ADAPTATION FUND

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

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ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project Category:	Regular
Country:	Lao PDR
Title of Project:	Building climate and disaster resilience capacities of vulnerable small towns in Lao PDR
Type of Implementing Entity:	Multilateral Implementing Entity
Implementing Entity:	United Nations Human Settlements Programme (UN-Habitat)
Executing Entities:	Ministry of Public Works and Transport, Ministry of Natural Resources and Environment, Provincial Department of Public Works and Transport in Savannakhet Province, and Department of Natural Resources and Environment in Savannakhet Province
Amount of Financing Requested:	US$5,500,000

Project Background and Context:

The Problem

Climate change is a major impediment to the attainment of national development goals.

Lao People's Democratic Republic (PDR) has been increasingly affected by extreme weather events. This is particularly problematic due to its high sensitivity, resulting from dependence on climate-sensitive natural resources and its low adaptive capacity. The impacts of extreme weather events have been severe to the point that in 2013 Lao PDR was named the seventh most severely affected country in the world by climate change, with 23 deaths and absolute losses of US$ PPP 263,510,000[1]. Irregularity in rainfall has led to both floods and droughts, with a variation in severity from year to year. Not only does Lao PDR have a high exposure to extreme weather events, particularly floods, but recent reports by the INFORM Global Risk Index show a low ability to cope with these events[2]. In addition to extreme events, variation in the seasons has disrupted cropping, causing food insecurity.

The high degree of climate change vulnerability in Lao PDR is due to several factors including the physical geography, low coping capacity and reliance on the agriculture

1 Global Climate Risk Index, 2015, p.7. Online at https://germanwatch.org/en/download/10333.pdf

2 Index for Risk Management (INFORM) Country Risk Profile for Lao PDR, 2018. Online through http://www.inform-index.org/Countries/Country-Profile-Map

sector. Geographically, the country can be separated into a number of regions, each of which is susceptible to different hazards. A trend of increasing rainfall is especially apparent in the south and central regions, leading to widespread flooding[3]. In rural areas, this damages or destroys food crops. In the rapidly growing small and emerging towns, there is significant damage to physical infrastructure, hindering economic development and disrupting livelihoods. Low coping capacity is a result of both the low institutional capability and the infrastructure. Currently, Lao PDR is showing a lower coping capacity than the average of nearby countries and also of countries which are at a similar income level[4].

As this proposal was being prepared, unusually heavy rains and flooding caused a dam to break in nearby Attapeu Province, leading to dozens of deaths and thousands of people displaced. Meanwhile, roads, bridges and other critical infrastructure throughout the country has been severely impacted by heavy rainfall which is, in turn, caused by the early onset of tropical storms in the South China Sea. Such infrastructure damage has affected the provision of basic services such as water supplies. These events have once again heightened the focus in Laos of the impacts of climate change and the serious risks they pose to life, livelihoods, infrastructure and sustainable development.

Looking forward, there is an increasing risk of severe weather events. There is a need for adaptive actions to be taken to mitigate the effects of these events which have the potential to severely derail the Government's development agenda. There has been a long-term goal of graduating from Least Developed Country (LDC) status by 2020 with a vision of achieving upper-middle income status by 2030[5]. To achieve this, the 8th National Socioeconomic Development Plan has focuses on economic growth, sustainable development and strengthened human resource capacity. Recent indications suggest that Laos will probably miss the 2020 graduation target. It is imperative, therefore, that steps are taken to ensure the predicted climatic changes do not prevent Lao PDR from moving forward according to its development aims. UN-Habitat is already working with the government to this end on the Adaptation Fund funded project entitled, "Enhancing the climate and disaster resilience of the most vulnerable rural and emerging urban human settlements in Lao PDR." The National Designated Authority has requested UN-Habitat to build on this initial project with a continued focus on small and emerging towns in highly vulnerable provinces. This proposed project is in different provinces than the initial project but caters to the government's ongoing need to build resilience in these small urban settlements.

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3 CLEAR: Consolidated Livelihood Exercise for Analysing Resilience. A special report prepared by the Ministry of Natural Resources and Environment's Department for Disaster Management and Climate Change (DDMCC) and the World Food Programme with technical support from the USAID Mekong ARCC project.

4 INFORM Country Risk Profile for Lao PDR, 2018. Online through http://www.inform-index.org/Countries/Country-Profile-Map

5 8th Five-Year National Socioeconomic Development Plan (2016–2020). Online at http://www.la.one.un.org/images/publications/8th_NSEDP_2016-2020.pdf

Economic Context

Climate change is already causing economic losses, but the government does not have the financial resources and technical capacity to respond.

