of Grievance Committee or members of the committee. It will be the responsibility of the Head of Grievance Committee to resolve the issue within 15 days from the date the complaint is received. All meetings shall be recorded and copies of the minutes of meetings will be provided to APs.

ii) Stage 2: If no understanding or amicable solution can be reached or if no response is received from the grievance committee within 15 days from filing the complaint, the affected stakeholder can elevate the case to the District Grievance Committee. The District Grievance Committee is expected to respond within 15 days upon receiving the affected stakeholder's appeal.

iii) Stage 3: If the affected stakeholder is not satisfied with the decision of the District Office, or in the absence of any response, the APs can appeal to the Provincial Grievance Committee (PGC). The PGC will review and issue a decision on the appeal within 30 days from the day the complaint is received.

iv) Stage 4: If the affected stakeholder is still not satisfied with the decision of the PGC or in the absence of any response within the stipulated time, the affected stakeholder's, as a last resort may submit his/her case to the provincial court. The court will address the appeal by written decision and submit copies to the respective entities which include the DICT, DONRE, DGC/PGC and the affected stakeholder. If, however, the affected stakeholder is still not satisfied the court's decision, the case may be elevated to the provincial court. If, however, the decision of the provincial court is still unsatisfactory to the affected stakeholder, the affected stakeholder may bring the complaints to the Higher Court.

171. The PMU with support from the PSC will be responsible for checking the procedures and resolutions of grievances and complaints. The PMU must have expertise and experience in social and environmental issues associated with infrastructure developments. The PMU may recommend further measures to be taken to redress unresolved grievances. The Project Management & Civil Engineering Support Consultant (PMCES) will provide the necessary training to improve grievance procedures and strategy for the grievance committee members when required.

172. The executing agency (Ministry of Information, Culture and Tourism (MICT)) will shoulder all administrative and legal fees that will be incurred in the resolution of grievances and complaints if the affected stakeholder wins the case. Other costs incurred by legitimate complaints will also be refunded by the project if the affected stakeholder wins their case.

173. In cases where affected stakeholder do not have the writing skills or are unable to express their grievances verbally, the affected stakeholder can seek assistance from civil society organizations, DONRE staff, or other family members, village heads or community chiefs to have their grievances recorded in writing, and to have access any environmental or social surveys or valuation of assets, to ensure that where disputes do occur, all the details have been recorded accurately enabling all parties to be treated fairly. Throughout the grievance redress process, the responsible committee will ensure that the concerned affected stakeholder is provided with copies of complaints and decisions or resolutions reached.

174. If efforts to resolve disputes using the grievance procedures remain unresolved or unsatisfactory, affected stakeholder has the right to directly discuss their concerns or problems with the ADB Southeast Asia Department through the ADB Lao PDR Resident Mission (LRM). If APs are still not satisfied with the responses of LRM, they can directly contact the ADB Office of the Special Project Facilitator (OSPF).

APPENDIX A: RESULTS OF IBAT ANALYSES OF SUBPROJECT AREAS

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Nakasong Boat Terminal
Latitude/Longitude	14° 0' 4" North, 105° 55' 9" East
Date generated	14th November 2017
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 1 km

Priority Sites for Biodiversity		
Key Biodiversity Area	Siphandon CR/EN, VU, endemic, migratory birds/congregations	37,320 ha

Features within 5 km

There are no additional features within 5 km.

Features within 15 km

National-level protected areas		
IUCN Category V-VI	Xe Pian	2,617 ha
Protected areas designated under regional or international conventions and agreements		
Ramsar	Middle Stretches of the Mekong River north of Stoeng Treng	317 ha
Priority Sites for Biodiversity		
Key Biodiversity Area	Chhep CR/EN, VU, migratory birds/congregations, other	243,661 ha
Key Biodiversity Area	Mekong River from Kratie to Lao PDR CR/EN, VU, endemic	83,501 ha
Key Biodiversity Area	Xe Pian CR/EN, VU	243,100 ha

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Integrated Biodiversity Assessment Tool

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Don Det Old French Port
Latitude/Longitude	13° 58' 55" North, 105° 55' 26" East
Date generated	14th November 2017
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 1 km

Priority Sites for Biodiversity		
Key Biodiversity Area	Siphandon CR/EN, VU, endemic, migratory birds/congregations	37,320 ha

Features within 5 km

There are no additional features within 5 km.

Features within 15 km

National-level protected areas		
IUCN Category V-VI	Xe Pian	2,617 ha
Protected areas designated under regional or international conventions and agreements		
Ramsar	Middle Stretches of the Mekong River north of Stoeng Treng	317 ha
Priority Sites for Biodiversity		
Key Biodiversity Area	Chhep CR/EN, VU, migratory birds/congregations, other	243,661 ha
Key Biodiversity Area	Mekong River from Kratie to Lao PDR CR/EN, VU, endemic	83,501 ha
Key Biodiversity Area	Xe Pian CR/EN, VU	243,100 ha

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Nam Ngum Reservoir
Latitude/Longitude	18° 31' 42" North, 102° 33' 2" East
Date generated	1st December 2017
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 2 km

There are no features within 2 km.

Features within 10 km

There are no features within 10 km.

Features within 20 km

National-level protected areas		
IUCN Category V-VI	Phou Khao Khoay	1,811 ha
IUCN Category V-VI	Phou Phanang	682 ha
Priority Sites for Biodiversity		
Key Biodiversity Area	Phou Khaokhoay CR/EN, VU	2,480 ha

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Kaeng Yui Waterfall Lao PDR
Latitude/Longitude	18° 57' 14" North, 102° 29' 33" East
Date generated	1st December 2017
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 1 km

There are no features within 1 km.

Features within 5 km

There are no features within 5 km.

Features within 20 km

There are no features within 20 km.

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Western Loop Road Vang Vieng
Latitude/Longitude	18° 55' 24" North, 102° 23' 45" East
Date generated	1st December 2017
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 2 km

There are no features within 2 km.

Features within 10 km

There are no features within 10 km.

Features within 20 km

There are no features within 20 km.

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	New bridge site in Vang Vieng
Latitude/Longitude	18° 55' 50" North, 102° 26' 37" East
Date generated	1st December 2017
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 2 km

There are no features within 2 km.

Features within 10 km

There are no features within 10 km.

Features within 20 km

There are no features within 20 km.

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Vang Vieng Dumpsite
Latitude/Longitude	18° 52' 6" North, 102° 30' 14" East
Date generated	1st December 2017
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 2 km

There are no features within 2 km.

Features within 10 km

There are no features within 10 km.

Features within 20 km

There are no features within 20 km.

APPENDIX B: STAKEHOLDER CONSULTATIONS – CHAMPASAK PROVINCE

Public Consultation Meeting on environmental concerns and related comments on (1) Nakasang Access Road and Port Rehabilitation and (2) Don Det-Don Khone Access Road Improvements Champasak Province, 30 August to 2 September 2017

Specific concerns and detailed result of public consultation meeting with related sectors and authorities:

Nakasang Access Road and Port Rehabilitation:

This project covers one village which there were a very intensive consulting meeting, almost of the concern had been addressed from the previous lesson learn of the previous project operation. Some of the different concerns are summarized in the table.
In general, all village members welcome the development project but noted contractors must follow construction standards and proper checking of QA/QC. The community participation in each phase were required for clearly acknowledgement of the Project's activities and policy. The detailed concerns and comments from those related sectors of village, district and province level had shown in the below Table.

Phase	Nakasang Access Road and Port Rehabilitation Concern Issues and Comments	
	Villagers and Village Authorities	**District and Province Authorities**
Subproject Benefits - Improve the parking area - Better transportation along the road to the port - Increasing the local income from the agricultural product export and tour service - Increasing the local economic development in the villages - Less traffic issue along the road - Increasing the tourist's numbers - Support the tour service, increasing the tourist number, improve the village infrastructure which conforms to the district socio-economic plan.		

