

Environmental Management Plan

July 2018

Lao PDR: Greater Mekong Subregion East-West
Economic Corridor Towns Development Project

Kaysone Phomvihane Solid Waste Management

Prepared by the Provincial Department of Public Works and Transport, Savannakhet Province, Lao PDR for the Asian Development Bank. This is an updated version of the draft originally posted in July 2012 available on <http://www.adb.org/projects/43319-022/documents>.

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CURRENCY EQUIVALENTS

(as of 1 September 2017)

Currency Unit	–	kip (KN)
KN1.00	=	\$0.00012
\$1.00	=	KN8,200

ABBREVIATIONS

ADB	–	Asian Development Bank
BOD	–	biological oxygen demand
CEMP	–	Contractor's EMP
COD	–	Chemical Oxygen Demand
CSCS	–	Construction Supervision and Consultant Service
DED	–	detailed engineering design
DMF	–	Design and monitoring framework
DONRE	–	Department of Natural Resources and Environment
DPH	–	Department of Public Health
DPWT	–	District Public Works and Transport Office
EA	–	Executing Agency
ECC	–	Environmental Compliance Certificate
ECO	–	Environmental Control Officer
EERT	–	External Emergency Response Team
EHS	–	Environmental, Health, and Safety
EIA	–	environmental impact assessment
EMAP	–	Environmental Management Plan
EMoP	–	Environmental Monitoring Plan
EMP	–	environmental management plan
ER	–	Environmental Representative
ERT	–	Emergency Response Team
ERTL	–	Emergency Response Team Leader
ESIA	–	Environment and Social Impact Assessment
ESO	–	environmental site officer
EWEC	–	East-West Economic Corridor
GMS	–	Greater Mekong Subregion
GPP	–	Grievance Point Person
GoL	–	Government of Lao PDR
GRM	–	Grievance Redress Mechanism
IA	–	implementing agency
IEE	–	initial environmental examination
Lao PDR	–	Lao People's Democratic Republic
LAK	–	Lao Currency

MONRE	–	Ministry of Natural Resources and Environment
MPWT	–	Ministry of Public Works and Transport
MRF	–	materials recovery facilities
MRC	–	Mekong River Commission
NTP	–	Notice to Proceed
O&M	–	operation and maintenance
OPWT	–	office of public work and transport (District)
PDPWT	–	Provincial Department of Public Works and Transport
PIT	-	Project Implement Team (of District)
PMU	–	project management unit
RP	–	Resettlement Plan
TSS	–	total suspended solids
UDAA	–	Urban Development and Administration Authority
USD	–	United States Dollar
UXO	–	unexploded ordnance
WREA	–	Water Resources and Environment Agency

WEIGHTS AND MEASURES

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

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I. BACKGROUND

1. This Draft Environmental Management Plan (EMP) for the Kaysone Phomvihane Solid Waste Management subproject updates the relevant parts of the EMP for Kaysone Phomvihane, dated July 2012.
2. The Initial Environmental Examination (IEE), 2012 considered the preliminary project design, the baseline environmental conditions, possible impacts and mitigation measures, and institutional arrangements to implement the same. Based on the findings of the IEE, the subproject was assigned Category “B” under ADB categorization. The updated IEE, 2017 and the EMP update confirm the original categorization.
3. In comparison with the preliminary project design, the scope of the subproject was revised during the detailed engineering design on the following accounts: A Septic Sludge Treatment plant was included; the Leachate Treatment plant was upgraded to also treat wastewater from the septic sludge treatment; the Compost plant was upgraded to include dried sludge in the process; the construction of landfill cell 1 and 2 joined into one cell and included in the first phase.

A. Subproject Investments

4. The scope of the Solid Waste Management subproject is summarized below:

Kaysone Phomvihane Solid Waste Management subproject	<ul style="list-style-type: none"> ▪ Establishment of a managed landfill on the existing dumpsite with modern landfill technology including leachate collection and treatment ▪ Procurement of additional equipment, collection trucks, and facilities ▪ Recycling Station (formerly a separate subproject known as Materials Recovery Facility) with modern efficient technology, including construction of facilities for storage, treatment, and recycling/reuse of suitable materials within the existing landfill site. ▪ Septage treatment facility for Kaysone Phomvihane (formerly part of the drainage and wastewater subproject).
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5. The duration of project phases is presented below.

Table I-1. Duration of project phases

Phase	Duration
Construction phase	2 years
Defects Liability Period	1 year

6. An aerial view of the existing solid waste site with the new facilities superimposed is presented below.

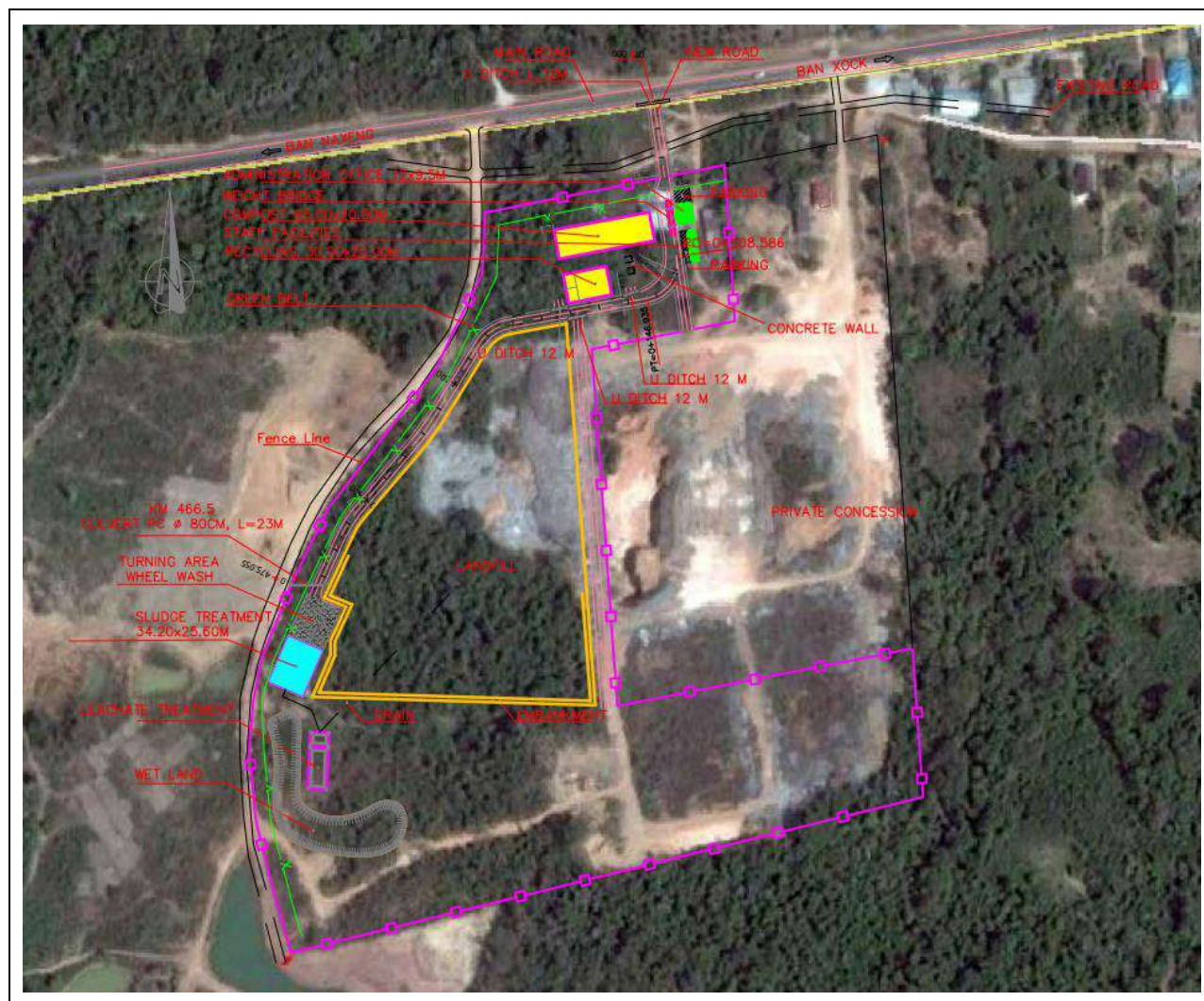


Figure 1. Aerial view of the existing solid waste site with new facilities superimposed

7. The general layout plan is presented below.

B. Specification of Activities and Facilities

8. The specification of activities and facilities to be implemented by the Contractor is presented in the table below (Table I-2). The schedule of the construction activities is presented in Table I-3. The works comprise the construction of a Waste Treatment Centre with civil works and buildings and mechanical and electrical works, including:
- Concrete access road;
 - A paved internal road, fence and gates;
 - A reception area with a weighbridge, staff parking area, an administration building, and a staff facility building;
 - An area with a compost building, recycling building, including workshop, and storage area,
 - Paved areas between the buildings;
 - A septic sludge treatment plant, with a wheel wash station;
 - A landfill cell;
 - A leachate treatment plant;
 - Water Supply;

- Electrical Installation

Table I-2. Specification of activities and facilities

Title	Specification of activities and facilities
Site preparation	<ul style="list-style-type: none"> Removing of dumped waste Clearing the site for vegetation Removing existing shed Excavate and removing topsoil to soil depot on site
Fence and gates	<ul style="list-style-type: none"> Renovating existing fence Establishing new fence Establishing new main gate Establishing gates as shown on drawings
Road, reception area, staff parking area	<ul style="list-style-type: none"> Installation of an outdoor pre-fabricated guard booth Excavation and earthworks for roads and working areas Construction of road base and concrete pavements Construction of concrete storm water ditches along roads Concrete pavements for all areas between buildings
Weighbridge	<ul style="list-style-type: none"> Construction of Concrete foundation and ramps (approach slabs) for weighbridge Supply and installation of Weighbridge platform Supply and Installation of Weighbridge computer and printer
Administration building, and staff facility building	<ul style="list-style-type: none"> Earthworks and construction works for an Administration building and Staff facility building with concrete columns and brick walls Electrical installations Air conditioning and ventilation Sanitary installations and Septic tank Drains and connection to Septic tank Kitchen furniture Laboratory furniture Office furniture Locker room furniture Laundry room furniture Supply and installation of an outdoor pre-fab guard booth
Material recovery building	<ul style="list-style-type: none"> Construction of Material recovery site including earthwork, base and concrete pavement
Compost building, recycling building	<ul style="list-style-type: none"> Construction of compost building and recycling Building including concrete foundations, walls and steel beam structures. Iron step ladder to deck roof Galvanised steel pipe railing (tension wire mesh) on deck roof Steel roof beam structure Roof plates: corrugated sheet metal Electrical installation Drain and sewer Workshop furniture and equipment Fuel tank with pump
Wheel wash station	<ul style="list-style-type: none"> Pressure washer and water tank Generator Trailer for mounting

Septic sludge treatment plant	<ul style="list-style-type: none"> • Excavation for foundation and drains • Concrete foundation and walls • Concrete floor with drain canal and flagstone cover • Drain layer of singles and coarse gravel • Steel roof beam structure • Roof plates: corrugated sheet metal • Splash plate • Movable front gate in wood
Landfill cell	<ul style="list-style-type: none"> • Excavation for landfill cell and bottom drain • Establishing of soil embankment • Backfilling and compaction of selected material • Installation of Geotextile • Installation of drain pipes • Installation of stone (filter gravel) drain layers
Leachate treatment plant	<ul style="list-style-type: none"> • Collection chamber • Aeration pond • Sedimentation pond • Inlet and outlet valve chambers • Excavations for foundation and drain • Compaction of selected material • Concrete floor and walls of the ponds and chambers • Galvanised steel pipe railing • Pipe works • Control valves and chambers • Supply and installation of submersible aerator • Construction of embankment layer • Supply and install waste water aeration equipment • Planting scrubs
Other	<ul style="list-style-type: none"> • Excavation of trenches for water, sewage and electricity • Electrical installation, 0.4 KV underground line, 22 KV line and 160 KV transformer • Drilling and equipment of Deep well for water supply, well head, rising main (Provisional Work) • Water supply station with booster pump and water tanks • All connecting pipe works

Table I-3. Schedule of the construction activities.

Sl. No.	Scope of works	Start	Finish
1	GENERAL PROVISIONS	20-Apr-18	31-Aug-18
2	GENERAL PROVISION (Monthly)	20-Apr-18	19-Mar-20
3	ROADS	1-Oct-18	2-May-19
4	CONCRETE PLATFORM	1-Apr-19	30-May-19
5	TURNING AREA	31-May-19	29-Jul-19
6	WEIGHBRIDGE STATION	30-Aug-19	25-Oct-19
7	ADMINISTRATION BUILDING	15-Aug-18	12-Mar-19
8	STAFF FACILITY BUILDING	1-Mar-19	28-Aug-19

9	RECYCLING BUILDING	15-Aug-18	1-Apr-19
10	COMPOST BUILDING	15-Mar-19	8-Oct-19
11	SLUDGE TREATMENT BUILDING	15-Sep-19	19-Mar-20
12	LAND FILL	1-Oct-18	12-Sep-19
13	LEACHATE TREATMENT	12-Sep-19	6-Feb-20
14	FENCE	15-Jul-19	10-Jan-20
15	GATES	11-Jan-19	31-Jan-19
16	ELECTRICITY INSTALLATIONS	1-Nov-18	2-Dec-18
17	WATER STATION	15-Jan-20	13-Feb-20
18	PIPELINES	14-Feb-20	19-Mar-20

II. REGULATORY FRAMEWORK AND GUIDELINES

9. The specific regulations and guidelines are summarized in Table II-1. The regulations and guidelines, inter alia, specify how the infrastructure investment should be located, constructed, and managed to prevent or minimize negative impacts on the environment. The complete list of environment-related laws and regulations of Lao PDR are described in Appendix A.
10. Environmental standards are listed in Appendix B. Where Lao PDR regulations differ from the environmental standards provided by the Environmental, Health and Safety Guidelines of the World Bank (2007), the reference will be whichever is more stringent.

Table II-1. Environmental Standards

Environmental Standards
<ul style="list-style-type: none"> National Environmental Standard Order No. 2734/PMO-WREA (2009): See Appendix B.

III. DESCRIPTION OF THE BASELINE ENVIRONMENT

A. Baseline Environment

a. Existing situation – Solid waste management

11. The existing Solid Waste facility is located in the village of Ban Xok about 10 km east of Kaysone Phomvihane town. The total land area of the site is 16 ha and the site is fenced. A 6 ha concession located within the site has been given out to an operator (Figure 2). Solid waste from households and businesses is currently collected and disposed to the dumpsite with four cells constructed in 1998 using UNDP and NORAD funds. UDAA is responsible for operating the site which is not designed nor operated as a sanitary landfill. The solid waste management system is inadequate to serve the municipality's increasing population.
12. The coverage level is only 35% with 4,300 households (out of >12,000) registered as customers by the UDAA. 25 out of 31 villages in the district are serviced. There are 368 factories (2010) and three large and two small trading markets, as well as 3226 commercial shops (2009). Hotels, restaurants and large businesses are responsible for disposal of their own wastes to the dump site.

13. An estimated 45-60 tons of solid waste are generated daily and an estimated 25-28 tons are collected daily, although there is no weighing system to measure the waste entering the site. The existing site has a fenced area of 16 ha, with 4 cells of 1.25 ha. An estimated 4 ha are currently in use. Two cells are partly excavated and partly filled with solid waste. Waste cells are not covered hence the site is continuously littered. There are frequent land fill fires at the site. No drainage was included in the works since the soils were presumed to be impermeable hence leachate was designed to be collected and flow to a treatment pond on-site. However, the system does not operate (probably due to leachate leaching into the soils). There is no system for managing hazardous wastes. The provincial hospital has a small autoclave for disposal of infectious medical wastes. Private contractors collect hazardous wastes from industries however the ultimate disposal point is not clear.
14. The existing recycling system is based on informal collection in the city of the most valuable fractions, selling them to junkyards and dealers. A materials recovery facility (MRF) is located on the dump site and is operated by a private contractor and recycles paper, plastics, and scrap metal. The recycled materials are transported to Thailand, China and Vietnam. A number of waste pickers operate at the site and there is extensive informal recycling/sorting carried out by the collection crews during collection. The "informal" sorting (waste picking) and recycling which occurs on the waste disposal site (as well as during waste collection) is extensive but has the side effect of making the waste disposal less efficient due to slowing down of the collection process or disposal process. The working conditions of waste pickers are poor and workplace health and safety is an issue.

b. Existing Septic Tank Sludge Management

15. Typically, wastewater from toilets is discharged to household septic tanks on-site, and the overflow discharges off-site to the road drainage system. Households are responsible for organizing septic tank sludge tankers to empty the sludge on a 6-12 monthly basis, however in reality households do not empty the contents on a regular basis. Septic tank sludge is currently collected on a private basis and sold to farmers, or disposed to the landfill or elsewhere - this is not controlled.
16. Currently, septic tank sludge is discharged to the existing dump site (located 10km from city center). Removal is normally done via private contractors, however there is no supervision of the disposal hence there is a risk of inappropriate disposal direct to the environment. If not disposed correctly, sludge may be considered a public health risk, however if disposed appropriately it may be an opportunity for beneficial re-use as a low-grade fertilizer for adjacent agricultural use. Disposal to the dump site is not ideal because the sludge contributes to filling up the site, and the organic content drains through the dump to the leachate collection system and then must be treated again in the leachate treatment plant. The leachate collection system of the existing cells is not in operation. It was designed to collect leachate and discharge to a wetland at the south-western part of the existing site. The wetland will be reestablished with the proposed subproject. The environmental compliance audit (ECA) on the existing dumpsite has identified several lapses in terms of environmental management. Based on the ECA findings, the subproject proposes to rehabilitate the leachate collection system of the existing cells for treatment of leachate prior to discharge to the wetland.

c. Climate

17. The climate of Savannakhet Province is the typical tropical monsoon (wet-dry) climate of the region. During the rainy season (June to October), the winds of the southwest monsoon is responsible for an average monthly rainfall of >200 mm, occasionally reaching >500 mm. The dry season (November to April) is dominated by the northeast monsoon. The average rainfall in Savannakhet is approximately 1,600 mm per year, which is about 170 mm less than the Lao average.
18. The temperatures in Savannakhet range from a minimum low of 13°C in January to a maximum high around 39°C in April. Savannakhet is the hottest and driest province of Lao PDR: the average temperature is estimated to be 26.1 degrees centigrade, which is about 2 degrees higher than the national average. The average number of hours of sunlight per year is estimated to be 2,280, which is about 256.8 hours longer than the national average.

d. Subproject area sensitive receptors

19. The subproject affected area is located near the village of Ban Xok. The ECA concludes that the landfill should maintain a minimum distance of 300 meters from the nearest residential cluster in accordance with the regulations, but that further urban expansion in the area will likely create issues in the near future if the urban development is not checked. The construction activities will primarily take place in the western and northern part of the landfill site and are, thus, located at further distance to the residential cluster. Considering the distance, landscape, and vegetation, the residential cluster is not considered to be sensitive with respect to the construction (civil works) related impacts. However, mitigation measures to protect adverse impacts to communities have been included in the EMP in Table VII-1.
20. The current landfill will continue operation during the construction activities and is therefore sensitive to civil works related impacts in particular dust emissions from the construction activities.

e. Air quality and noise

21. The ECA conducted ambient air quality monitoring of parameters temperature, humidity, PM₁₀, O₃, NO₂, SO₂, and CO at 12 locations (Figure 3). The ECA found that O₃ concentration was exceeded at one sampling location, NO₂ concentration was exceeded at 7 of 12 sampling locations, while SO₂ concentration was exceeded at 6 of 12 sampling locations. Other parameters were within permitted thresholds (XVIII APPENDIX G: Results of monitoring and analysis of local ambient air quality).



