



Technical Assistance Consultant's Report

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August 2013

Lao People's Democratic Republic: Water Supply and Sanitation Sector Project (Financed by ADB's Technical Assistance Special Fund [TASF-IV])

Prepared by Fraser Thomas Partners, Auckland, New Zealand, in association with Community and Environment Services Ltd.

For the Department of Housing and Urban Planning, Ministry of Public Works and Transport and the Asian Development Bank

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Asian Development Bank

Lao PDR

**Final Report
Volume 1 – Main Report
Lao People’s Democratic Republic
Water Supply and Sanitation Sector Project**



Submitted To:
The Asian Development Bank

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August, 2013



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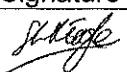
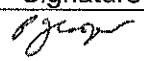
ENGINEERS RESOURCE MANAGERS SURVEYORS

Preamble:

This Final Report for TA8150-LAO, Water Supply and Sanitation Sector Project, presents the status of the project design at 20 July 2013. Subsequent changes to the project design contained in the Memorandum of Understanding of the Fact-Finding Mission between Government of Lao PDR and Asian Development Bank in the period 4-12 July 2013 and subsequent agreements between the two parties may not be reflected in the content of this report.

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Initial Environmental Examination for the Project

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Initial Environmental Examination for the Project

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ACRONYMS

| | |
|-------|---|
| ADB | - Asian Development Bank |
| BNP | - Branch Nam Papa |
| CBP | - Capacity Building Programs |
| DG | - Director General |
| DHUP | - Department of Housing and Urban Planning |
| DNRE | - Department of Natural Resources and Environment |
| DONRE | - Department of Natural Resources and Environment |
| DRC | - District Resettlement Committee |
| EA | - executing agency |
| EIA | - environmental impact assessment |
| EIRR | - economic internal rate of return |
| EMP | - environmental management plan |
| EPL | - Environmental Protection Law |
| FAO | - Food and Agriculture Organization (of the United Nations) |
| GOL | - Government of Laos |
| IA | - implementing agency |
| IE | - Executing Agency |
| IMO | - independent monitoring organization |
| LWU | - Lao Women's Union |
| MIDG | - Mid Term Development Goal |
| MNRE | - Ministry of Natural Resources and Environment |
| MONRE | - Ministry of Natural Resources and Environment |
| MPWT | - Ministry of Public Works and Transport |
| NAPA | - National Adaptation Program of Action |
| NBCA | - National Biodiversity Conservation Area |
| NGO | - nongovernment organization |
| NRMA | - National Mines Regulatory Authority |
| NRW | - Non Revenue Water |
| O&M | - operation and maintenance |
| OPWT | - Office of Public Works and Transport (District Level) |
| PAM | - Program Administration Manual |
| PCU | - Project Coordination Unit |
| PIA | - Project Implementation Assistance |
| PIU | - Project Implementation Unit |
| PMO | - Program Management Office |
| PNP | - Provincial Nam Papa |
| PPSC | - Provincial Project Steering Committee |
| PPTA | - Project Preparatory Technical Assistance |
| PRC | - Provincial Resettlement Committee |
| PSC | - Project Steering Committee |
| STWSP | - Small Towns Water Supply Project |
| US | - United States (of America) |
| UXO | - unexploded ordinance |
| VDC | - Village Development Committee |
| VEI | - Village Environmental Improvements |
| WSIP | - Water Supply Investment Plan |
| WSP | - Water Safety Plan |
| WSS | - Water Supply and Sanitation |
| WSSP | - Water Supply and Sanitation Sector Project |
| WTP | - Water Treatment Plant |

Figure 1: Project Location Plan



1 Executive Summary

- 1 The Water Supply and Sanitation Sector project (WSSP) will improve the performance of provincial nam papas (PNPs, provincial water utilities) and expand access to safe piped water supply and sanitation (WSS) for urban residents in Lao PDR's small towns. It is a sector project, the fourth funded by ADB for the water supply sector in Lao PDR. It will improve sector coordination and policy implementation in the area of corporatization and non-revenue water management; rehabilitating and expand existing water supply systems in small towns; develop new water supply systems in small towns; enhance community action in urban water supply and sanitation; and strengthen capacity for project implementation, and operation and maintenance (O&M). It is designed in accordance with Government's Water Supply Sector Policy Statement, 1999, water supply investment plan (WSIP) and Sector Strategy. It will strengthen and assist the implementation of the policy reforms put in place by the Small Towns Water Supply and Sanitation Sector Project (STWSP), a preceding ADB funded sector project.
- 2 The impact of the proposed Project will be expanded access to safe piped water supply and sanitation services for the urban population in Lao PDR. The outcome will be improved performance of PNPs in delivering sustainable water supply and sanitation services.

1.1 Project Towns

- 3 Three priority towns have been selected as sample subproject towns, for which feasibility study and fully subproject preparation is undertaken as part of the PPTA. These are (i) New Namtha in Luang Namtha province, (ii) Long in Luang Namtha province, and (ii) Phaoudom in Bokeo province. Further prioritized candidate towns are:

| Province | Provincial Town | Smaller Town |
|-------------|-----------------|----------------|
| Luangnamtha | New Namtha | Long |
| Bokeo | n/a | Pha Oudom |
| Attapeu | Samakhyxay | Sanxay |
| Vientiane | Phonehong | Kasy (or Meun) |
| Borikhamxay | Paksan | Phamouang |
| Xiengkhuang | Phonsavanh | Thathom |
| Sekong | Lamam | Dak Cheung |
| Huaphanh | Xamnoua | Sobbao |
| Xayabuly | Xayabuly | Botene |

1.2 Project Outputs

- 4 The project has five outputs (i) Improved sector coordination and policy implementation, (ii) Expanded water supply systems in small towns, (iii) New water supply systems in small towns, (iv) Enhanced community action in urban water supply and sanitation and (v) Strengthened Capacity for Project Implementation and Operation and Maintenance.

1.3 Policy, Legal and Administrative Framework

- 5 The law governing the protection of the environment, including the assessment and management of projects, is the Environmental Protection Law (EPL), 1999. An update was prepared and released in 2013, reflecting rapid economic growth and socioeconomic development and the need to address increasing conflict and social impacts as well as pollution issues with some larger projects, increasing foreign investment, and climate change. Responsibilities and procedures for Environmental Assessment, together with requirements for environmental monitoring of projects, have been revised and are set out in a new Decree on Environmental Impact Assessment (EIA decree), dated April 2010. The EIA decree is pursuant to the EPL. Investment projects are categorized according to a schedule in the

EIA Decree as Category 1- small scale investments that require an IEE, or Category 2- large scale investments that require an EIA.

- 6 The EIA Decree stipulates responsibilities for the key stakeholders involved in the process. These are listed as MONRE (or the local DONRE), local administrations, development project responsible agencies. The tasks required, from inception through to approval, are investigations, field inspections, information dissemination, public consultation, review of draft IEEs, updating IEEs in response to comments and the issuance of certificates of compliance. The roles and responsibilities of the key stakeholder groups, and procedures for IEE preparation and approval, are set out in the report.
- 7 Further legislation of relevance to the sector is the Water Supply Law (2009) and the Water and Water Resources Law (1996, under revision) which allocates priority to water supply.

1.4 Description of the Environment

- 8 The project towns are situated around the country. This section therefore provides a description of the Lao environment as a whole. Key features related to water supply are low population density, varied topography, tropical monsoonal climate and abundant water resources, but lengthy dry season, abundant forests and landlocked situation.

1.4.1 Physical Resources

- 9 Topography ranges from plains adjoining the Mekong River, particularly in the South of the country, to steep, mountain terrain classified as upland. The Project towns are situated in hilly terrain, on valley floors and on the Mekong flood plain. The predominant rock types are sandstones, mudstones and limestone of marine sedimentary origin, interspersed with igneous rock. Soils derived from these mainly sedimentary rocks are typically neutral to slightly acidic and sandy to sandy clay in texture. Soils on the flat terrain consist mainly of neutral to slightly acidic sands, and sandy clays derived from these alluvial deposits. The soils are suited to intensive irrigated and rain fed agriculture, predominantly rice.

1.4.2 Climate

- 10 The climate around most of the country is classified as tropical wet, with dry seasons, while in higher upland areas to the south of the country it is tropical monsoonal, and a belt to the northwest is warm temperate, with dry winters and hot summers. In general the climate features a pronounced dry season (November to February) and a wet season (May to October). Rainfall is generally high, averaging 1,600mm and reaching 3,700mm, in the uplands. Temperature averages 29°C over the year, with lowest temperatures occurring in December and January. Evaporation is at its peak in March and April.
- 11 The most significant climate change phenomena associated with predicted climate change for the country are increasing frequency and severity of heavy rainfall events, and longer, more severe, drought periods.

1.4.3 Water Resources

- 12 About 90% of the area of Lao PDR forms part of the Mekong river basin, some 25% of the total extent of the basin, contributing to around 35% of its total flow. 32 sub-basins have been identified. High rainfall levels over the country and the inflow of the Mekong River create water reserves, though use is constrained by the length and severity of the dry season, potentially affecting town water supplies where there is a high demand for irrigation water. The extent of groundwater reserves is much smaller but still substantial, however the identification of significant groundwater reserves with adequate accuracy for water supply development is highly problematic and in much of the country, aquifers appear to be relatively small, to occur at varying depths and not to be well inter-connected.

1.4.4 Ecological Resources

- 13 The country has considerable forest resources, occurring in a range of forest types that vary according to altitude, rainfall and soil types, and represent habitats of considerable international conservation value. The forests have an important role to play both in the national economy and the sustenance of traditional lifestyles. Timber and non timber forest products have a significant role in the economy, both on a large scale and for remote rural household incomes. A plantation forest industry is being developed, with some successes. A National Protected Area system has been established, comprising 19 areas which collectively account for 13% of the land area of the country.
- 14 Significant aquatic ecosystems occur in streams and rivers and wetlands. Fish are an important economic resource and fisheries management also needs to strike a balance between commercial exploitation and conservation. Fisheries make up approximately 13% of the GDP.
- 15 Land immediately surrounding most towns is usually extensively cultivated. Trees and shrubs tend to occur mainly along waterways, between fields, or in isolated patches. Intact, relatively undisturbed forests can occur near the towns, associated with temples where they are protected for religious or cultural purposes or on steep slopes where access for tree felling and extraction is difficult.

1.4.5 Items of Historical and Archaeological Significance

- 16 Sites of religious and cultural significance include temples and monuments. Temples appear in most towns. In Champasack and Luang Prabang, there are temples designated as World Heritage sites. In Savannakhet province, significant fossil finds have occurred in deposits of the early Cretaceous period of a species of dinosaur, named Tangvaysaurus.

1.4.6 Human and Economic Development

- 17 The project towns include provincial and district towns. Towns as such are not an administrative unit in Lao PDR, and the district towns tend to consist of clusters of villages, containing the district administrative areas. Economic development and population growth are taking place in the towns, with consequent increasing demands on infrastructure. Livelihoods in small towns are predominantly based on agriculture or on forest products, although the manufacturing and services sectors are growing in the country. Public health entrenches poverty, with water related and respiratory diseases strongly evident in data provided by the National Centre for Epidemiology.
- 18 Many ethnic groups are represented in country's population. Three general ethnic group classifications have arisen, the Tai-Kadai (66%), the Mon-Khmer (24%), and Sino-Tibetan groups (10%) in the north of the country.
- 19 Traditions for shifting agriculture are long established in the uplands and provide the most common form of subsistence activity for much of the rural population. Increasing population puts pressure on the land and fallow periods are often reduced, significantly compromising the sustainability of shifting agriculture.
- 20 Sanitation infrastructure in most small towns is basic, though coverage on household level is high: 85% of urban households outside Vientiane have pit latrines. Drainage problems are common, resulting in poor appearance and proliferation of ponds that provide habitats for insect vectors of disease. Water related diseases, including diarrhoea, dysentery and hepatitis, related to poor drinking water and hygiene conditions, and commonplace.
- 21 Unexploded ordinance remaining in Lao PDR from conflict that took place in the region between 1962 and 1976 is a continuing threat, and cause of frequent death and injury.

1.5 Anticipated Environmental Impacts and Mitigation Measures

- 22 The most significant impacts expected to arise from the project are major improvements to public health and the quality of life in the town from the provision of potable water. These benefits will be further enhanced by community initiatives elicited under project activities. The principal issues of potential concern are (i) management of sediment from the water treatment plant, (ii) protection of water sources, (iii) risks associated with unexploded ordinance, (iv) water resource conflicts (v) an increased burden on drainage systems due to improved water supplies and (vi) safety issues.
- 23 Sediment will be produced at each water treatment plant. It consists of the fine particles of inert material (mainly silt) that are removed from the raw water by the flocculation process, and traces of the flocculation agent, aluminium sulphate, or alum, which is not toxic. Options for disposal include discharge into rivers or streams, collecting it as sediment and depositing it at a solid waste disposal site. Levels of dilution can be very high, making discharge to streams acceptable in many cases. Where not practicable or acceptable, sediment can be collected in retention ponds, removed, dried and transported away from the water treatment plant site.
- 24 Most of the Project towns will obtain raw water for their piped water supply systems from rivers, streams or springs which are open to contamination from development and activities in the upstream catchments. While the quality of the existing raw water sources in general is suitable for urban water supply after full treatment, there is potential for water quality to degrade over time as a result of increased urbanization and economic activity. Large-scale measures are required to ensure that valuable water sources are not lost because of contamination of the water body from point and non-point sources of pollution some distance away from the drinking-water source. In accordance with recent legislation, provincial governments are required to issue regulations to protect the quality of the water sources.
- 25 Accidental detonation of unexploded ordinance occurs regularly, with excavation activities for infrastructure among the main causes. Managing the threat involves the use of data provided by the National Mines Regulatory Authority, seeking local knowledge, commissioning a verification survey and commissioning clearance services where necessary.
- 26 Potential water use conflicts may arise, particularly between demand for town water supplies and irrigation water. Options for mitigation include the use of alternative water sources and water storage facilities, however reliable information on stream flows is required.
- 27 Households receiving new water supply connections are likely to use more water for cooking and washing. Drainage is often limited and even relatively small quantities of additional grey water or sullage may form ponds of dirty water which provide a habitat for mosquitoes and pose a health hazard. This will be addressed by improved drainage and sanitation conditions in the villages through community initiatives and associated awareness raising activities. In towns where larger drains may be constructed, safety issues may arise, particularly for children. Where drains are large enough to pose a risk to children, this is mitigated by design of a wide cross section that both limits the depth of running water allows safe exit from the drains in the event that people accidentally fall into them, as well as provision of safe crossings.
- 28 Sector Level Impacts include (i) better water resource management, (ii) effects of sector strengthening and (iii) build-up of private sector capability. While sector strengthening and private sector capacity building are positive, the effects of increasing use of water are of potential concern, particularly as the length and severity of dry seasons can be high and could increase with climate change. Monitoring and awareness raising are necessary to develop capacities for managing water use conflicts.

1.6 Analysis of Alternatives

- 29 The principal alternatives associated with the project are the alternative towns to be selected for the subprojects. The subproject selection process is a mechanism for the detailed comparison of these alternatives. For the subproject feasibility studies, key alternatives such as identification of water source, treatment process, and siting of facilities are examined in each case. The "no project" alternative would mean that the opportunity to rehabilitate extensive and largely failed rural infrastructure and to address the key causes of their failure, would be missed.

1.7 Information Disclosure, Consultation and Participation

- 30 Consultations will take place at subproject sites, and will include focus group discussions and specific questions in socio-economic surveys. Draft IEEs will be presented to village officials and the public, to district administrations and to the PNPs. Copies will be left for review for a period of 30 days. During construction and operation, communities in and around the subproject area will be kept informed of construction activities that are likely to cause noise and dust nuisance, or disruption to irrigation flows or roads and pathways.

1.8 Grievance Redress Mechanism

- 31 A grievance redress mechanism, applicable to concerns about environmental issues as well as effects on property and productive assets, has been prepared in accordance with the ADB Safeguards Policy Statement (2009). This is described in detail in the report.

1.9 Environmental Management and Monitoring Plan

- 32 An Environmental Management Plan (EMP) will be prepared for each subproject. Overall responsibility for implementing the Environmental Management Plan rests with the PNPs, supported by the consulting team. The EMP should form part of the works contract documentation in each case so that the contractor in each case incorporates the cost of mitigation into the bid price. EMPs have been prepared in detail for each sample subproject.

1.10 Conclusion and Recommendation

- 33 The finding of the IEE is that the Project will not cause significant environmental problems and that potential adverse impacts are manageable through the implementation of the EMP. No further environmental assessment is therefore required, beyond the issues to be reviewed during detailed design.

2 Introduction

- 34 The Water Supply and Sanitation Sector project (WSSP) will improve the performance of provincial water utilities (PNPs, provincial water utilities) and expand access to safe piped water supply and sanitation (WSS) for urban residents in Lao PDR's small towns. It is a sector project, the fourth funded by ADB for the water supply sector in Lao PDR, and specific subprojects expand existing water supply systems, develop new systems and improve sanitation conditions in up to 14 priority small towns.

- 35 Environmental benefits as well as potential adverse impacts are anticipated, associated with location, design, construction and operation of the proposed infrastructure. This IEE examines the range of potential impacts that are anticipated to result from the subprojects. The IEE is prepared according to the ADB's Safeguard Policy Statement of June 2009 and the EIA decree of April 2010.

3 Description of the Project

3.1 Project Concept

- 36 Developing the small towns with populations of 4,000-20,000, which are key administrative and economic centers is becoming increasingly important to the nation's economic development, workforce employment, poverty reduction and diversity. Increased access to safe, piped urban water supply and improved sanitation systems and enhanced PNP service delivery play a vital role in the small towns by supporting economic development and improving the health profiles of urban residents.
- 37 The WSSP is designed in accordance with Government's Water Supply Sector Policy Statement, 1999, water supply investment plan (WSIP) and Sector Strategy. It will contribute to sector coverage targets for safe piped water supply of 80% and improved sanitation of 90% of the urban population by 2020. The Project will support the Government's Seventh National Socio-Economic Development Plan, 20011-2015 which focuses on the Millennium Development Goals (MDGs), and a framework for MDG acceleration which includes safe water supply and sanitation for small towns as one of its six main areas. In addition to infrastructure improvements, it will strengthen and assist the implementation of the policy reforms put in place by the Small Towns Water Supply and Sanitation Sector Project (STWSP), a preceding ADB funded sector project, and accords with sector policy of assisting Provincial Nam Papas (PNPs) to improve their operational performance and business management in the areas of corporatization (including corporate plans), non-revenue water (NRW) reduction, water quality monitoring and control, energy management, water safety plans and asset registers.