Phase	Nakasang Access Road and Port Rehabilitation Concern Issues and Comments	
	Villagers and Village Authorities	**District and Province Authorities**
Pre-construction project design &, impact assessment	- Less participation from the local authorities and villagers. - Less Project's information due to rarely public consultation among the local authorities and relate sectors. - No proper informing the local people on the construction schedule and plan. - No proper public informing and consultation for obstruct removal and construction commence. - No proper consulting for finding the detour way. - Improper design which reflects QA/QC checking. - Detail design should consider on the existing environmental condition including natural creek, stream and river flow. - Consider to preventing the blocking of natural water course.	- Need to have the public consulting with all affected households for preventing the misunderstanding on the project's policy (potential compensation or no compensation). - Initial induction to the affected people for Project design and to present the potential detour road. - Consider having a suspicious select the Contractor, temporary storage, worker camp location. - Consider engaging all affected household during initial environmental and social impact assessment. - Consider consulting and cooperate with the related sectors on the port improvement.
Construction phase	- No proper initial registration from Contractor to the village office. - Concern on the complaint issue among the local people and Contractor without informing the local authorities. - No proper QA/QC checking among the related sectors. - Preventing to use of the low quality of borrow pit. - Providing the detour way by consulting with local community (village and district officers). - Providing the safety measure.	- Proper participation of local authorities (village and district level). - Strongly checking on QA/QC during construction - Truck traffic causing increased risk of public injury particularly children. - Reduced and impeded access and travel along road due to construction activities. - Request supporting from the local community and having the public contribution to the local people on traffic concern. - Concern on the less coordination among village, district, contractor and Project owner.

Phase	Nakasang Access Road and Port Rehabilitation Concern Issues and Comments	
	Villagers and Village Authorities	**District and Province Authorities**
	- Initial induction on the Project's rule and required standard to Contractor. - Initial registration the Contractor to village authority needed for culture/traditional concern and village observation, - Ensure on the sufficient drainage system and pipe-culvert. - Consider having an install the temporary waste storage. - Dust, vibration and noise shall be prevented by Contractor with the local people supporting.	- Improper selection of borrow pit may occur. - Less concern on the mitigation measure by contractor. - Strongly engage local people to support and agree on the potential impact occur such as dust, vibration to the house and building, traffic, accident, blocking some accessibility. -
Operation phase	- Providing training to local people on the road maintenance and operation manual. - Providing the sufficient equipment for long term maintenance and operation - Consider engaging the local people on the maintenance, operation, observation, care/concern on the community property, community cleaning along the road.	- Strongly monitoring the QA/QC with community participation and also during the final check. - More attention for the market waste management and to ensure on the sufficient operation and maintenance plan. - Consider having a village authorities' participation and engage on market management - Consider having an official instruction for village engagement on the market management including waste, toilet, and cleaning and plot arrangement. - Consider having the participation from village level for the road maintenance and operation plan.
Other suggestions	- Consider having a community participation for market management includes waste management, routine cleaning, and market plot arrangement.	- To clear all obstacle along the river bank and port before construction commence particularly on the land compensation. - Previous experience had thought the impact on the less care of QA/QC and less community participation for social issue, and local people misunderstanding about

Phase	Nakasang Access Road and Port Rehabilitation Concern Issues and Comments	
	Villagers and Village Authorities	District and Province Authorities
		the Project's policy (without compensation but to engage all people to support the Project)

Don Det - Don Khone Access Road Improvements

This subproject covers three villages (Ban Don Det, Ban Don Khone, Ban Hang Khone) which there were a few consultation meetings, almost of the concern had been addressed in the same opinions and lesson learn from the neighbor village. Some of the different concern also point out in the below summary table.
In general, all village members are willing to support the development project, but one important point out is to best keep the existing natural condition as much as possible. The specific concerns and comments from those related sectors of village, district and province level had shown in the below table.

Phase	Don Det - Don Khone Access Road Improvements Concerns, Issues, and Comments	
	Villagers and Village Authorities	District and Provincial Authorities
Subproject Benefits - Better access and travel within the village area - Increasing the tourist number - Increasing the income and economic of the local people and village - Improve the beautiful vision and more attractive to tourists and visitors - More facility supporting for local community development - To initiate Don Det – Don Khone development in the future - Opportunity for local people to invest more business - Create more accessibility to the site seeing and natural place		

Pre-construction project design &, impact assessment	- Villagers fully support the project and always positive participation. - Not allow the previous Contractors to enter the village for any development activity. - Suspicious select the Contractor which it fully follows the construction standard and detail design. - Consider having the local authorities' participation for Contractor selection. - Proper select the detour road by community and household participation. - Attention for public participation among village, district, province office and Contractor for well select the borrow pit. - Less concern on the toilet waste management which may be discharged to the natural stream and river. - Proper design the Project's conception for applying to the tour service and village travel utilization and best keeping a natural environment. - Consider installing the temporary waste storage in the village area.	- Project need to conduct the environmental and social impact assessment by supporting of Consultant Company. - Detail assessment and public consultation should be conducted before construction commence. - All related sectors should be coordinated and join the consultation meeting more than previous Project. - The related committees in the provincial and district level should closely cooperate with the village authority. - Provide the clearly responsibility of related sectors and committee for Project's management. - Concern on the actual communication pipe among the related sectors and local community. - Detail design and assessment should consider on the keeping of existing natural environment condition. - Concern on the potential impact to the groundwater and surface water channel. - The initial design should be consulted together with PWT district, provincial level and with village participation. - The final detail design should be checked and finalized with all related sector in provincial, district and village level. - Initial detail design should concern on the natural environment, and existing geological condition. - To ensure the project shall not overlap or disturbing to other development project such as train way, historical cycle road, and other. - Consider limiting the direct discharge of wastewater through the pipeline and flows directly to the stream. - The assessment report should include the matter of social concern, natural environment, cultural tradition, management plan and rehabilitation plan.

Construction phase	- Contractor shall have a mitigation measure to preventing the dust, noise and vibration impact as possible. - Strongly providing an initial public outreach to local people, student and teachers on safety issue, detour road, tuck traffic, and workers camp. - Spoil soil disposal shall be disposed at the proposed area by the community participation. - Consider improving the existing detour before construction commence. - Concern on the improper storage of excavation waste and construction waste. - Strongly initial registration of new Contractor to the village authorities. - Priority consider on village workers to participate into the project's activities and under the official agreement. - Contractor camp should have a proper toilet and waste management. - To have a well demarcation along the construction area particularly the house/building area. - Consider having a short period of the construction activities.	- Company and Contractor need to fully response on the potential impact on the dust, noise, vibration impact. - Consider providing the mitigation measure for preventing the dust, noise and vibration impact. - Initial excavation and clearing should be informed and notice to the local authorities. - The selected borrow pit need to have an official agreement among the related authorities (Province, District, Village and Land owner). - Concerning on the heavy vehicle traffic along the road and riverbank. - Concern on the waste management and storage. - Strongly set up the rule of waste collection and management with the community participation.
Operation phase	- Consider having sufficient equipment and vehicle for waste management and collection. - Provide the training on the proper waste collection, proper waste management and set up the response unit in village. - Consider setting up the village fund for waste management by collecting from the related service possibility. - Concern on the existing accessibility to each house which it reflect to ignore the waste collection.	- Consider having the emergency fund from the tour service, road and vehicle service separately and possibility. - Consider having the budget for Project operation and maintenance. - Related stakeholder should initial consider to preparing the operation and maintenance plan for sustainable operation. - Consider having the local and community participation on the operation and maintenance plan preparing.