Figure 3. Sample locations of the ambient air quality and noise monitored from 7-15/06/2017

22. Construction will be undertaken within the site perimeter and considering the landscape and natural features it is not expected to impact significantly on residential areas with respect to noise. The ECA conducted noise monitoring at 12 locations. Based on the results the noise levels at the 12 sampling locations ranged from 52.2 to 68.7dB Laeq, while $L_{a_{max}}$ ranged from 65.9 to 84.5 dB(A). The Lao PDR noise standard, the noise standard should not exceed 70 dB(A) Leq and $L_{a_{max}}$ not exceeding 115 dB(A). The results are, thus, considered in line with the standard (APPENDIX B: Environmental Standards; Table XIII-4. Noise Standard).

f. Land use

23. The subproject is within the site perimeter of the existing landfill and will not affect land use in the area. The surrounding areas have the following land uses: agriculture, construction material excavation. The development of a detailed land use plan is part of the actions in the CAP.

g. Flora and fauna

24. The subproject affected area is within the site perimeter of the existing landfill and the affected area is considered a modified habitat. The area that will be excavated for the new cell is partly covered by vegetation, trees, and bushes. There are no natural or critical habitats directly affected by the project.

IV. SUMMARY OF ISSUES AND POTENTIAL IMPACTS

25. The expansion of the Savannakhet Landfill is undertaken within the existing site perimeter at the existing landfill site. The distance to nearest residential cluster is in line with the requirements in the regulation of 300 meter distance. No vulnerable ecosystems will be disrupted by the project.
26. Environmental impacts during the construction phase are temporary and short-term impacts associated with the construction work, including storm water management, noise, dust, solid and liquid waste, spoil generation, construction traffic, and access issues for the existing landfill operator. Construction during the wet season will be associated with additional impacts associated with flooding of the construction site and storm water runoff from the construction site. To mitigate these impacts earthworks will not be permitted during the rainy season and should be undertaken in dry weather.
27. The construction related impacts are of limited duration and extent and can be mitigated through standard methods and procedures of good housekeeping and good engineering practice.
28. The operation related impacts are assessed as mostly positive as the subproject will improve solid waste management in Kaysone Phomvihane, septage management in Kaysone Phomvihane, and leachate will be collected and treated.
29. A summary of issues and impacts associated with the subproject construction is presented in the table below (Table IV-1).

Table IV-1. Summary of Potential Environmental Impacts and Measures during Construction

Issues and Impacts	EMP measures
I. Pre-Construction Phase	
Finalization of Detailed Engineering Design (DED) to include recommendations of the Environmental Compliance Audit.	<p>Establish connection of the leachate collection system to the leachate treatment system included in the design of the new landfill.</p> <p>Prevention of Fire, include measures for Ignition Sources including prevention of smoking on site, and proper management of flammable materials and liquid.</p>
II. Construction Phase	
<p>Civil works related environmental impacts</p> <p>Degradation of water quality</p> <p>Damage to cultural property or values</p> <p>Improper closure of construction sites</p>	<p>Implement water quality monitoring.</p> <p>Implement chance find procedures; contractors to anticipate finds.</p> <p>Approval and implementation of site restoration plan.</p>
Land clearing, loss of trees and vegetation cover	Tree and vegetation removal, and site restoration actions. Trees to be maintained as much as possible and native species used in replantation

Dust/suspended particles/air pollution	Dust management plan and monitoring
Noise and vibration	Noise management plan
Generation of spoils, solid waste and hazardous waste	Spoil and waste management plans
Land, surface water and groundwater pollution	Construction materials, transport, and storage measures; spoil and waste management plans, erosion control measures. Timing of construction in dry season and dry weather. Groundwater sampling, and observations at the dumpsite indicate that leachate from the dumpsite is likely seeping into the ground.. Implement water quality monitoring.
Traffic	Traffic Plan
Reduced access and disruption for the landfill operator	Construction and traffic planning and stakeholder engagement
Accidental damage to properties/structures	Good construction practice
Community health and safety hazard	Public safety plan
Workers' health & safety hazard	Occupational Health and Safety Plan

V. RESULTS OF THE ENVIRONMENTAL COMPLIANCE AUDIT

A. Environmental Compliance Audit

30. The site is an existing Solid Waste facility near the village of Ban Xok, with an area of 16 hectares of which 4 hectares have been utilized for waste disposal. This site was constructed in 1998 and has operated since then. An Environmental Compliance Audit of the solid waste facility has been conducted in 2017 to determine compliance of existing facility to ADB and Government of Lao PDR requirements as well as potential risk and impacts for planned Solid Waste components under current project. The ECA identified and planned appropriate measures to address compliance issues in a corrective action plan. The result of the ECA are presented below.

31. The Environmental Compliance Audit was prepared in 2017 by a Consortium of Vietnam Sustainable Development Inc. and Research Center for Environmental Monitoring and Modeling.

a. Requirements of existing regulatory framework for landfills in Lao PDR.

32. The ECA reviewed the regulatory framework for landfills in Lao PDR and conducted a compliance assessment of the existing landfill operation. The key environmental regulations identified include the 2013 Ministerial Instruction on the Process of the Initial Environmental

Examination of the Investment Projects and Activities and the Lao PDR MONRE Ministerial Decree No.520/ TCPC, dated 23 Feb 2007 on disposal site management.

33. The Ministerial Instruction require existing landfills to develop Environmental and Social Monitoring and Management Plan (ESMMP) to obtain an Environmental Compliance Certificate (ECC).
34. The Decree No.520/ TCPC on disposal site management regulates landfill siting and the ECA identified the following issues:
 - While the existing site complies with the 300 m distance to closest residential cluster, the urban expansion in the area will likely create issues in the near future if the urban development is not checked.
 - The leachate management system should comprise of drainage system and leachate treatment pond and bottom layer should be compacted. The existing leachate management system is not in operation and the ECA recommends the installation of a leachate management system at the existing landfill.
 - Landfills are required to install gas emission systems and the ECA recommends installation of a gas emission control system.

b. Groundwater quality

35. The ECA drilled three hydrogeological test wells to the depth of 50 meters within and adjacent to the landfill site in order to analyze groundwater quality. The three hydrogeological test wells, groundwater sampling and observations at the dumpsite indicate that leachate from the dumpsite is likely seeping into the ground, therefore a water quality monitoring plan will have to be implemented.
36. The ECA also took water quality samples from eight dug wells of households living in the area surrounding the landfill. These dug wells are located at distances of approximately 300 meters from the existing landfill and have depths of 13 to 17 meters (Figure 4 and Figure 5). Local people informed that groundwater quantity is low in the dry season and further that most of the wells are emptied after 10-20 minutes of continued pumping. During rainy season the quantity increases.
37. The groundwater quality analysis conducted of the samples taken from the eight wells included 22 bio-physico-chemical parameters and heavy metals. With the exception of Cadmium concentration almost all other parameters were within the permissible standards for drinking water (WHO 2008 and Lao PDR groundwater quality standard). The Cadmium concentration in all eight samples exceeded the drinking water standards. On that basis, the ECA concluded that continued use of the shallow groundwater as a source of drinking water is a hazard to health and that improved water supply should be established/extended to Ban Xok.
38. Cadmium in groundwater is typically a result of contamination. However, the ECA could not establish a link between the Cd contamination and the landfill for the following reasons: 1) similar Cd concentrations were observed in all shallow groundwater samples regardless of distance to the landfill, 2) groundwater table and availability was not identified below the landfill. The soil samples did not indicate cadmium contamination, while surface water samples were found to contain similar cadmium concentrations. The ECA also found that the Cd concentrations in the landfill leachate were at the same levels as the groundwater and surface water samples and concluded that the Cd concentration in the leachate was low.

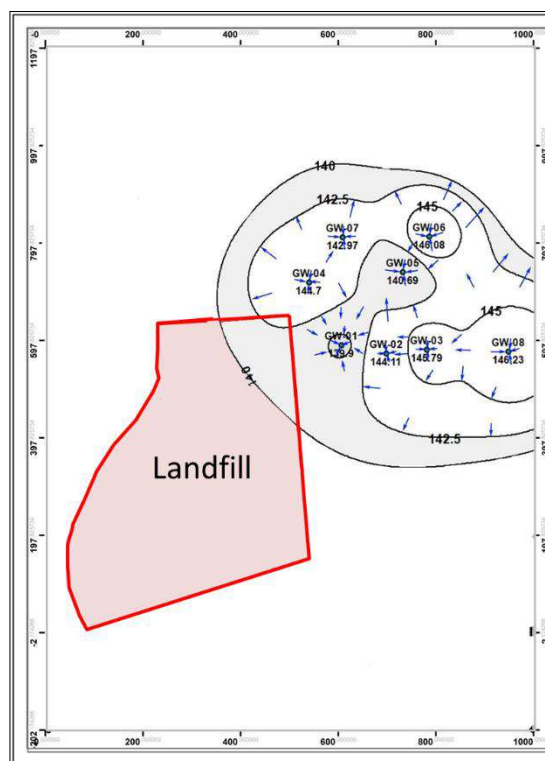


Figure 4. Map of groundwater level contour and groundwater flow direction

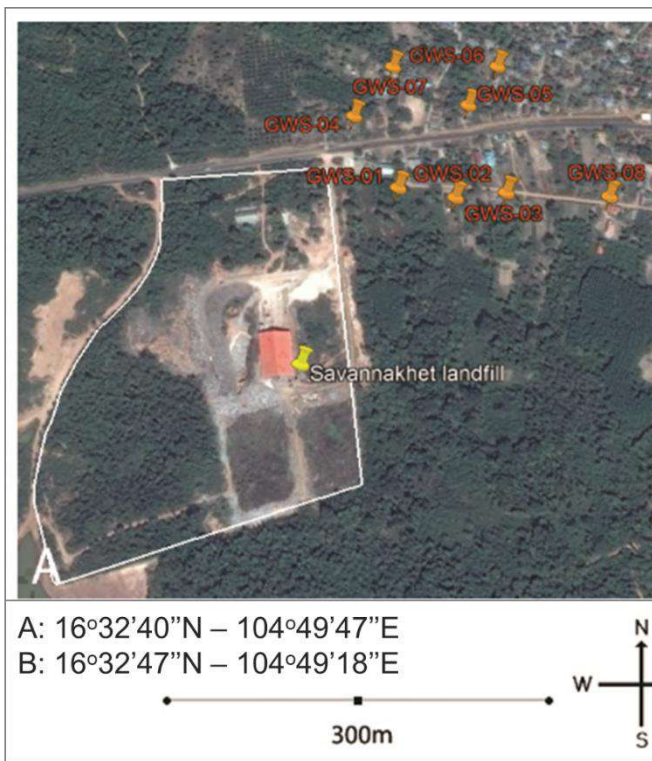


Figure 5. Map of groundwater sampling locations

c. Permeability of soils and hydrogeology

39. The lithology of the three drilled wells shows a significant varying of geological layers of the landfill soils (APPENDIX H: Spatial locations and lithologies of the three drilled wells). In general, it is marked that from the ground to a depth of 9m, there is a good stratum (impermeable layers) for constructing the landfill, meanwhile, from a depth of 9m to 17m, semi-permeable & permeable layers of geological structure of the existing landfill site are observed.
40. Based on the three test wells the ECA identified that from the ground to a depth of 9 meters, there is a good stratum (impermeable layers) for constructing the landfill, while from a depth of 9 meters to 17 meters, there are semi-permeable and permeable layers. Further, considering that no groundwater was identified beneath the landfill site, the ECA concludes that risk of groundwater contamination is very low and that an engineered liner (e.g., HDPE or equivalent flexible membrane liner) will not be required for the new sanitary landfill. The ECA finds that the bottom seal of compacted red clay hard surface as included in the DED is suitable for the new landfill to protect the surrounding environment by containing leachate generated within the landfill.

d. Content and toxicity of the existing cells

41. Leachate sampling and analysis was conducted at eight locations at the landfill (APPENDIX I: Comparison of some key parameters of the Kaysone leachate with those of leachate from other countries). The leachate analysis found that pH ranged from 7.04-8.56, averaging 7.8. The analysis of BOD₅ and COD varied between 211 mg/L and 442 mg/L for BOD₅ and COD between 403 mg/L to 960 mg/L. The ECA concludes that in comparison with other landfills the leachate is in the range of the typical value for landfill leachate on key parameters. It also finds that the Cd concentration in the landfill leachate is low.
42. The ECA also conducted waste quality analysis of eight waste samples taken from the landfill. The parameters included Total Solids (TS); Volatile Solids (VS); Moisture content; Ash content and TOC.

e. Influence of existing dumpsite on the environment

43. The ECA concluded that the existing landfill presents no particular contamination to the soil and groundwater and that it exercises no significant environmental threats to the surrounding areas, e.g. groundwater and soil. Heavy metal contamination of soil samples from the landfill was not detected.
44. The ECA makes recommendations to install drainage layer, collection drains, ponding, and treatment and to establish connection of the leachate collection system to the leachate treatment system included in the design of the new landfill.

f. Rehabilitation and closure options

45. Based on the information presented in previous sections of the document, ECA report includes the Corrective Action Plan (CAP, see section below) to identify gaps and improve the performance of the existing landfill to the level acceptable for fulfillment of local regulations of Lao PDR, ADB's 2009 Safeguard Policy Statement (SPS) requirements and other applicable standards..

g. Corrective action plan

46. The ECA prepared a CAP defining necessary remedial actions, the budget for such actions, and the time frame for resolution of noncompliance. The CAP is annexed in this EMP. The key actions in the CAP include:
 - Prepare ESMP and submit to environmental authority to obtain ECC;
 - Implement ESMP;
 - Develop and implement operational manual including Occupational Health and Safety and Community Safety measures;
 - Establish complaint resolution and grievance mechanism;
 - Install drainage layer, collection drains, ponding, and treatment;
 - Design a suitable leachate collection.
 - Recommended updates of the detailed engineering design of the new sanitary landfill

47. The ECA assessed that the DED of the new landfill is developed in accordance with applicable design standards of a sanitary landfill, expected to guarantee a long-term sustainability of the project with minimum social and environmental impacts. The ECA made recommendations to the DED on the following areas:

- Conduct a test weighing of current waste collection to justify the calculation of waste;
- Existing landfill to continue operation and the DED to take into account connections and shared facilities, in particular leachate treatment facility. Private operator of existing landfill to restore the leachate collection system to an outlet point from where it can be transported to the leachate treatment system by gravity.

h. Institutional setup and capacity for operating the Solid Waste site

48. The ECA did not conduct an in-depth assessment of the institutional setup and capacity for operating the solid waste site, but recommended the preparation and implementation of an ESMP, an OHS management system, and an operational manual for the currently operating landfill.