3.2 Project Impact and Outcome

- 38 The impact of the proposed Project will be expanded access to safe piped water supply and sanitation services for the urban population in Lao PDR. The outcome will be improved performance of PNPs in delivering sustainable water supply and sanitation services.

3.3 Candidate Towns

- 39 Three priority towns have been selected as sample subproject towns, for which feasibility study and fully subproject preparation is undertaken as part of the PPTA. These are (i) New Namtha in Luang Namtha province, (ii) Long in Luang Namtha province, and (ii) Phaoudom in Bokeo province. Further prioritized candidate towns are:

| Province | Provincial Town | Smaller Town |
|-------------|-----------------|----------------|
| Luangnamtha | New Namtha | Long |
| Bokeo | n/a | Pha Oudom |
| Attapeu | Samakhyxay | Sanxay |
| Vientiane | Phonehong | Kasy (or Meun) |
| Borikhamxay | Paksan | Phamouang |
| Xiengkhuang | Phonsavanh | Thathom |
| Sekong | Lamam | Dak Cheung |
| Huaphanh | Xamnoua | Sobbao |
| Xayabuly | Xayabuly | Botene |

3.4 Project Outputs

3.4.1 Output 1: Improved sector coordination and policy implementation

- 40 This output aims to strengthen the efficiency and effectiveness of the water supply sector, building on prior support to the sector under ADB financed and other projects. At central level, sector co-ordination will be facilitated and policy dialogue supported. At provincial level, support will be given to PNP corporate plan development, to include water safety plans, water quality standards (a draft of which has been prepared at national level), support to non revenue water management, asset management and advice on gender-inclusiveness in PNP plans.

3.4.2 Output 2 – Improved Non-Revenue Water Management and Water Supply Development in small towns

- 41 This output will integrate a comprehensive NRW reduction program with water supply development in about 5 provincial capitals.
- (i) The NRW program will be undertaken to address both “real losses” such as leakage and “apparent losses” such as metering losses and water theft. The NRW program will include physical works such as: (i) creating physical hydraulic zones in the network; (ii) installing pipes, valves and meters, and; (iii) undertaking leak detection and repairs. It will also include: (i) surveys to identify unauthorized connections; (ii) a water audit and water balance to identify the main NRW sources; (iii) improving record drawings and asset registers; (iv) updating customer registration; (v) implementing customer complaints register and pipeline repair register, and; (vi) formulating and implementing disconnection and meter management policies. Adoption of the “free connections” policy will help to minimize apparent losses by reducing the incentive for illegal or unauthorized connections.
 - (ii) Permanent leak detection and repair teams will be established within the concerned PNP. The teams will work with a NRW expert and a metering expert (attached to the PIA consultants), who will manage the NRW program and train national staff. Regional workshops will facilitate sharing of experiences, lessons learned and networking on NRW between PNPs. The NRW reduction program will offer business opportunities for PNP and private sector companies to develop expertise in NRW reduction. It is expected that these groups would be able to offer contract services for annual NRW audits in towns where NRW reduction has been carried out to sustain NRW at low levels, and participate in NRW reduction activities in other towns.
- 42 The water supply development and rehabilitation will be carried out on existing PNP water supply systems and expand services to unserved villages in the most densely populated suburbs of about five provincial capitals. The scope of works will cover the expansion, replacement and rehabilitation (if required) of: (i) water intakes from surface, spring or groundwater sources; (ii) raw water transmission; (iii) water treatment facilities; (iv) distribution network; (v) service reservoirs; (vi) individual metered service connections, and; (vii) improved office/workshop/store facilities for the PNP branch. Equipment and a flat bed truck for operation and maintenance (O&M) of the water supply systems will be procured. Free connections and meters will be provided for qualifying households.

3.4.3 Developed water supply systems in small towns

- 43 This output will develop safe, affordable, reliable PNP piped water supply systems for the core urban areas of about six subproject towns. It will include the development of: (i) surface, spring or groundwater source; (ii) raw water transmission; (iii) water treatment facilities, including a small water testing laboratory; (iv) distribution and reticulation pipework; (v) service reservoirs; (vi) individual metered service connections, and; (vii) an office/workshop/store for the PNP

branch. It also includes procurement of equipment and a flat bed truck for operation and maintenance (O&M) of the water supply systems. Households that apply to connect during the construction period will not be required to pay any up-front connection charges for small-bore reticulation, connections or meters, but the cost of these items will form part of the subproject capital cost and will be recovered through the water tariff. Marketing and awareness campaigns will inform communities about the Project's connections policies and the benefits of connecting to PNP piped water supply. The consultant support will provide system-specific capacity development and training for PNP provincial and district staff in system O&M and help each PNP to develop short and medium-term water supply investment plans for each of its water supply systems.

3.4.4 Output 4 – Enhanced community action in water supply and sanitation

- 44 This output will increase and sustain the benefits from investments in small town water supply systems through complementary activities. The output will facilitate the implementation of the water supply system and enhance the sustainability of water supply benefits with activities targeted at improved household sanitation, village environmental improvements (VEI) and community health awareness. Village Development Committees (VDCs) will be the main implementing group for these activities, in coordination with the district government.
- 45 Village environmental improvements will promote demand-driven, community-managed improvements in household sanitation and village environmental conditions. The VEI includes construction or upgrading of household latrines for the poor,¹ construction or rehabilitation of existing facilities in schools or village meeting places, construction or rehabilitation of small-scale community improvements such as drains and village access roads. Core villages within a small town will be eligible to participate, including those that agree to assume responsibility for implementing, operating and maintaining improvements, make a 10% cash contributions towards the capital costs of the improvements; and select specific improvements in a participatory, socially inclusive and transparent manner.² A cost-sharing arrangement will support the VEI—the project will contribute up to 80% of the cost of improvements (about \$25 per capita), while provincial or district governments will contribute 10% and the village will contribute at least 10% in the form of cash. Each village will enter into an agreement with the office of public works and transport (OPWT) for O&M of the VEI before any funds are release
- 46 The output also includes support for increased project and hygiene awareness. This includes (i) implementation of stakeholder consultation and community participation activities for informing, promoting and educating beneficiaries, consulting with individuals from different social and ethnic groups, and public disclosure of safeguard documents, water and sanitation policies, and corporate plans; and (ii) support to district authorities for sanitation and hygiene behavior change, including formative research on behaviors, expert assistance in developing hygiene and sanitation promotion campaigns and materials, design of new programs to cover emerging issues (e.g., water conservation or protection of water sources), and evaluation of program effectiveness.
- 47 Public sanitation facilities will be constructed in strategic areas where the O&M can be contracted to a nearby business or social entity (e.g., petrol stations, schools, pagodas, or bus stations). Where septage disposal facilities are not available in the subproject area, the project will provide technical assistance and grant funds for constructing septage disposal facilities at a suitable location on government land.

¹ The grant amount of \$120 has been established to cover materials to construct a durable water seal pit latrine with 10-year capacity for a household of six people. Poor households that decide not to connect to the PNP system will receive a smaller grant to enable them to improve their sanitary facilities.

² Non-eligible villages include those that have received previous ADB assistance, or are scheduled to receive investment for environmental improvements from other ADB or development partner project by 2020.

3.4.5 Output 5 – Strengthened Capacity for Project Implementation and Operation and Maintenance

- 48 This output includes support for project implementation assistance and capacity development for O&M, including effective implementation of environmental and social safeguards plans to enhance sustainability. Following the lessons on the previous projects, PNP capacity development for O&M will be supported through a long term twinning arrangement between a successful international water utility such as the Provincial Waterworks Authority of Thailand and the GOL. Formal training and on-the-job-training in Thai water facility, was followed by on-the-job training on the PNPs' own water facilities. PNPs staff highly rated this form of capacity development. The output will also provide support to VDCs to enhance their capacities to operate and maintain village infrastructure and their on-site water and sanitation facilities. It will procure computer hardware, basic laboratory water quality testing equipment and (where necessary) improved billing and accounting systems for the PNPs. For subprojects that involve NRW programs, the Project will also procure leak detection equipment. This output also includes incremental administration support to project staff for vehicles, and office and computer equipment in PCU and PIU offices.

4 Policy, Legal and Administrative Framework

4.1 Environmental Assessment

- 49 The law governing the protection of the environment, including the assessment and management of projects, is the Environmental Protection Law (EPL), 1999. An update was prepared and released in 2013, reflecting rapid economic growth and socioeconomic development and the need to address increasing conflict and social impacts as well as pollution issues with some larger projects, increasing foreign investment, and climate change. Responsibilities and procedures for Environmental Assessment, together with requirements for environmental monitoring of projects, have been revised and are set out in a new Decree on Environmental Impact Assessment (EIA decree), dated April 2010. The EIA decree is pursuant to the EPL.
- 50 The EIA Decree assigns primary responsibility for undertaking environmental assessment of projects to the project developer. The Ministry of Natural Resources and Environment (MONRE) is responsible for review and approval of environmental assessment reports, co-ordination of monitoring and evaluation, and issuance of compliance certificates. These functions may be fulfilled at central or provincial level, depending on the scope, size and nature of the project.
- 51 Investment projects are categorized according to a schedule in the EIA Decree as Category 1--small scale investments that require an IEE, or Category 2- large scale investments that require an EIA. Where a project is of a type that is not listed, an investment application should be submitted to MONRE for screening. The Decree sets out procedures, rights and responsibilities for the preparation and approval of IEEs and the preparation, approval, implementation and verification of environmental management and monitoring plans.
- 52 The EIA Decree stipulates responsibilities for the key stakeholders involved in the process. These are listed as MONRE (or the local DONRE), local administrations, development project responsible agencies (taken to mean, essentially, the line agency either at central or provincial level), concerned sector bodies and project developers. The responsibilities relate to the process of IEE preparation and approval. The tasks required, from inception through to approval, are investigations, field inspections, information dissemination, public consultation, review of draft IEEs, updating IEEs in response to comments and the issuance of certificates of compliance. The roles and responsibilities of the key stakeholder groups for the process, as described in Article 9 of the EIA decree, are summarized in **Error! Reference source not found..**

Table 1: Roles of Stakeholders in Environmental Assessment

| Stakeholders | Roles | | | | | | | | | Notes |
|-----------------------|----------------|------------------------|-------------------|-----------------------|-----------------|---------------------------|---------------------------------|----------|---------------------------|--|
| | Investigations | Dissemination meetings | Field inspections | Consultation Meetings | IEE preparation | Review and comment on IEE | Incorporation of comment in IEE | Approval | Issuance of certification | |
| MONRE | | | ✓ | ✓ | | | | ✓ | ✓ | MONRE may nominate provincial Water Resources and Environment Divisions to act on its behalf |
| Local Administrations | ✓ | ✓ | | ✓ | | | | | ✓ | Certification based on verification by MONRE |
| Line Ministries | | | | | | ✓ | | | | |
| Project Developers | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | |

- 53 Project developers are defined in Article 3 of the EIA Decree as any person, legal entity or organization, from the public or private sector, who/which is licensed to undertake study, survey, design, construction and operation of an investment project.
- 54 Procedures for IEE preparation and approval are described in Article 10 of the EIA Decree and are summarized as follows:
- (i) The project developer prepares the IEE report, in cooperation with other stakeholder agencies and including consultation at village, district and provincial levels;
 - (ii) On completion of consultations at district level and subsequent updating of the IEE report based on comments received, the project developer should send the IEE report to the relevant line ministry;
 - (iii) The line ministry should review the IEE report within 10 days and either accept or instruct the project developer to provide further information or make revisions;
 - (iv) Once accepted by the line ministry, the project developer should submit 15 hard copies and a soft copy of the IEE to the line ministry;
 - (v) The line ministry should send the IEE report to the local administration and concerned agencies within five days of receipt;
 - (vi) Recipients of the IEE report must send any comments on the IEE reports within 20 working days of receipt;
 - (vii) The line ministry should convene a technical workshop to review the IEE and, if necessary, undertake a field visit, following which comments are sent to MONRE with a recommendation as to the acceptability of the IEE; and
 - (viii) MONRE decides whether to issue a certificate of compliance, instructs the project developer to amend the IEE report, instruct the project developer to undertake further investigations, or to reject the IEE report.

4.2 Responsibilities relating to Water Resources

- 55 Further legislation of relevance to the sector is the Water Supply Law (2009) and the Water and Water Resources Law (1996, under revision).
- 56 The Water Supply Law (2009) allocates priority to water supply. It defines a principle of water supply activities (Article 5), as the coordination of all sectors and localities concerned in joint using of water sources by giving priority to water supply production.
- 57 Article 18 of the Water Supply Law states (in the unofficial translation) that "individuals or organizations may have the rights of possession and use of water sources for water supply production only if they have receive the authorization from the sectors concerned with the approval of the water resources and environment sectors at the same level." From this it is understood that approval for water use by the PNP requires the approval of the DONRE (the provincial water resources and environmental sector).
- 58 A revision of the Water and Water Resources Law (1996) is under preparation to reflect new institutional arrangements (in particular the formation of the Ministry of Natural Resources and Environment in 2011, replacing the former Water Resources and Environment Administration), growing usage of water for hydropower and irrigation as well as for water supply, and other issues. Public consultations for development of a revised law commenced in late 2012. The law vests ownership of water and water resources in "the national community whom the State represents" (Article 4). Provision is made for water resource allocation, but not in detail. Article 11 states that "The allocation of water sources and catchments shall be based on surveys and on data collected, in order that water and water resources are distributed, managed and used effectively and in accordance with their purposes. Article 12 states: "To ensure that water and water resources existing in the Lao People's Democratic Republic are used thoroughly and in accordance with their purposes, the government shall determine the distribution of water and water resources."
- 59 The law separates water use into small, medium and large scale use. The definition of medium scale use including constructing small scale intake structures for water (Article 16) and for large scale includes the construction of medium or large scale reservoirs. Provision for approvals is made in Article 18, which states that water and water resources shall be centrally managed, that large scale use shall be approved by government, and that medium scale use shall be approved by a relevant agency ("relevant agency" is not defined in the law).

4.3 Applicability and Compliance with Environment Laws

- 60 The following steps ensure compliance with the Environmental Protection Lao (amended, 2013) and the EIA Decree (2010)
- (i) The IEE is prepared by the DHUP, with assistance from the consultants and includes cooperation with other stakeholder agencies and including consultation at village, district and provincial levels;
 - (ii) The IEE is disclosed, consultations take place at district level, the IEE is updated based on comments received, and it is sent to MPWT for review.
 - (iii) The MPWT reviews the IEE and either accepts or instructs the DHUP to provide further information or make revisions;
 - (iv) Once accepted by the MPWT, 15 hard copies and a soft copy of the IEE are submitted to the MPWT;

- (v) The MPWT sends the IEE report to the DONREs in the province concerned to circulate locally for comment and if requested by DONRE, convenes a technical workshop to review the IEE, which may include a field visit
- (vi) The IEE is updated and sent to DONRE with a recommendation as to the acceptability of the IEE; and
- (vii) DONRE makes the final decision as to acceptance of the IEE report.

4.4 Timeline for Clearance and Approvals

- (i) On completion of the IEE report and submission to MPWT, 10 days for review and issuance of decision
- (ii) Revisions are made as required. IEE is then issued for consultations, comments must be received within 20 working days of receipt.
- (iii) IEE then updated to take account of comments and submitted for clearance by DONRE.

5 Description of the Environment

61 The project towns are situated around the country. This section therefore provides a description of the Lao environment as a whole. Key features related to water supply are low population density, varied topography, tropical monsoonal climate and abundant water resources, but lengthy dry season, abundant forests and landlocked situation.

5.1 Physical Resources

5.1.1 Topography

62 Topography ranges from plains adjoining the Mekong River, particularly in the South of the country, to steep, mountain terrain classified as upland. The uplands, comprising sloping land or high altitude plateaux, in fact account for the majority (70%) of the land area. The southern and central parts of the country are bounded by the Annamite highlands on the border with Vietnam to the west, where altitudes are typically 1,200m above sea level, declining to the Mekong flood plain where altitudes are in the range of 400m to 600m. The Northern part of the country is predominantly hilly. The Project towns are situated in hilly terrain, on valley floors and on the Mekong flood plain.

63 Most of the project towns are on flat terrain, on valley floors. Some core villages occupy or partially occupy adjoining undulating or hilly areas. Towns in mainly hilly terrain are Long, Dakcheung, and Sobbao.

5.1.2 Geology and Soils

64 The predominant rock types are sandstones, mudstones and limestone of marine sedimentary origin, interspersed with igneous rock. The marine sedimentary rocks in the uplands originate mainly from depositions made during the Paleozoic era (250 – 540 million years ago) while those in much of the lowland area along the Mekong are more recent, deposited during the Mesozoic era (65 – 250 million years ago). The depositions occurred when, during the tectonic plate movements that have taken place over geological time, approaching land masses formed oceanic basins, in which sediments were deposited. In upland areas, subsequent lifting folding, again due tectonic plate collisions, took place to form the Annamite hills. Volcanic intrusions occurred particularly along the tectonic lines formed by the converging land masses.

- 65 Soils derived from these mainly sedimentary rocks are typically neutral to slightly acidic and sandy to sandy clay in texture. Soils on the flat terrain consist mainly of neutral to slightly acidic sands, and sandy clays derived from these alluvial deposits. The soils are suited to intensive irrigated and rain fed agriculture, predominantly rice. Yields can be significantly improved through the application of mineral fertilizer. In hilly areas, soils are usually heavily leached, and acidic, and thereby have poor fertility and water retention.
- 66 In most of the towns are mostly slightly acidic, and sandy to sandy clay in texture, the exception being Phaksan and Botene which are located on flat terrain adjoining the Mekong and have neutral to slightly acidic sands and sandy clays.

5.2 Climate

- 67 The climate around most the country is classified as tropical wet, with dry seasons, while in higher upland areas to the south of the country it is tropical monsoonal, and a belt to the northwest is warm temperate, with dry winters and hot summers³. In general the climate features a dry season (November to February) and a wet season (May to October). The dry season is generally cooler, though temperatures rise significantly in March and April prior to the onset of the rains.
- 68 Rainfall is generally high, averaging 1,600mm and reaching 3,700mm, in the uplands⁴. Sustained high rainfall during the wet season is common particularly during July and August, leading to soil saturation, rendering sloping land vulnerable to landslides, while the dry season is quite pronounced. However all over the country, the dry season can be long enough to cause difficulty in sourcing adequate water for household supplies and for irrigation despite high rainfall as a whole.
- 69 Temperature averages 29°C over the year, with lowest temperatures occurring in December and January, reaching a low of 8°C in upland areas, while the higher temperatures occur in March and April, reaching 35°C in lowland areas.
- 70 Evaporation tends to peak in March and April when temperatures are high and rainfall is low, reaching typically 100mm and to be at its lowest, typically around 45mm, in the late rainy season, between July and September.