At a macroeconomic level, the Lao economy is characterised by strong growth, but it has the widest forecast current account deficit in Southeast Asia for 2017, at 17.5% of GDP[6]. As one of the least developed countries in the world, Lao PDR has one of the lowest annual incomes with GDP at US$14.36 billion in 2015 and GDP per capita at US$2,212 in 2015[7]. Despite its low level of development, the Lao economy is growing rapidly, with GDP growth hovering around 7% per year in recent years[8]. Economic growth is fuelled in a large part by large projects in the natural resources and extractive sectors, particularly hydropower projects. It has been estimated that 10 - 15% of the land area has been allocated for economic development purposes, including for mining, hydropower and plantations to foreign or joint venture investors for periods of up to 70 years[9]. However, these projects do not generate significant employment opportunities, and their benefits are not evenly distributed throughout the population, causing increased inequality[10].

The greatest number of workers in Lao PDR is employed in the agricultural sector. A 2014 World Bank report calculated that, of the number of hours worked in 2013, 61% were in the agriculture sector, 30% were in the construction and services sector, 8% were in manufacturing and 1% were in mining, electricity, water and gas[11]. The report estimated that 70% of workers were in low-productivity agricultural jobs. The low output produced by the agricultural sector in comparison to its number of workers is shown by the percentage of output produced by each sector where 44% of output is from the construction and services sector, 27% from agriculture, 18 percent from mining, electricity, water & gas and 11 percent from manufacturing.

A high proportion of the workforce dependent on agriculture and livestock increases overall vulnerability to climate change, as work in this sector tends to lead to low

6 Asian Development Outlook 2017 Update- Sustaining Development through Public-Private Partnership. Asian Development Bank, 2017. Available from https://www.adb.org/publications/asian-development-outlook-2017-update

7 International Monetary Fund. Report for selected countries and subjects. World economic outlook database. Report requested from https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/weoselgr.aspx

8 https://www.adb.org/countries/lao-pdr/economy#tabs-0-3

9 Background notice for ADB Governance and Capacity Development in Public Sector Management Program. Online at https://www.adb.org/sites/default/files/linked-documents/46059-001-lao-oth-02.pdf

10 See for example the Lao Economic Monitor May 2016, which states on p.10 that “The pace of poverty reduction and inclusiveness was less commensurate to the rate economic growth.” Online at http://documents.worldbank.org/curated/en/515521468197368035/pdf/AUS17628-WP-OUO-9-Lao-Economic-Monitor-May-2016-has-been-approved-P157829.pdf

11 Lao Development Report 2014. Expanding productive employment for broad-based growth. World Bank. Online at http://www.worldbank.org/content/dam/Worldbank/document/EAP/lao-pdr/LDR_2014_Eng.pdf

incomes and is directly dependent on a conducive climate. In the event of extremes and long-term changes in the climate, low incomes in the agriculture sector are highly threatened. Meanwhile, people who work in the construction sector, are often in unsecure employment, meaning they have irregular incomes, and/or minimal opportunities to save. This also limits their ability to invest in adaptation measures at the household level, or to respond after extreme events.

Hydropower is a key contributor to the Lao economy, both by providing a reliable and affordable domestic power supply and by earning foreign exchange from electricity exports to neighbouring countries. In the first half of 2017, electricity generation increased by 34.8% year on year[12]. According to the Ministry of Energy and Mines, electricity has accounted for 30% of Lao exports since 2008[13]. This is a significant part of the revenue coming into the country. Major projects such as hydropower and construction are responsible therefore for significant growth in the economy. However, these sectors do not generate employment for a large number of people. There is therefore, a need to diversify the economy from a reliance on natural resources.

Outside of these major projects, much of the economic activity occurs in Vientiane and in some of the provincial capitals. After Vientiane and the secondary towns of Luang Prabang, Thakek, Savannakhet and Pakse, small and emerging towns are playing an increasingly important role in economic growth. These settlements are experiencing a higher growth rate of population than the national average of 1.45% per annum[14], mainly due to rural-urban migration of people seeking better opportunities. However, the government does not have the resources to provide the needed infrastructure for these growing towns. There is, therefore, a significant need for investment in these settlements. This is because in the absence of investment, it is likely that unplanned development will occur, resulting in low quality developments and infrastructure which is both inadequate and prevents people from being resilient to floods, storms, landslides and droughts. Furthermore, it is far more desirable to integrate climate change adaptation measures into infrastructure when it is being newly built in emerging towns, rather than trying to retrofit it. Climate-resilient infrastructure also contributes to economic growth in the towns and contribute to achievement of the government's development goals.

Social context

Despite realising the necessity to build resilience in the poor communities which will be most severely impacted by climate change related disasters the government is challenged to respond to the need by a lack of finance and both human and technical capacity.

12 Asian Development Outlook 2017 Update

13 http://www.poweringprogress.org/new/2-uncategorised/3-hydropower-in-lao-pdr

14 Population growth rate 2005 – 2015 according to the 2015 census, available online at http://lao.unfpa.org/sites/default/files/pub-pdf/PHC-ENG-FNAL-WEB_0.pdf. The growth in small and emerging towns is commonly twice that of the national average.