VI. CONTRACTOR REQUIREMENTS

49. In the context of the project the construction Contractor should commit to respect the following during the whole period of the construction activities:

- (i) Establish an operational system for managing environmental impacts;
- (ii) To submit Contractor's Environmental Management Plan (CEMP), addressing at a minimum the subproject EMP, including subplans;
- (iii) To carry out the monitoring and mitigation measures specified in the EMP, to ensure adherence to the EMP throughout the construction stage, and to efficiently implement measures outlined in the EMP;
- (iv) To allocate sufficient budget to ensure that such measures are carried out;
- (v) To prepare and submit environmental monitoring reports as specified in the EMP;
- (vi) To comply with any corrective or preventative actions/measures identified in safeguards monitoring reports or as outcome of audits;
- (vii) Appoint an Environmental Representative to be the primary point of contact within his organization for all matters relating to environmental management;
- (viii) To comply with Lao PDR and ADB requirements and to provide self-monitoring program to ensure compliance;
- (ix) To prepare a corrective action plan with respect to non-compliance issues identified by the Project Manager and to implement by the date agreed;
- (x) To participate in pre-construction consultation as and if required by the PMU;
- (xi) To elaborate and manage the Occupational Health and Safety Plan;
- (xii) To respect internationally recognized good practices;
- (xiii) To provide effective environmental briefing/induction to personnel employed or contracted on environmental issues and the requirements for environmental management, maintain records of attendance of training, and provide ongoing training such as on site briefings or tool-box meetings;
- (xiv) to develop grievance management procedures, signpost contact points signpost contact information;
- (xv) to conduct informal consultations with affected persons and village heads in the project area;

- (xvi) to monitor the construction and impacts and submit regular monitoring reports as specified in the EMP; and
- (xvii) Admit regular monitoring and auditing of activities.

50. All contractual and legal obligations relating to the EMP should apply to both the construction contractors and their subcontractors. It should be the responsibility of the construction contractors to provide adequate resources to ensure effective implementation and control of the EMP. Each subcontractor should be accountable to its respective contractor for compliance with the measures presented in the EMP. Construction contractors and their subcontractors should ensure that the entire project staff is briefed and procedures are understood and followed.

VII. MITIGATION MEASURES AND PLAN

51. Environmental mitigation and management issues concerning the subproject arise in the construction and operation phases. Mitigation should be centered on the need to ensure that the contractor and operator act in an environmentally responsible way. Therefore, an environmental management plan (EMP) is part of the contract for construction. The EMP specifies the approach to construction site preparation and operation including pollution control and waste management.

52. The broad measures are as follows; while the specific measures are presented in Table 5:

- (i) Adequate consideration in detailed design of environmental concerns as sufficient perimeter buffer zone if this facility is envisioned for long-term operations, landfill gas migration or explosion, leachate overflows, appropriate operations to optimize use of site, among others.
- (ii) Specifying environmentally preferred construction practices, materials and technologies, where possible, in the detailed design and/or bidding documents, such as (but not limited to) management of cut and fill to minimize stockpile volume, safe handling of scattered wastes, appropriate approach to take to ensure safe landfill operations while rehabilitating and upgrading the landfill.
- (iii) Ensuring the engagement of an environment-responsible Contractor by incorporating the ADB-cleared Subproject EMP into the bidding documents for use as basis in the preparation of Contractor's EMP (CEMP), addressing as minimum the requirements of the Subproject EMP. Bidders' CEMPs to be quantitatively and qualitatively evaluated against the Subproject EMP.
- (iv) Good and environment-friendly engineering practices that avoid first, and (if unavoidable) mitigate, adverse impacts; and full implementation of the CEMP/Subproject EMP.
- (v) Quality construction supervision and environmental monitoring by the PMIU.
- (vi) Improved O&M Manual.
- (vii) Sufficient funds for sustained quality of operation and maintenance.
- (viii) Observance of the grievance redress mechanism and prompt action/ resolution.

53. The mitigation measures of the EMP are presented in a comprehensive mitigation plan for the subproject component summarized in Table VII-1. The plan includes the environmental issues and concerns raised at the stakeholder meetings. The plan identifies responsible parties, location, and timing. Indicative costs are tabled separately.

Table VII-1. Environmental Impacts Mitigation Measures Plan

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost	Responsibility	
							Super-vision	Implemen-tation
Pre-Construction Phase								
Consultation/ Disclosure, & community engagement	Community grievances	1. Pre-construction consultation with affected people, including dissemination of project level Grievance Redress Mechanism (GRM).	For all construction sites.	Before construction (but not later than 3 months after NTP)	Once regular GRM reporting	Management cost/ integrated in PMU budget	IA/PMU	PIT/GPP
Government approvals	-	2. Subproject EMP submitted to DONRE for approval. 3. Updated EMP shall be submitted to EAs/IAs for approval and endorsement to ADB. 4. The Contractor shall ensure that required permits and clearances have been obtained from relevant government agencies.	Entire subproject	Before bidding Before construction	Once As required	Management cost/ integrated in PMU budget	IA/PMU	IA/PMU
UXO survey, & removal	Injured worker or public	5. Obtain the appropriate Government certification on UXO (certificate of UXO clearance or no UXO clearance needed)	All construction sites.	Before construction (but not later than 3 months after NTP)	Once	Government cost	EA	Government
Bid documents	-	6. Updated EMP included in contractor tender documents, and tender documents specify that requirements of EMP must be budgeted. 7. Bid documents specify that contractor must have experience with implementing EMPs, or provide staff with the experience.	Entire subproject	Before bidding	Once	Management cost/ integrated in PMU budget	IA/PMU	IA/PMU
Construction Phase								
Initiate EMP & subplans	Prevent or minimize impacts	8. Contractor to submit Contractor's Environmental Management Plan (CEMP) for approval, addressing at a minimum the subproject EMP, including subplans (refer below).	For all construction sites	Before construction	Once	Integrated in Contractor's contract	CSCS	Contractor
Community engagement	Community grievances	9. Contractor to establish Grievance management procedures in line with project level GRM and signpost contact information (phone number and website).	For all construction sites	Before construction	Once	Integrated in Contractor's contract	CSCS/G PP	Contractor

		10. Contractor's Environmental Representative to conduct ongoing consultations with the affected persons in the project area through random site walks and consultations and to document the results of the consultations for inclusion in the environmental monitoring report.						
Obtain & activate permits and licenses	Prevent or minimize impacts	11. Contractors to comply with all statutory requirements set out by Government for use of construction equipment.	For all construction sites	Beginning of construction	Once	Integrated in Contractor's contract	CSCS	Contractor
Implement Construction materials acquisition, transport, and storage subplan	Pollution, injury, increased traffic, disrupted access	12. All topsoil and overburden removed should be stockpiled for later restoration. 13. Management of height of stockpile at site to avoid collapse and accidents. 14. Stockpiles and materials will be stored at least 50m from surface waters with drainage directed away from the irrigation canals or drainage channels and agricultural productive land. 15. Define & schedule how materials are transported, and handled & stored at sites. 16. All aggregate loads on trucks should be covered. 17. Piles of aggregates at sites should be used/or removed promptly, or covered and placed in non-traffic areas. 18. All construction fluids such as oils, and fuels should be stored and handled well away from vegetated areas.	For all construction areas	Throughout construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Implement Spoil management subplan	Contamination of land and surface waters from excavated spoil, and construction waste	19. Where possible spoil should be used for backfilling. 20. Spoil to be disposed of within the site perimeter, clearly marked and identified. 21. A record of type, estimated volume, source of disposed spoil, and location of disposal must be made. 22. Contaminated spoil disposal must follow Government regulations including handling, transport, treatment (if necessary), and disposal. 23. Suspected contaminated soil must be tested, and disposed of in designated sites identified as per Government regulations. 24. Before treatment or disposal, contaminated spoil must be covered with plastic and isolated from all human activity.	All excavation areas	Throughout construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Implement Solid and liquid construction	Contamination of land and surface waters from	25. Management of general solid and liquid waste of construction will follow Government regulations, and will cover, collection, handling, transport, recycling, and	All construction sites and work camps	Throughout construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor

waste subplan	construction waste	<p>disposal of waste created from construction activities and the work force.</p> <p>26. Hazardous Waste: Collection, storage, transport, and disposal of hazardous waste such as used oils, gasoline, paint, and other toxics must follow Government regulations.</p> <p>27. Wastes should be separated (e.g., hydrocarbons, batteries, paints, organic solvents)</p> <p>28. Wastes must be stored above ground in closed, well labeled, ventilated plastic bins in good condition well away from construction activity areas, all surface water, water supplies, and cultural and ecological sensitive receptors.</p> <p>29. All spills must be cleaned up completely with all contaminated soil removed and handled with by contaminated spoil subplan.</p>						
Implement Dust subplan	Dust	<p>30. Regularly apply wetting agents to exposed soil and construction roads.</p> <p>31. Establish baseline and implement air quality monitoring of parameters dust, suspended particles, SO_x, NO_x, and CO including at relevant location at the existing landfill operation following a recognized methodology and review results against ambient air quality standard (refer Table XIII-3. Ambient Air Quality Standard).</p> <p>32. Cover or keep moist all stockpiles of construction aggregates, and all truck loads of aggregates.</p> <p>33. Minimize time that excavations and exposed soil are left open/exposed. Backfill asap.</p>	All construction sites.	Fulltime	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Implement Noise subplan	Noise	<p>34. Establish a schedule (hours during the day) of construction activities, acknowledging daytime, evening, and night time noise limits and minimize noise intrusive impacts during most noise sensitive hours.</p> <p>35. Restrict working time to daytime when working close to or at risk of impacting residential areas.</p> <p>36. Schedule truck loading, unloading, and hauling operations so as to minimize noise levels near residences.</p> <p>37. Configure the construction site in a manner that keeps noisier equipment and activities as far as possible from nearby buildings. Orient plant and equipment known to emit noise strongly in a direction away from residences.</p>	All construction sites.	Fulltime	Monthly	Integrated in Contractor's contract	CSCS	Contractor

		<p>38. Establish temporary noise barriers around excessively noisy activity areas.</p> <p>39. Provide acoustic enclosures for diesel generators.</p> <p>40. Construction equipment manufactured or modified to reduce noise and vibration emissions shall be favoured, such as electric instead of diesel-powered equipment and hydraulic tools instead of pneumatic impact tools.</p>						
Implement Tree and vegetation removal, and site restoration subplan	Damage or loss of trees, vegetation, and landscape	<p>41. Restrict tree and vegetation removal to within the construction area and no unnecessary cutting of trees.</p> <p>42. Within the construction area, minimize removals, and install protective physical barriers around trees that do not need to be removed.</p> <p>43. Re-vegetate and landscape using native plant and tree species for revegetation</p>	All construction sites.	Beginning and end of subproject	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Implement Erosion control subplan	Land erosion	<p>44. Berms and plastic sheet fencing should be placed around all excavations and earthwork areas.</p> <p>45. Earthworks not permitted during the rainy season and to be conducted in dry weather.</p> <p>46. Maintain a stockpile of topsoil for immediate site restoration following backfilling.</p> <p>47. Protect exposed or cut slopes with planted vegetation, and have a slope stabilization protocol ready.</p> <p>48. Re-vegetate all soil exposure areas asap.</p>	All construction sites	Throughout construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Implement worker safety subplan	Worker injury and health	<p>49. Worker safety guidelines of Government and IFC EHS Guidelines should be followed, whichever is more stringent.</p> <p>50. Elaborate and manage the Plan for Occupational Health and Safety (OHS) for the works (refer Basic Specifications).</p> <p>51. Worker education and awareness seminars for construction hazards should be given. A construction site safety program should be developed and distributed to workers.</p> <p>52. Appropriate safety clothing and footwear should be mandatory for all construction workers.</p> <p>53. Adequate medical services must be on site or nearby all construction sites.</p> <p>54. Drinking water must be provided at all construction sites.</p> <p>55. Adequate worker facilities, including toilets, rest room, and washing facilities to be provided.</p> <p>56. Sufficient lighting be used during necessary night work.</p>	All construction sites	Fulltime	Monthly	Integrated in Contractor's contract	CSCS	Contractor

		57. All construction sites should be examined daily to ensure unsafe conditions are removed.						
Occupational H&S	Fire Risk	58. Smoking will be prohibited at existing dumpsites	All construction sites	Fulltime	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Implement public safety subplan	Public injury, and health	59. Proper fencing, protective barriers, and buffer zones should be provided around all construction sites. 60. Sufficient signage and information disclosure, and site supervisors and night guards should be placed at all sites. 61. Public safety guidelines of Government should be followed. 62. Speed limits should be imposed on all roads used by construction vehicles. 63. Standing water suitable for disease vector breeding should be filled in.	All construction sites	Throughout construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Civil works	Degradation of water quality	64. Erosion channels must be built around aggregate stockpile areas to contain rain-induced erosion. 65. Earthworks not permitted during the rainy season and should be conducted during dry weather. 66. All construction fluids such as oils, and fuels should be stored and handled well away from surface waters. 67. No washing or repair of machinery near surface waters. 68. Establish baseline and implement water quality monitoring of downstream water ponds following a recognized methodology and review results against Lao PDR surface water quality standard (Table XIII-1. Surface water quality standards in Lao PDR) 69. Develop staging plans	All construction sites	Throughout construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Implement Construction traffic subplan	Traffic disruption, accidents, public injury, community access	70. Schedule construction vehicle activity during light traffic periods. Use sufficient signage & warning lights. 71. Enforce speed limits, and create dedicated construction vehicle roads or lanes. 72. Plan construction-related activities to minimize impacts to the operation of the existing landfill and other businesses in the area. For example, park construction machinery and site works related equipment to avoid blocking access.	All construction sites	Construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Implement Construction Drainage subplan	Loss of drainage & flood storage	73. Provide adequate short-term drainage away from construction sites to prevent ponding and flooding. 74. Install temporary storm drains or ditches for construction sites.	All areas with surface waters	At the start, and throughout	Monthly	Integrated in Contractor's contract	CSCS	Contractor

		75. Ensure connections among existing drainage infrastructure and surface waters (ponds, streams) are maintained or enhanced to sustain existing stormwater storage and drainage capacity. 76. Protect surface waters (e.g. downstream ponds) from silt and eroded soil.		construction phase				
Civil works	Damage to cultural property or values, and chance finds	77. Chance-finds of valued relics and cultural values should be anticipated by contractors. Site supervisors should be on the watch for finds. 78. Upon a chance find all work stops immediately, find left untouched, and PMU notified. If find deemed valuable, provincial cultural authorities must be notified. 79. Work at find site will remain stopped until authorities allow work to continue.	All construction sites	At the start, and throughout construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Civil works	Improper closure of construction sites	80. Prior to demobilization, the contractor will remove all wastes and spoils from the construction sites and construction-related areas, and will undertake restoration of the disturbed sites, including rehabilitation of roads damaged during construction phase. The contractor shall submit for approval to the Engineer a Site Restoration Plan upon completion of work for each site.	All construction sites	At the end of construction phase	Once	Integrated in Contractor's contract	CSCS	Contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost	Responsibility	
							Super- vision	Implemen- tation
Operation of Landfill & Materials Recovery Facility (MRF)								
Operation of Existing Landfill	General	81. Implement Corrective Action Plan (CAP), including; 82. Prepare ESMP for existing landfill operation and submit to environmental authority to obtain ECC; 83. Implement ESMP for existing landfill operation; 84. Develop and implement operational manual including Occupational Health and Safety and Community Safety measures for the existing landfill; 85. Establish complaint resolution and grievance mechanism for the existing landfill operation; 86. Install drainage layer, collection drains, ponding, and treatment at existing landfill;	Existing Landfill	Upon agreement on CAP	Biannual	Refer approved CAP	UDAA/Private Landfill Operator	

		87. Establish connection of the leachate collection system to the leachate treatment system included in the design of the new landfill.					
Operation of landfill & facilities	General	88. Implement the Solid Waste Management Operation Manual.	Landfill	Continuously	Biannual	Management cost	UDAA/Private Landfill Operator
Operation of landfill & facilities	Land and surface water pollution	89. Ensure compact clay lining, pipelines, leachate collection system, septic sludge treatment plant, and leachate and septic sludge effluent treatment facility stay in good working order.	Landfill, septic sludge treatment plant, and leachate treatment facility	Continuously	Biannual	Management cost	UDAA/Private Landfill Operator
Operation of landfill	Land and water pollution	90. Develop and implement a regular testing protocol for the quality of the treated leachate and effluents.	Leachate facility	Periodically	Biannual	Management cost	UDAA/Private Landfill Operator
Operation of landfill	Worker and public injury	91. Educate workers in workplace safety. Prevent public access to landfill property and with fencing and warning signage.	Landfill and facilities	Continuously	Biannual	Management cost	UDAA/Private Landfill Operator
Operation of landfill	Emergency spills and untreated leachate discharges	92. Regularly review accident prevention management plan, and test emergency response plan for equipment failure and spills.	Landfill and leachate management facility	Periodically	Biannual	Management cost	UDAA/Private Landfill Operator
Operation of landfill	Disease vector & vermin habitat	93. Cover all standing water as much as possible, and cover landfill areas as soon as possible	Landfill	Continuously	Biannual	Management cost	UDAA/Private Landfill Operator
Operation of landfill	Sickness caused by operation of landfill & leachate facility	94. Coordinate with local public health officials to monitor incidence of water and air-borne sickness or disease in the local community and worker force that could be caused by the landfill & treated leachate disposal	Surrounding community areas	Continuously	Biannual	Management cost	UDAA/Private Landfill Operator
Operation of landfill	Surface water and air quality	95. Coordinate with DoNRE for regular monitoring of the upstream and downstream water and ambient air that potentially are influenced by landfill & leachate management and operation. Coordinate with DoNRE to identify sampling locations.	Upstream and Downstream water ponds and wells	Biannual	Biannual	Management cost	UDAA/Private Landfill Operator

Operation of landfill	Air quality	96. Installation of gas emission system	Landfill	At the start, and throughout construction phase	Monthly	Integrated in Contractor's contract	CSCS	Contractor
Operation of landfill	Occupational Health and Safety	97. The operator will detail how the health and safety of the staff at the site will be protected. This will include: <ul style="list-style-type: none"> • Measures taken during handling of waste including sorting any waste to segregate recyclables • Personal protective equipment provision and enforcement of its use • Health testing (frequency and parameters e.g. for Hepatitis B and tetanus) • Emergency and Incident Management including prompt medical attention for cuts to prevent contact with the incoming loads or feedstock • Good housekeeping measures e.g. Clean and wash with disinfectant the welfare facilities weekly and building and equipment every 4 weeks • Training plans (frequency and duration of training) in safe operations for all aspects of the operation including landfill gas and leachate management and use of heavy equipment. 	Landfill	Continuously	Biannual	Management cost	UDAA/Private Landfill Operator	

VIII. MONITORING AND REPORTING

54. The environmental monitoring plan for the EMP is provided in Table VIII-1. The monitoring plan focuses on the construction and operation phases of the subproject and consists of environmental indicators, the sampling locations & frequency, method of data collection, and responsible parties. Estimated costs are tabled separately. The purpose of the monitoring plan is to determine the effectiveness of the impact mitigations, and to document any unexpected positive or negative environmental impacts of the subproject.