5.3 Climate Change

- 71 In Lao PDR, the most significant phenomena associated with predicted climate change are increasing frequency and severity of heavy rainfall events, and longer, more severe, drought periods. The National Adaptation Programme of Action (NAPA) for climate change, was prepared for Lao PDR and submitted to the United Nations Framework Convention on Climate Change in May 2009. The NAPA identifies priority vulnerability areas, and these include water resources. Over time, greater maximum and minimum river levels can be expected with consequently greater risks of floods and droughts.
- 72 The areas at most risk of severe droughts are those occurring to the western border area with Myanmar in the northern part of the country where Phaoudom, Long and Xayabouly. Lie. Another zone is to the border with Vietnam just south of the central part of the country, which is not close to any project towns.

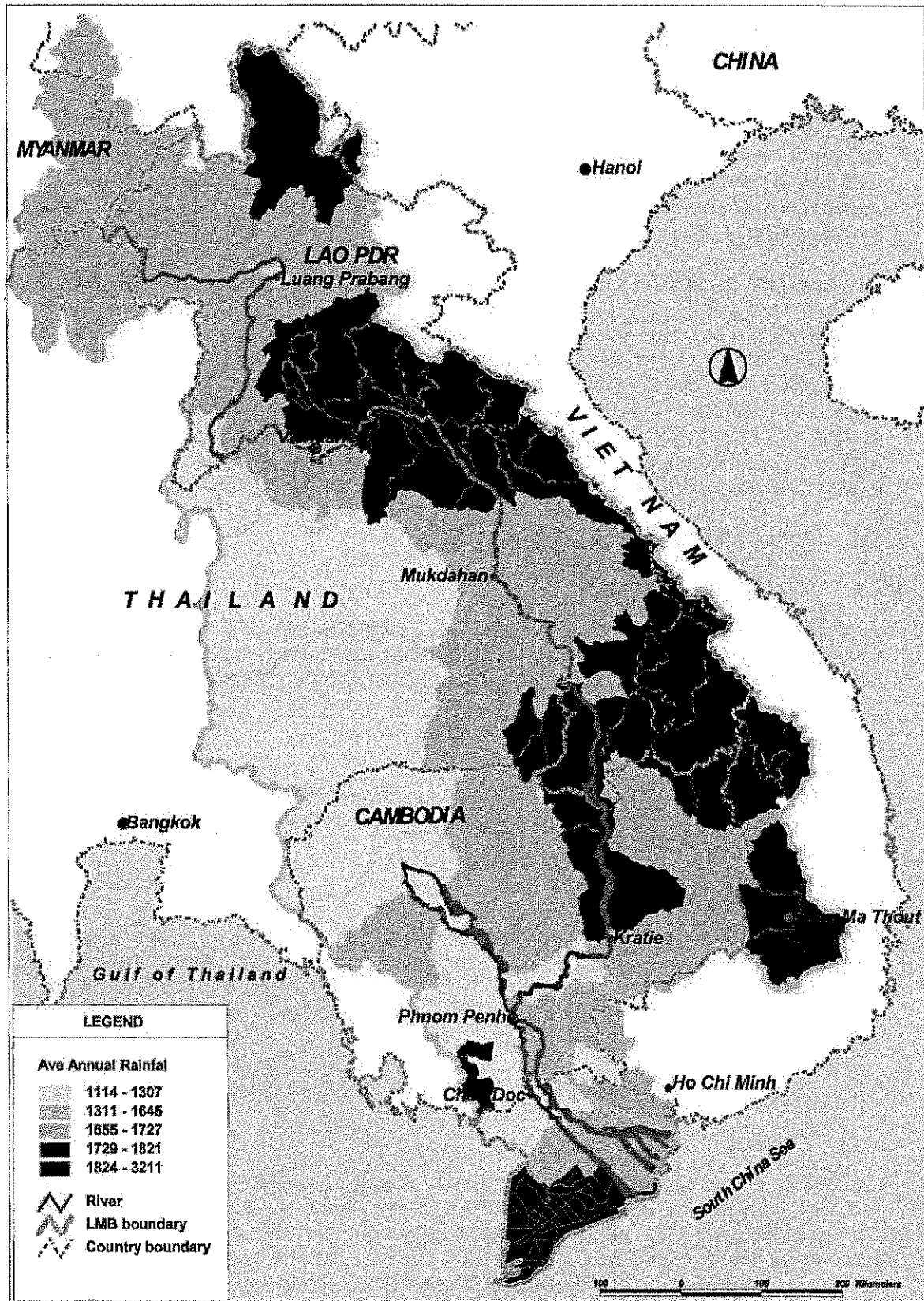
³ Peel, M. C., Finlayson, B. L., and McMahon, T. A. (2007), Updated world map of the Köppen-Geiger climate classification. Hydrology and Earth System Sciences, University of Melbourne.

⁴ FAO: "AquaStat" website

5.4 Water Resources

- 73 About 90% of the area of Lao PDR forms part of the Mekong river basin, some 25% of the total extent of the basin, contributing to around 35% of its total flow. 32 sub-basins have been identified. Information on water resources is summarized on the website maintained by the FAO: www.fao.org/nr/aquastat. Among countries that have a significant land area within the Lower Mekong Basin, Lao PDR has a relatively high rainfall, as illustrated in **Error! Reference source not found..**

Figure 2: Mean Annual Rainfall within the Lower Mekong Basin⁵



⁵ Mekong River Commission (2006). Basin Development Planning Atlas (cited in MRC (2009) Hydrological Flood Hazards in the Lower Mekong Basin).

- 74 Due to high rainfall levels over the country and the inflow of the Mekong River, water reserves in Lao PDR are vast, as evidenced by the growing number of major hydropower schemes being built in the country. The total quantity of surface water each year is estimated at 190 billion m³ per year, equating to around 35,000 m³ annually per capita. A constraint on water use however is the length of the dry season, potentially affecting town water supplies where there is a high demand for irrigation water. At present, around 1 billion m³ of water are extracted for use each year, mainly for irrigation (82%). There is considerable scope for the expansion of irrigated land in Lao PDR, the FAO estimates that some 600,000ha of land can be irrigated, while substantially less (around 155,500ha according to 1995 figures), is currently irrigated. However, demand irrigation for irrigation is highest during the dry season, when available water can be scarce.
- 75 The extent of groundwater reserves is much smaller but still substantial, around 38 billion m³ per year according to FAO estimates, though most of this forms base flow of rivers. Groundwater is used for water supply in some areas though it can be problematic, with wells running dry after some years of abstraction, and/or during the dry season. Much of the marine sedimentary rock that dominates the country's geology has high porosity and permeability, however not all rock types are suitable for drilling for water. Extensive groundwater studies carried out in two towns⁶ encountered difficulty in locating groundwater reserves using special detection techniques. In most geological conditions in the country, aquifers appear to be relatively small, to occur at varying depths and not to be well inter-connected.

5.5 Natural Hazards

5.5.1 Earthquakes

- 76 Small to moderate earthquakes have occurred within Lao PDR over recorded history. Northern and western mountainous regions, including the project area, have the highest earthquake risk, rated by the Modified Mercalli Scale (an international standard for earthquake risk) as moderate.

5.5.2 Floods

- 77 Lao PDR is prone to floods, mainly associated with the larger river basins. Eight rivers have been identified as particularly problematic, which do not include the Nam Long, or the Nam Ma.

5.5.3 Landslides

- 78 Steep hills surrounding the area are prone to landslides, which occur most frequently at times of high rainfall. Landslide susceptibility in the hills around the project area is rated as moderate by the Asian Disaster Preparedness Center. The town of Long itself is however on flat land not prone to landslides. Landslide events may sever transport links and result in debris outflows in the Nam Long river.

5.6 Ecological Resources

5.6.1 Forests

- 79 Lao PDR is endowed with considerable forest resources, occurring in a range of forest types that vary according to altitude, rainfall and soil types, and represent habitats of considerable international conservation value. The forests have an important role to play both in the national economy and the sustenance of traditional lifestyles. The balance between exploitation to realize the financial value of resources and conservation to preserve species diversity, protect

⁶ Norconsult (2002), Hydrogeological Investigations at Outhoumphone, 2000 – 2002 and Hydrogeological Investigations at Ton Pheung, 2000 – 2002

the environment and sustain lifestyles is difficult to strike. In recent decades, the decline of forest resources has been marked, even alarming. Estimates suggest a drop in forest cover from 70% of the total land area in 1940 to 41.5% in 2002. Efforts to determine sustainable levels of log extraction and curb logging to keep to these have proven problematic, difficulties arise in undertaking forest inventories, calculating allowable cut levels, and regulating logging concerns to keep to these. Where the annual allowable cut is exceeded (or not even determined) logging activity is likely to cause irreparable damage to forest ecosystems.

- 80 Non timber forest products are important as a food and tradable commodity source for a wide range of forest dependent communities around the country. These products include spices, oils, rattans, meat and resin, valued as foods, medicines, for handicraft and for other uses. Trade in non timber forest products is a very important part of the income of average rural families.
- 81 Attempts have been made to establish plantations and thereby produce timber and other forest products while buffering remaining natural forest reserves. However, success has been variable, due mainly to the standards of planning and management of forest plantations.

5.6.2 Protected Areas

- 82 The range of habitats, including forests in Lao PDR is wide, and of international conservation value, including lowland and upland forest, plateaux and riparian habitats. The diversity of the plant animal and fish species is high and there are a number of species with high endemism (not found or very rare outside Lao PDR). Besides encroachment on these habitats, wildlife is threatened by trade in wildlife products. In recognition of the high conservation value of the habitats, a National Protected Area system has been established, comprising 19 areas which collectively account for 13% of the land area of the country. These protected areas are managed by the Department of Forestry under the Ministry of Agriculture and Forestry, via provincial and district level offices, with villager participation and co-ordinated by the Division of Forest Resources Conservation. Management focuses on conservation, integrating traditional land uses (such as long rotation swidden agriculture) in most cases.
- 83 One town, Sanxay, is within a NBCA area, the Dong Amphan NBCA. Five towns are within 20km of the boundary of an NBCA: Long (8km from Nam Ha NBCA); New Namtha (12km from Nam Ha NBCA); Samakhyxay (4km from Don Hua Sao NBCA); Phonehong (5km f Phou Phanang NBCA) and Paksan (14km from Nam Kading NBCA).

5.6.3 Aquatic Ecosystems

- 84 With high levels of rainfall and an extensive mountainous terrain, freshwater reserves are diverse, from small, high altitude mountain streams to the Mekong River. This gives rise to diversity in aquatic habitat, also reflected in a diversity of fish species, which show a high degree of endemism. Besides streams and rivers, wetlands are significant aquatic habitats in Lao PDR, occurring mainly in the south of the country near the Mekong River. Important species in these areas include a number of large mammals and the Siamese crocodile, which is subject to excessive hunting and is endangered. Fish are an important economic resource and fisheries management also needs to strike a balance between commercial exploitation and conservation. Fisheries make up approximately 13% of the GDP.
- 85 Fisheries are one an important livelihood activity, particularly in the lowland areas where wetlands, oxbow lake remnants and rice fields are all sources of fish. There are seasonal migrations of fish between the Mekong and its tributaries, with the first major fish migration of the year commencing at the start of the wet season. The *pa doke keo* fishery starts during this migration period. Fishing of the migrating *cyprinid* family (which includes carp and minnows and known as *pa soi*) takes places in October, as the rainy season ends. At this time, fish are also moving out of rice fields, streams, ox bow lakes and inundated natural depressions to return to the main rivers. Fishing in these areas provides local communities with other aquatic

resources including shrimp, snails, earthworms (used for fish bait), frogs, crabs and aquatic insects. These resources are especially important in villages with a small area of wet rice fields or fields that are particularly vulnerable to flooding.⁷

5.6.4 The Periurban Landscape

- 86 Land immediately surrounding most towns is usually extensively cultivated. Trees and shrubs tend to occur mainly along waterways, between fields, or in isolated patches. Intact, relatively undisturbed forests can occur near the towns, associated with temples where they are protected for religious or cultural purposes, or on steep slopes where access for tree felling and extraction is difficult.

5.7 Items of Historical and Archaeological Significance

- 87 Sites of religious and cultural significance include temples and monuments. Temples appear in most towns, usually used and maintained by monks and visited regularly by many members of the community. Other items of cultural significance include monuments, and relicts of former administrative eras, for example an old (and abandoned) French military barracks in Huaixai. In Champasack, there is a temple designated as a World Heritage site.
- 88 In Savannakhet province, significant fossil finds have occurred in deposits of the early Cretaceous period (which took place in the late Mesozoic era) of a species of dinosaur, subsequently named the Tangvaysaurus (after the village of Tang Vay where the fossils were found). Most of the soils in the area were deposited since the Cretaceous period, though bedrock in the towns situated on the plains to the southwest of the country could in theory contain fossils. In other parts of the country, bedrock and soils in most of the towns predate the Cretaceous period, and are therefore unlikely to bear fossils of conservation significance.

5.8 Human and Economic Development

5.8.1 Urban Development

- 89 The project towns are generally district towns though some, such as Huaixai and Champasack, are provincial towns. Towns as such are not an administrative unit in Lao PDR, and the district towns tend to consist of clusters of villages, containing the district administrative areas. Economic development and population growth are taking place in the towns, with consequent increasing demands on infrastructure.

5.8.2 Livelihoods

- 90 Livelihoods in small towns are predominantly based on agriculture or on forest products, although the manufacturing and services sectors are growing in the country. Even with this growth, agriculture dominates the local economy in most parts of the country and is mainly based on rice production. Many rural families do not have regular cash incomes. Within the mainly agricultural setting, small towns are important as marketing and transport centres, providing access to more distant markets either within Lao PDR or internationally. Agricultural processing and administrative services are also important in small towns around the country.

5.8.3 Poverty Levels

- 91 Poverty varies around the country as is apparent from the incidence of poor households given in Table 1. The pattern of the occurrence of poverty in Laos is influenced by a range of demographic, geographic and historical factors. The conflict that has taken place in the country, associated with fighting both within the country as well as the war of the 1960s and 1970s have hampered opportunities to rise out of poverty. The prevalence of unexploded

⁷ The People and Their River - A survey of River Based Livelihoods in Xe Bang Fai River Basin in Central Lao PDR, 2001. Lao PDR/Canada Fund for Local Initiatives

ordinance both causes direct injury or death, and poses yet another constraint on land use. Public health further entrenches poverty, with water related and respiratory diseases strongly evident in data provided by the National Centre for Epidemiology. With increasing demand for land, reduced space to practice traditional swidden agriculture further entrench poverty. Although population density remains low, the relatively low agricultural productivity, and environmental degradation from unsustainable logging directly affect many rural communities, making them more vulnerable to seasonal food shortages, and to extremes in rainfall patterns which cause occasional flooding and drought.

5.8.4 Ethnic Groups

- 92 Many ethnic groups are represented in the population of Lao PDR. However three general ethnic group classifications have arisen, the Tai-Kadai (around 66% of the population) consisting of groups predominantly originating from the lowlands, the Mon-Khmer group (24%), which originated as paddy farmers but was displaced into upland areas and Sino-Tibetan groups (10%) of the north of the country, among which the Hmong group is the most numerous.

5.8.5 Land Use in Surrounding Areas

- 93 Much of the land in the country is sloping, and therefore vulnerable to landslides particularly at the height of the rainy season where soils are often saturated, curtailing their productivity and increasing the demand for productive land, which also increases as a result of population growth.
- 94 Traditions for shifting agriculture are long established in the uplands. Studies on traditional practices have shown that some systems do not appear to cause land degradation, particularly where land is left to redevelop its forest cover following cultivation. The long fallow periods typical of traditional swidden systems can allow forests to regenerate substantially, with most or all of the same plant species occurring in the regenerated forest as occurred in the original forest cover. Where the land is left for a sufficient period before again being cultivated, the system can continue in perpetuity. However, as demand for land increases and fallow periods are reduced, the effects of shifting agriculture can be harmful.

5.8.6 Public Health Infrastructure

- 95 Sanitation infrastructure in most small towns is basic, but coverage is high: 85% of urban households outside Vientiane have pit latrines, septic tanks or another toilet system. Households typically construct pit latrines. In the low and medium density conditions that typify most small towns, these are usually appropriate and adequate for the disposal of wastewater and household sullage, particularly as soils generally have adequate assimilative capacity, though difficulties can arise on stony ground which is unsuitable both for pit construction and assimilation. Other advantages are that they are easy and inexpensive to maintain and manage, and are an acceptable form of in situ sludge management, as pits, once full, are left while a new one is used. However septic tanks although a good alternative for on site sewerage treatment, are often inadequately designed and constructed and require vacuum tankers to periodically remove sludge build-up. Beyond private homes however, public sanitation facilities are rarely installed in small towns, and none of the project towns have sewerage systems.
- 96 Solid waste generation is currently increasing, particularly as trade in goods packaged in various forms of plastic containers increases.
- 97 Some small towns have collection systems but none have landfills, or any means of collecting leachate and treating or disposing of it properly. Collection systems are rarely adequate to collect refuse on a regular and thorough basis, and litter usually remains in and around roadside drains and public areas, greatly impairing the aesthetic appeal of most small towns.

Recycling and composting have the potential to significantly ameliorate solid waste problems, but are rarely practiced.

- 98 In many towns, their overall appeal is considerably impaired by poor drainage and prevalent solid waste. The main roads are lined with side drains, however these are in a variable state of upkeep and frequently blocked. Solid waste accumulates in the drains and causes accumulations of stagnant water, and elsewhere, the drains are clogged with prolific weed growth.
- 99 The prevalence of waterborne and water related diseases is strongly apparent, from epidemiology monitoring data maintained by the National Center for Epidemiology. Diarrhoea, dysentery and hepatitis, related to poor drinking water and hygiene conditions, and dengue fever, attributable to the presence of stagnant water where mosquito can breed, are among the most common five diseases in all towns.

5.8.7 Air Quality

- 100 Levels of air pollution in small towns are low, either from vehicles (car ownership in Lao PDR as a whole is very low, around 74 per 1000 people) or from industries. However, in many of the towns fuelwood remains the main cooking fuel, which can cause significant air quality issues particularly inside homes that are not well ventilated, and the practice of burning rice stubble can significantly reduce air quality temporarily during the dry season.