	- Less communication and cooperation among the villagers, business unit, district office for improving the waste management. - Strongly checking the QA/QC and provide the guaranty period without pay if it is not pass QA/QC - Concern on the residue social and environmental issue before final Project finalization. - Strongly getting the agreement among related sectors(private, government office and village authority) for road operation/maintenance and waste management. - Strongly providing the practicable operation and maintenance plan which could conduct by the village level. - Specific identify the responsible scope of all related units such as the village authority, villagers, tour service unit, vehicle service unit, accommodation service unit and others. - Concern to set up the community role on the waste management, waste collection and road utilization.	
Other suggestions	- Consider improving the accessibility to reach each house for supporting the waste collection. - Propose to backfill the village pond (at Ban Han Khone) by using the villages borrow pit. - Consider utilizing the borrow pit (at Ban Han Khone) as the village waste pit. - No larger development which it may expunge the existing natural environment.	- Propose to have more development plan for the riverbank protection along the island Det and Khone.

Photos of consultation meetings in Nakasang town and on Don Det / Don Khone islands, and with DNRE and DPWT.






Champasak Consultation Participation List:

No	Name	Responsibility/Position	Sector
Ban Nakasang			
1	Mr. Phonesavanh	Village governor secretary	
2	Mr. Vangsin Phomvongsing	Village defense chief	
3	Mr. Khampho Sombundith	Village vice head	Village office
4	Mr. Phouma Keobounthan	Young union chief	
5	Mr. Bounleua Vilavong	Boat union chief	
6	Mr. Khamsing Keomany	Village vice head	Village office
7	Mrs. Somphoud	Women union chief	Village women Union
8	Mr. Bounthavy Chinthavong	Village vice head	Village office
9	Mr. Somxai Phomnathep	Village vice head	Village office
10	Mr. Khamsing Bounchalern	Deputy head office	District ICT Office
11	Mr. Bounnouan Vilayphone	Deputy head of environment office	District NRE office
12	Mr. Bounkhouang Phengboudkeo	Head office	District PWT office
13	Mr. Soukdavone Sengthavy	Technical officer	Department of ICT
14	Mr. Anousone Keophaphon	Deputy head of PICT	Provincial Information Culture and Tour
Done Det			
1	Mr. Kham Chanthavong	Village governor secretary	Village office
2	Mr. Souk	Village member	
3	Mr. Soiy	Village member	
4	Mr. Khamfoy Khanyasy	Older Chief	Village office
5	Mr. Thongsy Kauboualy	Young union head	
6	Mr. Ped	Boat union head	
7	Mr. Sing	Vehicle union member	
8	Mr. Long	Vehicle union chief	
9	Mr. Phonevilay	Village vice head	Village office
10	Mr. Air	Village member	
11	Mr. Soubin Phimthong	Village vice head	Village office
12	Mr. Sylei	Village member	
13	Mr. Khampheuang Inthavong	Women union chief	Village women Union

14	Mr. Bounthing	Governor secretary	
15	Mr. Khamsing Bounchalern	Deputy head office	District ICT Office
16	Mr. Bounnouan Vilayphone	Deputy head of environment office	District NRE office
17	Mr. Bounkhouang Phengboudkeo	Head office	District PWT office
18	Mr. Soukdavone Sengthavy	Technical officer	Department of ICT
19	Mr. Anousone Keophaphon	Deputy head of PICT	Provincial Information Culture and Tour
Done Khone			
1	Mrs. Venphet	Women union chief	Village women Union
2	Mr. Sisaart Bouapaserth	Economic village staff	Village office
3	Mr. Pun Pouyphachandeng	Village Defense staff	Village office
4	Mr. Khamkheuam Keonoon	Older chief	Village Community
5	Mr. Kaysot	Young union member	Village office
6	Mrs. La	Women union member	Village women Union
7	Mrs. Khaung	Women union member	Village women Union
8	Mr. Khamsing Bounchalern	Deputy head office	District ICT Office
9	Mr. Bounnouan Vilayphone	Deputy head of environment office	District NRE office
10	Mr. Bounkhouang Phengboudkeo	Head office	District PWT office
11	Mr. Noy	Restaurant owner	
12	Mrs. Somsamouk	Restaurant owner	
13	Mr. Khammone Panboun	Vice village head	Village office
14	Mr. Thepmai	Guesthouse owner	
15	Mr. Bun Inthalungsy	Village head	Village office
16	Mr. Soukdavone Sengthavy	Technical officer	Department of ICT
17	Mr. Anousone Keophaphon	Deputy head of PICT	Provincial Information Culture and Tour
Han Khone			
1	Mr. Noumay Bouapaseuth	Village governor secretary	Village office
2	Mr. Khamsing Bounchalern	Deputy head office	District ICT Office
3	Mr. Bounnouan Vilayphone	Deputy head of environment office	District NRE office
4	Mr. Bounkhouang Phengboudkeo	Head office	District PWT office
5	Mr. Bounsieng Malayvong	Village vice head	Village office
6	Ms. Phoutsamone	Village member	
7	Mr. Khamking	Young union member	Village office
8	Mr. Van	Village member	

9	Mr. Souk	Village defense member	Village office
10	Mr. Bounthavy	Village defense chief	Village office
11	Ms. Somphone	Women union chief	Village women Union
12	Mr. Pong	Village defense member	Village office
13	Ms. Lai	Village member	
14	Mr. Sommai	Village member	
15	Ms. Pa	Village member	
16	Mr. Anousone Keophaphon	Deputy head of PICT	Provincial Information Culture and Tour
17	Mr. Soukdavone Sengthavy	Technical officer	Department of ICT
Department of Natural Resources and Environment(NRE), Champasack Province			
1	Mr. Somsack Xaymedvong	Head of forestry section	Department of Natural Resources and Environment
2	Mr.Vilaxay Pasithsack	Deputy head of environment section	
3	Ms. Thipphachanh Vongsena	Head of planning section	
Department of Public Work and Transpiration(PWT), Champasack Province			
1	Mr. Bounxoiy Phuntiyavong	Deputy Head of PWT Division	Department of PWT
2	Mr. Vanhchay Soukkaseum	Representative of Road Division	Road Division
3	Mr. Phoukhan Pathoumthong	Technical officer	Urban Planning Division
4	Mr. Khamsoy Pathoumthong	Deputy director of PWT Department	Department of Public Work and Transportation
5	Mr. Bounthavy Vioudom	Deputy head of planning division	Department of Public Work and Transportation
6	Mr. Anousone Keophaphon	Deputy head of PICT	Provincial Information Culture and Tour
7	Ms. Souksakhone Sihalath	Environmental specialist	Consultant

APPENDIX C: STAKEHOLDER CONSULTATIONS – VIENTIANE PROVINCE

Public Consultation Meeting on the environmental concern and related comments on:

Nam Ngum Reservoir Access Improvements,
Kaeng Yui Waterfall Access Improvements,
Western Loop Rural Access Road and Bridge Improvements,
Vang Vieng Urban Renewal and
Vientiane Province Sanitary Landfill Development.

Vientiane Province, 26-28/ August/ 2017

Nam Ngum Reservoir Road Access Improvements

This subproject covers one village (Ban Sengsavang) which there is an intensive meeting, the related authorities have fully shared of the information and comment, with the positive participation from each sectors and local community had been finalized into the below summary table.