A. Environmental Standards for Subproject

55. Environmental standards are listed in Appendix B. Where Lao PDR regulations differ from the environmental standards provided by the Environmental, Health and Safety Guidelines (General and applicable) of the World Bank (2007), the reference will be whichever is more stringent.

B. Performance Monitoring

56. Performance monitoring is required to assess the overall performance of the EMP. Select indicators of major components of the environment that will be affected primarily by the construction phase are drawn from the mitigation and monitoring plans and summarized in Table VIII-2.
57. Under the CSCS, Environmental Specialists will be employed to support the implementation of the environmental monitoring program. The IA/PMU and PIT will provide logistical support where necessary for the implementation of the environmental monitoring plan.

C. Reporting

58. Regular reporting on the implementation of mitigation measures, and on monitoring activities during construction phase of the subproject is required. Reporting should document progress and the results of mitigation. The Reporting will be conducted at different levels and is the overall responsibility of the PMU. The mitigation and monitoring plans (Table VII-1 and Table VIII-1) summarize proposed timing of reporting. The Contractor will report on monthly basis on implementation of the mitigation plan and on the monitoring plan. Environmental monitoring reports will be prepared quarterly for the EA by the PMU and PIT supported by the CSCS Environmental Specialists and send to the DONRE and ADB. A semi-annual Safeguards Monitoring Report will be submitted to ADB. A draft format and outline for the Environmental Monitoring Report is provided in the Appendix Draft format for Environmental Monitoring Report.

Table VIII-1. Environmental Monitoring Plan

Aspect/Parameter to be monitored	Location	Means of Monitoring	Frequency	Reporting	Responsibility	
					Compliance Monitoring	Implement
Construction Phase						
Environmental mitigation implemented according to the CEMP/EMP	All construction sites	Field observations Consulting affected residents Review of grievances	Regular and random Random Regular	Monthly	CSCS	Contractor
Ambient air quality (TSP, PM ₁₀ , SO _x , NO _x , and CO), baseline and periodically during construction against Lao PDR standards.	Sensitive receptors and control points upwind and downwind of construction site.	Following recognized methodology, method specified in Agreement 2734/PMO, WREA, 2009	Prior to construction (but not later than 3 months after NTP) Quarterly	Before construction Quarterly	CSCS	Third party environmental monitoring laboratory/ company to be commissioned by CSCS
Water quality in the upstream and downstream water ponds against Lao PDR surface water quality standards. Baseline and annual monitoring of: TSS, heavy metals (As, Cd, Pb,) oil and grease, total & faecal coliform, pH, DO, COD, BOD ₅ , temperature, TDS, NH ₃ , NH ₄ , other nutrient forms of N & P, sulphides, surfactants, turbidity (NTU). Quarterly monitoring of: Temperature, pH, COD, BOD ₅ , TSS, turbidity (NTU),	Upstream and downstream of construction site	Following recognized methodology, method specified in Agreement 2734/PMO, WREA, 2009	Prior to construction (but not later than 3 months after NTP) Large group as baseline and annually Small group quarterly	Before construction Quarterly	CSCS	Third party environmental monitoring laboratory/ company to be commissioned by CSCS

[illegible]

Aspect/Parameter to be monitored	Location	Means of Monitoring	Frequency	Reporting	Responsibility	
					Compliance Monitoring	Implement
Worker or public injury associated with O&M.	Landfill	Regular record keeping.	Continuously	For each event	UDAA/Private Landfill Operator	
Ambient air quality (TSP, PM ₁₀ , SO _x , NO _x , and CO), baseline and periodically during operation against GoL standards.	Sensitive receptors and control points upwind and downwind of construction site.	Following recognized methodology, method specified in Agreement 2734/PMO, WREA, 2009	Prior commissioning to Quarterly	Before construction Quarterly	DONRE	UDAA/Private Landfill Operator
Water quality in the upstream and downstream water ponds against GoL surface water quality standards. Baseline and quarterly monitoring of TSS, heavy metals (As, Cd, Pb,) oil and grease, total & faecal coliform, pH, DO, COD, BOD ₅ , temperature, TDS, NH ₃ , NH ₄ , other nutrient forms of N & P, sulphides, surfactants, turbidity (NTU). Establish baseline prior to commissioning and periodically during operation.	Upstream and downstream of construction site	Following recognized methodology, method specified in Agreement 2734/PMO, WREA, 2009	Prior commissioning to Quarterly	Before commissioning Quarterly	DONRE	UDAA/Private Landfill Operator through third party laboratory/company
Treated Leachate quality at discharge point. Baseline and quarterly monitoring of: TSS, heavy metals (As, Cd,	At discharge to wetland.	Following recognized methodology, method specified in Agreement 2734/PMO, WREA, 2009	Prior commissioning to Quarterly	Before commissioning Quarterly	DONRE	UDAA/Private Landfill Operator through third party laboratory/company

Aspect/Parameter to be monitored	Location	Means of Monitoring	Frequency	Reporting	Responsibility	
					Compliance Monitoring	Implement
Pb,) oil and grease, total & faecal coliform, pH, DO, COD, BOD ₅ , temperature, TDS, NH ₃ , NH ₄ , other nutrient forms of N & P, sulphides, surfactants, turbidity (NTU). Establish baseline prior to commissioning and periodically during operation.						

Table VIII-2. Performance Monitoring Indicators for the Solid Waste Management Subproject

Major Environmental Component	Key Indicator	Performance Objective	Data Source
Pre-construction Phase			
Public Consultation & Disclosure	Affected public & stakeholders	Meetings with stakeholders contacted during IEE & new stakeholders convened for follow-up consultation & to introduce grievance mechanism.	Minutes of meeting, and participants list
Bid Documents	Requirements of EMP (CEMP)	EMP appended to bidding documents with clear instructions to bidders for CEMP.	Bid documents
Environmental compliance certificate (ECC)	ESIA prepared and ECC secured from DONRE	Compliance with Law on Environmental Protection	Updated IEE/ESIA
Construction Phase			
Air quality	Dust, suspended particles, SO _x , NO _x , CO from construction site not exceeding Lao PDR standards at receptors.	Air quality monitoring implemented and results in line with standards Dust control measures implemented.	Contractor and CSCS monitoring reports
Noise	Noise from construction sites not exceeding Lao PDR standards at receptors (existing landfill operation, surrounding residential areas).	Noise control measures implemented.	Contractor and CSCS monitoring reports
Soil quality	Solid & liquid waste from all construction activities quantified and notified to the CSCS and disposed of in line with regulations and requirements.	Rigorous program of procedures & rules to collect and store all waste from sites practiced.	Contractor and CSCS monitoring reports
Water quality	No significant impact on the water quality in the downstream water ponds attributed to construction activities.	Water quality monitoring implemented and results show no significant impact to water quality attributed to the construction activities. Water quality protection measures implemented to prevent pollution of surface water.	Contractor and CSCS monitoring reports

Hazardous materials & waste	Hazardous materials & waste quantified and notified to CSCS and disposed of in line with regulations and requirements	Rigorous program of procedures to manage and store all waste from construction sites practiced.	Contractor and CSCS monitoring reports
Public & worker safety	Frequency of injuries	Adherence to Lao PDR policy and site-specific procedures to prevent accidents. Incidents are investigated and corrective actions identified and implemented.	Contractor reports
Cultural property	Incidence of damage, or complaints	No valued cultural property, or unearthed valuable relic is damaged in any way.	Public input, contractor reports and CSCS reports
Grievances and Grievance Redress Mechanism	Grievances lodged	Lodged grievances are acted upon and the Grievance Redress Mechanism (GRM) is followed.	Hotline number posted at construction site, grievances/complaints received through website, GRM reports.
Traffic	Frequency of disruptions & blocked access	Disruptions, stoppages, or detours are managed to absolute minimum.	Public input, contractor reports and CSCS reports
Operation Phase of Components			
Worker or public injury associated with O&M of facilities.	Frequency of accidents	Zero incidents.	Records of UDAA/OPWT
Surface water quality	Contamination from landfill leachate and effluent	Leachate treated to Lao PDR specifications and disposed in approved location.	Public input, MoNRE inspections, Kaysone SW. regular reporting
Groundwater quality	Contamination from landfill cells	Groundwater not penetrated, no contamination	DoNRE well sampling, Kaysone SW. regular reporting
Air quality	Dust, suspended particles, SO _x , NO _x , CO not exceeding Lao PDR standards at receptors.	Air quality monitoring implemented and results in line with standards	DONRE

IX. ESTIMATED COST OF EMP

59. The cost for implementing the EMP includes costs for implementing the environmental mitigation, management, and monitoring measures. The costs for implementing impact mitigation measures

are integrated in the Construction contract. The costs for conducting environmental monitoring measures should be priced by the Contractor in their bid.

60. The estimated cost for the budgeted items of the implementation of the EMP for the Solid Waste Management Subproject is USD 19,800 (Table IX-1), excluding the costs that should be integrated in the Construction Contract, Construction Supervision Contract, or the PMU budget.

Table IX-1. Cost Estimation of EMP for the Solid Waste Management Subproject

Activity	Indicative Cost (USD)			
	Integrated into Construction Contract	Integrated into Supervision Contract (CSCS)	Integrated into PMU Budget	Training*, Technical Assistance & Services Budget
Environmental Mitigation				
Construction Phase				
Implementation of Mitigation Plan	Subproject cost ⁷	Subproject cost ⁷		
Environmental Monitoring				
Construction Phase				
Monitoring of community & workers' health and safety	Subproject cost ⁷	Subproject cost	Subproject cost	
Monitoring of Environmental mitigation and management	Subproject cost	Subproject cost	Subproject cost	
Baseline and quarterly monitoring of water quality in downstream water ponds	Subproject cost ⁷	Subproject cost		
Baseline and quarterly monitoring of air quality	Subproject cost ⁷	Subproject cost		
Performance Monitoring				
Project audits, including DONRE audit	8,000			
Seminars/Workshops				10,000
Sub-Total (USD)				18,000
Contingency at 10%				1,800
Total (USD)				19,800

61. *The UDAA staff do not appear to be familiar with modern practices in landfill management, incl. planning of the landfill, sorting of waste streams, opening and closing landfill cells, treatment of

sorted organic wastes, leachate treatment, landfill gas collection and energy production, maintenance of equipment. Staff training is required in these areas.

X. INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

62. The primary management framework overseeing the implementation of the environmental management plan (EMP) is defined by the: 1) Ministry of Public Works and Transports (MPWT) who is the executing agency (EA) of the subproject; 2) the Provincial Department of Public Works and Transport (PDPWT) Savannahket province who is the implementing agency (IA) of subproject; 3) a project management unit (PMU) formed by the IA to oversee implementation of the subproject in Kaysone and the subprojects in Phine and Dansavanh; and 4) the project implementation team (PIT) established in Kaysone Phomvihane, Phine, and Dansavanh to coordinate project activities at the district level.
63. The project has designated an Environmental Control Officer (ECO) in the PMU and PIT, while the construction contractor will nominate an Environmental Representative (ER). A Construction Supervision Consulting Services (CSCS) Consultant with environmental expertise will be appointed. The CSCS will be responsible to ensure that the Contractor implements the EMP during the Contract Period, to establish monitoring programme, review the EMP, and supervise its implementation. During the construction phase, the Contractor will generally be responsible for implementation of the mitigation measures as specified in the mitigation plan and the CSCS will supervise the implementation.
64. The Environmental Control Officer (ECO) will be responsible for monitoring, reviewing, and verifying compliance with the EMP by the construction contractor. In addition, the ECO will be responsible for ensuring that mitigation and compensation measures developed in the EMP are implemented where applicable. Monitoring these measures will also be the responsibility of the ECO, supplemented by additional staff if required. The ECO should be a local government official with the necessary training, equipment, and access to specialist support, if required.
65. The Contractor's Environmental Representative (ER) will be the construction contractor's focal point for all environmental matters and is routinely on-site for the duration of the construction works. The ER is an appropriately briefed technical officer (often the CC site engineer). The ER carries out regular inspections of the CC activities in relation to environmental issues, and provides day-to-day advice to contractor personnel about environmental issues. The Environmental Representative will have the authority to instruct any area of the Contractor's operations to implement the requirements of the Environmental Management Plan and any instructions from the Project Manager.

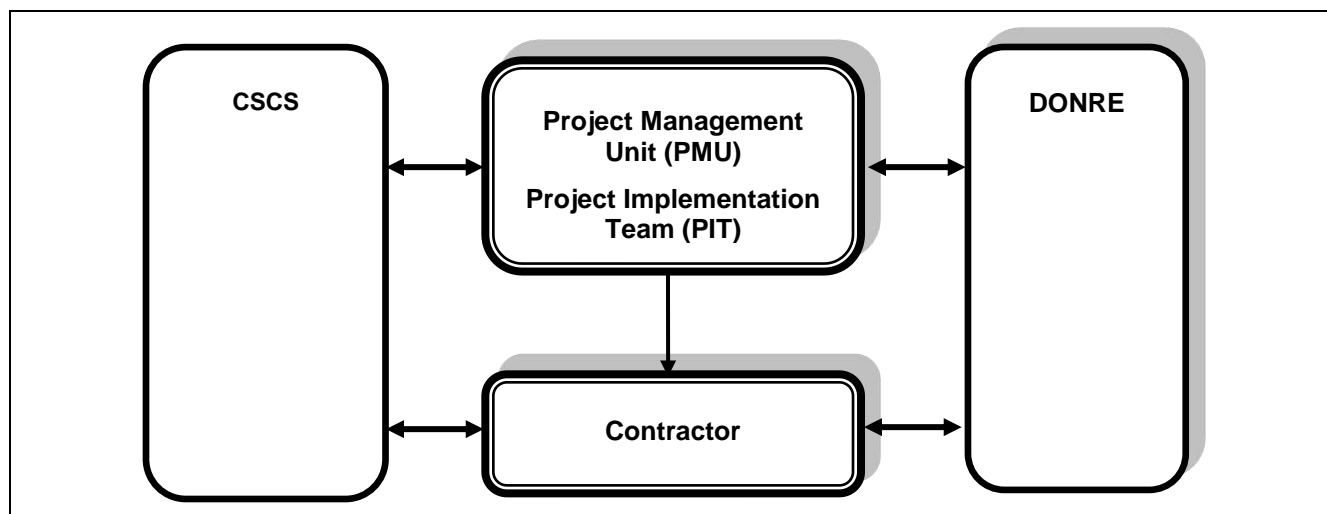


Figure 6. Organizational chart for EMP implementation

66. The responsibilities of the IA/PMU are summarized below:

1. Overall responsibility for project implementation and coordination of project activities;
2. Supervise the activities of the Project Implementation Teams organized within the District Authorities;
3. Undertake procurement of goods, works and services including recruitment of consultants for project management support, capacity development and training, independent audit and safeguards monitoring;
4. Develop and adapt a project performance management system in monitoring project activities using indicators and parameters in the design and monitoring framework;
5. Obtain necessary approvals and clearances of environment and resettlement from MONRE prior to awarding of civil works contracts;
6. Manage separate project financial records and accounts, and prepare financial reports;
7. Supervise the implementation of social and environmental safeguards and including timely disclosure of safeguards documents;
8. Supervise the implementation of the Consultation and Participation Plan, Gender Action Plan, and Stakeholder Communication Strategy;
9. Supervise the implementation of the resettlement plans including adequate measures to mitigate adverse resettlement impacts;
10. Ensure that environment management plans and gender considerations are incorporated in the detailed engineering designs and included in the civil works contracts;
11. Undertake regular quality control inspection of project facilities;
12. Manage the handover of project facilities to agencies responsible for operation and maintenance;
13. Prepare and submit quarterly and annual physical and financial progress reports to the EA; and

14. Undertake monitoring of compliance of social and environmental safeguards.

67. The responsibilities of the PIT are summarized below:

1. Coordinate the implementation of project activities at the district level;
2. Ensure the implementation of the approved work plans and program of activities;
3. Prepare and submit regular quarterly and annual physical and financial progress reports to the PMU;
4. Oversee and coordinate civil works and construction activities;
5. Ensure the implementation of social and environmental safeguards and including timely disclosure of safeguards documents;
6. Ensure the implementation of the Consultation and Participation Plan, Gender Action Plan, and Stakeholder Communication Strategy;
7. Ensure implementation of resettlement plans including adequate measures to mitigate adverse resettlement impacts;
8. Coordinate implementation of environmental management plan, and submit regular monitoring reports to the PMU;
9. Coordinate the updating of the resettlement plans and monitor implementation of resettlement activities; and
10. Undertake monitoring of project activities based on the indicators and parameters in the Design and Monitoring Framework (DMF) and prepare regular reports to the PMU on project achievements.