5.8.8 Unexploded Ordinance

- 101 Unexploded ordinance remaining in Lao PDR from conflict that took place in the region between 1962 and 1976 is a continuing threat, and cause of frequent death and injury. Unexploded devices are typically encountered when ploughing fields, searching for scrap metal and even by children playing. Much of the ordinance was dropped by US forces, who released many different kinds of bombs on suspected and observed targets over the period, around a third of which did not detonate. Data on ordinance dropped by the US is available at the National Mines Regulatory Authority and has been reviewed. Around many towns, ordinance has been dropped at locations that may be on or close to intake, transmission line or water treatment plant sites. Further, records of ordinance from bombings by Southern Vietnamese, Lao or Thai air forces, or from ground fighting are not available in any verified source though local residents have knowledge of the possible occurrence of these. Where there is a significant risk of the presence of unexploded ordinance, specialist clearance and/or verification services are necessary.
- 102 Of the project towns, records show that ordinance was dropped by US forces in the periphery of Samakhyay Thathom and Sabbao and in both the town and periphery of Kasy, Phonsavanh, Lamam and Xamnoua,

6 Anticipated Environmental Impacts and Mitigation Measures

6.1 Method of Assessment

- 103 Potential impacts have been assessed by means of site visits to the sample subproject towns, discussions with local authorities and beneficiaries and the use of secondary sources of information. This section summarises the potential environmental impacts and required mitigation, which is incorporated into the Environmental Management Plan prepared for each subproject.

6.2 Overview of Subproject Impacts

- 104 The most significant impacts expected to arise from the project are major improvements to public health and the quality of life in the town from the provision of potable water. These benefits will be further enhanced by community initiatives elicited by output 4, which will

include improved public and household sanitation and drainage improvements. These actions address priority problems. Some items of potential concern arise in connection with project location, the construction phase and the operation phase.

- 105 The principal issues of potential concern are (i) management of sediment from the water treatment plant, (ii) protection of water sources, (iii) risks associated with unexploded ordinance, (iv) water resource conflicts (v) an increased burden on drainage systems due to improved water supplies and (vi) safety issues. Impacts and mitigation of these are described below.

6.3 Sediment from Water Treatment

- 106 Sediment will be produced at each water treatment plant. It consists of the fine particles of inert material (mainly silt) that are removed from the raw water by the flocculation process, and traces of the flocculation agent, aluminium sulphate, or alum, which is not toxic. The volume of sediment produced depends on both the quantity of capacity of the treatment plant and the turbidity of the raw water. Turbidity will vary seasonally, as most water sources are streams and rivers which invariably carry significantly higher sediment loads during the wet season.
- 107 The sediment has few potential applications for re-use though research has taken place on the possible uses in brick making, and as a growing medium. However, in the small town situation the supply of sediment from WTPs will be limited and variable, negating any scope for re-use. Options for disposal include discharge into rivers or streams, collecting it as sediment and depositing it at a solid waste disposal site (preferably landfills, though very few of these exist in small towns in Lao PDR). When discharging to a river or stream, the sediment can be piped in liquid form, either as backwash water from filters at the treatment plant, or as slurry. This is often acceptable, as the effect of dilution can be expected to negate the impact. For example, the schemes in the project towns will typically produce around 2,000 m³/day, from source rivers with minimum flows of at least 5 m³/s (432,000 m³/day). The solids will be released in backwash water. The volume of backwash water produced by such a plant will be in the range of 50 – 100 m³/day. The dilution ratios for the backwash water will be in the range of 4,000:1 and 8,500:1 (source water: backwash water) during the dry season and greater for the wet season.
- 108 Where the option of discharge into a river or stream is not practicable or acceptable, sediment can be collected in retention ponds, removed, dried and transported away from the water treatment plant site. While the material can be spread on open land, this is not suitable for agricultural land as it brings little benefit, either to soil structure or to nutrient availability. In addition, the remaining traces of alum react with phosphate ions in the soil to form insoluble aluminum phosphate, reducing the availability of phosphate to plants and potentially reducing crop growth and yield. However, the dried material will be limited in volume and can be disposed of on land that is not used for agricultural production or at a solid waste disposal site, such as a landfill.

6.4 Protection of Water Sources

- 109 Most of the Project towns will obtain raw water for their piped water supply systems from rivers, streams or springs which are open to contamination from development and activities in the upstream catchments. While the quality of the existing raw water sources in general is suitable for urban water supply after full treatment, there is potential for water quality to degrade over time as a result of increased urbanization, industrial activity, agricultural development, animal production and deforestation in the upstream catchments. To ensure that water quality is maintained, both localized and wider measures are required to protect the sources used for the urban water supplies. Local measures are required to ensure that the actual water source is not at risk from contamination in its immediate environment. Large-scale measures are required to ensure that valuable water sources are not lost because of

contamination of the water body from point and non-point sources of pollution some distance away from the drinking-water source.

- 110 In accordance with the Water and Water Resources Law (No 02-96/NA, September 1996, currently under revision and to be updated during 2013 or 2014) and the associated Implementation Decree (No 204/PM, October 2001), the provincial governments are required to issue regulations to protect the quality of the water sources. Such action involves land use planning, ensuring land uses compatible with water conservation and soil protection in each area. In many parts of the country, land use planning is taking place and any water source protection measures must be made to complement these.
- 111 In cases where polluting developments or activities are already established in the local protection zone or catchment-wide protection zone, it may be necessary to close the polluting activity with payment of appropriate compensation, or to implement mitigating measures. For example, if villages exist within the local protection zone, suitable mitigating measures may include provision of proper on-site sanitation facilities for 100% of households, or collection and diversion of wastewater to an outfall downstream of the intake. In the wider catchment, adequate standards of effluent quality should be established and enforced.
- 112 Awareness campaigns conducted by community groups and PNPs during Project implementation will also make communities aware of the need to protect water sources, the extent of protection zones and the activities permitted within them. These awareness raising campaigns will extend to upstream communities whose involvement is essential to watershed protection.

6.5 Risks Associated with Unexploded Ordinance

- 113 Accidental detonation of unexploded ordinance occurs regularly, with excavation activities for infrastructure among the main causes. Managing the threat involves the use of data provided by the National Mines Regulatory Authority, seeking local knowledge, commissioning a verification survey and commissioning clearance services where necessary.
- 114 During feasibility study, care needs to be taken while inspecting water sources and potential transmission routes to avoid walking into high risk areas. When prospective sites are determined for intakes, transmission mains and water treatment plant, an up to date map from the National Mines Regulatory Authority should be consulted to assess the risk of encountering ordinance from US sources, and questions asked of local residents to assess the risk of ordinance from other sources. As is currently done for Small Towns Water and Sanitation Project (STWSP) subprojects, advance survey groups should scan for the presence of UXO when setting out for construction. Should clearance work be found to be necessary, experienced teams from the Lao PDR defence force should be engaged, as for STWSP, to ensure that all areas where excavation, or access road construction will take place are clear of unexploded ordinance, including work areas around these sites.

6.6 Water Resource Conflicts

- 115 Potential conflicts may arise, particularly between demand for town water supplies and irrigation water. Options for mitigation include the use of alternative water sources and water storage facilities, however reliable information on stream flows is required. At present, little monitoring work is done by PNPs, nor is information collected by other agencies, except for rivers that are used or potentially to be used for hydropower generation. The installation and regular use of stream monitoring equipment has however been problematic for hydropower, irrigation and water supply purposes. With both irrigation and water supply demands set to grow, the issue of water resource conflicts is considered as a sector level impact.

6.7 Increased Burden on Drainage Systems

- 116 Households receiving new water supply connections are likely to use more water for cooking and washing, although liberal use will be constrained by tariff charges. In towns on flat terrain or valley floors, drainage is often limited and even relatively small quantities of additional grey water or sullage may form ponds of dirty water which provide a habitat for mosquitoes and pose a health hazard. This will be addressed by (i) improved drainage and sanitation conditions in the villages through community initiatives elicited under output 4; (ii) behavioral changes in sanitation practices and raised awareness of sanitation and health; (iii) improvements to public sanitation facilities and drainage; (iv) enhanced capacity of district OPWTs and communities to manage drainage and sanitation through capacity building and supply of O&M equipment. Further, the Provincial Government will be required to issue modified sanitation regulations, prepared with assistance of the implementation consultants. The modified regulations will require all households, businesses and institutions to install or upgrade sanitation and drainage facilities, and to register them with the OPWTs.

6.8 Safety Issues

- 117 Improved drains in project towns will carry larger volumes of water at greater velocity than previously, creating potential safety hazards to children or the infirm. To mitigate this hazard, assistance will be provided to design a wide cross section that both limits the depth of running water allows safe exit from the drains in the event that people accidentally fall into them. In addition, concrete crossings will be provided where the drains intersect pathways and in the busier commercial centers of the towns.

6.9 Detailed Description of Subproject Impacts and Mitigation

- 118 Table 2 presents the expected impacts related to location, the construction phase and the operation phase.
- 119 The table shows the assessment of impacts as minor, moderate or major in consideration of the scale of the change to be brought about by the project and the significance of the change to human populations. In each case, changes may be positive or negative. "No impact" refers to cases where no change is expected to occur as a result of the project, or changes are expected to be negligible.
- 120 Mitigation measures have been identified to avoid or ameliorate potential negative impacts.

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact With/without recommended mitigation | Temporary or Permanent |
|--|---|-----------------------------------|---|--|------------------------|
| Impacts due to Location | | | | | |
| Disturbance of Unexploded Ordnance | Some digging will be necessary to lay foundations for intake structures and the tanks and facilities at the WTP and the installation of the distribution network. Records are available on aerial bombings by US forces, though further ordnance exists from bombings by the Royal Thai, Lao and Southern Vietnamese air forces as well as from ground fighting, for which there are no reliable records. | All towns | Assess risk of buried ordnance at the WTP arising from ground fighting through consultation with local people. Include provision for advance survey teams to scan for UXO | Major / minor | Temporary |
| Encroachment of precious ecological areas. | In most towns, project works will either take place in areas that are already built up, though in some towns it is possible that intakes and transmission mains may need to be located partly within nearby protected areas. The biggest threat to the integrity of protected areas however is that of hunting or exploitation by temporary workers or their families living in the towns to work on scheme construction. Also, the extraction of materials such as concrete aggregate could cause damage to forests and landscape. | Towns close to protected areas | Avoidance of protected areas to the extent practicable during scheme design to minimise any clearance in protected areas, and to avoid placing intakes and transmission lines in protected areas. Restriction of activities of workers engaged in construction of the system to prohibit the cutting of wood for cooking, any hunting activity or trade in wildlife products. Sourcing of concrete aggregate from outside any protected area. | Moderate / minor | Temporary |
| Historical/cultural monuments and values | In many of the towns, there are monuments or temples of cultural significance, which could be affected if scheme outputs are built too close to them. | Towns with temples and monuments: | Design of schemes to avoid monuments and temples and their surrounding areas | Significant/No impact | N/a |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact With/without recommended mitigation | Temporary or Permanent |
|--|--|--|---|--|------------------------|
| Flooding of the town area. | Some towns in flat terrain or on valley floors are subject to flooding during the wet season, causing damage to public and private property and unhygienic conditions. Under the project, the design and construction of drainage improvements will alleviate the effects of flooding | Towns in flat terrain or on valley floors | N/a | Major positive | Permanent |
| Potential hazards from using the stream as a raw water source. | The quality of raw water may be severely impaired by activities such as gravel or sand extraction from river and stream beds, polluting activities, or land developments close to water sources. | All towns | Continued water quality monitoring Requirement that the Provincial Government prohibits land clearance or other development on land above or within 1km either side of small stream intakes, or prohibits the discharge of refuse such as solid waste, and animal remains into the river, also any extraction of sand from the river within 10km of the water supply intake, in accordance with Article 31 of the Water and Water Resource Law (1996, currently under revision). | Minor / Minor | Permanent |
| Resettlement / Loss or damage to property | Some property will be affected by the construction of water supply schemes and drainage structures. This may involve compensation measures including temporary or permanent resettlement. | All towns | Compensation as provided for in the Resettlement Plan for the subproject. | Moderate / Minor | Permanent |
| Risks associated with hospital waste. | In some towns hospitals or clinics are situated near to drains that are to be improved. Even if the hospitals have on-site wastewater disposal systems, there are some risks of discharge of hazardous hospital waste to the drainage system. | Towns for which drainage improvements are included | Maintenance of the hospital's on site wastewater disposal system in good operable condition. | Minor / Minor | Permanent |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact with/without recommended mitigation | Temporary or Permanent |
|--|---|---|--|--|------------------------|
| Safety risks posed by open drains | Where drainage is to be improved, existing drains will be made larger and capable of carrying water at higher volume and greater velocity and therefore there is an increased safety risk, particularly to children during the wet the wet season. | Towns for which drainage improvements are to be carried out | Design of a wider, shallower drain cross section, with a gradual batter to reduce the risk of falling into drains. Provision of concrete crossings where required and covers in more heavily trafficked areas. Awareness raising of the dangers of open drains during periods of heavy rainfall or flooding. | Moderate / Minor | Permanent |
| Impacts related to Construction | | | | | |
| Disruption of supply | WTP and network upgrading and expansion will cause disruption in supply, including possible temporary cut-off. | | Staging WTP construction to allow the plant to continue operating. Providing advance information to affected areas stating expected severity and duration of the disruption of service | Moderate / Minor | Temporary |
| Accidental damage to utilities | Most towns either have existing power supplies, or plans to have them installed in the coming years. No towns have sewerage networks. There is some risk of damage to power lines during the works. | All towns | Careful site supervision by the Contractor's staff, to reduce risks of accidental damage. | Moderate / Eliminated | Temporary |
| Blocking, impeding access to property or facilities, or creating traffic hazards, during the installation of transmission lines. | In some towns, difficulties may arise during the trench digging, pipelaying and possibly WTP construction to do with blocking or impeding traffic or access to property or facilities, especially where construction operations are carried out in more built up areas. | All towns | Advanced planning of construction operations and provision of information to the public, where appropriate, of the timing and duration of operations that will affect access. Erection of warning and information signs prior to and during the operations. | Minor | Temporary |
| Erosion risks | Where transmission mains, water treatment plant or storage reservoirs are situated on sloping land, there is a risk of erosion risks being exacerbated by excavation operations. | All towns in hilly terrain or on valley floors | Careful supervision of the works to minimise exposure of excavated sites to erosion risks. Placement of silt traps. Planning of work on the slopes to take place during the dry season only. | Minor | Temporary |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact With/without recommended mitigation | Temporary or Permanent |
|--|--|------------|---|--|------------------------|
| Generation of construction waste | For most schemes, minor volumes of waste will be generated, from excavations, access road construction and the operation of construction plant. Empty fuel drums and other packaging will be untidy if left. Quantities of spoil from excavations made to lay the transmissions mains will be minor. | All towns | Removal of surplus waste to a landfill or other approved location. Re-use of spoil from excavations on access road construction, where practicable. | Minor / Eliminated | Temporary |
| Noise and dust nuisance from construction activities. | Noise and dust is likely to be caused by excavation of trenches, operation of vehicles and plant. The impact will occur mainly at sites where excavation is done, and will be temporary. There are few homes in the vicinity of the intake, WTP and transmission line routes but homes within the town will be affected by installation of the piped water supply network and the drainage rehabilitation works. In some towns, there may be sensitive sites such as hospitals and schools located close to where operations are taking place. | All towns | Providing information to nearby residents by signage and notices in the local media about the duration of noise generating operations. Planning of construction operations to minimize public nuisance. Limit construction operations to take place during daytime hours (7am to 6pm) only, particularly near sensitive sites. Wetting of bare earth sites during construction in situations where dust may be blown towards sensitive sites such as hospitals. | Minor / Minor | Temporary |
| Pollution from chemicals, fuels and temporary worker toilet facilities | Improper storage and handling of chemicals and fuels used in construction pose a risk at construction sites as does the risk of raw sewage from inadequate toilet facilities. The impact is temporary, as the risk will be confined to the construction period. | All towns | Secure and controlled storage of all toxic and hazardous materials including fuels. Provide sanitation arrangements at work sites, such that no raw sewage is released into drains or streams. Maintenance of vehicles and plant in sound operable condition, preventing oil leakages and excessive exhaust emissions. | Moderate / Eliminated | Temporary |
| Release of silt from construction operations | Silt and other fine material extracted during excavations for pipelines, drains, intake construction, access roads, and foundations for WTP structures may be released. | All towns. | Use of silt traps during construction. Avoidance of excavation operations during the wet season. | Moderate / Minor | Temporary |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact with/without recommended mitigation | Temporary or Permanent |
|--|--|-----------|---|--|------------------------|
| Safety hazards to workers and the public | Workers or members of the public may be exposed to the risk of accidents during construction. The risk is temporary, and confined to the construction period. | All towns | <p>Allocation of responsibility and training of workers on safety precautions, for themselves and others.</p> <p>Provision of protective clothing and equipment to workers as appropriate.</p> <p>Ensuring that vehicle and equipment operators are properly licensed and trained.</p> <p>Arranging for provision of first aid facilities, emergency transport to the nearest hospital; accident and emergency department. Allocation of responsibility to ensure that these arrangements are kept in place.</p> <p>Provision of hazard warning signs at construction sites as appropriate.</p> | Moderate / Minor | Temporary |
| Temporary vehicular access | A temporary access roads may be formed in some cases to allow access to some construction sites. This often entails removal of vegetation | All towns | <p>No trees of diameter greater than 15cm at 1.3m above the ground will be cut for construction of the temporary access.</p> <p>Following construction a footway will be constructed and remaining ground rehabilitated by planting with species approved by DONRE.</p> | Minor | Temporary |
| Items of cultural importance | During the course of construction, there is a small chance that items of cultural or historical significance, such as archaeological relics may be uncovered, particularly during excavation operations. Should such items be found, a decision is required as to whether to preserve the items in situ or remove them for safekeeping off site. The guiding principle is to keep items of cultural importance intact for the benefit of future generations. | All towns | <p>Should items of cultural importance be identified work should cease and an immediate site assessment by the DONRE Water and Environment Research Institute requested. The DONRE must direct appropriate action for the preservation of the item.</p> | Minor | Temporary |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact With/without recommended mitigation | Temporary or Permanent |
|---|---|-----------|--|--|------------------------|
| Impacts during to Operation | | | | | |
| Algal growth in water storage reservoir | Minimal risk, throughout the operation phase, as the treated water will be disinfected prior to transfer to the storage tank. | All towns | N/a | Minor | N/a |
| Changes in access to homes and property | Impaired access if roads are damaged by pipelaying operations. Applies throughout operation phase. | All towns | Where pipelaying takes place, roads will be reinstated and improved. | Minor / Minor positive | Permanent |
| Conflicting demands at the water source | Potential conflicts occur with water use for irrigation, particularly during the dry season, when scarcity relative to the wet season is very high. Applies throughout the operation phase and may increase as demand for water grows | All towns | Stream flow monitoring Co-ordination and planning with the irrigation department, PAFO irrigation department and Provincial Department of Energy and Mines Ensuring that the hydropower operator releases stored water during the dry season, at a rate to be recommended by MONRE | Minor | Permanent |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact With/without recommended mitigation | Temporary or Permanent |
|--|--|---|---|--|------------------------|
| Discharge of pollutants from road and stormwater drainage network into river systems | Drainage channels most towns are often used for minor refuse dumping of liquid and solid household and other waste which usually accumulates in drainage channels although some solid waste is collected. The drains then flow into rivers or swamp areas. Drainage improvement works under the project will reduce risks associated with the accumulation of pollutants, by removing them from the market area to the river where they will be assimilated by natural processes. | Towns where primary drains are to be improved | Levels of liquid pollutants or solid waste transported out of the town via the drainage system will be mitigated by the installation of simple trapping devices to facilitate the collection of waste. Public awareness Program. | Positive / Major positive | Permanent |
| Erosion, or long term effects on slope stability. | Leakages from the distribution network on the hillsides could, or from storage tanks (particularly if the storage tank walls fail) promote gully formation and erosion. | Towns in hilly terrain or on valley floors | Use of durable poly-ethylene pipes. Careful construction supervision to ensure proper joining and pipe laying. Appropriate design of reservoir walls. Use of a compartment design for reservoirs, so that quantities of water released in the event of a rupture will be limited. Regular inspections of the network, and prompt isolation and repair when leaks occur | Moderate / Minor | Permanent |
| Improved drainage | The upgrading of selected routes of main drain lines in the town and further upgrading of minor drainage lines under the output 4 will reduce the incidence of ponding and remove pollutants from populated areas, reducing risks to the public. | All towns where drains are to be improved | Provision for planting of deep-rooting perennial grass on sides of the drains to prevent loss of soil into the drains. Continued improvement and regular maintenance of the drainage network, to enhance and sustain the effects of improved drainage. Safe disposal of silt to an approved location | Positive / Major Positive | Permanent |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact With/without recommended mitigation | Temporary or Permanent |
|---|--|---|---|--|------------------------|
| Increased waste water flow in the towns due to increased water supply | New water supply connections are likely to result in increased water usage, and hence greater release of waste water into the drainage system. However, since sewage is managed by the use of pit latrines in most households, it is mainly grey water that will be released into the channels. The improvement of selected drainage channels under the project will increase the capacity of part of the drainage network, and improvements to minor drains under the output 4, the project will enable more homes to have access to adequate drainage to cope with the increased amounts of grey water. However drainage improvements may not be carried for some homes that will receive new water supply connections. Where drainage of grey water is inadequate there is a risk of accumulation, providing sites where mosquitoes and other insect vectors of disease can breed. Malaria is prevalent in the project towns. | All towns on flat terrain or in valley floors | All drainage improvements under the project, which will greatly improve the drainage of grey water in the most densely built-up part of the town. Participatory planning of output 4, so that potential beneficiaries are aware of the need for adequate drainage of waste water when their homes receive new connections. Public awareness raising on economy of water use and hygiene issues. | Moderate negative / Positive | Permanent |
| Noise and other public nuisance from treatment plant | Some noise may be emitted from WTPs, particularly from air blowers where these are used. | Towns where the WTP is not distant from residential areas | Encasing of air blowers in noise absorbing material. | Minor / Minor | Permanent |
| Pollution from sediment produced by the water treatment plant | Suspended solids produced by the treatment process will consist of inert solids and traces of alum, which is not toxic. Higher volumes of solids will be produced where source water has high sediment loads, particularly during the wet season. | All towns | Passing backwash water into a settlement pond, collection of the sediment, drying on site and removal to a suitable disposal site agreed with the DONRE. | Minor / Minor | Permanent |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact With/without recommended mitigation | Temporary or Permanent |
|---|---|-----------|---|--|------------------------|
| Risk of release of hazardous chemicals such as those used for water treatment | Potential risks occur, such as release of chlorine through inadequate facilities for handling and storing hazardous chemicals. Those most at risk are the plant operators, there is also a remote risk to the public if chlorine dosing exceeds safe limits. | All towns | Provision for secure, dry storage facilities for hazardous chemicals. Use of chlorine compounds in powder form, which is safer than gas Training of staff and allocation of responsibility to ensure that materials are properly handled and used | Minor / Minor | Permanent |
| Supply of potable water | At present, health complaints related to poor quality water for drinking and food preparation, such as waterborne diseases, feature prominently among the most commonly reported in all project towns. | All towns | N/a | Major positive | Permanent |
| Effects of natural disasters | The area is potentially vulnerable to flooding, earthquakes and landslides. Floods and earthquakes may occur within the town while landslides will occur in the surrounding hills. Risks of damage to system assets are low in each case. Key assets such as the pump house, water treatment plant and reservoirs are situated above flood level. Transmission mains and pipes in the distribution network will be constructed of Polyethylene (PE), which is flexible and durable and less likely to be ruptured by events such as earthquakes. Water storage tanks, constructed of concrete, may potentially be damaged by earthquake events, releasing water that may damage property. | All towns | Use of PE pipe Construction of WTP and tanks in reinforced concrete Siting of the WTP at a location where there are no homes immediately beneath. | Minor | Permanent |