Overall, all sectors and authorities are fully support and willing to welcome the development project, somehow some of the concern and comment had been raised and discussed particularly on the potential detail design of the project's component, Project's policy, mitigation measure, community participation and technical methodology for construction and also the public consultation with the related sectors and authorities. The summary concern and comment from those related sectors of village, district and province level had shown in the below table:

Phase	Concern Issues and Comments	
	Villagers and Village Authorities	**District and Province Authorities**
Subproject Benefits	- Good to improve the existing old building and small shop to have a better environmental vision and more attractive tourists - Increase the local income and tourists accessibility - Provincial public gathering site - Opportunity for setting up the night market and other small business - Create a new tourist attractive sites - Potential solving the waste issue and disorder zone and structure - Comfortable travelling and convenient parking vehicles	

Pre-construction project design &, impact assessment	- Providing the clear message of the Project's policy on the social and environmental impact. - Public consultation with the existing business, office and obstacle owner need - Providing the initial public informing on the Project's activities.	- The proper selection of the temporary storage, parking, worker camp should be concerned - The existing business, service, offices and building along the Port Zone and Green Area Plan should be cleared before project's commence - Request to have a proper design and to have a community participation during the detail design such as parking area, transportation lane, permanent shop and building movement, - Proper design the road and parking construction which should preventing the risk accident from the landslide and detour transport materials - Consider to provide the detour way or other access road for the local people and tourists
Construction phase	- To allow the villagers to be employed as workers and/or low skill workers. - Consider to provide the detour road for local people before construction commence. - Consider to provide the mitigation measure for preventing the sediment, dust, noise pollution. - Strongly follow the construction standard. - Consider to set up the Project committee for supporting the cooperation among related sectors.	- Steep slope is caused the erosion issue, accident and sedimentation along the riverbank. - The potential issue on the environmental flow and water drainage would occur, - Proper include the wastewater treatment system or/and septic system in the proposed building and shop and service structures - Truck traffic causing increased risk of public injury particularly children - Reduced and impeded access and travel along road due to construction traffic
Operation phase	- Consider to improve the landfill under the construction standard - Consider to provide the operation and maintenance plan and equipment for long tern operation - The small business and hotel should have a proper septic system - Consider to provide the public toilet, waste bins along the green zone. - Consider to priority local people to join invest in the tour development program.	- Proper providing the scope of wastewater treatment system of the shop, service building and other structure, and to limit the free discharge the wastewater to the natural water course or/and river/stream

	- Consider to have a proper waste management. - Consider to training the villager for joining the long term development plan.	
Other suggestions	Allow the villager to take a part of the investment and small business in the Project area.	

Kaeng Yui Waterfall Access Improvements

Overall, this subproject cover about three villages (Ban Na Doung, Ban Phonpheng, Ban Vangvieng), includes the upgrading to existing tourism node, and upgrading the access road serving 3 villages to Tad Kae Yui. Villagers and village authorities are willing to hear the Project commence, villagers are fully support the development project. Some concern had been summarized as below table.

Phase	**Concern Issues and Comments**	
	Villagers and Village Authorities	**District and Province Authorities**
Subproject Benefits	- Local stakeholders be informed about all the project's components and welling to support the project - Facilitate greater access - Increase number of tourists / tourism development - Increase income for family and village - Villager could sale more the agricultural products - Village development and increasing of the household number - Provincial public gathering site - Opportunity for setting up small business - Develop an existing tourist attractive sites - Comfortable travelling and convenient parking vehicles	
Pre-construction project design &, impact assessment	- Consider to have the initial announcement and registration to the local authority. - Consider to have community participation for the project design conception (detour access and temporary storage and workshop area allowance). - Allow the villagers to be employed as workers and/or low skill workers.	- Consider to have local participation for sharing the environment information (detour accessibility, borrow pit and other mine resources). - Initial public information sharing about the Project's activity and policy should be presented. - New Contractor should initial registrar to the local authorities before construction commence. - All the local authorities should have the positive participation to the Project. - Detail design survey shall be public shared and informing to the local community.

Construction phase	- Culture/traditional issue shall be concerned by the construction team to villages. - Existing underground water supply shall be reverted by the community with the district authorities' supervision. - Potential dust, noise and vibration pollution should be supported by the contractor and also villagers. - Truck traffic causing increased risk of public injury particularly children. - Reduced and impeded access and travel along road due to construction traffic. - Less tourist number during the construction. - Emergency accidents may occurred.	- Having the official documentation with local authorities for any use of mineral resources. - Construction team should have an initial approach to the village authorities for first present. - Both villagers and construction team shall be aware for the mitigation measures of the environmental impact and prevention. - Village authorities including teachers, village's heads should be informed the project's activities. - Village authorities may be reflected to the decreasing tourist service and income. - The construction team should have the specific site environmental and social management plan including the potential environmental mitigation measures. - The potential use of natural resources in the community are, it shall be initial informed and presented to the related local authorities.
Operation phase	- Road accident may occur - Income increasing may reflect to the villagers expense and village development.	- Consider to rehabilitate the temporary area as previous condition. - All construction wastes should be managed and disposed to the disposal area. - Final checking on the Project quality should be fully inspected by the related supervisors. - The maintenance program should be raised and concerned into the operation plan. - The construction team should support to clean up and close all the environmental concern before operation completion. - The mineral resource and borrow pit should be well backfilled and closed with the owner agreement.

Western Loop Rural Access Road and Bridge Improvements

In overall, this proposed project includes upgraded western loop road and access to village/tourist nodes, construct the northern river bridge, and to construct the link road from northern river bridge to the west loop road. This project covers 11 villages which there were a very intensive consulting meeting, almost of the concern had been addressed from the previous experience of the previous project operation. Some of the different concern also point out in the below summary table.

In general, all village members are welcome the development project but important point out had been raised is to seriously selection of Contractor which it is going to follow all the construction standard and proper checking of QA/QC. The community participation in each phase were required for clearly acknowledgement of the Project's activities and policy. The summary concern and comment from those related sectors of village, district and province level had shown in the below table:

Phase	Concern Issue and Comments	
	Villagers and Village Authorities	**District and Province Authorities**
Subproject Benefits	- Improve the road condition and accessible to the sightsee places - Increasing the local economic development in the villages - Increasing the local income and small business - Comfortable travelling and convenient parking vehicles - Support the tour service by increasing the tourists numbers - Improve the village infrastructure which conforms to the district socio-economic plan	
Pre-construction project design &, impact assessment	- Public community consultation on the project's activities should be conducted firstly. - Clear the Project's policy on potential social and environmental loss. - Initial informing the new comer contractor for village registration and induction - Concerning on the using of community gravity water and water supply - Consider to select the potential waste disposal area for construction waste, spoil soil, camp wastes, - Initial approach the villagers for sharing the Project's policy and responsibility. - To have a village participation on the finding detour access.	- The propose plan is to have a detail design for supporting the tour development and for local business. - Consider to have less column for the bridge design. - Concern on the construction quality which may not follow the construction standard. - Allow local people understanding on the Project activities. - Allow local people to join and sharing information during the detail design period.

Construction phase	- Allow local people to join working for the project as any skill employee. - Dust and noise issues should be informed and prevented under the environment standard. - Safety issue shall be provided the mitigation measures particularly for the children. - Truck traffic causing increased risk of public injury particularly children. - Reduced and impeded access and travel along road due to construction traffic. - Less waste management may occur. - Drug issue may occur from both side of workers and local people. - Water flow and water drainage system on the new road alignment may occur to the nearby rice field. - Consider to preventing the water blocking or flooding to the rice field and other area. - Concern on the materials transport, which may over loading and unsafe cover along the existing road way. - Concern on the camp waste management particularly on the toilet waste. - Request the Contractor to follow the agreement and minute with local authorities, and to follow the detail design effectively. - Potential filched construction materials at camp and construction area. - Apply the construction standard and Contractor should fully following the detail design.	- Concern on misunderstanding among Project and local authorities on the project's policy and compensation. - Less attention on the negative and positive assessment before construction. - Less participation of local authorities into Project's activities. - Concern on the safety issue during the construction. - Consider to preventing the sediment flow to the downstream. - Providing the construction wastes management. - Temporary storage area should be secured and safe. - Strongly preventing the property damage to the local building and other property. - The excavation work should have a well preparing and planning for preventing the sedimentation, flooding, construction waste and spoil soil disposal. - Consider to provide the disposal area for construction wastes. - Contractor should have the mitigation measure for preventing the dust, vibration, noise impact. - The workers camps should include the proper sanitation and waste management particularly the toilet waste. - Having a short period for working in stream for preventing the sedimentation down to downstream villages. - Select the quality borrow pit for road work - Having the regular QA/QC checking during the road construction.