68. The PMU with assistance from the DED ensures that the EMP becomes part of the construction contract and with assistance from the CSCS that the EMP is implemented and that the Contractor abides by the EMP. The ECO should undertake regular site inspections and the results should be recorded and submitted to the relevant authorities as part of progress reporting.

A. Consultation and Public Participation Process

69. Information disclosure and stakeholder consultations were conducted as part of the environmental assessment process. The consultations involved in-depth key informant interviews with relevant Government agencies and focus grouped discussions.
70. The consultations aimed on environmental issues and concerns affecting the community. Specifically, the objectives of the consultation meetings are the following:
 - To present the proposed projects to the stakeholders;
 - To solicit views of the stakeholders relative to the proposed project;
 - To identify the most important project components for the locals;
 - To identify possible environmental issues inherent on the proposed project and
 - To identify mitigation measures to address these issues in the project design.
71. Subsequent information dissemination to, consultation with and participation of affected people and involved agencies will reduce the potential for conflicts and minimize the risk of project delays. Further information and consultations will be carried out before construction starts (during the first year of the project) and during the construction period.
72. Prior to the start of the construction, consultation will be carried out in all the areas where the proposed project activities are anticipated. The objective will be to provide the local population with accurate information on activities to be undertaken, on the schedule of these activities and on the potential nuisances for them during construction. This information stage, which concerns all the project sites, will be carried out jointly with the team in charge of RP preparation in those areas concerned by compensation and/or resettlement.
73. During the construction stage, consultation will be carried out with local population in specific area where construction activities are expected to start within 1 month. This will be carried out through focus group discussion with residents and key stakeholders (police station, ward heads) on possible nuisances (noise, dust, traffic/access constraint, temporary suspension of public utility, etc.), on safety measures they will have to respect (regarding engines under activity, risks of fall in excavations, risks specific to children etc.) and on the detailed schedule of activities.
74. At the end of the construction activities in a dedicated site, inspection of site to ensure cleaning and rehabilitation has been done by the Contractor will include interview of residents to possibly identify non-compliance in the rehabilitation of the site.

B. Grievance Redress Mechanism

75. A summary description of the Grievance Redress Mechanism is included below. For a more detailed description, please refer APPENDIX C: Project Level Grievance Redress Mechanism.
76. The PMU will appoint a Grievance Point Person (GPP) to handle environmental grievances lodged prior to construction, during construction and during operation. The PMU will provide sufficient support system, i.e., communication facilities, recording, and reporting system and funds, among others, shall have been set up to sustain the effective implementation of the mechanism. The GPP shall ensure that the mechanism, including names and contact details of responsible persons in the affected villages, PMU, UDAA and DPWT, is publicly disclosed, and posted in the offices of the affected villages and in strategic places of the Project's area of

influence. During operation, the GPP will liaise with the UDAA and the DPWT (the operators) for the management of the mechanism until loan closure.

77. The affected person lodge complaints to any of the following: i) village officers; ii) Contractor, during construction; iii) DPWT or UDAA; iv) PMU, through its GPP, or v) third parties, e.g., NGO, religious groups. The AP may also lodge complaint through ADB's accountability mechanism. Complaints may be acted on immediately by the responsible party. However, it shall be made a policy that all informally lodged and acted on complaints shall have to be registered with the PMU as soon as possible for record purposes.
78. The Contractor is required to establish grievance management procedures in line with the project level GRM and signpost contact information (phone number and website) on the construction site. The Contractor's Environmental Representative is required to conduct ongoing consultations with the affected persons in the project area through random site walks and consultations.
79. The CSCS and the GPP will conduct site visits and site walks and conduct consultations with affected persons and village heads to obtain information on grievances.

XI. EMERGENCY RESPONSE PLAN

80. The Contractor must develop emergency and incident response procedures for the construction phase. In the operational phase the operator/civil authorities will have responsibility for any emergencies or serious incidents. In the construction phase the key players include: a) Emergency Response Team (ERT) of the Contractor as initial responder; b) the District and City fire and police departments, emergency medical service, and the Department of Public Health (DPH), collectively referred to as the External Emergency Response Team (EERT), as ultimate responders. The Contractor will provide and sustain the required technical, human and financial resources for quick response during construction.

Table XI-1. Roles and Responsibilities in Emergency Incident Response in construction phase

Entity	Responsibilities
Contractor Team (ERT)	<ul style="list-style-type: none"> • Communicates/alerts the EERT. • Prepares the emergency site to facilitate the response action of the EERT, e.g., vacating, clearing, restricting site. • When necessary & requested by the EERT, lends support/ provides assistance during EERT's response operations.
External Emergency Response Team (EERT)	<ul style="list-style-type: none"> • Solves the emergency/incident
Contractor Resources	<ul style="list-style-type: none"> • Provide and sustain the people, equipment, tools & funds necessary to ensure Subproject's quick response to emergency situations. • Maintain good communication lines with the EERT to ensure prompt help response & adequate protection, by keeping them informed of Subproject progress.

81. The ERT will be led by the senior Contractor engineer (designated ERTL) on site with a suitably trained foreman or junior engineer as deputy. Trained first-aiders and security crew will be the core members of the ERT.
82. The Contractor will ensure that ERT members are physically, technically and psychologically fit for their emergency response roles and responsibilities.
83. Prior to the mobilization of civil works, the Contractor, through its Construction Manager, ERTL, in coordination with the PMU, will meet with the ultimate response institutions to discuss the overall construction process, including, but not limited to:
 - a) Subproject sites;
 - b) construction time frame and phasing;
 - c) any special construction techniques and equipment that will be used;
 - d) any hazardous materials that will be brought to and stored in the construction premise and details on their applications and handling/management system;
 - e) the Contractor's Emergency Management Plan
 - f) names and contact details of the ERT members
84. The objective of this meeting is to provide the ultimate response institutions the context for:
 - a) their comments on the adequacy of the respective Emergency Management Plans
 - b) their own assessment of what types, likely magnitude and likely incidence rate of potential hazards are anticipated
 - c) the arrangements for coordination and collaboration.
85. To ensure effective emergency response, prior to mobilization of civil works, the Contractor will:
 - a) set up the ERT;
 - b) set up all support equipment and facilities in working condition
 - c) make arrangements with the EERT;
 - d) conduct proper training of ERT members, and encouraged and train volunteers from the work force;
 - e) conduct orientation to all construction workers on the emergency response procedures and facilities, particularly evacuation procedures, evacuation routes, evacuation assembly points, and self-first response, among others; and
 - f) conduct drills for different possible situations.
86. To sustain effective emergency response throughout Subproject implementation an adequate budget shall be provided to sustain the capabilities and efficiency of the emergency response mechanism, the emergency response equipment, tools, facilities and supplies. Drills and reminders will take place regularly, the former at least every two months and the latter at least every month.

A. Alert Procedures

87. Means of communicating, reporting and alerting an emergency situation may be any combination of the following: i) audible alarm (siren, bell or gong); ii) visual alarm (blinking/rotating red light or orange safety flag); iii) telephone (landline); iv) mobile phone; v) two-way radio; and vi) public address system/loud speakers. Some rules relative to communicating/alerting will be:

- a) Whoever detects an emergency situation first shall immediately:
 - Call the attention of other people in the emergency site,
 - sound the nearest alarm, and/or
 - report/communicate the emergency situation to the ERT.
- b) Only the ERTL and, if ERTL is not available, the Deputy ERTL are authorized to communicate with the EERT. Exceptional cases to this rule may be necessary and should be defined in the Emergency Management Plans.
- c) When communicating/alerting an emergency to the EERT, it is important to provide them with at least: i) the type of emergency situation; ii) correct location of the emergency; ii) estimated magnitude of the situation; iii) estimated persons harmed; iv) time it happened; v) in case of a spill, which hazardous substance spilled; and vi) in case of fire and explosion, what caused it. Such details would allow the EERT to prepare for the appropriate response actions.

88. For an effective reporting/alerting of an emergency situation:

- a) The names and contact details of the relevant persons and institutions should be readily available in, or near to, all forms of communication equipment, and strategically posted (at legible size) in all Subproject sites and vehicles:
 - Most relevant construction/operations staffs namely, the ERTL, Deputy ERTL, first-aiders, supervising engineers, foremen
 - EERT institutions/organizations
 - Concerned village authority/ies
 - PMU Office, ECO
- b) All Subproject sites should have good access to any combination of audible and visual alarms, landline phones, mobile phones and two-way radio communication at all times.
- c) Contractor's construction vehicles should also be equipped with the appropriate communication facilities.

B. Emergency Response Situations

89. The following tables suggest general procedures that will be described in more detail in the Emergency Management Plans of the Contractor.

Table XI-2. Evacuation Procedure

Procedure	Remarks
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<ul style="list-style-type: none"> Move out as quickly as possible as a group, but avoid panic. 	<ul style="list-style-type: none"> All workers/staff, sub-contractors, site visitors to move out, guided by the ERT.
<ul style="list-style-type: none"> Evacuate through the directed evacuation route. 	<ul style="list-style-type: none"> The safe evacuation shall have been determined fast by the ERTL/Deputy ERTL & immediately communicated to ERT members.
<ul style="list-style-type: none"> Keep moving until everyone is safely away from the emergency site and its influence area. 	<ul style="list-style-type: none"> A restricted area must be established outside the emergency site, all to stay beyond the restricted area.
<ul style="list-style-type: none"> Once outside, conduct head counts. 	<ul style="list-style-type: none"> Foremen to do head counts of their sub-groups; ERTL/Deputy ERTL of the ERT.
<ul style="list-style-type: none"> Report missing persons to EERT immediately 	<ul style="list-style-type: none"> ERTL/Deputy ERTL to communicate with the EERT
<ul style="list-style-type: none"> Assist the injured in evacuation & hand them over to the ERT first-aiders or EERT medical group 	<ul style="list-style-type: none"> ERT to manage injured persons to ensure proper handling.
<ul style="list-style-type: none"> If injury warrants special care, DO NOT MOVE them, unless necessary & instructed/directed by the EERT. 	<ul style="list-style-type: none"> ERTL/Deputy ERTL communicates with EERT to get instructions/directions in handling the injured.

Table XI-3. Response Procedure During Medical Emergency

Procedure	Remarks
<ul style="list-style-type: none"> Administer First Aid regardless of severity immediately. 	<ul style="list-style-type: none"> Fundamentals when giving First Aid: Safety first of both the rescuer and the victim. Do not move an injured person unless: victim is exposed to more danger when left where they are, e.g., during fire, chemical spill it would be impossible for EERT to aid victims in their locations, e.g., under a collapsed structure instructed or directed by the EERT. First AID to be conducted only by a person who has been properly trained in giving First Aid.
<ul style="list-style-type: none"> Call the EERT emergency medical services &/or nearest hospital. 	<ul style="list-style-type: none"> ERTL/Deputy ERTL or authorized on-site emergency communicator
<ul style="list-style-type: none"> Facilitate leading the EERT to the emergency site. 	<ul style="list-style-type: none"> ERTL/Deputy ERTL to instruct: an ERT member on- site to meet EERT in access road/strategic

	<p>location. He/she shall hold orange safety flag to get their attention & lead them to site.</p> <ul style="list-style-type: none"> • Other ERT members to clear access road for smooth passage of the EERT.
<ul style="list-style-type: none"> • If applicable, vacate site & influence area at once, restrict site, suspend work until further notice. 	<ul style="list-style-type: none"> • Follow evacuation procedure

Table XI-4. Response Procedure in Case of Fire

Procedure	Remarks
<ul style="list-style-type: none"> • Alert a fire situation. 	<ul style="list-style-type: none"> • Whoever detects the fire shall immediately: • call the attention of other people in the site, • sound the nearest alarm, and/or • Foreman or any ERT member among the construction sub-group contacts the fire department (in this case it should be agreed on that it is alright for any ERT member in the sub-group to alert the fire department) report/communicate the emergency situation to the ERTL/Deputy ERTL.
<ul style="list-style-type: none"> • Stop all activities/operations and evacuate. 	<ul style="list-style-type: none"> • All (non-ERT) workers/staff sub-contractors, site visitors and concerned public to move out to safe grounds following the evacuation procedure.
<ul style="list-style-type: none"> • Activate ERT to contain fire/control fire from spreading. 	<ul style="list-style-type: none"> • Guided by the training they undertook, ERT members assigned to mitigate the fire shall assess their own safety situation first before attempting to control fire spread.
<ul style="list-style-type: none"> • Call the nearest fire & police stations &, if applicable, emergency medical services. 	<ul style="list-style-type: none"> • When alerting the EERT, ERTL will give the location, cause of fire, estimated fire alarm rating, any injuries.
<ul style="list-style-type: none"> • Facilitate leading the EERT to the emergency site. 	<ul style="list-style-type: none"> • ERTL/Deputy ERTL to instruct: • an ERT member to meet the EERT in the access road or strategic location and lead them to the site. He/she shall hold the orange safety flag to get their attention and lead them to the site.

	<ul style="list-style-type: none"> • some ERT members to stop traffic in, & clear, the access road to facilitate passage of the EERT.
<ul style="list-style-type: none"> • ERT to vacate the site as soon as their safety is assessed as in danger. 	<ul style="list-style-type: none"> • Follow appropriate evacuation procedure.

XII. APPENDIX A: ENVIRONMENTAL PROTECTION LAWS & STRATEGIES

Law or Decree	Article	Relating To	Content
Constitution of the Lao PDR People's Democratic Republic (1991, amended 2003)	17	Environment in general	"All organizations and citizens must protect the environment and natural resources: land, underground, forests, fauna, water sources and atmosphere."
Environmental Protection Law (2013) Revised version)	5	Environmental Protection Policy(s) (new)	The State promotes protection and rehabilitation of social and natural environment through dissemination of regulations and Environmental information, building of awareness and knowledge, training and conducting campaigns for individuals and organizations; both domestic and international, to recognize importance of social and natural environment in daily livelihoods and in strictly implement the Environmental protection regulations, methods and measures.
	10	Impact on Social Environment (new)	An impact on social environment is an adverse impact on human life and health, properties and livelihoods, including shelters of people, and on cultural and historical heritages.
	11	Impact on Natural Environment (new)	An impact on natural environment is an adverse impact on natural ecological fundamentals, natural resources, biodiversity, arable land, water sources, climate change and natural heritages.
	13	Environmental Protection Practices (new)	Environmental protection consists of these key following practices: (i) Environmental prevention(ii) Pollution control(iii) Toxic chemical control and waste disposal (iv) Environmental certification and permission (v) Promotion and public participation
	14	Environmental Prevention (revised)	Environmental prevention is an action of safeguarding and preventing against any natural or manmade events, which may possibly happen, are happening or already happened, leading to damages or depletions of social and natural environment

	19	Strategic Environmental Assessment (new)	<p>A strategic environmental assessment (SEA) is a process of anticipating an impact that may affect social and natural environment, while developing policies, strategic plans, and programs, including considerations towards impacts of climate change. This impact assessment shall determine methods and measures to avoid or mitigate impacts on social and natural environment in order to accomplish sustainable development goals.</p> <p>While developing the policies, strategic plans, and programs, particularly of energy and mining, agriculture and forestry, industry and commerce, public works and transportation, post-telecommunication and communication, information-culture and tourism sector, a strategic environmental assessment shall be conducted, except a plan, which applies to uses of small-scale areas and subject to the Integrated Spatial Plans.</p>
	21	Initial Environmental Examination (new)	Initial Environment Examination (IEE) is a data examination, exploration and analysis to anticipate possible minor environmental impacts, while identifying appropriate methods and measures to prevent, avoid or mitigate environmental impacts from investment projects or activities including considerations of climate change.
	22	Environmental Impact Assessment (revised)	<p>Environment Impact Assessment (EIA) shall be a process of addressing an issue in order to anticipate impacts that may affect the environment, society and nature, derived from investment projects or activities, along with considerations related to climate change in Lao PDR, and development of reports. Apart from reporting, there shall</p> <p>be development of Environmental Social Management and Monitoring Plans. Both the report and the plan shall be approved by MONRE prior to functioning investment projects and activities. The process of assessing impacts from the investment project and the activity on the environment, society and nature, shall comply with the specific regulations.</p>
	29	Pollution control (revised)	Pollution is a chemical substance, radiation, dust, smoke, including noise, light, odour, vibration and heat mixing in the air, soil, and water with concentration exceeding the National Environmental Quality Standards or National Pollution Control Standards, as the results of manmade or nature, affecting human life and health, animals, plants, other living creatures and ecosystem