| Potential Environmental Impact | Nature and duration | Location | Mitigation measure(s) | Assessment of impact With/without recommended mitigation | Temporary or Permanent |
|--------------------------------------|--|-----------|---|--|------------------------|
| Risks of contamination by pesticides | Persistent pesticides, while banned by the Regulation on Control of Pesticides (2010), may be in use as chemicals on sale in local markets are usually labelled in the Chinese language only and their active ingredients not known. Incidents of excessive application of pesticides for the establishment of industrial plantations are known to have taken place. | All towns | Awareness raising during subproject implementation on potential risks associated with the occurrence of pesticides, ongoing awareness raising as part of the Water Safety Plan (WSP). | Low risk / reduced risk | Permanent |

6.10 Sector Level Impacts

6.10.1 Water Resource Conflicts

- 121 Further population and economic growth will result in increased demand for water in the future. Water supply schemes in many of the towns are likely to be expanded, and either draw more water from existing sources or link to supplementary sources. Further, the demand for irrigation water is likely to increase because the economies of small towns are based primarily on agriculture and are likely to remain mainly within that sector for the coming decades at least. It can therefore be expected that the extent of irrigated land will be increased. The combined effects of increased demand for water supply for and irrigation water are likely to lead to difficulties at certain water sources. Although water resources are relatively abundant in Lao PDR this in effect ceases to be the case during the dry season. With scope for groundwater storage apparently very limited in most of the country this potential problem is likely to grow in significance. Mitigation can be achieved by improved water resource management. Besides capacity building, water resource management in Lao PDR can benefit substantially from improved collection and management of information on stream and river flows. Ongoing monitoring of flows in streams and rivers that are used or potentially used as sources for water supply and irrigation will facilitate planning by providing reliable information on minimum stream flows and annual variations. Provision is made for the survey of water resources in the Water and Water Resources Law (1996, under revision), Article 11 and the Decree to Implement the Law on Water and Water Resources (2001). Information on flow quantity over several years enables more informed feasibility review of options for the use of supplementary water sources and water storage, enabling better management for the avoidance of water resource conflicts.

6.10.2 Effects of Sector Strengthening

- 122 Sector strengthening under the project will build on progress achieved under NCRWSSP and STWSP, and will consist of sector coordination and policy implementation. These are designed to enhance the sustainability of the sector, assisting with the build-up of skills to manage the sector into the future. These actions will enhance the ability of the Government and private sector agencies to manage environmental issues such as growing water resource conflict, the incorporation of environmental impact assessment into the planning of further schemes or scheme expansions, and in sustaining the public health and socio-economic benefits of improved water supply and sanitation. The effects are cumulative and positive.

6.10.3 Build-up of Private Sector Capability

- 123 Private sector consultants and contractors involved in the schemes will acquire experience design and construction that can be replicated on other water supply schemes and associated infrastructure in further small towns around the country. The experience will enable some of the pitfalls that have occurred in earlier schemes to be avoided. An example is inappropriate choice of pipe material for transmission mains, which result in environmental risks such as erosion or contamination. A further effect will be to increase the demand for materials and equipment used in water supply schemes, such as good quality pipe, pumps and meters, lowering the cost of these items and thereby the costs of scheme maintenance and repair.

7 Analysis of Alternatives

- 124 The principal alternatives associated with the project are the alternative towns to be selected for the subprojects. The subproject selection process is a mechanism for the detailed comparison of these alternatives. For the subproject feasibility studies, key alternatives such as identification of water source, treatment process, and siting of facilities are examined in each case.

125 The “no project” alternative would mean that the opportunity to rehabilitate extensive and largely failed rural infrastructure and to address the key causes of their failure, would be missed.

8 Information Disclosure, Consultation and Participation

126 Consultations will take place at subproject sites, and will include focus group discussions and specific questions in socio-economic surveys. The works involved in expansion or new construction of water supply facilities will be explained, along with additional work such as small-scale drainage improvements that is also to be incorporated in the scope of the subproject. The tentative implementation schedule will also be disclosed. Views will be invited on the subproject. Discussions and their outcomes will be recorded, and taken account of in subproject design.

8.1 Further Information Disclosure

127 Draft IEEs will be presented to village officials and the public, to district administrations and to the PNPs. Copies will be left for review for a period of 30 days.

128 During construction and operation, communities in and around the subproject area will kept informed of construction activities that are likely to cause noise and dust nuisance, or disruption to irrigation flows or roads and pathways.

129 Summary of requirements:

| Project Stage | Purpose |
|-----------------------------------|--|
| Subproject preparation | Disclosure of subproject plans, and potential environmental impacts, positive and negative. Determine concurrence/acceptance of the subproject |
| Completion of feasibility studies | Disclosure of IEE incorporating summary of project design, to ensure stakeholders are informed and to seek feedback |
| Construction | Feedback on compliance with mitigation measures stipulated in EMP |
| Operation | Customer satisfaction; issues required for rectification or improvement. |

9 Grievance Redress Mechanism

130 Article 13 of Decree 192/PM requires the Project to establish an effective mechanism for grievance resolution. Lao legal requirements for this mechanism are further described in Part VI of the Decree’s Implementing Regulations, and in detail in the Technical Guidelines. The mechanism to address any grievances on environmental issues is the same as that designed to address grievances related to land acquisition and resettlement.

131 Decree 192/PM determines that the prime responsibility for grievance resolution is the Project proponent, i.e., MPWT. As they are responsible for carrying out Project works which are likely the source of grievances they are best placed to respond to and resolve grievances in the most timely and acceptable method.

132 A well-defined grievance redress and resolution mechanism will be established to resolve grievances and complaints in a timely and satisfactory manner. The objective of the grievance redress mechanism is to resolve complaints as quickly as possible and at the local level through a process of conciliation; and, if that is not possible, to provide clear and transparent procedures for appeal. All affected persons will be made fully aware of their rights, and the

- detailed grievance redress procedures will be publicized through an effective public information campaign.
- 133 Complainants are entitled to lodge complaints regarding any aspect of the project. Complaints can be made verbally or in written form. It is recognized that in many cases, complainants do not have the writing skills or ability to express their grievances verbally, however, complainants are encouraged to seek assistance from family members, village heads or community chiefs to have their grievances recorded in writing and to ensure that where disputes do occur all the details have been recorded accurately enabling all parties to be treated fairly. In the case of verbal complaints, a written record of the complaint will be made during the first meeting with the complainant. Complainants who present their complaints within the prescribed procedures will be exempt from all administrative fees incurred. In addition, Complainants who lodge complaints and appeals to district courts will be provided with free legal representation.
- 134 For the purposes of grievance redress and resolution, the Project will rely on the existing village arbitration units where they have already been established in core villages. The village arbitration unit generally consists of the village chief and/or deputy chief, village elders and village representatives of the Lao Women's Union, Lap Front for National Construction and the police; the unit is responsible for settling disputes between villagers through conciliation and negotiation. In the absence of these units, the members of the village committee (if formed) or the village leaders will act as grievance officers. At the district and provincial levels, the district and provincial resettlement committees that are composed of concerned departments, local officials, village chiefs and mass organizations will act as grievance officers.
- 135 All complaints and resolutions will be properly documented by the concerned resettlement committee and be available for the public and review for monitoring purposes.
- 136 Safeguard monitoring reports will include the following aspects pertaining to progress on grievances: (a) number of cases registered with the Grievance Redress Committee (GRC), level of jurisdiction (first, second, and third tiers), number of hearings held, decisions made, and the status of pending cases; and (b) lists of cases in process and already decided upon may be prepared with details such as name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e. open, closed, pending).
- 137 The following procedures are proposed for redress of grievances during the WSSSP.

Table 9-1: Grievance Redress Procedures

| No. | Grievance Redress Procedures |
|-----|--|
| 1 | Stage 1: In the first instance, Complainants will address complaints on any aspect of compensation, relocation or unaddressed losses to the village arbitration unit or other designated village grievance officers. The unit will organize a meeting with the complainants to resolve the issue using its traditional methods of conciliation and negotiation; the meeting will be held in a public place and will be open to other members of the public to ensure transparency. |
| 2 | Stage 2: If within 5 days of lodging the complaint, no understanding or amicable solution can be reached or no response is received from the village arbitration unit, the complainant can bring the complaint to the District Resettlement Committee (DRC). The DRC will meet with the complainant to discuss the complaint, and provide a decision within 10 days of receiving the appeal. |
| 3 | Stage 3: If the complainant is not satisfied with the decision of the DRC or in the absence of any response, the complainant can appeal to the Provincial Resettlement Committee (PRC). The PRC will provide a decision on the appeal within 10 days. |
| 4 | Stage 4: If the AP is still not satisfied with the decision of the PRC, or in the absence of any response within the stipulated time, the complainant can submit his/her grievance to DHUP. The DHUP acting on behalf of the MPWT will render within 10 days of receiving the appeal. |

| No. | Grievance Redress Procedures |
|-----|--|
| 5 | Stage 5: As a last resort, the complainant may submit his/her case to the Court of Law. The complaint will be lodged with the Court of Law; the decision of the Court will be final. The DHUP will be responsible for forwarding the complaint and ensuring its process in the courts. |

- 138 All legal and administrative costs incurred by complainants and their representatives throughout this process are to be covered by the Project.
- 139 At each stage of the grievance redress process, careful written records will be maintained. The village arbitration unit will submit reports to the DRC documenting the following: (i) the complaints as received; (ii) the names and other pertinent information about complainants; (iii) the dates of the original complaint, meetings and any other actions; and, (iv) the outcomes and/or resolution. The DRC, PRC and DHUP (or PCU acting for DHUP) will each maintain similar records for appeals that are submitted to them. The records of grievances will be included in regular progress reporting on the subproject.

10 Environmental Management and Monitoring Plan

10.1 Responsibilities for Environmental Management

- 140 The responsible agency will be the executing agency, the Ministry of Public Works and Transport (MPWT), acting through the Department of Housing and Urban Planning (DHUP) which will house the Project Coordination Unit (PCU) with responsibility for overall planning and coordination of implementation, including programming, budgeting, financial planning, accounting and reporting. The PCU will receive overall direction and policy guidance from a Project Steering Committee (PSC).
- 141 Within the meaning of the EIA Decree, the project developer is the MPWT. As such, the MPWT is responsible for ensuring that environmental compliance certification is obtained, prior to allowing works to commence (EIA Decree section 4 (1)), the accuracy of information in the IEE (or EIA) and to ensure adherence to the EMP.
- 142 For each subproject, a Project Implementation Unit (PIU) will be established at provincial level, with the responsibility of day-to-day coordination, and supervision of project implementation. The PIU has representation from the Provincial Nam Papa (PNP), the Provincial Department of Public Works and Transport (DPWT) and other provincial and district level agencies. The PIU will have representatives from district agencies including the district health and education offices and Lao Women's Union (LWU). In each subproject village, the Village Development Committees will serve as the main conduit for all communications between the Project and the community., possibly within existing village committees, to mobilize local communities and work with the PIU and the PIA Consultants in implementing village improvements and awareness activities.
- 143 The PIU will receive support in co-ordinating the provincial and district level agencies including the provincial department of Natural Resources and Environment (DONRE), and take decisions on behalf of the provincial government from a Provincial Project Steering Committee (PPSC), chaired by the Provincial Vice Governor. At the district level, the District Governor (DG) or Vice Governor will oversee the project, monitor progress, review quality of work, coordinate the subproject with the PIU and local communities, and report on progress to the PPSC. The PPSC will include a representative of DONRE.
- 144 Technical support across all aspects of project implementation will be provided by the Project Implementation Assistance Consultants.

11 Conclusion and Recommendation

- 145 The initial environmental examination process has found that the project will not cause significant negative environmental impacts. Potential negative impacts relate mainly to the construction phase and can be managed and brought to acceptable levels through the implementation an Environmental Management Plan for each subproject. No further environmental assessment is therefore required.
- 146 The project is therefore be classified as Category B according to the ADB's classification system. This refers to projects that are judged to have some adverse environmental impacts, but of lesser degree or significance than those for Category A projects.
- 147 It is recommended that the Environmental Management Plan for each subproject is included in contract documentation for works contracts, and in agreements formed with water user groups. Emphasis should be placed on regular monitoring of stream water flows.