The 2015 census found there were 3,237,458 females in Lao PDR and 3,254,770 males, making a total population of 6,492,228[15]. Since the first census in 1985, the population has grown by about a million every decade and it has grown by 1.45% since 2005. It is expected to reach 8.8 million by 2030, with 96,000 more people reaching working age every year[16].

Ethnicities are classified into 49 different groups, with the main groups shown in **Error! Reference source not found.**. There is a diversity of languages, cultures and lifestyles amongst the ethnic groups. The main religion is Buddhism, practised by 65% of the population. The census recorded 2% of the population as practising Christianity, while 31% stated that they had no religion. There are many people, however, with animist beliefs. Some ethnic groups are marginalised, with limited access to education, health and other services, partly because they often live in remote areas with little access to infrastructure.

While the majority of Lao PDR's population lives in rural areas, there is rapid urbanisation. It was estimated that 37.6 percent of the population were urban dwellers in 2014, up from only 15.4 percent in 1990[17]. In terms of rural and urban characteristics, most towns in Lao PDR have a small population, and in 2012 there were only 10 towns with a population greater than 20,000[18]. It is in the small towns (with a population of at least 4,000) and emerging towns (many with a population under 4,000) that much of the urban growth is occurring. Many of these towns are in locations which are exposed to climate change related hazards and there is a need to build resilience as they are developed.

15 Census report online at http://lao.unfpa.org/sites/default/files/pub-pdf/PHC-ENG-FNAL-WEB_0.pdf

16 Lao Development Report 2014. Expanding productive employment for broad-based growth. World Bank.

17 Key Indicators for Asia and the Pacific, 2015. Asian Development Bank. Online at https://www.adb.org/sites/default/files/publication/175162/ki2015.pdf

18 Lao People's Democratic Republic: urban development sector assessment, strategy, and road map, 2012. Asian Development Bank. Online at https://www.adb.org/sites/default/files/institutional-document/33722/files/lao-pdr-urban-sector-assessment.pdf

Table 1: Population by Figure 1 - Location of the Two Target Districts in Lao PDR group

	Population	% to total Population
Lao	3,427,665	53.2
Khmou	708,412	11.0
Hmong	595,028	9.2
Phouthay	218,108	3.4
Tai	201,576	3.1
Makong	163,285	2.5
Katang	144,255	2.2
Lue	126,229	2.0
Akha	112,979	1.8
Others	749,153	11.6

Source: Table P2.7 (2015 PHC, Appendix 1)