	32	National Pollution Control Standards (new)	<p>The National Pollution Control Standards are identification of pollutant concentrations emitted by persons, legal entities and organizations with permission, from any sources into the air, soil or water. The Government shall identify the National Pollution Control</p> <p>Standards based on the proposal from MONRE upon coordinating with line sectors.</p>
	36	Toxic Chemical Control	The natural resources and environmental sector is directly responsible in coordinating with other line sectors for inspection and endorsement of toxic chemical lists, which are under periodical Management by the sector.
	38	Waste Disposal (new)	Disposal of general wastes, particularly rubbish, shall be separation for different purposes such as recycle, reuse, reprocess as new products and elimination with methods and techniques within identified areas based on regulations.
	55	Responsibilities in Environmental Rehabilitation (new)	Persons, legal entities or organization implementing investment projects or activities, which create environmental and social impacts, shall correct, improve, rehabilitate and remunerate damages within the affected areas.
		Environmental Protection Fund (revised)	<p>The State promotes establishment of the Environmental Protection Fund used in environmental researches, prevention, correction, and rehabilitation.</p> <p>Implementation and performance of the EPF shall be stipulated by the specific regulations.</p>
Water and Water Resources Law 24/Dec-2007	4	Rights to use water resources	Defines rights, obligations, and procedures to gain approval for use of water resources
	18	Permission for use	Stipulates that medium and large scale uses require feasibility studies, EIAs, and mitigation plans, before permission is granted for use of the resource
	22	Principles in water resource development management	Stipulates that water resource development must be consistent with national and sector plans, must ensure preservation of the natural beauty of the resources, and must protect against harmful effects of water
Lao Forestry Law (amended 24-Dec-2007)	5	Policy on forest and forest land	The GOL has the policy to preserve, regenerate, and develop forests and forest land to help preserve the environment, water resources, biodiversity, and people's livelihoods.
	9 to 13	Forest types	Classify the various types of forests according to use, including forests for village use

	26	Preservation of water resources in forest zones	Stipulates the preservation of water resources in forest zones for those areas where waterways originate and flow, including strict management and regulations to control logging, shifting cultivation, and destructive forest uses
	70	Conversion of forestland	Stipulates that forestland can be converted to other land type if it brings a high level of benefits to the nation and to livelihoods of the people, and is included in the national development plan
	71	Types of converted forestland	Stipulates that for uses such as dam construction, the timber and forest resources to be harvested in those areas are property of the State
Wildlife and Aquatic Law (24 Dec-2007)	31	Use for Household purposes	Allows use by village households of wildlife and aquatic species in the common and general category list in particular seasons or permitted areas, using tools or equipment that do not adversely affect habitats or compromise the species population.
	32	Customary Use	Allows use of wildlife or aquatic species in the common and general category list by village households for “necessary cultural beliefs.”
	52	Prohibitions	Prohibits taking of wildlife, including parts of the animals, from their habitats; tormenting wildlife and aquatics; illegal catching, hunting, trading and possession; catching aquatic and hunting in conservation zones, in breeding season, or when pregnant; devastation of habitats and feeding zones.
Land Law (2003)	6	Protection of Land and Environment	Declares that all individuals and organizations are obliged to protect the land from degradation,
	14	Changes in Land Category	Land use can be changed if it does not cause social or environmental harm and if prior approval is obtained from the authorities.
Decree on Land Lease or Concession (2009)	39	Obligation of Person or Legal Entity Who Leases or Obtains Concession	The person or legal entity that leases land or obtains a concession is obligated, among other things, “not to cause any damage to the quality of land and negative impact to the natural environment and the society.”
Road Law (1999)	15	Public Road Construction	The public road contractor shall perform the work in accordance with design documents, and shall ensure quality, safety and environmental protection.
	19	Compensation for Land Acquired for Public Road Activities	If, in the construction of various kinds of public roads, it is necessary to use land that is legally owned by a private person or by an

			organization, the owner of the expropriated land used for public road construction shall receive reasonable compensation
Prime Ministerial Decree No. 112/PM on Environmental Impact Assessment (2010)		Stipulates the need for Environmental Impact Assessment	Stipulates rights of those affected by projects, and need for participation. Outlines the process of conducting the EIA, preparing environmental management and monitoring plans, social management and monitoring plans, issuing environmental compliance certificates, monitoring compliance with the various plans, establishing the institutional framework including grievance procedures.
Ministerial Instruction on the Process of Initial Environmental Examination of the Investment Projects and Activities. No. 8029/MONRE, 17 December 2013		The process of Initial Environmental Examination of investment projects and activities.	Instruction for implementing and extending the provisions prescribed under Article 21 of the Law on Environmental Protection (Amended) No. 29/NA, Dated 18 December 2012.
Ministerial Instruction on the Process of Environmental and Social Impact Assessment of the Investment Projects and Activities. No. 8030/MONRE, 17 December 2013		The Process of Environmental and Social Impact Assessment of the Investment Projects and Activities.	Instruction for implementing and extending the provisions prescribed under Article 22 of the Law on Environmental Protection (Amended) No. 29/NA, Dated 18 December 2012.
Ministerial Agreement on the Endorsement and Promulgation of List of Investment Projects and Activities Requiring for Conducting the Initial Environmental Examination or Environmental and Social Impact Assessment. No. 8056/MONRE, 17 December 2013	1	Screening decision on conduct of IEE or ESIA	To endorse and promulgate a list of Investment Projects and Activities which shall conduct the Initial Environmental Examination or Environmental and Social Impact Assessment (Amended).

XIII. APPENDIX B: ENVIRONMENTAL STANDARDS

Environmental standards are presented below. Where Lao PDR regulations differ from the environmental standards provided by the general and applicable Environmental, Health and Safety Guidelines of the World Bank (2007), the reference will be whichever is more stringent.

The basis for the Lao PDR standards are:

- Environmental Protection Law No. 02/99/NA, dated 3 April, 1999.
- The Agreement on National Environment Standards in Laos, No 2734, December 7, 2009. Prime Minister Office and WREA (now MONRE) in Lao PDR.
- Decree on mandate of Water Resources and Environmental Administration dated 149/PM, dated 10 May 2007.

Table XIII-1. Surface water quality standards in Lao PDR

No	Substances	Symbol	Unit	Standard Value	Method of Measurement
1	Color, Odor and Taste	-	-	Natural level	-
2	Temperature	t	°C	Natural level	Thermometer
3	Potential of Hydrogen	pH	-	5-9	Electronic pH Meter
4	Dissolved Oxygen	DO	mg/l	6	Azide Modification
5	COD	COD	ml/l	5	Potassium permanganate
6	BOD ₅	BOD ₅	mg/l	1.5	Azide Modification at 20 degrees C, 5 days
7	Total Coliform Bacteria	Coliform Bacteria	MPN/100 ml	5000	Multiple Tube Fermentation
8	Fecal Coliform Bacteria	Fecal Coliform	MPN/ 100 ml	1000	
9	Nitrate-Nitrogen	NO ₃ -N	mg/l	<5.0	Cadmium Reduction
10	Ammonia-Nitrogen	NH ₃ -N	mg/l	0.2	Distillation Nesslerization
11	Phenols	C ₆ H ₅ -OH	mg/l	0.005	Distillation, 4-Amin anti-pyrenne
12	Copper	Cu	mg/l	0.1	Atomic Absorption Direct Aspiration
13	Nickel	Ni	mg/l	0.1	
14	Manganese	Mn	mg/l	1.0	
15	Zinc	Zn	mg/l	1.0	
16	Cadmium	Cd	mg/l	0.005	
17	Chromium, Hexavalent	Cr ⁶⁺	mg/l	0.05	
18	Lead	Pb	mg/l	0.05	
19	Mercury	Hg	mg/l	0.002	Atomic Absorption Cold Vapor
20	Arsenic	As	mg/l	0.01	Atomic Absorption

					Direct Aspiration
21	Cyanide	CN ⁻	mg/l	0.005	Pyridine-Barbituric
22	Alpha -Radioactive	α	Becquere l/l	0.1	Counting machine
23	Beta -Radioactive	β	Becquere l/l	1.0	
24	Total Organochlorine	-	mg/l	0.05	Gas Chromatography
25	DDT	C ₁₄ H ₉ Cl ₅	mg/l	1.0	
26	Alpha -BHC	αBHC	mg/l	0.02	
27	Dieldrin	C ₁₂ H ₈ Cl ₆ O	mg/l	0.1	
28	Aldrin	-	mg/l	0.1	
29	Heptachlor and Heptachlor Epoxide	-	mg/l	0.2	
30	Endrin	-	mg/l	None	

Source: The Agreement of National Standards of Environment in Laos, March 2009. Prime Minister Office and WREA

Table XIII-2. Soil Quality Standards for Residential and Agriculture

No.	Substances	Symbol	Unit	Standard Value	Method of Measurement
I. Volatile Organic Compound					Gas Chromatography or Gas Chromatography/. Mass Spectrometry (GC/MS) or other methods approved by DONRE
1	Benzene	C ₆ H ₆	mg/kg	0.5	
2	CarbonTetrachloride	CCl ₄	mg/kg	89	
3	1,2 Dichloroethane	CH ₂ Cl- CH ₂ Cl	mg/kg	230	
4	1,1 Dichloroethylene	CCl ₂ =CH ₂	mg/kg	1,700	
5	Cis 1,2 Dichloroethylene	CHCl=CHCl	mg/kg	57	
6	Trans-1,2- Dichloroethylene	CHCl=CHCl	mg/kg	520	
7	Dichloromethane	CH ₂ Cl ₂	mg/kg	28	
8	Ethly benzene	IC ₂ ClC-CH ₃	mg/kg	630	
9	Styrene	C ₆ H ₅ - CH=CH ₂	mg/kg	8.4	
10	Tetrachloroethylene	C ₂ Cl ₄	mg/kg	210	
11	Toluene	C ₆ H ₅ -CH ₃	mg/kg	6.5	
12	Trichloroethylene	Cl ₂ C=CHCl	mg/kg	2.5	
13	1.1.1 Trichloroethane	Cl ₃ C-CH ₃	mg/kg	3.5	
14	1.1.2 Trichloroethane	Cl ₂ CH- CH ₂ Cl	mg/kg	43	
15	Total Xylenes	(CH ₃ -C ₆ H ₄ - CH ₃)	mg/kg	63	
II. Heavy Metals					Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively
1	Arsenic	As	mg/kg	3.9	
2	Cadmium and its compounds	Cd	mg/kg	37	

					Coupled Plasma-Mass Spectrometry or Atomic Absorption, Gaseous Hydride or Atomic Absorption, Borohydride Reduction or other Methods Approved by DONRE
3	Hexavalent Chromium	Cr ⁺⁶	mg/kg	300	Coprecipitation or Colorimetric or Chelation/ Extraction or other Methods Approved by DONRE
4	Lead	Pb	mg/kg	400	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Techniques or other Methods Approved by DONRE
5	Manganese and its compounds	Mn	mg/kg	1,800	
6	Mercury and its compounds	Hg	mg/kg	23	Cold-Vapor Technique or other Methods Approved by DONRE
7	Nickel, soluble salts	Ni	mg/kg	1,600	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Techniques or other Methods Approved by DONRE
8	Selenium	Se	mg/kg	390	
III. Pesticides					
1	Atrazine	C8H14ClN5	mg/kg	22	Gas Chromatography or other Methods Approved by DONRE
2	Chlordane	-	mg/kg	16	Gas Chromatography/ Mass Spectrometry (GC/MS) or other Methods Approved by DONRE
3	2,4 D	-	mg/kg	690	Gas Chromatography or High Performance Liquid Chromatography/ Thermal Extraction/ Gas Chromatography/Mass Spectrometry (TE/GC/MS) or other Methods Approved by DONRE
4	DDT	DDT	mg/kg	17	Gas Chromatography or Gas Chromatography/ Mass Spectrometry (GC/MS) or other Methods Approved by DONRE
5	Dieldrin	C12H8Cl6O	mg/kg	0.3	
6	Heptachlor	Cl7	mg/kg	1.1	
7	HeptachlorEpoxide	-	mg/kg	0.5	
8	Lindane	-	mg/kg	4.4	
IV. Others					
1	Benzo(a)pyrene	-	mg/kg	0.6	Gas Chromatography/ Mass Spectrometry (GC/MS) or Thermal Extraction Gas Chromatography/ Mass Spectrometry (TE/GC/MS) Chromatography/ Fourier Transform Infrared (GC/FT-IR) Spectrometry or other Methods Approved by DONRE

2	Cyanide and its compounds	CN ⁻	mg/kg	11	Total and Amenable Cyanide: Distillation, or Total Amenable Cyanide (Automated Colorimetric, with off-line Distillation), or Cyanide Extraction Procedure for Solids and Oils or other Methods Approved by DONRE
3	PCBs	-	mg/kg	2.2	Gas Chromatography or other Methods Approved by DONRE
4	Vinyl Chloride		mg/kg	1.5	Gas Chromatography or Gas Chromatography/ Mass Spectrometry (GC/MS) or other Methods Approved by DONRE

Table XIII-3. Ambient Air Quality Standard

Parameters	Symbol	Average Time Unit: mg/m3					Method of Measurement
		Hours			1 month	1 year	
		1 hr	8 hr	24 hr			
Carbon monoxide	CO	30	10.26	-	-	-	Non dispersive infrared detection
Nitrogen dioxide	NO2	0.32	-	-	-	-	Chemilumine scene method
Sulphur dioxide	SO2	0.78	-	0.30	-	0.10	UV Fluorescence (1hr, 24hr, 1yr) or Pararosaniline (1hr,4hr)
Total Suspended Particulate	TSP	-	-	0.33	-	0.10	Gravimetric
Particulate Matter less than 10 microns	PM-10	-	-	0.12	-	0.05	Gravimetric or Beta Ray or Taper Element Oscillating Microbalance or Dichotomous
Ozone	O3	0.20	-	-	-	-	Chemiluminescence or UV Absorption Phoptometry
Lead	Pb	-	-	-	1.5	-	Atomic Absorption Spectrometer

Table XIII-4. Noise Standard

Standards	Method of Measurement
Maximum Sound Level (L _{max}) should not exceed 115 dB(A)	Equivalent Sound Level (L _{eq}) from Fluctuating Noise
L _{eq} 24 hour not exceeding 70 dB(A)	Equivalent Sound Level (L _{eq}) from Steady Noise

Table XIII-5. Ambient Noise Standard, Lao PDR

	Standard Value in dB(A)
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Type of Area	6.00-18.00	18.00-22.00	22.00-6.00
Quiet areas: hospitals, libraries, treatment places, kindergarten and schools	50	45	40
Residential areas: hotels and houses	55	55	45
Commercial and service areas	70	70	50
Small industrial factories located in residential areas	70	70	50

XIV. APPENDIX C: PROJECT LEVEL GRIEVANCE REDRESS MECHANISM

Purpose of the Mechanism

The grievance redress mechanism (or, the mechanism) is meant for persons seeking satisfactory resolution to their complaints on the environmental performance of the Subproject. The mechanism will ensure that: i) the basic rights and interests of every person affected by poor environmental performance of a Subproject are protected; and ii) their concerns arising from the poor environmental performance of a Subproject during the conduct of pre-construction, construction and operation activities are effectively and timely addressed.

Access to the Mechanism

Any person who has complaint regarding the environmental performance of the Subproject during pre-construction, construction and operation phases shall have access to the mechanism free of charge. The Project Management Unit (PMU), through its Grievance Point Person (GPP), shall ensure that the mechanism, including names and contact details of responsible persons in the affected villages, PMU, UDAA and DPWT, is publicly disclosed, and posted in the offices of the affected villages and in strategic places of the Project's area of influence so that the mechanism is accessible to all segments of the affected villages.

The Grievance Redress Mechanism

Grievances raised on environmental impacts are critical to the health and wellness of APs. Hence, prompt responses/actions are critical to avoid prolonging the misery of affected persons (APs). Prior to the public disclosure of the mechanism, the PMU shall have engaged/designated a Grievance Point Person (GPP) to handle environmental grievances lodged prior to construction, during construction and during operation. Sufficient support system, i.e., communication facilities, recording, and reporting system and funds, among others, shall have been set up to sustain the effective implementation of the mechanism. During operation, the GPP will liaise with the Kaysone Phomvihane UDAA and the DPWT (the operators) for the management of the mechanism until loan closure.

Informally, an AP can approach or call the village heads, Contractor, the PMU, UDAA or DPWT to raise his/her complaints/concerns. Complaints may be acted on immediately by the responsible party. However, it shall be made a policy that all informally lodged and acted on complaints shall have to be registered with the PMU as soon as possible for record purposes. If informally lodged complaint is not acted on promptly, or if AP is not satisfied with the resolution undertaken, he/she can then avail of the formal mechanism, as follows:

Step 1: Lodging complaint

It is possible that APs lodge complaints to any of the following: i) village officers; ii) Contractor, during construction; iii) DPWT or UDAA; iv) PMU, through its GPP, or v) third parties, e.g., NGO, religious groups. The AP may also lodge complaint through ADB's accountability mechanism¹.

¹ *ADB's accountability mechanism provides a forum where people adversely affected by ADB-assisted projects can voice and seek solutions to their problems and report alleged noncompliance of ADB's operational policies and procedures. It consists of two separate but complementary functions: problem solving and compliance review function. Complaints must be in writing and addressed to the Complaints Receiving Officer. More information can be found at: (<http://www.adb.org/site/accountability-mechanism/main>).*

Step 2: Grievance Documentation/Registration

The GPP as appointed by the PMU will be responsible for documenting and registering complaints received during construction. In operation the responsibility will be of the DPWT and UDAA depending on the asset. Other potential complaint recipients shall make sure that the received complaints are directed to, documented by, and registered with, the GPP as soon as possible. The GPP shall make sure that documented/registered complaints are acknowledged, duly referenced.

Step 3: Screening of complaint

The AP shall immediately be informed if the grievance is within, or outside, the purview of the mechanism. If it is outside the scope, AP shall be directed to the proper institution and/or proper mechanism for the complaint.