Appendix: REA Checklist table

| Screening Questions | Yes | No | Remarks |
|--|-----|----|--|
| A. Project Siting Is the project area... | | | |
| ▪ Densely populated? | | ✓ | The subprojects will cater to villages that are urban in nature but not densely populated. |
| ▪ Heavy with development activities? | | ✓ | |
| ▪ Adjacent to or within any environmentally sensitive areas? | | | |
| • Cultural heritage site | | ✓ | Sites of religious and cultural significance include temples and monuments are found in most towns, maintained by monks and visited regularly by local residents. An example is an old (and abandoned) French military barracks in Huoixai. Sub-project selection criteria in the EARF ensures that these sites will be avoided while locating the facilities. |
| • Protected Area | | ✓ | Environmentally sensitive areas will be avoided per the site selection criteria for sub-projects. Note that one town, Sanxay, is within the Dong Amphan National Biodiversity Conservation Area (NBCA) although the facilities will be within town boundary and are not expected to result in any loss of biodiversity. Mitigation measures guided by the EARF and identified by the IEEs will be put in to the EMP. . All other sites are outside NBCA (ranging from 8 to 14 km away). |
| • Wetland | | ✓ | |
| • Mangrove | | ✓ | |
| • Estuarine | | ✓ | |
| • Buffer zone of protected area | | ✓ | |
| • Special area for protecting biodiversity | | ✓ | |
| • Bay | | ✓ | |
| B. Potential Environmental Impacts Will the Project cause... | | | |

| Screening Questions | Yes | No | Remarks |
|--|-----|----|--|
| ▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff? | | ✓ | Limited risk of grey and black water from users' homes and businesses located adjacent to intake may enter streams and rivers. The subproject includes sanitation measures which will reduce wastewater runoff and ponding within the urban area. , Measures to divert wastewater downstream of intake will be implemented. Regular monitoring of [raw] water quality at intake will be done as part of EMP, and included as a parameter in the project monitoring system |
| ▪ impairment of historical/cultural monuments/areas and loss/damage to these sites? | | ✓ | Proper siting of WTP and other facilities will ensure that no temples or other cultural assets will be affected. |
| ▪ hazard of land subsidence caused by excessive ground water pumping? | | ✓ | Groundwater sources will not be used. |
| ▪ social conflicts arising from displacement of communities ? | | ✓ | No communities or households will be displaced |
| ▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters? | | ✓ | The water sources are typically also used for irrigation and/or hydropower purposes, however the flow required for the proposed schemes is not expected to suffice to conflict with irrigation water, though this needs to be confirmed in each case. |
| ▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)? | | ✓ | The quality of raw water is similar to that used for comparable schemes in small towns around the country. Levels of pathogens and mineral constituents will be brought to standards acceptable for drinking water by the proposed treatment processes. |
| ▪ delivery of unsafe water to distribution system? | | ✓ | The scheme includes a treatment process to ensure that water in the distribution system is safe. |
| ▪ inadequate protection of intake works or wells, leading to pollution of water supply? | | ✓ | The design provides for robust protection of the intake structure, excluding polluting activity. |
| ▪ over pumping of ground water, leading to salinization and ground subsidence? | | ✓ | N/A |
| ▪ excessive algal growth in storage reservoir? | | ✓ | In most cases, no raw water reservoir will be constructed. All sources are streams and rivers, which are relatively clean and unlikely to contain sufficient substrate for algal growth. |

| Screening Questions | Yes | No | Remarks |
|---|-----|----|--|
| ▪ increase in production of sewage beyond capabilities of community facilities? | | ✓ | The improvements will cause increased wastewater production. The project includes household and public sanitation improvements. Grey water is disposed of separately to soakaways or to pit latrines which will be constructed or improved under the Project. |
| ▪ inadequate disposal of sludge from water treatment plants? | | ✓ | The standard scheme for subprojects is to collect sludge from water treatment plants in retention ponds, dry it and dispose to landfill or other approved site |
| ▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities? | | ✓ | WTP sites can usually be located away from population centres. |
| ▪ impairments associated with transmission lines and access roads? | | ✓ | There are construction impacts associated with the installation of transmission lines. Mitigation measures will be addressed in EMP. No significant operational impacts is foreseen. |
| ▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals. | | ✓ | Standard designs for water treatment plant include adequate provision to prevent such hazards |
| ▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation? | | ✓ | Construction impacts, will be addressed in the EMP, and operation impacts to be addressed by training provisions, adopting standard approaches for small towns in Lao PDR. Possibility of hazards is highly reduced as occupational, health and safety standards will be adopted by contractors and enforced by EA. Implementation of OHAS for chemicals and other hazardous substance materials |
| ▪ dislocation or involuntary resettlement of people? | | ✓ | Scheme components can be located in locations not currently inhabited and often on Government land. While some land acquisition is usually necessary, relocation or involuntary resettlement, temporary or permanent is not envisaged |
| ▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups? | | ✓ | The proposed schemes result in significant benefits to women and children including connections to IP or vulnerable groups in the area. |
| ▪ noise and dust from construction activities? | ✓ | | Construction activities, particularly excavation for pipe laying, cause significant noise and dust impacts. These are temporary and will be addressed in the EMP. |
| ▪ increased road traffic due to interference of construction activities? | ✓ | | Construction activities result in temporary constriction of roads and occasional temporary road closure, but not on high traffic volume roads. |

| Screening Questions | Yes | No | Remarks |
|---|-----|----|---|
| <ul style="list-style-type: none"> ▪ continuing soil erosion/silt runoff from construction operations? | ✓ | | Temporary stockpiling of excavated material will cause silt runoff. Mitigation measures will be included in EMP. No significant erosion risks are foreseen. |
| <ul style="list-style-type: none"> ▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems? | | ✓ | The project addresses existing risks of unsafe water delivery that also include exposed pipework. Improvements to be enhanced by capacity building for O&M and institutional strengthening to provincial water supply agencies |
| <ul style="list-style-type: none"> ▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals? | | ✓ | Polyethylene, or polyvinyl chloride pipework is used which is not susceptible to corrosion. Daily monitoring of pH at WTP outlet will be undertaken. |
| <ul style="list-style-type: none"> ▪ accidental leakage of chlorine gas? | | ✓ | The dosing process for standard WTP designs does not involve the use or release of chlorine in gaseous form. |
| <ul style="list-style-type: none"> ▪ excessive abstraction of water affecting downstream water users? | | ✓ | While water is also extracted for irrigation in most sites, the typical levels of abstraction do not pose a significant conflict with such use. Water allocation is based on Government policy which dictates that direct human use has priority. |
| <ul style="list-style-type: none"> ▪ competing uses of water? | | ✓ | As above |
| <ul style="list-style-type: none"> ▪ increased sewage flow due to increased water supply | | ✓ | The schemes will cause increases in sullage, which is disposed of separately to sewage and some increase in volumes of wastewater, but project scope also includes provision for improved household and village level drainage. |
| <ul style="list-style-type: none"> ▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant | | ✓ | Increased water availability will result in increased sullage, though water is metered and is not likely to be used liberally. Improvements in drainage are planned. |
| <ul style="list-style-type: none"> ▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? | | ✓ | Only relatively small teams of technicians and some skilled labourers will be temporarily resident during construction. |
| <ul style="list-style-type: none"> ▪ social conflicts if workers from other regions or countries are hired? | | ✓ | N/A |
| <ul style="list-style-type: none"> ▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction? | | ✓ | Construction does not entail use of explosives, other dangerous chemicals or levels of fuel consumption that greatly exceed normal levels. |
| <ul style="list-style-type: none"> ▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning? | ✓ | | Excavations and the construction of tanks are potentially hazardous. Mitigation/prevention/avoidance measures on construction safety risks are included in the EMP especially in terms of public safety and occupational (EHS/OHS) measures. |

| Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks. | Yes | No | Remarks |
|---|-----|----|--|
| <ul style="list-style-type: none"> • Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)? | | ✓ | There are risks of flood flows. However, sites of facilities are invariably elevated. If necessary, provisions on such hazards will be included in the detailed design/s. |
| <ul style="list-style-type: none"> ▪ Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)? | ✓ | | Extreme drought could affect the systems |
| <ul style="list-style-type: none"> ▪ Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)? | | ✓ | The areas around each small town are not densely populated. Ethnic minority villages located in area of WTP will not be disturbed, They will benefit from piped water, improved sanitation and village environmental improvements. |
| <ul style="list-style-type: none"> ▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)? | | ✓ | The project will augment existing water supplies and reduce disaster vulnerability |

Core Appendix 11

Environmental Assessment and Review Framework

Contents

Environmental Assessment and Review Framework

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Annexes

- 1 – Alignment of National and Sector Plans and Policies. ADB and Government of Lao PDR
- 2 – Key Development Constraints

ACRONYMS

| | |
|-------|---|
| ADB | - Asian Development Bank |
| BNP | - Branch Nam Papa |
| CBP | - Capacity Building Programs |
| CIPP | - Community Information and Participation Plan |
| DNRE | - Department of Natural Resources and Environment |
| EA | - executing agency |
| EIA | - environmental impact assessment |
| EIRR | - economic internal rate of return |
| EMP | - environmental management plan |
| EPL | - Environmental Protection Law |
| GOL | - Government of Laos |
| IA | - implementing agency |
| MNRE | - Ministry of Natural Resources and Environment |
| MONRE | - Ministry of Natural Resources and Environment |
| MPWT | - Ministry of Public Works and Transport |
| NGO | - nongovernment organization |
| NRMA | - National Mines Regulatory Authority |
| O&M | - operation and maintenance |
| OPWT | - Office of Public Works and Transport (District Level) |
| PAM | - Program Administration Manual |
| PCU | - Project Coordination Unit |
| PIA | - Project Implementation Assistance |
| PNP | - Provincial Nam Papa |
| PPSC | - Provincial Project Steering Committee |
| UXO | - unexploded ordinance |
| VEI | - Village Environmental Improvements |
| WSSP | - Water Supply and Sanitation Sector Project |
| WTP | - Water Treatment Plant |

1 Introduction

- 1 The Water Supply and Sanitation Sector Project (WSSP) will improve the performance of provincial nam papas (PNPs) and expand access to safe piped water supply and sanitation for urban residents in small towns of Lao PDR, consistent with the Government's urban water supply and sanitation sector policy and investment plan and supporting targets for piped water supply for the urban population. It is the fourth ADB-funded water supply sector project in Lao PDR, and follows the Small Towns Water Supply and Sanitation Sector Project (STWSP: Grant 0143-LAO) which is currently being implemented. This document sets out the responsibilities and procedures for the environmental assessment of WSSP subprojects, based on the relevant laws of the royal government of Lao PDR (GOL) and ADB requirements, as stated in the Decree on Environmental Impact Assessment of the GOL (2010) and the Safeguards Policy Statement (2009) of the ADB respectively. The guidelines in this document are intended to provide for effective integration of environmental assessment and environmental management planning into the preparation and implementation of subprojects.

2 Overview of Type of Projects to be Assessed

- 2 The project has five outputs: (i) improved sector coordination and policy implementation; (ii) improved non-revenue water management and water supply development, (iii) developed new water supply systems in small towns; (iv) enhanced community action in water supply and sanitation, and (v) strengthened capacity for project implementation, and operation and maintenance (O&M). Of these, the first is a sector wide intervention, directed at central level institutions. The remaining four outputs will apply to each subproject, which will take place in small towns which may or may not have an existing water supply system.
- 3 **Improved non-revenue water management and water supply development** will integrate a comprehensive NRW reduction program with water supply development in about 5 provincial capitals.
 - (i) The NRW program will be undertaken to address both "real losses" such as leakage and "apparent losses" such as metering losses and water theft. The NRW program will include physical works such as: (i) creating physical hydraulic zones in the network; (ii) installing pipes, valves and meters, and; (iii) undertaking leak detection and repairs. It will also include: (i) surveys to identify unauthorized connections; (ii) a water audit and water balance to identify the main NRW sources; (iii) improving record drawings and asset registers; (iv) updating customer registration; (v) implementing customer complaints register and pipeline repair register, and; (vi) formulating and implementing disconnection and meter management policies. Adoption of the "free connections" policy will help to minimize apparent losses by reducing the incentive for illegal or unauthorized connections.
 - (ii) Permanent NRW management team, leak detection and repair teams will be established within the concerned PNPs. The teams will work with a NRW expert and a metering expert (attached to the PIA consultants), who will manage the NRW program and train national staff. Regional workshops will facilitate sharing of experiences, lessons learned and networking on NRW between PNPs. The NRW reduction program will offer business opportunities for NPN and private sector companies to develop expertise in NRW reduction. It is expected that these groups would be able to offer contract services for annual NRW audits in towns where NRW reduction has been carried out to sustain NRW at low levels, and participate in NRW reduction activities in other towns.
 - (iii) The water supply development and rehabilitation will be carried out on existing PNP water supply systems and expand services to unserved villages in the most densely

populated suburbs of about five provincial capitals. The scope of works will cover the expansion, replacement and rehabilitation (if required) of: (i) water intakes from surface, spring or groundwater sources; (ii) raw water transmission; (iii) water treatment facilities; (iv) distribution network; (v) service reservoirs; (vi) individual metered service connections, and; (vii) improved office/workshop/store facilities for the PNP branch. Equipment and a flat bed truck for operation and maintenance (O&M) of the water supply systems will be procured. Free connections and meters will be provided for qualifying households.

- 4 **Development of new water supply systems** will develop safe, affordable, reliable PNP piped water supply systems for the core urban areas of about six subproject towns. It will include the development of: (i) surface, spring or groundwater source; (ii) raw water transmission; (iii) water treatment facilities, including a small water testing laboratory; (iv) distribution and reticulation pipework; (v) service reservoirs; (vi) individual metered service connections, and; (vii) an office/workshop/store for the PNP branch. It also includes procurement of equipment and a flat bed truck for operation and maintenance (O&M) of the water supply systems. Households that apply to connect during the construction period will not be required to pay any up-front connection charges for small-bore reticulation, connections or meters, but the cost of these items will form part of the subproject capital cost and will be recovered through the water tariff. Marketing and awareness campaigns will inform communities about the Project's connections policies and the benefits of connecting to PNP piped water supply. The consultant support will provide system-specific capacity development and training for PNP provincial and district staff in system O&M and help each PNP to develop short and medium-term water supply investment plans for each of its water supply systems.
- 5 **Enhanced community action** will increase and sustain the benefits from investments in small town water supply systems through complementary activities. The output will facilitate the implementation of the water supply system and enhance the sustainability of water supply benefits with activities targeted at improved household sanitation, village environmental improvements (VEI) and community health awareness. Village Development Committees (VDCs) will be the main implementing group for these activities, in coordination with the district government.
- 6 Village environmental improvements will promote demand-driven, community-managed improvements in household sanitation and village environmental conditions. The VEI includes construction or upgrading of household latrines for the poor,¹ construction or rehabilitation of existing facilities in schools or village meeting places, construction or rehabilitation of small-scale community improvements such as drains and village access roads. Core villages within a small town will be eligible to participate, including those that agree to assume responsibility for implementing, operating and maintaining improvements, make a 10% cash contributions towards the capital costs of the improvements; and select specific improvements in a participatory, socially inclusive and transparent manner.² A cost-sharing arrangement will support the VEI—the project will contribute up to 80% of the cost of improvements (about \$25 per capita), while provincial or district governments will contribute 10% and the village will contribute at least 10% in the form of cash. Each village will enter into an agreement with the office of public works and transport (OPWT) for O&M of the VEI before any funds are release
- 7 The output also includes support for increased project and hygiene awareness. This includes (i) implementation of stakeholder consultation and community participation activities for informing, promoting and educating beneficiaries, consulting with individuals from different

¹ The grant amount of \$120 has been established to cover materials to construct a durable water seal pit latrine with 10-year capacity for a household of six people. Poor households that decide not to connect to the PNP system will receive a smaller grant to enable them to improve their sanitary facilities.

² Non-eligible villages include those that have received previous ADB assistance, or are scheduled to receive investment for environmental improvements from other ADB or development partner project by 2020.

- social and ethnic groups, and public disclosure of safeguard documents, water and sanitation policies, and corporate plans; and (ii) support to district authorities for sanitation and hygiene behavior change, including formative research on behaviors, expert assistance in developing hygiene and sanitation promotion campaigns and materials, design of new programs to cover emerging issues (e.g., water conservation or protection of water sources), and evaluation of program effectiveness.
- 8 Public sanitation facilities will be constructed in strategic areas where the O&M can be contracted to a nearby business or social entity (e.g., petrol stations, schools, pagodas, or bus stations). Where septage disposal facilities are not available in the subproject area, the project will provide technical assistance and grant funds for constructing septage disposal facilities at a suitable location on government land.
- 9 **Strengthened capacity for project implementation, and operation and maintenance (O&M).** Includes support for project implementation assistance and capacity development for O&M, including effective implementation of environmental and social safeguards plans to enhance sustainability. Following the lessons on the previous projects, PNP capacity development for O&M will be supported through a long term twinning arrangement between a successful international water utility such as the Provincial Waterworks Authority of Thailand and the GOL. Formal training and on-the-job-training in Thai water facility, was followed by on-the-job training on the PNPs' own water facilities. PNPs staff highly rated this form of capacity development. The output will also provide support to VDCs to enhance their capacities to operate and maintain village infrastructure and their on-site water and sanitation facilities. It will procure computer hardware, basic laboratory water quality testing equipment and (where necessary) improved billing and accounting systems for the PNPs. For subprojects that involve NRW programs, the Project will also procure leak detection equipment. This output also includes incremental administration support to project staff for vehicles, and office and computer equipment in PCU and PIU offices.

3 Subproject Eligibility Criteria

- 10 The selection of subprojects involves screening and prioritization, following which individual town subprojects, are selected for feasibility study. Feasibility study then confirms subproject eligibility for which the criteria are listed below. Three sample subprojects have been selected following initial information gathering and screening, and then a set of prioritization criteria aimed primarily at ensuring alignment with government priority, maximizing impact in terms of numbers and maximum contribution to economic development and poverty alleviation.
- 11 The eligibility criteria, to be confirmed after feasibility study are:
- (i) The feasibility study shows that the subproject: (a) meets Asian Development Bank's (ADB) and the Government of the Lao PDR's (GOL) technical, economic, financial, institutional and social development requirements for the Project; (b) is "Category B or C" according to ADB's safeguards classifications; (c) has an economic internal rate of return (EIRR) for water supply investments of at least 12%, and;(d) has a financial internal rate of return for water supply investments that exceeds the weighted average cost of capital.
 - (ii) The provincial and district governments and the PNP confirm to adopt the GOL's water sector policies, cost recovery principles, tariffs, arrears, sanitation regulations, 'free' connection policy, non-revenue water (NRW) program, and other reforms agreed by GOL and ADB.