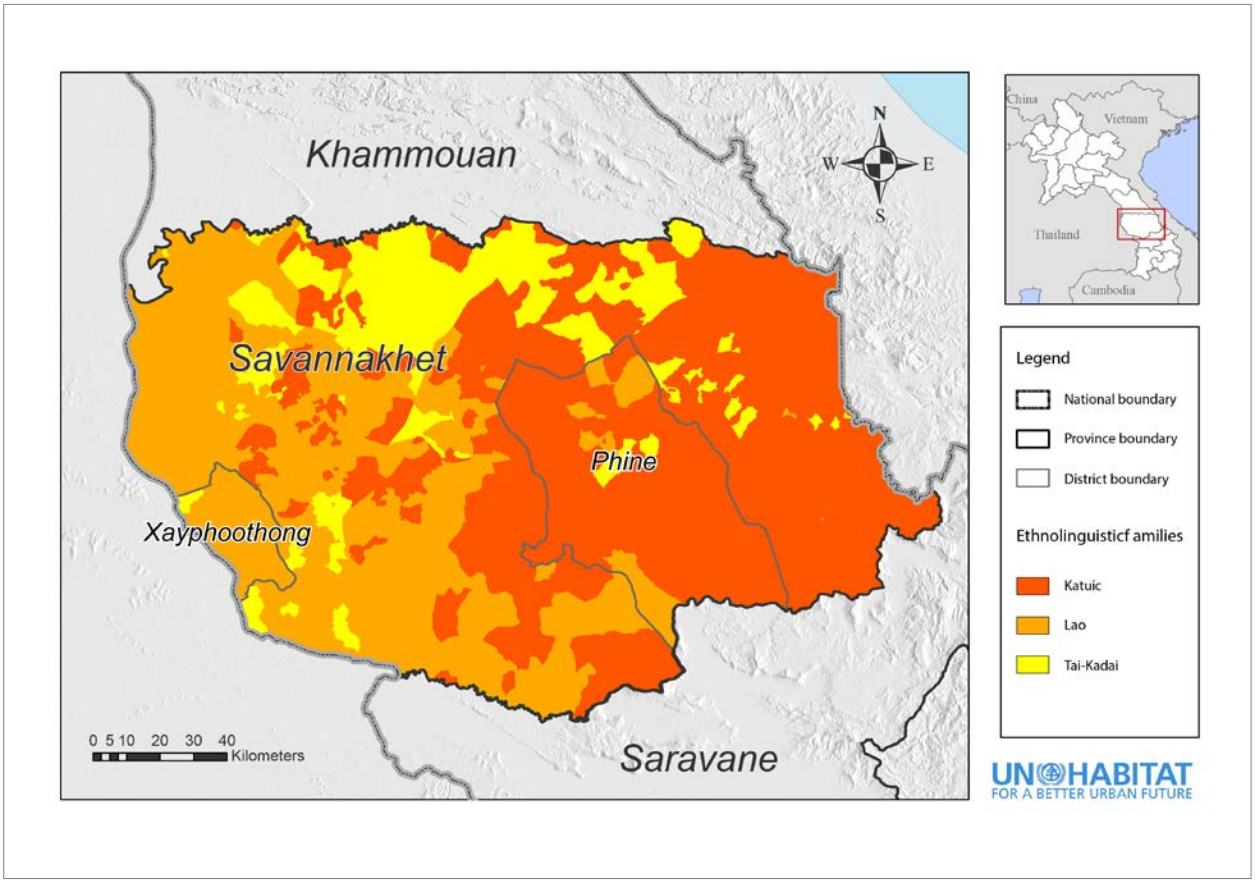

Figure 0 – Map of Ethnicities in Savannakhet province

Poverty declined from 33.5% in 2002/3 to 23.2% in 2012/3[19]. However, the decrease in poverty was not evenly spread throughout the population and so the reduction in poverty was slower than if wealth had been more evenly distributed. The uneven distribution is shown by the fact that the cumulative growth in average consumption was 25 percent over 10 years, but the cumulative growth for the bottom 40 percent was only 14%[20]. People living on less than $1.25 (2005 PPP) a day made up 30% of the population in 1998 - 2012[21].

Similar to the differences in poverty reduction amongst different socioeconomic groups, poverty is more pronounced in some regions than others. Poverty is particularly concentrated in areas with high concentrations of ethnic minority groups, and remoteness, exclusion, and lack of education are all associated with extreme poverty [22]. The 2013 Millennium Development Progress Report also showed a link between gender and poverty, with women finding it more difficult to escape poverty because of social norms and values that govern the gender division of labour. Female–maintained households have been over-represented amongst the poor[23]. Gender disparities in education are more pronounced amongst the poor. In employment, although men and women are equally represented in the workforce, there are more women than men working in vulnerable employment. Women are well represented in the National Assembly, making up 25% of its members. However, there is very low representation of women in other decision-making positions, and especially in provincial and district level governments.

Development Context

The government has plans and strategies to bring development but does not have the financial resources or human capacity to implement its plans.

Lao PDR's development has been consistent over the years as measured by the Human Development Index, for which it scored 0.340 in 1980, rising to 0.586 in 2015. In 2015 it was ranked 138 of the 188 ranked countries, placing it in the lowest quartile of medium developed countries. The government has had a policy of promoting foreign direct investment into natural resources such as land, mining and hydropower and these have driven rapid economic growth.[24].

To date, social progress has not kept up with the rapid economic growth experienced in Lao PDR. Despite the economy's growth, Lao PDR is still classed as an agrarian society, with over 80% of the rural population still subsistence farmers. Lao PDR has

19 Drivers of Poverty Reduction in Lao PDR, World Bank, 2015. Online at http://documents.worldbank.org/curated/en/590861467722637341/pdf/101567-REPLACENENT-PUBLIC-Lao-PDR-Poverty-Policy-Notes-Drivers-of-Poverty-Reduction-in-Lao-PDR.pdf

20 Ibid

21 Key Indicators for Asia and the Pacific, 2015. Asian Development Bank. Online at https://www.adb.org/sites/default/files/publication/175162/ki2015.pdf

22 MDG progress in Lao PDR Online at http://www.la.one.un.org/images/publications/MDGR_2013.pdf

23 MDG progress in Lao PDR Online at http://www.la.one.un.org/images/publications/MDGR_2013.pdf

24 http://www.fao.org/Lao PDR/fao-in-Lao PDR/Lao PDR-at-a-glance/en/

had varying success with achieving MDG targets. For MDG 1, the national poverty rate was halved from 46% in 1992/93 to 23% by 2012/13. However, inequalities have increased, particularly between the main cities and rural areas, and there is an uneven distribution of health services and financing. In 2015 there was still widespread food insecurity, with 20% of the population consuming less than the minimum dietary energy requirements. Some key recent human development indicators are shown in Table 2.