Operation phase	- Less concern on the rehabilitation on the used borrow pit and other mineral resources and temporary disposal and storage area. - Consider to prevent the potential accident occurs along the road. - Consider to provide the operation manual to the local authorities for actual maintenance. - Providing the reminding sign and board for traffic control. - Consider to have a domestic waste management plan after completing project. - To providing the training to local community for road operation and maintenance. - To limit the material loading and any transportation through the village road.	- To prepare the Operation and Maintenance Manual. - More attention on the Operation and Maintenance Manual with the local community participation. - Concerning on the construction quality before final check and completion. - To allow local people to be employed for cleaning the drainage system.
Other suggestions	- To have the awareness program on the mitigation measure, preventing the impact and to know about waste management. - Propose to have the disposal are for dispose the construction waste and spoil soil. - No any revised and/or adjust the detail design where it is not conform to the construction standard. - Local people fully support the Project and to support by finding the solution for any environmental concern. - Most activities of the proposed Project are not harm any major environmental and social condition, only minor impact due to the improving an existing development. The most important is to engage all local people to understand about the project which it is the government project and development project, which all people need to support and positive participation for development project.	

Vang Vieng Urban Renewal

This proposed project cover parts of three villages (Ban Savang, Ban Viengkeo, Ban Mueangxong), most of the improvement plan is to develop the exiting streetscape in the urban area and improving the roads and roadside drainage in the selected residential areas. The previous lesson learn of the waste trap at the wastewater pipeline, which it failed because of less concern on waste load and discharge flow.

This subproject had been concerned by the Public Work and Transpiration Division which it is willing to support and sharing of the expertise from the previous experience. The most concern is to have a well planning and detail design and complain with the construction standard. The technical review and supervision during the construction should be strongly conducted by related sectors. The potential operation and maintenance manual and budget should be considered for the long term operation.
The summary concern and comment from those related sectors of village, district and province level had shown in the below table:

Phase	Concern Issue and Comment	
	Village and District Authorities	**Provincial Authorities**
Subproject Benefits	- Improve the village infrastructure which conforms to the district socio-economic plan - Reduction of waste, sludge, odor pollution - Convenient to travel and make the town cleaner - Improve the drainage system and create the beautiful seeing in the town - Good environmental condition and more pedestrian - Improve the existing drainage system	
Pre-construction project design &, impact assessment	- Initial informing on the local people on the Project's design and policy. - To select the temporary waste disposal area for sludge and domestic waste. - Concern on the detail design of drainage system which able to simple cleaning. - Allow local authorities knowing and sharing information during the detail design period	- The propose plan is to have a detail design for supporting the tour development and for local business. - Seriously learn from the previous experience of failed waste collection at the drainage system. - To have a local people support and community participation for sharing the information of the existing environmental condition.
Construction phase	- Initial outreach the Project's policy and activities to the related community. - Preventing the property damage to the local building and other property. - Consider to preventing the dust, noise and vibration issues by Contractor. - Providing the safety mitigation measures particularly for the children - Consider to prevent the sludge discharge though the culvert. - Truck traffic causing increased risk of public injury particularly children - Reduced and impeded access and travel along road due to construction traffic - Less waste management may occur, - Materials transport may over loading and unsafe along the existing road way, - Request the Contractor to follow the agreement and the detail design effectively. - Consider to have a short construction period as possible.	- The impact mitigation measure shall be in-placed by the contractor. - The initial public consultation with local authorities shall be conducted. - Most activities of the proposed Project are not harm any major environmental and social condition, only minor impact due to the improving an existing development. The most important is to engage all local people to understand about the project policy and activities.

Operation phase	- Consider to provide the practicable operation and maintenance manual. - Providing the reminding sign and board for traffic control - Consider to manage the domestic waste and sludge. - Consider to provide the training to local community for actual operation and maintenance - Allow the local people to be employed for cleaning the drainage system.	- To have the awareness program on the mitigation measure, preventing the impact and to know about waste management. - Having the regular quality checking during the construction

Vientiane Province Sanitary Landfill Development

This proposed project cover one village (Ban Phon Vieng), the main feature are to (i) design and implement of managed landfill and (ii) restoration and closure of the existing dumpsite.

In general, villagers are welcome the development project, the existing dumpsite has producing the odor pollution and insect scattering through the village area and school. This proposed project shall be the key mitigation measures for decreasing the odor pollution and insect disease.
The below concerns are the lesson learn sharing and some comments also have been addressed into the below table.

Phase	Concern Issue and Comment	
	Village and District Authorities	**Provincial Authorities**
Subproject Benefits	- Previous landfill had been used well during a few years from 2007-2011, the landfill function had been felt because of the insufficient operation and maintenance. - The new proposed project is useful to improve the existing landfill and to develop the new disposal area sufficient for the overload community waste. - Improve the current waste management and collection - Reduction the odor pollution and insect emission in the village and school. - Good for the villager health nearby the landfill area. - Solving the overload waste collection and waste dropping. - Landfill site improvement could improve the town cleaner.	
Pre-construction project design &, impact assessment	- Detail design should concern to the user types and user number (quantity of each kind of wastes) and including the tourists. - Lesson learn from the previous design and operation should be undertook and required the community participation for more information. - Less consider on the design to be conformed to actual operation by local community. - Less communicate and coordinate with other related sectors (DoNRE and UDDA/DPWT). - Less participation of local community and related authorities.	

	- Concern on the proper location of the new proposed landfill where it may near community residence and school. - More attention on the detail design and to conform with the actual implementing and practicable. - Consider to build the landfill far away from the residence area and school. - Consider to have a village authorities participation.	
Construction phase	- Request more official documentation among the contractor and local community with any agreement made. - Initial induction of the new contractor and new comers should be informed to the village authorities. - Local culture and traditional shall be suggested by village authority. - Truck traffic causing increased risk of public injury particularly children. - Reduced and impeded access and travel along road due to construction traffic. - Consider to have a construction materials transport controlling. - Blocking and backfill the natural creeks and water course should be prevented and prohibited. - No select the borrow pit where shall block the natural drainage channel. - Concern on the proper selection of the disposal area particularly for the spoil soil and construction waste. - Safety issue and accident prevention measure should be included in EMP. - More concern on the QA/QC checking. - Less detail design checking and no closely monitoring. - Consider to have a village authority's participation.	- To have a proper coordination and consulting with related authorities of District and Provincial level for better understanding among the related sectors.
Operation phase	- Mitigation measure for preventing the insect and odor pollution should be included in the EMP - Less concern on the operation and maintenance plan, and no budget and equipment for long term operation. - Concerning to prepare the operation and maintenance plan and includes all necessary equipment and vehicle for long term operation.	None

Photos of consultations in the five subproject areas in Vientiane province

Participation List:

No	Name	Responsibility/Position	Sector
List Participants on the Public Consultation Meeting and Field Visit at LAO-V1: Nam Ngum Reservoir Access Improvements, at Keooudom District, Vientiane Province.			
1	Mr. Boounthanuth	Vice head	District PWT office
2	Mr. Vilavoud Pakith	Vice district governor	Keooudom district office
	Mr. Phommalath Souvannalay	Office head of NRE office	District NRE office
3	Mr. Phouthasone Phomxayma	Deputy head of NRE section	Department of NRE
4	Mr. Phetsamone Xayyavong	Head of ICT section	District of ICT section
5	Mr. Savang Silimano	Deputy head of PWT section	Department of PWT
6	Mr. Fongsamoud Xaypanya	Head of ICT Unit	District ICT section
7	Mr. Amphone Silapaseuth	Village vice head	Village office
8	Mr. Khammy Phouththavong	Head of ICT section	Department of ICT
9	Ms. Souksakhone Sihalath	Environmental specialist	Consultant
10	Mr. Anoukhone Lathsavong	Vice head of ICT office	District ICT section
11	Ms. Kaysone Keochampa	Technical officer	Department of ICT
12	Mr. Boualy Milattanapheng	Deputy head of ICT Department	Department of ICT
13	Mr. Souli Phimman	Village Vice young union chief	Village office
14	Mr. Keo Insisiengmai	Unit head of village	Village office
15	Mr. Bounsouan Singhavong	Older chief	Village office
16	Mr. Sithuth Vinayya	Village vice head	Village office