- (iii) The subproject covers only the most densely populated core villages, and in the case of system expansion, covers the core villages and contiguous densely populated expansion areas.
- (iv) Following subproject commissioning, the PNP must generate sufficient revenues to meet full operation and maintenance (O&M) costs and cover debt service (i.e. repayment of principal and interest on the subsidiary loan from Government to PNP) with debt service ratio greater than 1.2.
- (v) The provincial and district governments and communities agree to provide adequate resources to meet the O&M requirements of the village environmental improvements and public sanitation improvements constructed under Output 4.
- (vi) The district government has issued a district sanitation regulation, acceptable to ADB and MPWT.
- (vii) The PNP has identified potential sources of water for the subproject and has collected adequate flow and water quality data for each source to indicate that minimum flows exceed the design flow for the water supply system and indicate water treatment requirements.
- (viii) The provincial government has given a written assurance that: (a) the water supply subproject will have first priority for raw water from the proposed surface source and has obtained the agreement to that effect of the owner or operators of any upstream facility (e.g. hydropower or irrigation scheme as identified in the feasibility study) that may adversely impact on the minimum daily dry weather flow at the proposed urban water supply intake site.
- (ix) The provincial government has given a written assurance that it will issue and enforce regulations to protect raw water quality upstream of the proposed water supply intake, including restricting the use of pesticides and fertilizers.
- (x) The concerned central government agencies and the provincial governments have approved the Resettlement Plans, Indigenous Peoples Plans (if applicable), Initial Environmental Examination and Environmental Management Plans following the approved Resettlement Framework, Indigenous Peoples Planning Framework, Environmental Assessment and Review Framework, and have agreed to implement the aforementioned Plans in accordance with GOL and ADB policies.
- (xi) In case a participating PNP wants to expand the system using its own resources the concerned provincial government shall have confirmed in writing that government budget is available for additional civil works or services (if applicable) under the proposed subproject.
- (xii) The Executing Agency and project implementation consultants confirm that prior to the start of Project implementation, the province, district and PNP are ready to implement the subproject based on: (a) PIU established, staffed by adequate, competent staff; (b) the capacity of the PIU to manage the project; (c) the capacity and plans of the PNP to manage, operate and maintain the proposed water supply system, including arrangements for ongoing training, technical and management support; (d) PNP performance including approved corporate plan in place and arrears less than 90 days; (e) debt service capacity of the PNP; (f) adjustment of tariffs in the province to financially sustainable levels according to the project's financial criteria, and; (g) in the case of subprojects involving NRW programs, the PNP's NRW task force, leak detection team and leak repair team established.

- 12 Of particular significance for the purpose of environmental assessment and management planning is that criteria (i) and (ii) require that the subproject entails no significant environmental impacts. Also of importance is that the criteria in general seek to ensure institutional and financial sustainability which is necessary if schemes are to be properly operated and maintained, avoiding environmental consequences of scheme failure.

4 Anticipated Environmental Impacts of Subprojects

- 13 The most significant impacts expected to arise from the project are major improvements to public health and the quality of life in the town from the provision of potable water together with enhancements from the VEI. Both of these actions address priority problems. Some items of potential concern arise in connection with project location, the construction phase and the operation phase.
- 14 The principal issues of potential concern are (i) management of sediment from the water treatment plant which bears traces of aluminium sulphate (alum) used in water treatment, (ii) protection of water sources, (iii) risks associated with unexploded ordinance, (iv) water resource conflicts (v) an increased burden on drainage systems due to improved water supplies and (vi) safety issues. Impacts and mitigation of these are described below.
- 15 **Management of Sediment from WTPs.** Sludge from pre-sedimentation, sedimentation and filtration processes at each water treatment plant will require periodical removal. It consists of the fine particles of inert material (mainly silt) that are removed from the raw water by the sedimentation, flocculation and filter backwash processes, and traces of the flocculation agent, aluminium sulphate, or alum, which is not toxic. Quantities are dependent on raw water quality and the capacity of the treatment plant and will vary seasonally, but are minor. While traces of alum will be minor, it should not be allowed to build up in soil as it "locks up" nutrients and prevents their uptake by plants. Effects are controlled by (i) release of backwash water into moving water, where dilution ensures that the alum, already in minor quantities, is vastly diluted and not allowed to build up and (ii) by collecting sediment in retention ponds, dewatering and disposal in an approved site (where available, a landfill).
- 16 **Protection of Water Sources.** Most of the Project towns will obtain raw water for their piped water supply systems from rivers, streams or springs which are open to contamination from development and activities in the upstream catchments. While the quality of the existing raw water sources in general is suitable for urban water supply after full treatment, there is potential for water quality to degrade over time as a result of increased urbanization, industrial activity, agricultural development, animal production and deforestation in the upstream catchments. Provision is made in the national legislation for source protection regulations to be made. The project consultants will assist the relevant authorities to prepare appropriate regulations and the implementation of these will be supported. In addition, awareness campaigns conducted during Project implementation will make communities aware through Output 4 of the need to protect water sources, the extent of protection zones and the activities permitted within them. In addition, Water Safety Plans, including water quality monitoring plans will be prepared prior to commissioning of a new or rehabilitated water treatment plant which will identify measures for ongoing source protection and awareness.
- 17 **Risks Associated with Unexploded Ordinance.** Accidental detonation of unexploded ordinance occurs regularly throughout the country, with excavation activities for infrastructure among one of the main causes. Managing the threat involves the use of data provided by the National Mines Regulatory Authority (NRMA), seeking local knowledge, commissioning a verification survey and commissioning clearance services where necessary. Provision is made for these.
- 18 **Water Resource Conflicts.** Potential conflicts may arise, particularly between demand for town water supplies and irrigation water, although priority is given to water supply in the Water

- Supply Law (2009) in article 5. To manage potential conflicts monitoring of stream flows by PNPs is necessary. Existing full time river monitoring systems exist only on major rivers, usually tributaries of the Mekong.
- 19 **Increased Burden on Drainage Systems.** Households receiving new water supply connections are likely to use more water for cooking and washing, although liberal use will be constrained by tariff charges. In towns on flat terrain or valley floors, drainage is often limited and even relatively small quantities of additional grey water or sullage may form ponds of dirty water which provide a habitat for mosquitoes and pose a health hazard. This will be addressed primarily through initiatives under the VEI, IEEs need to emphasise the need for these.
- 20 **Safety Issues.** Where installed under the VEI, improved drains in project towns will carry larger volumes of water at greater velocity than previously, creating potential safety hazards to children or the infirm. To mitigate this hazard, drains will be small size, designed to a wide cross section that both limits the depth of running water and allows safe exit from the drains in the event that people accidentally fall into them. Awareness activities under Output 4 will also inform communities, especially children, of the need to stay away from drains during significant rainfall events. In addition, concrete crossings will be provided where the drains intersect pathways and in the busier commercial centers of the towns.
- 21 **Construction Impacts.** Potential impacts that may occur during construction include (i) generation of waste from excavation (ii) blocking or impeding public rights of way, (iii) noise and dust nuisance, (iv) release of silt from construction operations, (v) pollution from chemicals, fuels or temporary worker toilet facilities, (vi) safety hazards to workers and the public, (vi) accidental damage to utilities, (vii) erosion, where operations take place on slopes and (viii) impacts on items of cultural, historical or scientific importance that are uncovered by chance during the works. Construction will however be temporary, and provision will be made in the EMP for each subproject to mitigate these, bringing them to acceptable levels.

5 Lao PDR Environmental Assessment and Review Procedures

5.1 Environmental Assessment

- 22 The law governing the protection of the environment, including the assessment and management of projects, is the Environmental Protection Law (EPL), 1999. An update was prepared and released in 2013, reflecting rapid economic growth and socioeconomic development and the need to address increasing conflict and social impacts as well as pollution issues with some larger projects, increasing foreign investment, and climate change. Responsibilities and procedures for conducting environmental assessments, together with the requirements for environmental monitoring of projects, have been further revised in the Decree on Environmental Impact Assessment (the EIA Decree, of 16 February 2010), for which an unofficial English translation is available. The EIA decree is pursuant to the EPL.
- 23 The EIA Decree assigns primary responsibility for undertaking environmental assessment of projects to the project developer. The Ministry of Natural Resources and Environment (MONRE) is responsible for review and approval of environmental assessment reports, co-ordination of monitoring and evaluation, and issuance of compliance certificates. These functions may be fulfilled at central or provincial level, depending on the scope, size and nature of the project.
- 24 Investment projects are categorized according to a schedule in the EIA Decree as Category 1-small scale investments that require an IEE, or Category 2- large scale investments that require an EIA. Where a project is of a type that is not listed, an investment application should be submitted to MONRE for screening. The Decree sets out procedures,

rights and responsibilities for the preparation and approval of IEEs and the preparation, approval, implementation and verification of environmental management and monitoring plans.

- 25 The EIA Decree stipulates responsibilities for the key stakeholders involved in the process. These are listed as MONRE (or the local DONRE), local administrations, development project responsible agencies (taken to mean, essentially, the line agency either at central or provincial level), concerned sector bodies and project developers. The responsibilities relate to the process of IEE preparation and approval. The tasks required, from inception through to approval, are investigations, field inspections, information dissemination, public consultation, review of draft IEEs, updating IEEs in response to comments and the issuance of certificates of compliance. The roles and responsibilities of the key stakeholder groups for the process, as described in Article 9 of the EIA decree, are summarized in **Error! Reference source not found.**

Table 1: Roles of Stakeholders in Environmental Assessment

| Stakeholders | Roles | | | | | | | | | Notes |
|-----------------------|----------------|------------------------|-------------------|-----------------------|-----------------|---------------------------|---------------------------------|----------|---------------------------|---|
| | Investigations | Dissemination meetings | Field inspections | Consultation Meetings | IEE preparation | Review and comment on IEE | Incorporation of comment in IEE | Approval | Issuance of certification | |
| MONRE | | | ✓ | ✓ | | | | ✓ | ✓ | MONRE may nominate provincial Water Resources and Environment Departments, to act on its behalf |
| Local Administrations | ✓ | ✓ | | ✓ | | | | | ✓ | Certification based on verification by MONRE |
| Line Ministries | | | | | | ✓ | | | | |
| Project Developers | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | |

- 26 Project developers are defined in Article 3 of the EIA Decree as any person, legal entity or organization, from the public or private sector, who/which is licensed to undertake study, survey, design, construction and operation of an investment project.
- 27 Procedures for IEE preparation and approval are described in Article 10 of the EIA Decree and are summarized as follows:
- (i) The project developer prepares the IEE report, in cooperation with other stakeholder agencies and including consultation at village, district and provincial levels;
 - (ii) On completion of consultations at district level and subsequent updating of the IEE report based on comments received, the project developer should send the IEE report to the relevant line ministry;

- (iii) The line ministry should review the IEE report within 10 days and either accept or instruct the project developer to provide further information or make revisions;
- (iv) Once accepted by the line ministry, the project developer should submit 15 hard copies and a soft copy of the IEE to the line ministry;
- (v) The line ministry should send the IEE report to the local administration and concerned agencies within five days of receipt;
- (vi) Recipients of the IEE report must send any comments on the IEE reports within 20 working days of receipt;
- (vii) The line ministry should convene a technical workshop to review the IEE and, if necessary, undertake a field visit, following which comments are sent to MONRE with a recommendation as to the acceptability of the IEE; and
- (viii) MONRE decides whether to issue a certificate of compliance, instructs the project developer to amend the IEE report, instructs the project developer to undertake further investigations, or to reject the IEE report.

5.2 Responsibilities relating to Water Resources

- 28 Further legislation of relevance to the sector is the Water Supply Law (2009) and the Water and Water Resources Law (1996, under revision).
- 29 The Water Supply Law (2009) allocates priority to water supply. It defines a principle of water supply activities (Article 5), as the coordination of all sectors and localities concerned in joint using of water sources by giving priority to water supply production.
- 30 Article 18 of the Water Supply Law states (in the unofficial translation) that "individuals or organizations may have the rights of possession and use of water sources for water supply production only if they have receive the authorization from the sectors concerned with the approval of the water resources and environment sectors at the same level." From this it is understood that approval for water use by the PNP requires the approval of the DONRE (the provincial water resources and environmental sector).
- 31 A revision of the Water and Water Resources Law (1996) is under preparation to reflect new institutional arrangements (in particular the formation of the Ministry of Natural Resources and Environment in 2011, replacing the former Water Resources and Environment Administration), growing usage of water for hydropower and irrigation as well as for water supply, and other issues. Public consultations for development of a revised law commenced in late 2012. The law vests ownership of water and water resources in "the national community whom the State represents" (Article 4). Provision is made for water resource allocation, but not in detail. Article 11 states that "The allocation of water sources and catchments shall be based on surveys and on data collected, in order that water and water resources are distributed, managed and used effectively and in accordance with their purposes. Article 12 states: "To ensure that water and water resources existing in the Lao People's Democratic Republic are used thoroughly and in accordance with their purposes, the government shall determine the distribution of water and water resources."
- 32 The law separates water use into small, medium and large scale use. The definition of medium scale use including constructing small scale intake structures for water (Article 16) and for large scale includes the construction of medium or large scale reservoirs. Provision for approvals is made in Article 18, which states that water and water resources shall be centrally managed, that large scale use shall be approved by government, and that medium scale use shall be approved by a relevant agency ("relevant agency" is not defined in the law).

5.3 Requirements for compliance with the legislation

- 33 The EIA decree requires (i) appropriate screening, based on project categorization, of the required level of environmental assessment, (ii) environmental assessments to identify direct and indirect physical, biological, socioeconomic and cultural resources, (iii) presentation of alternatives (where an EIA is required), (iv) analysis to identify ways of avoiding and/or mitigating negative impacts and enhancing positive impacts, (v) extensive stakeholder consultation, (vi) disclosure to the public, (vii) preparation, approval, implementation and verification of environmental management and monitoring plans, (vi) specific provision for national biodiversity conservation areas and (vii) engagement of competent expertise for environmental impact assessment and management planning. These show strong adherence to the principles of the ADB safeguard policy.
- 34 The following steps ensure compliance with the Environmental Protection Law (amended, 2013) and the EIA Decree (2010)
- (i) The IEE is prepared by the DHUP, with assistance from the consultants and includes cooperation with other stakeholder agencies and including consultation at village, district and provincial levels;
 - (ii) The IEE is disclosed, consultations take place at district level, the IEE is updated based on comments received, it is sent to MPWT for review.
 - (iii) The MPWT reviews the IEE and either accepts or instructs the DHUP to provide further information or make revisions;
 - (iv) Once accepted by the MPWT, 15 hard copies and a soft copy of the IEE are submitted to the MPWT;
 - (v) The MPWT sends the IEE report to MONRE or to the DONREs in the province concerned to circulate locally for comment and if requested by DONRE, convenes a technical workshop to review the IEE, which may include a field visit
 - (vi) The IEE is updated and sent to DONRE with a recommendation as to the acceptability of the IEE; and
 - (vii) DONRE makes the final decision as to acceptance of the IEE report.

5.4 Timeline for Clearance and Approvals

- (i) On completion of the IEE report and submission to MPWT, 10 days for review and issuance of decision
- (ii) Revisions are made as required. IEE is then issued for consultations, comments must be received within 20 working days of receipt.
- (iii) IEE then updated to take account of comments and submitted for clearance by DONRE.

6 Specific Procedures to be used for Subprojects under the Project

- 35 The following procedures provide for assessment of environmental impacts, reporting and environmental management planning and have been designed to meet both GOL requirements as specified in the EIA Decree (2010) and therefore the EPL (1999) and ADB requirements, as specified in the Safeguards Policy Statement (2009).

6.1 Responsibilities and Authorities

- 36 The responsible agency will be the executing agency, the Ministry of Public Works and Transport (MPWT), acting through the Department of Housing and Urban Planning (DHUP) which will house the Project Coordination Unit (PCU) with responsibility for overall planning and coordination of implementation, including programming, budgeting, financial planning, accounting and reporting. The PCU will receive overall direction and policy guidance from a Project Steering Committee (PSC). The PSC will include only one representative from MONRE.
- 37 Within the meaning of the EIA Decree, the project developer is the MPWT. As such, the MPWT is responsible for ensuring that environmental compliance certification is obtained, prior to allowing works to commence (EIA Decree section 4 (1)), the accuracy of information in the IEE (or EIA) and to ensure adherence to the EMP.
- 38 For each subproject, a Project Implementation Unit (PIU) will be established at provincial level, with the responsibility of day-to-day coordination, and supervision of project implementation. The PIU has representation from the Provincial Nam Papa (PNP), the Provincial Department of Public Works and Transport (DPWT), Department of Natural Resources and Environment (DONRE) and other provincial and district level agencies. The PIU will have representatives from district agencies including the district health and education offices and Lao Women's Union (LWU). In each subproject village, the Village Development Committees will serve as the main conduit for all communications between the Project and the community., possibly within existing village committees, to mobilize local communities and work with the PIU and the PIA Consultants in implementing village improvements and awareness activities.
- 39 The PIU will receive support in co-ordinating the provincial and district level agencies including the provincial department of Natural Resources and Environment (DONRE), and take decisions on behalf of the provincial government from a Provincial Project Steering Committee (PPSC), chaired by the Provincial Vice Governor. At the district level, the District Governor (DG) or Vice Governor will oversee the project, monitor progress, review quality of work, coordinate the subproject with the PIU and local communities, and report on progress to the PPSC. The PPSC will include a representative of DONRE.
- 40 Technical support across all aspects of project implementation will be provided by the Project Implementation Assistance Consultants.

6.2 Procedures for Environmental Assessment of Subprojects

6.2.1 Environmental Screening and Classification

- 41 The environmental categorization for each subproject will be determined by the PCU with assistance from the project implementation consultants. Categorization will be based on: (i) the schedule contained in the EIA Decree of April 2010, which allocates projects into Category 1 (requiring an IEE) and Category 2 (requiring an EIA), based on parameters identified therein, and (ii) the ADB's rapid environmental assessment checklists, as above. All subprojects will be subject to a screening process which aims to ensure that subprojects being considered for financing will not have significant negative environmental impacts and that minor impacts can be mitigated through the implementation of subproject environmental management plan prepared with each IEE. This ensures that each subproject will be within Category B of the ADB system and none will be Category A. Similarly, all subprojects will fall into Category 1 according to schedule attached to the EIA Decree. Within this schedule, Category 1 projects include water treatment plant and distribution systems (item 3.52) and urban drainage systems (item 4.8). All subprojects eligible under subproject selection criteria, are therefore likely to be of Category 1 status for the purpose of environmental assessment, and thus will require IEEs.

- 42 To confirm the subproject category, a Rapid Environmental Assessment (REA) checklist will be prepared and submitted to the project officer, similar to the one prepared for the IEEs for the three sample subprojects.
- 43 One town that has been short-listed for a subproject is Sanxay, in Attapeu province. Sanxay is situated within the Dong Amphan Biodiversity Conservation Area. As such, it is potentially Category 2 in terms of the EIA Decree. With regard to the ADB Safeguards Policy Statement, the key feature is that the project does not cause any net loss in biodiversity. In the case of the Sanxay project, a preliminary description of the proposed scheme layout and anticipated environmental effects should be forwarded to MONRE to request confirmation, in compliance with article 6(s) of the EIA decree, that the subproject is Category 1 on the grounds that no biodiversity impact is foreseen, should the site visit confirm that to be the case.

6.2.2 IEE Preparation

- 44 REAs and IEEs will be prepared by the PIUs with participation from the relevant OPWTs, and with the assistance of project implementation consultants. IEEs will be submitted as part of the feasibility study for each subproject. The REA will be included as an appendix to the IEE.