Table 2: Key Human development indicators for Lao PDR

Life expectancy at birth (years)	66.6
Stunting (moderate or severe) (% under age 5)	43.8
Adult literacy rate (% ages 15 and older)	79.9
Mean years of schooling (years)	5.2
Primary school dropout rate (% of primary school cohort)	22.4
Maternal mortality ratio (deaths per 100,000 live births)	197
Vulnerable employment (% of total employment)	83.9

In 2010 the government identified six focus areas to accelerate the achievement of MDG targets. One of the six areas concerned the expansion of safe water supply and improved sanitation for all rural areas and small towns. The government is aiming for an equitable provision of services to all geographic areas and social groups. This is part of a strategy to achieve SDGs and those MDGs for which the targets were not achieved. Proposed activities include coping with climate/weather
changes and reducing the damages caused by natural hazards that could occur, transforming villages into developed units, designing good village planning, constructing necessary basic infrastructure and providing clean water and latrines[25]. A major need for physical infrastructure is found in the fast growing emerging and small towns. Growth in these towns is due to rural –urban migration and is aided by government policy and projects such as the Greater Mekong Region (GMS) economic corridors, designed to attract investment to the major transport routes across the region, with spinoffs of economic growth through green growth and climate resilience[26]. In the past, the focus of the government's investment has been Vientiane capital and the four secondary towns, followed by provincial capitals and district capitals. However, in 2016 there were approximately 130 small and emerging towns in Lao PDR, as well as 1,070 officially designated "village clusters", many of which are developing into urban areas[27]. There is a window of opportunity to build resilience into these smaller towns now, as they are experiencing rapid development. Planned development can ensure that climate change resilience is built into the design of the towns, rather than having them develop

[25] See outcome 2 of The 8th Five Year National Socio-economic Plan. Online at http://www.la.one.un.org/images/publications/8th_NSEDP_2016-2020.pdf

[26] Lao People's Democratic Republic: Second Greater Mekong Subregion Corridor Towns Development Project. 2015. ADB.

[27] The process of developing the water supply and sanitation strategy for emerging towns in Lao PDR. Water Governance Facility report, 2016. Online through http://watergovernance.org/resources/wgf-report-7-process-developing-water-supply-sanitation-strategy-emerging-towns-Lao PDR/

in an ad hoc manner, thereby damaging ecosystems and exacerbating the effects of climate change and extreme weather events.

Environmental context

Land degradation and damage to ecosystems exacerbate the impacts of extreme weather events such as floods and storms and reduce climate change resilience.

The development – environment nexus has been one of tension in Lao PDR, where unregulated development agendas have damaged previously well-functioning ecosystems. The state of the forests is a concern. Although there are different statistics for the area of forest, based on varying conditions of forest cover, it is clear that forest cover has declined gradually in recent years, but it declined sharply in previous decades. One figure given is from 70% to 43% of the country over the last 50 years[28]. There has also been a deterioration in the quality of forests, with dense forests declining from 29% in 1992 to 8.2% in 2002 and a corresponding increase in open forests from 16% to 24.5%. Forest loss in Lao PDR has numerous drivers, many of which are related to development activities including agricultural expansion, small-scale cutting for fuel and construction materials, forestry plantations, mining, hydropower and infrastructure and urban development[29]. Lao PDR is being supported by external organisations to improve its forests through REDD+.

As it has become more industrialised, Lao PDR's greenhouse gas emissions have increased and, combined with the decline in forest cover, Lao PDR became a net emitter of CO_2 for the first time in 2000.' With its economic focus on extractive activities, deforestation is an ongoing challenge in Lao PDR. It is increasing the risk of flooding, a risk which will be exacerbated by climate change as wet seasons become wetter and more intense and dry seasons become drier.

Another environmental issue of concern is water quality. While in the past the water quality of Lao PDR's numerous rivers has been good, it is increasingly deteriorating in the context of rapid demographic growth, socio-economic development and urbanisation[30]. Poor sanitation and a lack of sewerage facilities are key causes of the deterioration in quality. There is therefore, an urgent need to continue to provide infrastructure for both the supply of safe water and for sanitation, to protect the water sources and to improve public health.

Environmental concerns are a key focus in the 8th National Socioeconomic Development Plan, with one of three outcomes being that "Natural resources and the environment are effectively protected and utilized according to green-growth and sustainable principles; there is readiness to cope with natural disasters and the effects

28 Profile on Environmental and Social Considerations in Lao P.D.R., JICA, 2013. Online at http://open_jicareport.jica.go.jp/pdf/12144762.pdf

29 https://theredddesk.org/countries/Lao PDR/statistics

30 Profile on Environmental and Social Considerations in Lao P.D.R., JICA, 2013. Online at http://open_jicareport.jica.go.jp/pdf/12144762.pdf

of climate change and for reconstruction following natural disasters[31]." Under this outcome, the three outputs are (1) Environmental Protection and Sustainable Natural Resources Management; (2) Preparedness for Natural Disasters and Risk Mitigation; and (3) Reduced Instability of Agricultural Production. The government has prioritised activities to be carried out in order to achieve these outputs. However, it lacks the financial resources for implementation and is dependent on overseas assistance for many projects. In addition, the technical and administrative capacity is very limited, particularly at district and local levels. Thus, while the government is supportive of a way forward which is environmentally sustainable, it requires assistance to achieve this goal.

Climate change projections and expected impacts

Climate change projections

There is little historical data on climatic conditions in Lao PDR and it is only in very recent times that climate data has been analysed at a country or more local level. Data is more available at a regional level. Analyses which are now being conducted support anecdotal evidence and observations of temperature increase and changes in rainfall.