17	Mr. Bounkong Southammavong	Village governor secretary and village head	Village office
18	Mr. Yoihai Phommasane	Member of young union committee	Village office
List Participants on the Public Consultation Meeting and Field Visit at LAO-V2: Kaeng Yui Waterfall Access Improvements, at Vang Vieng District, Vientiane Province.			
1	Mr. Sengdao Vongphachan	Village head	
2	Mr. Thavone Vilaykham	Village vice head	
3	Mr. Singthong Phommabath	Village vice head	
4	Ms. Kongpheng Phunthaboud	Women union committee	
5	Mr. Phoudthasone	Head of management and planning section	Urban Development and Planning Section
6			
7	Mr. Phommany Souvannasing	Head of NRE section	District NRE section
8	Mr. Khammy Phouththavong	Head of ICT section	Department of ICT
9	Mr. Boualy Milattanapheng	Deputy head of ICT Department	Department of ICT
10	Mr. Khamsouk Xayyavong	Head of PWT section	District PWT section
11	Mr. Bounmy Phommavongsa	Head of ICT section	District ICT section
12	Mr. Alon	Village defense chief	Village office
13	Mrs. Thongmy	Village women union chief	Village office
14	Mrs. Douangchay	Village women union member	Village office
15	Mrs. Thongmay	Village member	Village office
List participants on the Public Consultation Meeting on the Public Consultation Meeting and Field Visit at LAO-V3: Western Loop Rural Access Road and Bridge Improvements and LAO-V4: Vang Vieng Urban Renewal; at Ban Nathong, Ban Namouang, Ban Naxay, Ban Napea, Ban Naxom and Ban Nathong at VangVieng District			
1	Mr. Thongdam Phimmasone	Village head	Nathong village
2	Mr. Somsanith Soundala	Village head	Naxay village
3	Mr. Phouvieng Baiouthong	Village head	Phaunkham village
4	Mr. Khun Taiyavong	Village head	Namouang kang village
5	Mrs Khammany	Village vice head	Namouang village
6	Mrs. Xeng Lor XongLeng	Village vice head	Naxom village
7	Mr. Khammy Phouththavong	Head of ICT section	Department of ICT
8	Mr. Boualy Milattanapheng	Deputy head of ICT Department	Department of ICT
9	Mr. Khamsouk Xayyavong	Head of PWT section	District PWT section
10	Mr. Bounmy Phommavongsa	Head of ICT section	District ICT section
11	Mr. Bounthan Oanthasing	Village head	Phathong village
12	Mr. Phoudthasone	Head of management and planning section	Urban Development and Planning Section
13	Mr. Vunhphone Vilaphun	Village head	Phaunxay village
14	Mr. Chomkeo Sackkhavong	Vice head of village committee	Village committee

APPENDIX D: DRAFT TOR FOR GROUNDWATER STUDY AT LANDFILL SITE

GMS Tourism Infrastructure for Inclusive Growth Project

TOR: Groundwater Sampling and Analysis, Vang Vieng, Lao PDR
Draft October 2017

1.0 Introduction & Rationale

The Ministry of Information, Culture and Tourism (MICT) is supporting tourism infrastructure developments at select locations in Lao PDR with the objective to improve and develop local and regional tourism. Vang Vieng town in Vientiane province is one of the target locations. One of the proposed subprojects for Asian Development Bank financing is improvements to solid waste management in Vang Vieng town. The project includes upgrading the existing active dumpsite South of the town into a more modern and effective landfill site. The upgrading of the dump site requires knowledge of groundwater in the area, specifically the depth of the water table, groundwater quality, and whether the existing dumpsite is contaminating the groundwater.

The project requests a quote to complete the following terms of reference. The quote should include costs for all field and laboratory analyses, and costs for travel to/from Vientiane Capital.

1.1 Objectives

The objective of the assignment is to determine the depth and quality of groundwater near the existing dumpsite, and to understand of the effects, if any, of existing dumpsite on groundwater quality, including groundwater quality from any nearby wells.

The scope of the assignment includes:

1) sampling and laboratory analyses of groundwater quality at wells near the existing dumpsite if wells exist; and

2) bore hole drilling at dumpsite site to supplement existing nearby wells data.

1.2 Coordination with Detailed Design Phase of Project

The assignment will be conducted at the beginning of the detailed design phase of the project. The Project Management and Supervision Consultant (PMSC) with support from the IU/PIU, and in consultation with DONRE will tender and oversee completion of the assignment. The locations of all groundwater sampling locations will be determined at detailed design when this ToR is finalized.

2.0 Detailed Requirements

The requirements of the assignment are as follows:

2.1 Existing dumpsite

1) Confirm the location of any active wells within 1 km of the site. Sample groundwater at existing wells;

2) Identify the number of supplementary bore holes that need to be drilled to provide a total of 4 equidistant sampling sites on an approximate 500-800 m radius of dumpsite site. Two of the sampling sites must be down-slope of the site;

3) Collect and preserve the groundwater samples from the 4 sites using accepted International procedures (e.g., AWWA)[25] to maintain the in-situ quality of the samples while they are transported to laboratory in Vientiane.

4) Analyze samples in laboratory using accepted International procedures (e.g., AWWA).

2.3 Groundwater variables to be sampled and analyzed at each site

The groundwater parameters should be sampled and analyzed at all sites are listed in Table 19.

Table 19. Groundwater quality variables to be determined at all sampling sites.

Groundwater Variable	Location of Analysis
depth of water table	at well site
temperature (C^o)	at well site with meter
dissolved oxygen DO (mg/l)	at well site with meter
pH	at well site with meter
Conductivity	at well site with meter
chemical oxygen demand COD (mg/l)	in laboratory
total dissolved solids DS (mg/l)	in laboratory
heavy metals: As, Cd, Fe, Pb, Zn, Cu (mg/l))	in laboratory
oil and grease (mg/l)	in laboratory
total and faecal coliform bacteria (mpn)	in laboratory
nitrogen: TN, NH_3, NO_3, NO_2 (mg/l)	in laboratory
phosphorus: TP, PO_4 (mg/l)	in laboratory
hydrogen sulphide H_2S, (mg/l)	in laboratory
surfactants (detergents) (mg/l)	in laboratory
Quality Control & Assurance Samples	
2 field sampling blanks with distilled water: 1 for existing landfill and 1 for new SLF 2 laboratory analysis blanks: 1 for samples from existing landfill, and 1 for new SLF samples	

3.0 Reporting

A report on the above field and laboratory investigations must be prepared and accepted by MICT.

3.1 Location of sampling sites

The report must provide a map indicating the location of the groundwater sampling sites in relation to the existing dumpsite. Each sampling site must include a latitude and longitude

[25] American Water Works Association AWWA, 2013). Standard Methods for Examination of Water and Wastewater: Water Wells.

coordinate. The map should also indicate the location of the nearest houses or settlements. The map must distinguish the bore hole sites from existing wells.

3.2 Groundwater quality

In a table format the report must provide the groundwater quality variables from Table 1 that were determine in the field, and in the laboratory for both sites. The tables should also include the QA/QC samples for all variables from Table 1.

3.3 Sampling & Analysis Methodology

The report must include a brief description of all field and laboratory methods that were used to sample and analyze the groundwater samples.

APPENDIX E: ENVIRONMENTAL COMPLIANCE AUDIT OF VANG VIENG DUMPSITE

Second Greater Mekong Subregion Tourism Infrastructure for Inclusive Growth Project

Solid Waste Dumpsite in Vang Vieng, Lao PDR

Environment Compliance Audit

Terms of Reference

1.0 Background:

The Second Greater Mekong Subregion Tourism Infrastructure for Inclusive Growth Project will upgrade solid waste management of Vang Vieng town and vicinity (Vang Vieng Solid Waste Management Improvements). Central to the subproject is upgrading the existing garbage dumpsite in Vang Vieng, Vientiane Province to a modern managed landfill. The purpose of upgrading the dumpsite and overall solid waste management of Vang Vieng is to improve the ability of the municipality to handle and process the steadily increasing solid waste that is being produced by tourism and general population growth of the area.