Step 4: Reviews, Investigation and Discussion

If it is covered by the mechanism, the AP shall be informed/reminded of the expected action timelines as set forth in the established mechanism. If both the AP and the other party, Contractor or PMU, are available, the complaint shall be immediately reviewed, investigated and discussed. If not, the review, investigation and discussion should immediately take place on the next day. The discussion will center on the measures to implement based on the review and investigation.

Step 5: Action/Resolution

If complaint is minor, the Contractor/DPWT/UDAA shall immediately act on the complaint. Minor complaint will be those impacts/issues that would not require thorough review and investigation and will be easy to resolve. If impact/issue will need thorough review and investigation, more work to be done, and/or supplies/parts to be procured, to resolve, the Contractor/DPWT/UDAA shall immediately provide the most suitable interim measure to reduce the magnitude of the impact; and to start work on the final measure not later than 5 days from the day discussion meeting is held.

Step 6: Acceptance of Resolution

If, according to the AP, the impact has been resolved satisfactorily, the GPP shall obtain a written confirmation of satisfaction from the AP, which will form part of the grievance documentation.

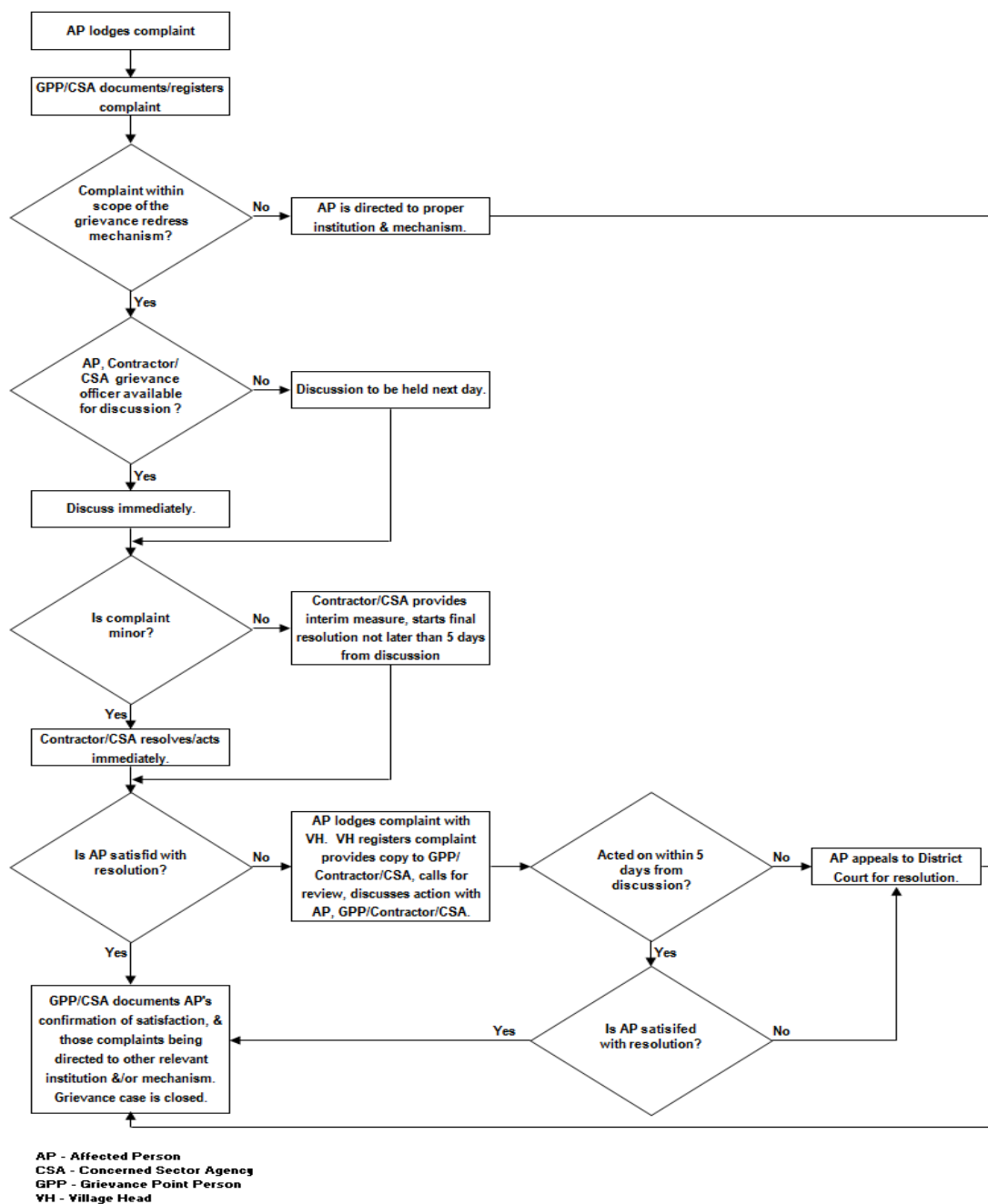
Step 7: Monitoring and Evaluation

For at least a week after closure of grievance (that is, when action implemented has been satisfactorily confirmed in writing by the complainant), the GPP shall monitor the effectiveness of the resolution. Monitoring and evaluation shall be properly documented and included in the Project Environmental Monitoring Report of the PMU.

Step 8: Lodging of Appeal by Dissatisfied APs


In the event the issue/impact persists, AP can lodge an appeal to his/her village head. The village head shall immediately: (i) record the appeal; (ii) contact the GPP, Contractor/DPWT/UDAA and provide them with copy of the appeal; and (iii) call for a meeting to review the history of the grievance and discuss the appeal and quick resolution of the issue. If the agreed on action/measure has not started within 5 days from the time of formal lodging of the appeal, or if the issue still persists despite the second action, AP can seek assistance from village head to raise the grievance to the District Court. It is highly unlikely that grievance redress process will reach the level wherein APs need to go through the "appeal" stage.

Figure 7. Flow-chart over the Grievance Redress Procedure



XV. APPENDIX D: APPROVAL BY MONRE/DONRE

Copy of Environmental Compliance Certificate for IEE and English translation, 2012:

	
ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນາຖາວອນ -----00000-----	
ກະຊວງ ຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ	ເລກທີ 497 ກຊສ ນະຄອນຫລວງວຽງຈັນ, 30 ກໍລະກົດ 2012
ໃບຢັ້ງຢືນ	
- ອີງຕາມ ກົດໝາຍ ວ່າດ້ວຍ ການປົກປັກຮັກສາສິ່ງແວດລ້ອມ ສະບັບເລກທີ 02/99/ສພຊ, ລົງວັນທີ 03 ເມສາ 1999. - ອີງຕາມ ດຳລັດ ວ່າດ້ວຍການຈັດຕັ້ງ ແລະ ການເຄື່ອນໄຫວ ຂອງກະຊວງ ຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ສະບັບເລກທີ 435/ນຍ, ລົງວັນທີ 28 ພະຈິກ 2011. - ອີງຕາມ ດຳລັດ ວ່າດ້ວຍ ການທົດແທນຄ່າເສຍຫາຍ ແລະ ການຍົກຍ້າຍຈັດສັນປະຊາຊົນ ຈາກໂຄງການ ພັດທະນາ, ສະບັບເລກທີ 192/ນຍ, ລົງວັນທີ 07 ກໍລະກົດ 2005. - ອີງຕາມ ດຳລັດ ວ່າດ້ວຍ ການປະເມີນຜົນກະທົບ ຕໍ່ສິ່ງແວດລ້ອມ, ສະບັບເລກທີ 112/ນຍ, ລົງວັນທີ 16 ກຸມພາ 2010. - ອີງຕາມ ການສະເໜີ ຂອງກອງປະເມີນຜົນກະທົບ ຕໍ່ສິ່ງແວດລ້ອມ ແລະ ສັງຄົມ, ສະບັບເລກທີ 893/ກຊສ.ກປສສ, ລົງວັນທີ 23 ກໍລະກົດ 2012.	
ກະຊວງ ຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ (ກຊສ) ຕົກລົງ:	
1. ເຫັນດີຮັບຮອງເອົາບົດລາຍງານ ການສຶກສາສິ່ງແວດລ້ອມເບື້ອງຕົ້ນ, ໂຄງປະກອບວຽກງານທົບທວນ ແລະ ການປະເມີນສິ່ງແວດລ້ອມ, ແຜນການເວນຄືນທີ່ດິນ ແລະ ການຊົດເຊີຍຄ່າເສຍຫາຍ, ໂຄງປະກອບການເວນຄືນທີ່ດິນ ແລະ ການຊົດເຊີຍຄ່າເສຍຫາຍ ສະບັບເດືອນ ມິຖຸນາ 2012 ຂອງໂຄງການພັດທະນາຕົວເມືອງ ຕາມແລວທາງອະນຸພາກພື້ນແມ່ນ້ຳຊອງ ທີ່ແຂວງ ສະຫວັນນະເຂດ.	
2. ໃຫ້ເຈົ້າຂອງໂຄງການ (ກົມເຄຫາ ແລະ ຜັງເມືອງ, ກະຊວງໂຍທາທິການ ແລະ ຂົນສົ່ງ) ປະຕິບັດຕາມ ເງື່ອນໄຂດັ່ງນີ້: ກ.) ຮັບຜິດຊອບໂດຍກົງ ຕໍ່ການສຶກສາ ແລະ ຂໍ້ມູນ ທີ່ໄດ້ລະບຸໄວ້ ໃນບົດລາຍງານ ການສຶກສາສິ່ງແວດລ້ອມ ເບື້ອງຕົ້ນ ແລະ ແຜນການທົດແທນຄ່າເສຍຫາຍ. ໃນກໍລະນີ ມີບັນຫາທາງດ້ານສິ່ງແວດລ້ອມ ແລະ ສັງຄົມ ເກີດຂຶ້ນ ທີ່ບໍ່ໄດ້ສຶກສາໄວ້ໃນບົດລາຍງານ ແລະ ແຜນການດັ່ງກ່າວ, ເຈົ້າຂອງໂຄງການຕ້ອງຮັບຜິດຊອບເພີ່ມເຕີມ ໃນການສ້າງແຜນການຄຸ້ມຄອງສິ່ງແວດລ້ອມ ແລະ ສັງຄົມ, ມີມາດຕະການຫຼຸດຜ່ອນ/ແກ້ໄຂ ບັນ	

ຫາຜົນກະທົບເຫຼົ່ານັ້ນ ພ້ອມທັງຮັບປະກັນ ໃຫ້ມີງົບປະມານພຽງພໍ ໃນການຈັດຕັ້ງປະຕິບັດ ມາດຕະການ ດັ່ງກ່າວ;

ຂ.) ຮັບປະກັນໃຫ້ມີງົບປະມານພຽງພໍ ເພື່ອເຮັດໜ້າທີ່ ຕິດຕາມກວດກາ ສິ່ງແວດລ້ອມ ແລະ ສັງຄົມ;

ຄ.) ໃນເວລາຊຸດຄົ້ນເອົາດິນ, ຫີນ ແລະ ຊາຍ ເພື່ອໃຊ້ໃນການກໍ່ສ້າງ ຕ້ອງໄດ້ຮັບອະນຸຍາດຈາກ ອົງການປົກຄອງ ທ້ອງຖິ່ນ ແລະ ຂະແໜງການຕ່າງໆ ທີ່ກ່ຽວຂ້ອງ;

ງ.) ທົດແທນຄ່າເສຍຫາຍ ສຳລັບເນື້ອທີ່ດິນ ແລະ ຊັບສິນອື່ນໆ ຂອງປະຊາຊົນ ທີ່ໄດ້ຮັບຜົນກະທົບ ຈາກການ ດຳເນີນໂຄງການ ໂດຍປະຕິບັດຕາມລະບຽບກົດໝາຍຢ່າງເຂັ້ມງວດ ບົນພື້ນຖານການປົກສາຫາລື ແລະ ເປັນ ເອກະສານນຳກັນ ລະຫວ່າງຜູ້ທີ່ໄດ້ຮັບຜົນກະທົບ ແລະ ເຈົ້າຂອງໂຄງການ;

ຈ.) ໃນເວລາກໍ່ສ້າງ ໃຫ້ຈຳກັດຢູ່ໃນເຂດເນື້ອທີ່ກຳນົດ ແລະ ໃຫ້ມີຜົນກະທົບໜ້ອຍທີ່ສຸດ ໂດຍເອົາໃຈໃສ່ ເປັນພິເສດ ໃນການຈັດຕັ້ງປະຕິບັດຕາມແຜນການຄຸ້ມຄອງສິ່ງແວດລ້ອມ ໃນການກຳຈັດສິ່ງເສດເຫຼືອ, ຄາບນາ໌ມັນ, ຂີ້ຝຸ່ນ ແລະ ການຕິດປ້າຍເຕືອນໄພຕ່າງໆ;

ສ.) ແຕ່ງຕັ້ງຜູ້ປະສານງານໂຄງການ ເພື່ອຈັດຕັ້ງປະຕິບັດ ແຜນການຄຸ້ມຄອງສິ່ງແວດລ້ອມ ແລະ ສັງຄົມ, ພ້ອມທັງເອົາໃຈໃສ່ຕິດຕາມກວດກາ ຜູ້ຮັບເໝົາຢ່າງເຂັ້ມງວດ ໃນການຈັດຕັ້ງປະຕິບັດແຜນການດັ່ງກ່າວ;

ຊ.) ພາຍຫຼັງສຳເລັດການກໍ່ສ້າງ ເຈົ້າຂອງໂຄງການຕ້ອງໄດ້ປົວແປງ ແລະ ຟື້ນຟູພື້ນເຂດທີ່ຖືກຜົນ ກະທົບ ຍ້ອນການກໍ່ສ້າງ ໃຫ້ຄືນສູ່ສະພາບທີ່ສາມາດນຳໃຊ້ໄດ້ເປັນປົກກະຕິ;

ຈ.) ເຮັດບົດລາຍງານປະຈຳໄຕມາດ, 6 ເດືອນ ແລະ ປະຈຳປີ ກ່ຽວກັບ ການຈັດຕັ້ງປະຕິບັດວຽກງານສິ່ງ ແວດລ້ອມ ແລະ ສັງຄົມ ຂອງໂຄງການ ສົ່ງໃຫ້ ກຊສ, ພະແນກຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ແຂວງສະຫວັນນະເຂດເພື່ອຊາບຕິດຕາມ.

3. ມອບໃຫ້ ພະແນກຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ແຂວງສະຫວັນນະເຂດ ສົມທົບກັບບັນດາ ຂະແໜງການ ແລະ ອົງການປົກຄອງເມືອງໄກສອນ ພົມວິຫານ, ເມືອງພິນ ແລະ ເມືອງເຊໂປນ ປະຕິບັດ ໜ້າທີ່ຕິດຕາມກວດກາ ການຈັດຕັ້ງ ປະຕິບັດ ມາດຕະການຫຼຸດຜ່ອນ/ແກ້ໄຂຜົນກະທົບ ທີ່ອາດຈະເກີດຂຶ້ນ ຕໍ່ສິ່ງແວດລ້ອມ ແລະ ສັງຄົມ ຂອງໂຄງການດັ່ງກ່າວ ແລ້ວລາຍງານໃຫ້ ກະຊວງຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ເປັນປົກກະຕິ.

ໃບຢັ້ງຢືນສະບັບນີ້ ມີຜົນນຳໃຊ້ໄດ້ ນັບແຕ່ວັນລົງລາຍເຊັນເປັນຕົ້ນໄປ. ທ



ສີສະຫວັດ ວິຫະໄຊ

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Ministry of Natural Resource and Environment

No: 4973/MONRE
Vientiane Capital, Date: 30 July 2012

Certificate

- Reference to the Law on Environmental Protection No 02/99/NA date 03 April 1999
- Reference to MONRE's role and responsibility No 435/MN date 28/11/2011
- Reference to the Decree on compensation No192/MN Date 07 July 2005
- Reference to the Decree IEA No 112/MN date 16 Feb. 2010
- Reference to the proposal from IEA Meeting No 893/MONRE date 23 July 2012

The Ministry of Natural Resource and Environment agree:


1. To accept the report on the IEE, the Environmental Assessment Structure, Compensation Plan, Compensation structure with the cost dated Jun 2012 of EWECTD in Savannakhet Province.
2. And request the Department of Housing and Urban Planning, MPWT to proceed the following:
 - a. The Department assumes direct responsible for the studies required in the environmental assessment and as reported in the IEE, including in the event of occurrence of social and environmental issues not yet studied in the report and plan. The project owner is responsible in addition to prepare the social and environmental plan, to set up the measure to reduce the impact and ensure sufficient budgets for implementation.
 - b. To ensure sufficient budget for the implementation of those measures.
 - c. During the excavation of soil, stone and sand for the construction purpose, to obtain required permission from local authority and concerned sectors.
 - d. To compensate the loss of land and other properties of people affected by the project implementation and conduct consultation in accordance with rules and legislation and ensure completed compensation documentation is signed by the project affected persons and the Project owner.
 - e. During the construction, the construction work should be minimized and limited to the identified area and specially to implement the Environmental Management Plan to mitigate impacts from solid waste, oil, and dust and ensure proper use of required warning signals and signs.
 - f. To ensure nomination of a Project Coordinator to implement the plan and to monitor the contractor's implementation of the plan.
 - g. After completion of the construction the project management should improve the impact area from the construction to the same situation as before.
 - h. To prepare Quarterly, 6 month and annual monitoring reports concerning the implementation of social and environmental management measures for submission to MONRE and DONRE of Savannakhet Province.
3. Giving to DONRE of Savannakhet Province in cooperation with the other Department and District Authority of Kalsone Phomvihane, Phine and Sepone responsibility to monitor, reduce and solve the impacts of the project, then to report to MONRE regularly.