Lao PDR's climate has two distinct seasons: a dry season from mid-October to April and a rainy season characterised by the south-west monsoon which brings high rainfall, high humidity, and high temperature between May and mid-October[32]. The country can be divided into three climatic zones:

1. The northern zone is a mountainous area with average temperatures below the other regions in Lao PDR. Average rainfall is from 1,500 – 2000 mm.
2. The central zone has higher average temperatures and the average annual rainfall is from 2,500 – 3,500mm, the highest of the three zones. The rainy season in the central region occurs from June - August while the driest months are from January – March. There is a risk of drought during these dry months.
3. The southern region consists of lowland plains which have an average annual rainfall of 1,500 – 2,000mm. Both floods and droughts occur in the lowland plains, including in the Mekong River Basin. In the southern region the wettest months are September and October.

Temperatures during the March-May period can rise above 40°C, while in mountainous areas and during the dry season's cooler months of December and January, temperatures can drop below 15°C. Analysis suggests that over the last 40 years, the annual mean temperature has risen by up to 0.05°C per year, with the greatest increases being in the southern region[33]. According to the IPCC's Fifth Assessment Report, annual mean temperatures will carry on rising by 0.1-0.3°C per decade, and the

31 8th NSEDP, p.89.
32 Vulnerability, Risk Reduction, and Adaptation to Climate Change, Lao PDR. World Bank, 2011.
33 Lao PDR Second National Communication. Online at http://unfccc.int/resource/docs/natc/laonc2.pdf

number of days with temperatures above 33°C will increase. Correspondingly, the number of days with temperatures below 15°C will drop by two to three per year.

At a country level, the average annual rainfall ranges between 1,300-3,000mm with more than 70% of the annual rainfall occurring during the wet season. However, the yearly rainfall varies markedly due to large-scale climate drivers such as the El Nino-Southern Oscillation {ENSO)[34]. Variability between wetter and drier years is predicted to increase[35]. The mean annual rainfall is also projected to increase, with increases of 10-30%, especially in the eastern and southern part of Lao PDR. The increase is not projected to be uniform throughout the seasons. Instead, the most significant increases are expected in the wet season[36].

Expected impacts

In recent years floods and droughts have caused substantial loss of life, economic loss and damage to infrastructure in Lao PDR. In 2008, more than 200,000 people and 75,000 hectares of agricultural lands were affected by floods. In 2010, severe drought during the normal rainy months between May and October severely affected the year's harvest and created extreme food shortages in southern Lao PDR, affecting around 85,000 people. This drought followed Typhoon Ketsana, which damaged agricultural land, housing and infrastructure especially in the southern provinces and was responsible for 28 deaths and an economic loss of US$58 million[37]. Floods in 2011 caused a loss of US$200 million. In 2013 a series of flood events caused by different weather systems occurred in different locations from July through till October. Twelve of the seventeen provinces were affected with an estimated 395,000 people affected and the reported loss of over 20 lives[38].

It is not only the projected increase in rainfall that is of concern in Lao PDR, but the projected increase in intensity of rainfall whereby more rain is expected to fall over a shorter time period, leading to an increased risk of flooding. The Fifth IPCC Assessment Report identifies future risks for Asia as "increased flood damage to infrastructure, livelihoods and settlements, heat-related human mortality, and increased drought-related water and food shortage".

The increased intensity in rainfall is also resulting in long, dry spells and this is predicted to result in increased droughts. Drought-prone areas have already suffered severe impacts such as the unavailability of water and loss of crops leading to widespread food insecurity. External assistance has been required to distribute emergency food aid during severe droughts.

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34 Lao PDR Second National Communication. Online at http://unfccc.int/resource/docs/natc/laonc2.pdf

35 Strategy on Climate Change of the Lao PDR. Online at http://mirror.unhabitat.org/downloads/docs/12679_1_595432.pdf

36 Vulnerability, Risk Reduction, and Adaptation to Climate Change, Lao PDR. World Bank, 2011.

37 http://www.un-spider.org/sites/default/files/41.%20UN-SPIDER_Lao PDR%20rev1-ilovepdf-compressed.pdf

38 https://www.reuters.com/article/us-Lao PDR-floods/floods-in-Lao PDR-kill-20-damage-rice-crops-idUSBRE97R0BB20130828

The most severe secondary hazard associated with extreme weather events is epidemics. In a study of natural disasters from 1970 to 2009, it was shown that the type of disaster causing the greatest loss of life was epidemics[39]. It has been shown that the transmission of communicable diseases, particularly faecal-oral diseases, increases in flooded conditions[40]. The decline in sanitary conditions and lack of access to safe drinking water, which commonly occur in a flood event, contribute significantly to the spread of disease. In Lao PDR, the link between floods and disease is commonly observed, and there is also a marked rise in skin infections and diarrhoea[41]. Health concerns are a major issue associated with the projected increase in flooding.