Solid waste management and the dumpsite in Vang Vieng is operated by the Urban Development Authority (UUDA) under the Ministry of Public Works and Transport. The Ministry of Natural Resources and Environment (MONRE) is the regulatory body for environmental protection

The feasibility design of the upgraded managed landfill incorporates lined impermeable garbage cells, peripheral surface runoff collection and drainage, leachate collection and treatment, and gas recovery and flaring. The feasibility design also includes a materials recycling facility (MRF), a treatment facility for septage collected from septic tanks in Vang Vieng and area, special cells for hospital waste and other hazardous waste, and new garbage compacting trucks.

2.0 Purpose and requirement of Environmental Compliance Audit

The Environmental Compliance Audit (ECA) of the existing dumpsite will provide additional critical site and operation information on the dumpsite which is needed for the future detailed and final design of the upgraded managed landfill. The results of the ECA will be combined with the groundwater quality and soils study of the dumpsite that has been drafted for the detailed design phase which is appended to the IEE for the subproject.

The Vang Vieng dumpsite is an *Existing Facility* of the Vang Vieng Solid Waste Management Improvements subproject which necessitates an ECA be conducted of that facility pursuant to the SPS (2009), para 10 of Appendix 1 and para 12 of Appendix 4. Specifically, para 12 of Appendix 4 of SPS (2009) states:

……*for projects involving facilities and/or business activities that already exist or are under construction, the borrower/client will undertake an environment and/or social compliance audit, including on-site assessment, to identify past or present concerns related to impacts on the environment, involuntary resettlement, and Indigenous Peoples. The objective of the compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for borrowers/clients and to identify and plan appropriate measures to address outstanding compliance issues. Where noncompliance is identified, a corrective action plan agreed on by ADB and the borrower/client will be prepared. The plan will define necessary remedial actions, the budget for such actions,*

and the time frame for resolution of noncompliance. The audit report (including corrective action plan, if any) will be made available to the public in accordance with the information disclosure requirements of the SPS (2009).

More accurately for the context of the Vang Vieng subproject is that in order to protect the integrity and sustainability of the subproject an ECA of the existing dumpsite is needed to identify present or past concerns or issues related to impacts of the dumpsite on the environment that could negatively affect the subproject. The ECA will accomplish the following objectives: 1) determine whether the dumpsite is in compliance with current government laws and regulations; and 2) identify important information on the design/operation of the existing dumpsite and affected environment that will assist with the successful detailed and final design of the upgraded managed landfill. Objective 2 will be assisted with the application of IFC EHS Guidelines for Solid Waste Management Facilities[26] to the existing dumpsite to identify shortcomings of existing dumpsite, and moreover, the requirements of the detailed design of the upgraded landfill. The "*corrective action plan*" for any "*noncompliance issues"* identified above will become part of the detailed design of the new managed landfill along with improved solid waste manage of Vang Vieng.

Because the subproject involves upgrading an existing dumpsite [the existing facility], the SPS (2009) calls for the preparation of an environmental assessment and a compliance audit of the existing dumpsite. However, in this case the ECA along with the IEE of the subproject will suffice as the environmental assessment.

3.0 Scope of the ECA for the Vang Vieng dumpsite

Pursuant to the ADB SPS (2009) the consultant will conduct an ECA of the existing Vang Vieng dumpsite. To complete the ECA the Consultant will obtain and report on the detailed information for the existing Vang Vieng dumpsite listed in Table 1.

Table 20. Information requirements of ECA of Vang Vieng dumpsite

Description of Dumpsite:

1. Location of dumpsite (latitude and longitude coordinates);
2. Size of dumpsite (ha);
3. Date dumpsite was commissioned (became operational);
4. Current operator and responsible authority of dumpsite;
5. Types of solid waste disposed in dumpsite (e.g., domestic, hospital, construction, industrial);
6. Rate of solid waste disposal at dumpsite (tonne/day or tonne/month);
7. Clarify the design and operation of the existing dumpsite by obtaining following information:
    a) the number and depth (m) of waste cells;
    b) underlying waste cell lining material, if it exists;
    c) description of surface runoff collection and drainage system, if it exists;
    d) description of leachate and gas collection and treatment, if it exists;
    e) description of septage disposal and management system;

[26] IFC/World Bank 2007. Environmental Health and Safety Guidelines: Waste Management Facilities; Municipal Solid Waste.

f) description of waste recycling process by local waste pickers;
g) description of vehicles and equipment used to collect and transport solid waste from Vang Vieng and vicinity to dumpsite; and
h) current weekly schedule for transport of solid waste to dumpsite

Compliance with Government Regulations:

8. Determine if government issued permits or licenses for dumpsite operation exist. If yes, identify the permit or license, and determine whether dumpsite operation is in compliance with permit or license;

9. For government regulation and policy listed below clarify whether the design and operation of existing Vang Vieng dumpsite is in compliance, and clarify any non-compliance issues. Identify any regulation or directive for solid waste management that is missing from list below.

   a) Decree No 520 / TCPC, (dated 23 Feb 2007), on Disposal Site Selection, Design, and Management, Article 09: Criteria for site selection:

      - The site should be at least 7km away from the centre of the city on flat land and 5km in mountainous areas (special case at least 3 km);
      - At least 3km away from airports;
      - At least 1km away from historic/ prehistoric areas;
      - At least 300 metres away from communities, rivers, canals, wet lands, marshes, reservoirs and wells;
      - Not located on the upstream or upwind of villages or communities nearby;
      - Not located on flooding areas;
      - Not located on areas landslides or areas with slopes greater than 30%.

   b) 2009 Draft Decree on SWM [still not approved in 2017];

10. For regulations/policy in #9 above define remedial corrective measures that are required for dumpsite to be compliant especially for non-compliance issues with community, and occupational health and safety regulations.

Additional IFC Waste Management Facility Guidelines: Municipal Solid Waste

11. Obtain existing data on groundwater (well) quality near the dumpsite from DoNRE or DPWT/UDAA;

12. Describe air pollution mitigation measures at dumpsite (e.g., road wetting agents to control dust, controlling # of trucks entering dumpsite, covering garbage);

13. Determine distance of nearest surface waters (stream, lake) that could be affected by the dumpsite, and obtain existing surface water quality data

14. Determine distance of nearest homestead or business from dumpsite;

15. Determine number of full-time and part-time waste pickers that work and live at dumpsite

Community response

16. Consult surrounding community and waste pickers to determine if there are present environmental, social, or human health issues with the operation of the existing dumpsite.

4.0 Site Visit and Interview of UDAA

A site visit to existing dumpsite is required. The staff at the UDAA in Vang Vieng must be interviewed to obtain the required information listed above.

5.0 Report on ECA

Prepare a report on the ECA which details the 15 information and data requirements listed in section 3.0 above. The report should have the following general sections:

(i) Executive Summary.

(ii) Brief description of Vang Vieng dumpsite with 1-2 photographs.

(iii) A table or set of tables which clearly provide the 16 detailed information and data requirements identified in Table 1. All available groundwater or surface water quality data should be tabled separately.

(iv) List of people and institutions contacted for information and data.

(v) Recommendations for upgraded managed landfill for Vang Vieng.

APPENDIX F: NATIONAL ECOLOGICAL CONSULTANT: TOR

Second Greater Mekong Subregion Tourism Infrastructure for Inclusive Growth Project

Terms of Reference

National Ecological Consultant

A. Project Background

1. The project proposes improvement of access infrastructure and urban environmental services, including construction of a new loop road to link National Road 10 to the parking area for Nam Ngum Reservoir. The alignment passes through an area that was previously designated as part of the Phu-En Provincial Forest Protected Area. The area affected by the project has been rezoned for tourism development but the adjacent area is still part of the protected area.