This certificate is going in force after the signature of the Minister.

For Minister of
MONRE

Mr Sisavath Vilthaxay

Copy of Environmental Compliance Certificate for IEE, 2017:



ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ
ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນາຖາວອນ

ພະແນກຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມແຂວງ

049
 ເລກທີ...../ພຊສ.ສຂ
 ແຂວງສະຫວັນນະເຂດ, ວັນທີ. 22 MAY 2017


ໜັງສືຕໍ່ອາຍຸ ໃບຢັ້ງຢືນ ກ່ຽວກັບ ສິ່ງແວດລ້ອມ


- ອີງຕາມກົດໝາຍ ວ່າດ້ວຍ ການປົກປັກຮັກສາສິ່ງແວດລ້ອມ ສະບັບປັບປຸງ ເລກທີ 29/ສພຊ, ລົງວັນທີ 18 ທັນວາ 2012;
- ອີງຕາມ ດໍາລັດ ວ່າດ້ວຍ ການທົດແທນຄ່າເສຍຫາຍ ແລະ ການຍົກຍ້າຍຈັດສັນປະຊາຊົນ ຈາກໂຄງການ ພັດທະນາ ສະບັບເລກທີ 84/ລບ, ລົງວັນທີ 05 ເມສາ 2016;
- ອີງຕາມ ຂໍ້ຕົກລົງ ວ່າດ້ວຍ ການຈັດຕັ້ງ ແລະ ການເຄື່ອນໄຫວ ພະແນກຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມແຂວງ ສະບັບເລກທີ 1467/ກຊສ ລົງວັນທີ 9 ມີນາ 2012
- ອີງຕາມ ຄໍາແນະນຳ ຂະບວນການສຶກສາເບື້ອງຕົ້ນ ກ່ຽວກັບ ຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ຈາກໂຄງການລົງທຶນ ແລະ ກິດຈະການຕ່າງໆ ສະບັບເລກທີ 8029/ກຊສ, ລົງວັນທີ 17/12/2013;
- ອີງຕາມບົດບັນທຶກ ລະຫວ່າງຫົວໜ້າພະແນກ ຊສ ແຂວງ ແລະ ຫົວໜ້າພະແນກໂຍທາທິການ ແລະ ຂົນສົ່ງ ແຂວງ ກ່ຽວກັບການຕໍ່ໃບຢັ້ງຢືນໃຫ້ກ່ອນ ສະບັບລົງວັນທີ 05 ພຶດສະພາ 2017.

ພະແນກຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ແຂວງສະຫວັນນະເຂດ ຕົກລົງ:

1. ຕໍ່ອາຍຸ ໃບຢັ້ງຢືນ ກ່ຽວກັບ ສິ່ງແວດລ້ອມ ຮັບຮອງເອົາ ແຜນການຄຸ້ມຄອງ ແລະ ຕິດຕາມກວດກາສິ່ງແວດລ້ອມ ສັງຄົມ ແລະ ທຳມະຊາດ ສະບັບປັບປຸງ ເດືອນ....., ປີ..... ສຳລັບ ໂຄງການພັດທະນາຕົວເມືອງ ຕາມແລວ ເສດຖະກິດ ຕາເວັນອອກ-ຕາເວັນຕົກ ອະນຸພາກພື້ນແມ່ນ້ຳຂອງ ທີ່ເປັນໂຄງການຂອງກົມເຄຫາ ແລະ ຜັງເມືອງ ກະຊວງ ໂຍທາທິການ ແລະ ຂົນສົ່ງ.
2. ເຈົ້າຂອງໂຄງການ ຕ້ອງປະຕິບັດຢ່າງເຂັ້ມງວດ ບັນດາເງື່ອນໄຂ ທີ່ໄດ້ກຳນົດໄວ້ໃນ ບົດບັນທຶກ ລະຫວ່າງຫົວໜ້າ ພະແນກຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມແຂວງ ແລະ ຫົວໜ້າພະແນກໂຍທາທິການ ແລະ ຂົນສົ່ງແຂວງ ກ່ຽວກັບການຕໍ່ໃບຢັ້ງຢືນໃຫ້ກ່ອນ ສະບັບລົງວັນທີ 05 ພຶດສະພາ 2017.
3. ໃບຢັ້ງຢືນ ກ່ຽວກັບ ສິ່ງແວດລ້ອມ ສະບັບນີ້ ມີຜົນໃຊ້ໄດ້ 3 ປີ ນັບຕັ້ງແຕ່ວັນລົງລາຍເຊັນເປັນຕົ້ນໄປ.

ຫົວໜ້າພະແນກ
ຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມແຂວງ





ພະຍາກອນ ສະຫວັນນະເຂດ

XVI. APPENDIX E: DRAFT FORMAT FOR ENVIRONMENTAL MONITORING REPORT

1. Introduction and Project Overview

Project Number and Title:		
Safeguards Category	Environment	
	Indigenous Peoples	
	Involuntary Resettlement	
Reporting period:		
Last report date:		
Key sub-project activities since last report:	This section can include, among others, the following: <ul style="list-style-type: none"> • Activities of Proponent • Progress of Work (% physical completion) • Changes of Surrounding Environment • Status of Permits / Consents 	
Report prepared by:		

2. Environmental Performance Monitoring

a. Summary of Compliance with EMAP Requirements (Environmental Performance)

EMAP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
Use environmental impact as main heading and EMAP as listing (see example below)	Use EMoP list as basis for rating/evaluating compliance (see example below)		
Rise of employment opportunities: <ul style="list-style-type: none"> • Job openings of the project should give priority to local communities. • Recruitment of local laborers should be stipulated in the contract for construction 	<ul style="list-style-type: none"> • Field inspections and interviews with communities - DONE • Note each complaint case in the field – 3 COMPLAINTS RECEIVED • Set up grievance centre and report as part of monitoring action plan – NOT DONE 		

b. Issues for Further Action

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of EMoP measures or activities not completed (last column of previous table)			
New Issues from This Report			

c. Other activities

- Other issues not covered by EMAP/EMoP
- Environmental monitoring as required by GOI (e.g., air quality, water sampling)

3. Involuntary Resettlement Performance Monitoring

a. Summary of Compliance with RP Requirements

RP Requirements	Compliance status Yes/No/Partial	Comment or Reasons for Compliance, Partial Compliance/Non- Compliance	Issues for Further Action ²
Establishment of personnel in PMU/PIU			
Public consultation and socialization process		Provide information on: <ul style="list-style-type: none"> • Public consultation, participation activities carried out • Inclusive dates of these activities To be elaborated on in Item 5	
Land area to be acquired is identified and finalised			
Land acquisition completed			

² To be elaborated further in table 3.b (Issues for Further Action)

Establishment of Resettlement Site(s)		Please state: <ul style="list-style-type: none"> • Number of AHs to be relocated as per agreed RP • Number of AHs already relocated • Number of houses built • Status of installation of community facilities to be provided as per agreed RP 	
Compensation payments for affected assets is completed		Please state: <ul style="list-style-type: none"> • Total Number of Eligible AHs and APs (as per agreed RP) • Number of AHs and APs compensated as of this monitoring period • Total Budget allocation as per agreed RP • Total budget disbursed to AHs as of this monitoring period 	
Transport assistance for relocating affected households		As above	
Additional assistance to vulnerable affected household		Please state: <ul style="list-style-type: none"> • Total Number of vulnerable AHs and APs (as per agreed RP) • Agreed forms of assistance as per RP • Number of AHs and APs assisted as of this monitoring period 	
Income Restoration Program		Please state progress per income restoration feature/activity and actual period of implementation	
Temporary impacts have been addressed (affected properties restored to at least pre-project conditions)		Please state: <ul style="list-style-type: none"> • Total Number of AHs affected by temporary impacts as per agreed RP • Actual Number of AHs and total area affected by temporary impacts (if this differs from the projected number, such as in cases of unforeseen project impacts) • Status of restoring affected property 	
Capacity building activities			

b. Issues for Further Action

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of RP activities not completed (last column of previous table)			
New Issues from This Report			

4. Occupational, Health and Safety (OHS) Performance Monitoring

a. OHS for worker

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

b. Public Safety

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

5. Information Disclosure and Socialization including Capability Building

- Field Visits (sites visited, dates, persons met)
- Public Consultations and meetings (Date; time; location; agenda; number of participants disaggregated by sex and ethnic group, not including project staff; Issues raised by participants and how these were addressed by the project team)
- Training (Nature of training, number of participants disaggregated by gender and ethnicity, date, location, etc.)
- Press/Media Releases
- Material development/production (e.g., brochure, leaflet, posters)

6. Grievance Redress Mechanism

Summary:

- Number of new grievances, if any, since last monitoring period: _____
- Number of grievances resolved: _____
- Number of outstanding grievances: _____

Type of Grievance	Details (Date, person, address, contact details, etc.)	Required Action, Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

7. Conclusion

- Important results from the implementation of EMAP/EMoP and RP monitoring
- Recommendations to improve EMAP/EMoP and RP management, implementation, and monitoring

8. Attachments

1. Consents / permits
2. Monitoring data (water quality, air quality, etc.)
3. Photographs
4. Maps

XVII. APPENDIX F: CORRECTIVE ACTION PLAN FOLLOWING ECA

No.	Areas of concerns	Proposed actions	Assessment criteria	Implementation schedule	Estimated Cost (USD)	Responsibility
A1	Compliance with local regulation for Environmental Assessment by the private contractor of the landfill	Consult with district environmental authority for EA process	District environmental authority for EA process consulted	As soon as possible	10,000	The landfill operator
		Proceed with preparation of a required ESMP	ESMP report prepared	Within 3 months after ECA receipt		The landfill operator
			ESMP report submitted for approval	Within 60 days after ESMP is completed		The landfill operator
			Environmental Compliance Certificate obtained	Within 120 days after the ESMP is submitted		MONRE
	Lack of public involvement	Submit to MONRE for ECC approval	Public consultation with local authority and affected people during preparing ESMP conducted	During the preparation of ESMP	3,000	The landfill operator

A2	Development of formal environmental management system in place, preparation of corporate environmental management plans inclusive of pollution prevention, waste management plans, gas system, monitoring programs, capping and rehabilitation, stakeholder involvement and arrangement	Prepare a ESMP	ESMP with environmental and health and safety policy document prepared and approved; ESMP system documents developed to include waste management and pollution prevention plans, monitoring programs, capping and rehabilitation measures, stakeholder involvement and arrangement	Together with ESMP preparation within 3 months after ECA receipt	3,000	The landfill operator
A3	Establishment of operational manual with waste management procedures to include hazardous materials management, establishment of hazardous waste temporary storage areas on site	Incorporate hazardous management in operational manual	The waste management procedures in place, hazardous waste temporary accumulation area in place	Together with ESMP preparation within 3 months after ECA receipt	3,000	The landfill operator
A4	Complaint resolution and grievance mechanism	Incorporate procedure for Complaint resolution	procedure for Complaint resolution included	Together with ESMP preparation	2,000	The landfill operator
A5	Biological treatment for solid waste	Install drainage layer, collection drain, ponding and treatment	ESMP system documents updated to include waste management and pollution prevention plans	Together with ESMP preparation	145,000 (including 110,000USD for building wastewater treatment system + 35,000USD for building leachate	The landfill operator

A6	No system in place for Occupational Health and Safety, Community Health and Safety	<p>Develop Operational Manual adequately addressing Occupational Health and Safety</p> <p>Incorporate Community Health and Safety Management in EIA</p>	<p>Operational Manual developed with Occupational Health and Safety section</p> <p>EIA and ESMP developed with Community Health and Safety Management section</p>	Together with OM and ESMP preparation	1,000	The landfill operator
A7	Possibility to connect the leachate treatment of the existing landfill to that of the new sanitary landfill for co-treatment	<p>Provide an add-on to the design of the new landfill addressing the leachate connection options between the two landfills.</p> <p>Revise the current contract to incorporate the sharing possibility regarding co-treatment</p>	<p>ESMP for the existing landfill developed in close consultation with the DED team of the new sanitary landfill to discuss, agree and incorporate connection options</p> <p>Contract revised and agreed including amendment to financial and institutional terms for co-treatment</p>	During ESMP preparation and DED completion	Cost including in the DED	<p>The landfill operator PMU</p> <p>The landfill operator UDAA</p>

XVIII. APPENDIX G: RESULTS OF MONITORING AND ANALYSIS OF LOCAL AMBIENT AIR QUALITY

Statistical of the analyzed result of twelve air quality samples collected from June 7 - 15, 2017

Par	Unit	Average	Min	Percentile					Max	¹ WHO's	² Lao's
				10	25	50	75	90			
Temp	°C	31.79	25.10	28.41	28.88	32.25	34.13	35.85	37.00		
Humidity	%	63.46	41.00	51.20	54.50	62.25	74.75	81.50	84.00		
Pressure	hpa	991.70	990.00	990.02	990.20	992.10	992.63	993.00	993.00		
Winds											
Wind speed	m/s	1.23	0.30	0.50	0.65	1.20	1.63	2.33	2.40		
Total dust PM10	µg/m ³	115.00	10.00	40.00	40.00	120.00	150.00	168.00	320.00	50 (24h)	
Pb	µg/m ³	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		50
O3	µg/m ³	9.00	5.00	6.00	7.50	10.00	11.00	11.60	12.00	100 (8h)	200
NO2	µg/m ³	334.17	60.00	177.60	270.00	348.50	430.50	514.20	521.00		320
SO2	µg/m ³	275.88	66.00	78.60	92.25	117.00	145.25	533.30	1437.00	500 (10min)	780
CO	µg/m ³	5296.83	3002.00	3136.30	3649.75	4680.50	5416.50	7933.80	12284.00		30000
Vibration	m/s ²	0.004	0.002	0.002	0.003	0.004	0.005	0.006	0.01		
Noise	Lamax	dB(A)	77.092	65.900	67.20	73.125	58.600	59.200	83.590	84.500	
	Laeq		58.058	52.200	53.64	54.525	77.950	83.350	62.980	68.700	

Source

1. World Health Organization's Air quality guidelines

2. Lao's Air quality standards

Number of Samples: 12

XIX. APPENDIX H: SPATIAL LOCATIONS AND LITHOLOGIES OF THE THREE DRILLED WELLS

DEPTH (m)	DESCRIPTION	ELEVATION (m)	SYMBOL
1	Clay mixed with pebble - gravel, brownish yellow, soft, very fine grained	148	
2		147	
3			
4			
5	Silty clay, brown, soft and sticky, very fine grained		
6			
7			
8			
9	Siltstone, brown, hard, very fine grained		
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22	Siltstone, grayish green, non-sticky, very fine grained	129	
23		129	
24			
25			
26	Shale, greenish gray, firm, very fine grained		
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38	Siltstone, brown, hard, very fine grained	115	
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50		100	



DEPTH (m)	DESCRIPTION	ELEVATION (m)	SYMBOL
1	Silty Clay mixed with gravel, dusky red, soft, fine grained.		
2			
3			
4			
5			
6			
7			
8			
9		150	
10			
11			
12			
13	Clayey sands, sand - clay - gravel mixtures, dusky red, from soft to loose, fine to coarsen grained.		
14			
15			
16			
17		142	
18			
19			
20			
21	Clayey sands, sand - clay - mixtures, grayish brown, soft, fine to coarsen grained.		
22			
23			
24			
25		132	
26			
27			
28			
29	sandy clay, light brown, soft, fine to medium grained.		
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50		109	

DEPTH (m)	DESCRIPTION	ELEVATION (m)	SYMBOL
1	Solid Waste layers of the landfill.		
2			
3			
4		161	
5	Clay mixed with some gravels, brown, soft, fine to very fine grained.		
6			
7		157	
8			
9	Silty clay, brownish yellow, non-plastic, fine to medium grained		
10			
11		153	
12			
13	Clayey sands, sand - gravel - clay mixtures, grayish brown, fine to coarse grained.		
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25		136	
26			
27			
28			
29	Clay, brown, soft & plastic, very fine grained		
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40		125	
41	Siltstone, grayish brown, hard, very fine grained		
42			
43			
44			
45			
46			
47			
48			
49			
50		115	

XX. APPENDIX I: COMPARISON OF SOME KEY PARAMETERS OF THE KAYSONE LEACHATE WITH THOSE OF LEACHATE FROM OTHER COUNTRIES

Par.	Unit	This study, Lao PDR	SA, Taiwan ^a	BEA, Egypt ^b	Kuwait ^c	USA ^d
Age	years	5 - 17	10-16	-	-	-
pH	-	7.04 – 8.35	7.03 – 8.50	8.2	6.9 – 8.2	-
BOD ₅	mg/L	211 - 442	-	3,400	-	-
COD	mg/L	403 - 960	320 – 1,340	8,250	158 – 9,400	-
Turb.	NTU	2.40 – 12.50	-	1,400	-	-
Cd	mg/L	0.0178	< 0.15	-	-	-
Ni	mg/L	0.0261	0.04 – 0.14	-	-	-
Cu	mg/L	0.2389	0.01 – 4.38	-	-	0 – 0.1
Fe	mg/L	17.0	0.26 – 5.44	-	0.35 – 54.1	4.2 – 1,185

Notes:

^a Huan-jung et al., 2006

^b Raghab et al., 2013

^c Al-Yaquout and Hamoda, 2003

^d Al-Wabel et al., 2011