6.2.3 Review of IEEs

- 45 The PCU will be responsible for the review of IEEs and will therefore undertake internal review, with the assistance of the consultants as required. In accordance with the EIA decree, the IEEs will also be reviewed by DONRE and local administrations and presented to stakeholders at provincial, district and village level for public review. The PCU will be responsible for updating the IEE in response to comments received.
- 46 The IEEs, included with each Feasibility Study report, will be sent to the ADB project officer who shall arrange review and clearance by the relevant ADB environmental specialist.

6.3 Environmental Monitoring

6.3.1 Rationale for Monitoring

- 47 Environmental issues associated with the subprojects that potentially merit monitoring are: (i) compliance with EMPs during construction and operation to ensure that the required monitoring takes place, (ii) the quality of water in the supply systems, and (iv) the adequacy of dry season flows in the streams and rivers used as the water source.
- 48 Construction impacts will be limited by their temporary nature and adherence to the EMPs which provide for mitigation. Construction sites for intakes, WTP and transmission main installation will mostly be distant from homes, limiting such effects as noise and dust nuisance. Monitoring for compliance with EMPs, and seeking community feedback is recommended.
- 49 The monitoring of water quality within the water supply system, while of environmental relevance, is required in any case for the design, construction and operation of the water supply system. Raw water sources are initially tested for hardness, turbidity, pH, total suspended solids and alkalinity (a measure of the presence of cations such as calcium, magnesium ions and carbonate ions, as opposed to pH) during the wet and dry season at the feasibility and design phases. These are required to design the water treatment process and the plant itself. Additional specialized tests (e.g. for pesticides) may be undertaken for the raw water source as required by project consultant, PNP or district government based on: (i) assessment of point and non-point sources of pollution in the catchment, catchment characteristics, proposed or potential development in catchment; (ii) local knowledge of raw water quality, and; (iii) type of treatment proposed.
- 50 Prior to commissioning of the water treatment plant, the PNP with assistance of DHUP and the project consultant will prepare a Water Safety Plan including a water quality monitoring plan

which will be implemented following plant commissioning. Testing of treated water quality at the water treatment plant is also undertaken at the time of commissioning by the Contractor to demonstrate the performance of the completed water treatment plant.

- 51 Following commissioning, water quality is regularly tested by the PNP to determine correct levels of chemical dosing in the water treatment process, to ensure the quality of treated water supplied to customers, to monitor the effectiveness of treatment and to monitor compliance with appropriate water quality standards³. Results from water quality monitoring should be included in environmental monitoring reports during subproject implementation, but the cost of this monitoring is either a design, construction or operation cost and not part of the environmental assessment and management budget.
- 52 On previous projects, noise level measurements have specified as a monitoring activity. In practice however, it is difficult to take measurements that actually reflect levels of annoyance to neighbouring communities. While noise meters are widely available and often inexpensive, most are relatively simple devices that measure the strength of pressure waves. The human ear however responds differently to sounds of different frequencies, and so readings from simple noise meters have little relevance to actual impacts on humans. Furthermore, levels of tolerance are dependent on factors such as duration and time of day. These problem can be overcome by defining acceptable noise levels using complex modelling (known as A-weighting) that mimic the response of the human ear, and further modelling to apply these noise levels to different periods of the day (known as continuous noise equivalent levels). However these parameters require sophisticated noise meters known as integrating noise meters for measurement and specialist software. Integrating noise meters are expensive either to purchase or to hire, while repeated measurements during the day and night are required to determine noise levels. Effective noise measurement would therefore entail the purchase of several integrating noise meters, and the training and deployment of a specialist team to take measurements in project towns. On the other hand, feedback from communities themselves allows the acceptability of noise levels to be determined and problems to be identified.
- 53 It is therefore recommended that monitoring is confined to monitoring for compliance with EMPs, community feedback during construction and operation and reporting on water quality monitoring as described in paras 49 – 51 above. A simple monitoring format has been prepared and attached to the IEE prepared for each sample subproject. The simple format allows for the information to be collected easily during the day to day duties of the PIU staff. The emphasis is on providing a reliable and easily retrievable record of compliance, community feedback and water quality data.
- 54 Water quality monitoring is required prior to design, on commissioning and during operation as is summarised as follows:

| Phase of the Project | Frequency | Responsibility | Cost Allocation |
|----------------------|--|-----------------|-----------------------------------|
| Planning and design | Four times per year (twice in the rainy season) | PIA Consultants | Survey and investigations cost in |

At present, PNPs, government agencies and private companies located in the provinces do not have the capacity or resources to sample and test for the full range of parameters and frequencies set out in the current (2005) or draft (2012) Ministry of Health (MOH) Drinking Water Quality Standards. Currently, PNPs undertake daily water quality tests for pH, turbidity and residual chlorine, and send one or two water samples per year to Vientiane for testing of a wide range of parameters in accordance with what are commonly referred to as the "Lao Standards" for drinking water quality. These are based on the Nam Papa Lao Guidelines developed in the 1990's and World Health Organization (WHO) Drinking Water Quality Guidelines. The project supports a phased approach to testing of PNP treated water quality, whereby the type and frequency of water quality testing are advanced towards the MOH Drinking Water Quality Standards as the capacity and resources for water quality testing in each province are improved.

| | | | |
|--------------|--|------------|---------------------------|
| | and twice in the dry season) | | PIA consultants' contract |
| Construction | Once, on commissioning | Contractor | Contractor's contract |
| Operation | As required for implementing the Water Safety Plan (WSP) | PNP | PNP costs |

55 Results of water quality monitoring are quoted, as appropriate, in the regular monitoring reports.

6.3.2 Monitoring for Compliance with EMPs

56 To ensure that potential environmental problems are detected and addressed appropriately, environmental monitoring will take place during construction and operation of each subproject. During construction, the key tasks are monitoring the compliance with environmental mitigation measures in the environmental management plan for each subproject, which shall be done by the PIU and construction supervision team. During operation, responsibility for monitoring shall rest with the provincial departments.

7 Public Consultation and Information Disclosure Plan

7.1 Public consultation for IEE preparation and disclosure

57 Public consultation will be carried out for IEE preparation, and again once the IEEs are prepared, to invite comment from the public in accordance with the EPL.

58 During IEE preparation meetings with groups from the target villages for the subproject will take place to inform them of the proposed subproject and the possible environmental and social impacts, and to collect opinions from people who may be affected by the project. At this stage, the following agenda should be used to ensure that there is adequate exchange of information and opinion:

- (i) A summary of the proposed works under the subproject;
- (ii) A summary of subproject objectives and likely positive and negative environmental impacts, covering the construction phase and operational impacts;
- (iii) Invitation for feedback in respect of any areas of concern that the public may have, and suggested means of implementation;
- (iv) Disclosure of and feedback on the Grievance Redress Mechanism
- (v) Acceptability of the proposed works to the public; and
- (vi) Request for information on the known occurrence of unexploded ordinance in the area where the scheme components will be built.

59 For the consultations, the dates, attendees, topics covered and conclusions should be recorded and included with the IEE report. These are to take the form of meetings, at which the findings of the IEE will be presented in addition to key background information. Comments are recorded and the IEE updated accordingly.

- 60 Once the IEE is completed, a summary should be prepared in Lao. The IEE and Lao language summary should be distributed to the district authorities for their information and for display to the public for a period of thirty days.

7.2 Public consultation during construction

- 61 Prior to construction, subproject design and the IEE document is disclosed and feedback sought. During construction and operation, the project developer is obliged to inform project affected people and other stakeholders of project activities which are likely to create environmental and social impacts, and to allow them to access general information about the subproject. In addition, should people affected by the project have any grievances, they have the right of lodging complaints through a grievance redress process established for the subproject.

7.3 Grievance Redress Mechanism

- 62 Article 13 of Decree 192/PM requires the Project to establish an effective mechanism for grievance resolution. Lao legal requirements for this mechanism are further described in Part VI of the Decree's Implementing Regulations, and in detail in the Technical Guidelines. The mechanism to address any grievances on environmental issues is the same as that designed to address grievances related to land acquisition and resettlement.
- 63 Decree 192/PM determines that the prime responsibility for grievance resolution is the Project proponent, i.e., MPWT. As they are responsible for carrying out Project works which are likely the source of grievances they are best placed to respond to and resolve grievances in the most timely and acceptable method.
- 64 A well-defined grievance redress and resolution mechanism will be established to resolve grievances and complaints in a timely and satisfactory manner. The objective of the grievance redress mechanism is to resolve complaints as quickly as possible and at the local level through a process of conciliation; and, if that is not possible, to provide clear and transparent procedures for appeal. All affected persons will be made fully aware of their rights, and the detailed grievance redress procedures will be publicized through an effective public information campaign.
- 65 Complainants are entitled to lodge complaints regarding any aspect of the project. Complaints can be made verbally or in written form. It is recognized that in many cases, complainants do not have the writing skills or ability to express their grievances verbally, however, complainants are encouraged to seek assistance from family members, village heads or community chiefs to have their grievances recorded in writing and to ensure that where disputes do occur all the details have been recorded accurately enabling all parties to be treated fairly. In the case of verbal complaints, a written record of the complaint will be made during the first meeting with the complainant. Complainants who present their complaints within the prescribed procedures will be exempt from all administrative fees incurred. In addition, Complainants who lodge complaints and appeals to district courts will be provided with free legal representation.
- 66 For the purposes of grievance redress and resolution, the Project will rely on the existing village arbitration units where they have already been established in core villages. The village arbitration unit generally consists of the village chief and/or deputy chief, village elders and village representatives of the Lao Women's Union, Lao Front for National Construction and the police; the unit is responsible for settling disputes between villagers through conciliation and negotiation. In the absence of these units, the members of the village committee (if formed) or the village leaders will act as grievance officers. At the district and provincial levels, the district and provincial resettlement committees that are composed of concerned departments, local officials, village chiefs and mass organizations will act as grievance officers.

- 67 All complaints and resolutions will be properly documented by the concerned resettlement committee and be available for the public and review for monitoring purposes.
- 68 Safeguard monitoring reports will include the following aspects pertaining to progress on grievances: (a) number of cases registered with the Grievance Redress Committee (GRC), level of jurisdiction (first, second, and third tiers), number of hearings held, decisions made, and the status of pending cases; and (b) lists of cases in process and already decided upon may be prepared with details such as name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e. open, closed, pending).
- 69 The following procedures are proposed for redress of grievances during the WSSSP.

Table 7-1: Grievance Redress Procedures

| No. | Grievance Redress Procedures |
|-----|--|
| 1 | Stage 1: In the first instance, Complainants will address complaints on any aspect of compensation, relocation or unaddressed losses to the village arbitration unit or other designated village grievance officers. The unit will organize a meeting with the complainants to resolve the issue using its traditional methods of conciliation and negotiation; the meeting will be held in a public place and will be open to other members of the public to ensure transparency. |
| 2 | Stage 2: If within 5 days of lodging the complaint, no understanding or amicable solution can be reached or no response is received from the village arbitration unit, the complainant can bring the complaint to the District Resettlement Committee (DRC). The DRC will meet with the complainant to discuss the complaint, and provide a decision within 10 days of receiving the appeal. |
| 3 | Stage 3: If the complainant is not satisfied with the decision of the DRC or in the absence of any response, the complainant can appeal to the Provincial Resettlement Committee (PRC). The PRC will provide a decision on the appeal within 10 days. |
| 4 | Stage 4: If the AP is still not satisfied with the decision of the PRC, or in the absence of any response within the stipulated time, the complainant can submit his/her grievance to DHUP. The DHUP acting on behalf of the MPWT will render within 10 days of receiving the appeal. |
| 5 | Stage 5: As a last resort, the complainant may submit his/her case to the Court of Law. The complaint will be lodged with the Court of Law; the decision of the Court will be final. The DHUP will be responsible for forwarding the complaint and ensuring its process in the courts. |

- 70 All legal and administrative costs incurred by complainants and their representatives throughout this process are to be covered by the Project.
- 71 At each stage of the grievance redress process, careful written records will be maintained. The village arbitration unit will submit reports to the DRC documenting the following: (i) the complaints as received; (ii) the names and other pertinent information about complainants; (iii) the dates of the original complaint, meetings and any other actions; and, (iv) the outcomes and/or resolution. The DRC, PRC and DHUP (or PCU acting for DHUP) will each maintain similar records for appeals that are submitted to them. The records of grievances will be included in regular progress reporting on the subproject.

8 Staffing Requirements and Budget

- 72 An international environment specialist will be required to provide initial training in IEE preparation and intermittent support for 8 years, supported by a domestic environment specialist who will provide direct support to Provincial Implementation Units (PIUs) in IEE preparation. These specialists will be required for 11 months and 22 months respectively.

| Item | UNIT COSTS | QUANTITY | COST (US\$) |
|--|-------------------------------------|----------|------------------|
| Staff Costs | | | |
| International Environment Specialist | \$20,000 | 11 | \$220,000 |
| National Environment Specialist | \$ 3,300 | 22 | \$72,600 |
| Construction Supervisors: 5% of time | 5% of \$500,000 total | | \$25,000 |
| PCU Deputy Manager | Position filled by GoL staff member | | |
| PIU Water Supply / Sanitation Engineer 25% of time | | | |
| Air Travel and Per Diem | | | |
| International Air Travel | \$2,500 | 3 | \$7,500 |
| Domestic Air Travel | \$220 | 10 | \$2,200 |
| Per Diem: International Specialist | \$120 | 120 | \$14,400 |
| Per Diem: National Specialist in provinces | \$35 | 50 | \$1,750 |
| Office support costs | | | |
| Office Consumables | Lump Sum | | \$2,000 |
| Report printing and copying | Lump Sum | | \$1,200 |
| Communications (month) | \$50 | 18 | \$900 |
| Total | | | \$347,550 |

9 Terms of Reference for the Environment Specialists

9.1 Environmental Specialist (International)

- 73 The environmental specialist will assist the Team Leader and Feasibility Study Specialist to prepare environmental assessments for the feasibility studies of about 11 subprojects and provide capacity development in environmental assessment and monitoring to PCU and PIU staff. The international environmental specialist will work closely with the national environmental expert.
- 74 The International Environment Specialist will have a postgraduate degree in a relevant discipline such as environmental engineering, engineering, or the biological sciences, and at least 12-years of experience in the environmental management of infrastructure projects, including environmental assessment, and works supervision (preferably, of donor-funded projects). S/he will primarily ensure that the various subprojects conform to ADB's Safeguard Policy Statement 2009 particularly to the environmental aspects. S/he will also assess compliance with applicable Lao PDR environment laws and update environmental safeguard documents and undertake field visits to assist with IEE and EMP preparation and with supervision of construction.
- 75 Specific tasks include:
- (i) Provide orientation to PCU and PIU staff in environmental assessment and management. The capacity development should cover purposes, methods of assessment, reporting requirements, grievance redress procedure, public consultation process, effective EMP preparation, inclusion of EMP into works contracts, and compliance monitoring during supervision. Further, the capacity development should be based on the Environmental Assessment and Review Framework (EARF) for the Project.
 - (ii) Prepare/accomplish/update ADB's rapid environmental assessment (REA) checklist/s for the 11 subprojects.
 - (iii) Prepare the required environmental assessment report for 11 subproject identifying direct, indirect, cumulative and induced impacts of the project including the relevant climate and/or climate-induced impacts in accordance with the EARF.

- (iv) Provide advice and support to the National Environment Specialist and staff of PCU and PIU for the preparation of IEEs, providing guidance on site in the subproject towns.
- (v) Provide design inputs to technical specialists on environmentally sustainable good practices on design of sludge management, waste water systems and sanitation strategies to ensure upstream "avoidance" of environment impacts.
- (vi) Provide inputs on capacity awareness programs
- (vii) Assist in the conduct of the information campaigns and public consultation.
- (viii) Incorporate EMP requirements in the civil construction contract documents.
- (ix) Assist PCU and PIUs to design and implement environmental monitoring programs;
- (x) Assist PCU to prepare standard reporting formats for environmental monitoring reports in accordance with the EARF.
- (xi) Assist PCU and PIUs to undertake consultations with local communities on environmental issues to ensure that their needs and concerns are incorporated in subproject design and implementation.
- (xii) Provide inputs to feasibility studies, progress reports and project completion report.
- (xiii) Ensure that the IEEs/EMPs meet the requirements of the Government and ADB's Safeguard Policy Statement 2009, and carry out or arrange for any further tasks such as site investigations, design of mitigation measures or additional reporting.
- (xiv) Visit subproject towns during construction and provide guidance relating to supervision and compliance monitoring, advising PIUs of any actions required to ensure compliance with the EMP.
- (xv) Periodically review monitoring reports and identify any adaptations or improvements necessary in order to ensure that the EMP is being properly implemented.
- (xvi) Guide the national consultant on all of the above aspects

9.2 Environmental Specialist (National)

- 76 The environmental expert will assist the Team Leader and Feasibility Study Specialist to prepare environmental assessments for the feasibility studies of about 11 subprojects and provide capacity development in environmental assessment and monitoring to PCU and PIU staff. S/he will work closely with the international environmental specialist.
- 77 The National Environment Specialist will have a postgraduate degree in a relevant discipline such as environmental engineering, engineering, or the biological sciences, be familiar with the Environmental Protection Law of Lao PDR and other relevant environmental legislation and have at least 7 years of experience of working on infrastructure projects involved in environmental assessment, monitoring, or carrying out mitigation measures. Also, fluency in English and proven report preparation skills is required. Specifically, S/he will:
- (i) Assist the International Environment Specialist, in designing and carrying out orientation to PCU and PIU staff in environmental assessment and management, including the preparation of material and instruction in the Lao language.
 - (ii) Visit each subproject town and provide assistance on IEE/EMP report preparation, in accordance with the EARF for the Project.
 - (iii) Participate in the design development of the ECA and VEI to ensure that adequate environmental consideration is incorporated into the designs.
 - (iv) Coordinate with the resettlement specialist to ensure that environment management plans are prepared for relocation sites in-case there is large resettlement and specific sites need to be planned for the same.
 - (v) Assist with preparation and review of IEEs/EMPs, and co-ordinate with PIUs for any further investigations or reporting that may be necessary.
 - (vi) Provide inputs to feasibility studies, progress reports and project completion report.

- (vii) Visit subproject towns during construction and provide guidance relating to supervision and compliance monitoring, advising PIUs of any actions required to ensure compliance with the EMP.
- (viii) Visit subproject towns where construction has been completed and assist with establishing environmental monitoring procedures for the operation phase of the subprojects.
- (ix) Assist the EAs or LAs and IAs or PCU/PIUs in securing environmental clearance certificates for each project component as required by the Lao PDR Government. Prepare and document necessary information to comply with such government guidelines.