2. All projects funded by Asian Development Bank are subject to the Safeguard Policy Statement (SPS, 2009) requirements which include identifying potential impacts and risks to biological resources in the project's area of influence. The SPS has specific provisions that must be satisfied if project activities are proposed that may have impacts on legally protected areas[27], endangered species[28] and critical[29] and natural habitats[30].

3. Initial screening with IBAT biodiversity tool has identified that there is potential for endangered species to occur in the project area of influence. Further study is needed to confirm the impacts of the proposed road construction on ecology and to confirm that SPS provisions in respect of biodiversity and protected areas are satisfied.

B. Objective of the Assignment

4. The objectives of the assignment are to carry out a more detailed assessment of ecological baseline conditions of Nam Ngum link road, potential impacts of the project on protected species, habitats and the watershed; and consult with key stakeholders to identify site-specific opportunities for mitigation, compensation and monitoring through the proposed destination management plan that would support conservation objectives of the Phu-En Provincial Forest Protected Area.

C. Tasks

5. The tasks will include:

[27] **SPS Requirement Legally Protected Areas:** Where project activities are located within a legally protected area, the borrower will meet the following requirements: (i) Act in a manner consistent with defined protected area management plans; (ii) Consult protected area sponsors and managers, local communities, and other key stakeholders on the proposed project; (iii) Implement additional programs, as appropriate, to promote and enhance the conservation aims of the protected area.

[28] **SPS Definition Endangered Species:** As defined by the World Conservation Union's Red List of Threatened Species or as defined in any national legislation.

[29] **SPS Definition Critical habitat:** Critical habitat includes areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species; areas having special significance for endemic or restricted-range species;

[30] **SPS Requirement Natural Habitat:** In areas of natural habitat, the project will not significantly convert or degrade such habitat, unless the following conditions are met: (i) No alternatives are available; (ii) A comprehensive analysis demonstrates that the overall benefits from the project will substantially outweigh the project costs, including environmental costs; (iii) Any conversion or degradation is appropriately mitigated. Mitigation measures will be designed to achieve at least no net loss of biodiversity.

(i) **Data Review.** Familiarise with ADB Safeguard Policy Statement requirements as cited above. Review available project information, baseline ecological data and other relevant information available through desk study. Consult with authorities mandated with management of the site to determine key features of interest, other relevant local authorities and experts and members of the local community, as needed.

(ii) **Site Visit.** Undertake a site survey to confirm ecological baseline conditions in the project area of influence, review project proposals and confirm potential ecological impacts of road and tourism development.

(iii) **Ecological Recommendations.** Review existing ecological protection mitigation and monitoring measures proposed in the IEEs and EMPs for design, construction and operation phases and make additional recommendations, as needed. Identify additional measures that could be incorporated into the project to support conservation objectives of the protected area.

(iv) **Reporting.** Prepare a draft ecology report that confirms the presence and location of critical, valuable natural or modified habitats and protected species within the project area of influence and anticipated impacts of project activities on ecology. Document discussions and agreements made and recommendations for ecological mitigation and monitoring during design, construction and operation. Submit draft report for review by ADB. Address comments by ADB and develop final report for submission to ADB.

D. Qualifications

The Consultant should have an academic qualification in ecology (or similar) and a minimum of 5 years' experience of ecological baseline survey in forest habitats in Lao PDR. Experience of assessing impacts of development on ecological habitats and species and developing mitigation/compensation plans is desirable but not essential. They will have sufficient fluency to prepare a technical report in

APPENDIX G: SUMMARY: RAPID BIODIVERSITY ASSESSMANT, PHU EN FOREST

RAPID BIODIVERSITY ASSESSMENT, NAMNGUM ACCESS ROAD

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28 January 2018
Vientiane

Objectives of Study:

To carry out a more detailed assessment of ecological baseline conditions near Nam Ngum access road, potential impacts of the subproject on protected species, habitats and the watershed; and consult with key stakeholders to identify site-specific opportunities for mitigation, compensation and monitoring through the proposed destination management plan that would support conservation objectives of the Phu En Provincial Protected Area.

Methods:

1.0 Literature Review
2.0 Field Surveys:
    2.1 in-forest transect & plot surveys
    2.1 local community & resource management agency interviews

Summary of Results:

Nam Ngum Access Road Alignment

The proposed access road is 5.9 km along an existing road and trail alignment, with about 2 km comprising the narrow trail to be widened. Forest and vegetation in the Phu En Protection Forest and subproject area comprised mixed deciduous and semi-evergreen forest. The proposed access road passes through regenerating forest that is recovering from logging and agriculture, conducted 3–15 years in the past. No rare or endangered tree or animal species were found in subproject area of influence.

Common species of mammals, birds, reptiles, and amphibians were found near the link road alignment. Dominant mammals species observed are *Bandicota indica* (the most abundant), followed by *Callosciurus pygerythrus, Paradoxurus hermaphrorites* and other species. A total of 24 bird species were recorded along the road link alignment. Dominant bird species include *Botaurus stellaris*, *Centropus sinensis*, *Dicrurus paradiseus*, *Egreta garzetta*, *Gallus*, *Picnonotus aurigaster*, and *Streptopelia orientalis.* A total of 22 species of reptiles (13) and amphibians (9) were observed or documented in the road alignment area. The following three snakes were identified: Ngou leum (*Python reticulata*), Ngou kan pong (*Bungarus fasciatus*) and Ngou chong arng (*Ophiophagus hannas*).

The dominant canopy tree species identified near the proposed access rad alignment are Mai tin ped (*Alstonia scholaris*), Mai khee mou *(Ormosia pinnata*), Mai hum pou (*Ficus hirta*), Mai pung (*Sapium discolor*), and Mai tiw daeng (*Cratoxylum formosum* var*. prunuflorum*). Common mid-storey tree species identified included Mai leuang keo (*Rinorea javanica*), Mai tong ta ven (*Mallotus barbatus*), Mai tong tau (*Mallotus paniculatus*)*,* Mai por hou (*Trema orientalis*). Bamboo cover is about 60 % of the area dominated Mai hia (*Cephalostachyum virgatum*), Mai pharng (*Cephalostachyum pergracile*), Mai lai (*Oxytenanthera albociliata*)*,* and Mai sord (*Oxytenanthera parvifolia*)*.* Common understory species included Ngar kiw (*Chromolaena odorata*), Ngar khompao (*Scleria terrestris*)*,* Lao (*Saccharum spontaneum*), Khar (*Catimbium bracteatum*), Khaem (*Thysanolaena maxima*), and Khua hang kuang (*Ancistrocladus tectorius*). Some teak trees were also found.

Greater Phu En Protection Forest

The greater Phu En forest survey found predominately mixed deciduous forest. Villagers report logging since 1996. At the present time, the forest is about 60% bamboo. Dominant tree species are: Mai khaen hen (*Hopea ferrea*), Mai ka bok (*Irvingia malayana*), Mai khee mou (*Ormosia pinnata*), Mai hua lon (*Parkia sumatrana*), Mai mark kheng (*Dialium cochinchinensis*), Mai hai daeng (*Ficus altissima*) and other tree species. Bamboo species include Mai hia (*Cephalostachyum virgatum*), Mai pharng (*Cephalostachyum pergracile*), Mai hok (*Dendrocalamus* sp.), Mai lai (*Oxytenanthera albociliata*)*,* and Mai sort (*Oxytenanthera parvifolia*)*.*

Recommended Action Plan

Based on rapid biodiversity assessment, the following conservation actions are incorporated into the subproject's environmental management plan and capacity building activities:

1. Rehabilitate roadside vegetation to stabilize slopes and plant native tree species along the road. Borrow pit rehabilitation must be done with native vegetation and tree species.

2. Carry out awareness-raising campaigns on wildlife conservation and fish and forest conservation for villages in subproject area and construction workers.

3. Establish village fish and forest conservation zones as part of the Nam Ngum tourism master plan updating.

4. Train community tourism group members to manage and monitor of village forest and fish conservation zones.