A further key impact from climate change related flooding concerns land use. Although the Government aims to "ensure sustainable development with harmonization among the economic development and socio-cultural development and environmental protection[42]", there has already been major alteration to eco-systems which have aggravated the impacts of extreme weather. With rapid population growth and urbanisation, there is pressure on the land which is near urban settlements, many of which are close to rivers, deforested areas and degraded catchment areas. Without a strengthening of land use planning, it is likely that there will be both increased flooding because of eco-system changes, and more severe human and economic impacts from the flooding.

Projected increases in flooding and droughts are expected to impact livelihoods, health, physical infrastructure and the economy in general. It is imperative that Lao PDR builds resilience to natural disasters so that it can protect its people and environment and continue on its development trajectory.

Focus of the Proposal

As described below, the main objective of the proposed project is to build resilience to climate change in communities along the east-west economic corridor in the central region of Lao PDR. This will be achieved by the provision of climate resilient infrastructure and the mainstreaming of climate action into urban planning. To achieve this objective, the project focuses its actions on highly vulnerable settlements along the east-west economic corridor in the province of Savannakhet. Two towns, Sayphouthong, in the district of the same name and Sethamouak (in Phine District), with respective populations of 48,188 and 8,956 will be targeted by the project. All residents of the towns are expected to benefit from the project, so in total the project will have 57,144 direct beneficiaries from its infrastructure component, 29,669 of whom are women.

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39 Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment, December 2010, ASEAN Disaster Risk Management Initiative. Online at http://www.unisdr.org/files/18872_asean.pdf

40 Mike Ahern, R. Sari Kovats, Paul Wilkinson, Roger Few, Franziska Matthies; Global Health Impacts of Floods: Epidemiologic Evidence, Epidemiologic Reviews, Volume 27, Issue 1, 1 July 2005, Pages 36–46, https://doi.org/10.1093/epirev/mxi004

41 For example, see http://www.wpro.who.int/Lao PDR/mediacentre/releases/2015/20150816/en/

42 A Key Government Direction for the 8th NSEDP, see 8th Five-Year National Socioeconomic Development Plan (2016–2020)

Table 3: Population details of target towns

District	Population of District (2017)	Population of target settlement (2017)	No. of Women in the target settlements	Population growth rate (% per annum)	Projected population of settlement in 2025	Ethnic minorities (%)
Phine (Sethamouak Town)	64,184	8,956	4,868	2.5	11,358	62%
Sayphouthong	48,188	48,188	25,699	1.65	61,596	48%
TOTAL	**109,907**	**57,144**	**30,567**		**72,954**	

The target settlements have been selected due to their low level of resilience based on high levels of poverty, high exposure to severe climatic events and low institutional capacity and preparation.

As shown in Table 4, below, both towns have recently been exposed to storms, floods and droughts. The poverty headcount remains high in both districts, at 17.1 per cent below the poverty line in Sayphouthong and over 42.4 per cent in Phine District (including Sethamouak Town). A high percentage of the population – 48 per cent in Sayphouthong and 62 per cent in Phine District – are ethnic minorities. See Table 1, above, for a breakdown of the ethnic minority groups in Laos, and Table 3 for a breakdown of the population in the target towns. Other indicators on social development are also very weak in the two target districts. Net high school enrolment, for example, was 6.2 per cent in Phine District and 17.6 per cent in Sayphouthong District in 2015, according to the census[43]. Figure 1 shows the poverty rate and climate hazards of the two target districts and their locations within Lao PDR.

[43] MPI (2016) Where are the Poor, Lao PDR 2015 Census-Based Poverty Map: Province and District level Results, p.105

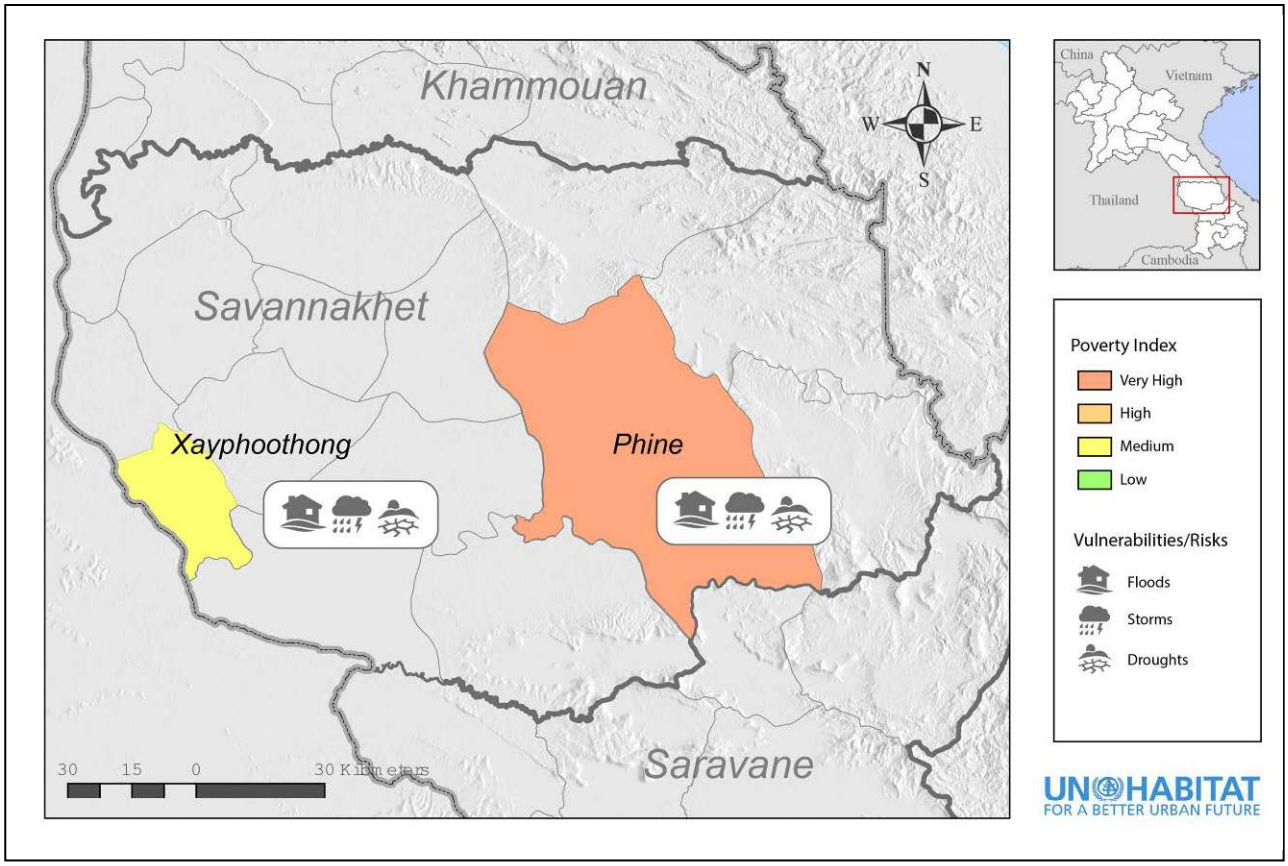


Figure 2 - Location of the Two Target Districts in Lao PDR

Table 4 shows recent extreme weather events in the target districts, where flooding is the most common event. Floods commonly destroy houses and infrastructure such as roads, bridges, water and sanitation facilities, and public buildings including health centres and schools. Common health problems resulting from the consumption of contaminated water include diarrhoea, Dengue Fever and skin conditions. There is a greater risk of epidemics following floods or in times of drought when access to usual water supplies is denied through flooding, damaged infrastructure or though water sources drying up. With few resources for rebuilding and rehabilitation, the damage and destruction of infrastructure can severely affect livelihoods and health for extended periods of time. A slower building hazard is the droughts which are increasingly occurring in some districts. These lead to crop failure, food insecurity and a lack of useable safe water sources, compelling people to source water from contaminated sources.

Table 5 summarises the hazards and underlying vulnerabilities in the target towns. These underlying vulnerabilities exacerbate the impacts of climate change hazards. As mentioned above, poverty is high in both districts, especially in Phine District. High school enrolment rates are among the lowest in the country, which is a proxy indicator of limited adaptive capacity and suggests people depend on climate sensitive livelihoods. More critically, however, both districts lack a water supply or sanitation

system. This means people are highly sensitive to changes in water availability and water quality, driven by climate change; they suffer insufficient water access during the dry season, and especially in drought periods, and from poor quality water during the rainy season, as rivers and wells can become contaminated. Inadequate sanitation is also a year-round problem, heightened during severe weather events, which in turn causes significant public health problems.

Table 4: Recorded extreme weather events in targeted districts

District	Flood	Storm	Drought	Landslide
Phine	Years: 2005/2009/2011/2012/2017	Hima/Ketsana/Nokten/Doksuri	Years: 2013/2014/2015	
Sayphouthong	Years: 2005/2009/2011/2012/2017	Hima/Ketsana/Nokten/Doksuri	2014	

Table 5: Vulnerability in target towns

Province	District of target settlement	Hazards	Underlying vulnerability
Savannakhet	Phine District	Floods, storms, droughts	Very high poverty levels (42.4%), low literacy and very low high school attendance rates (47.6% and 6.2%, respectively), lack of water supply system, drainage and wastewater disposal, low (43%) sanitation coverage, low institutional capacity of local authorities regarding disaster resilience
	Xayphoothong	Floods, storms	High poverty levels (17.6%), very low high school enrolment rates (17.6%) unexploded ordinance, displacement due to mining, dependence on agriculture, no safe water supply system, no drainage, wastewater or solid waste disposal system, 51% sanitation coverage, low understanding of disaster risk reduction

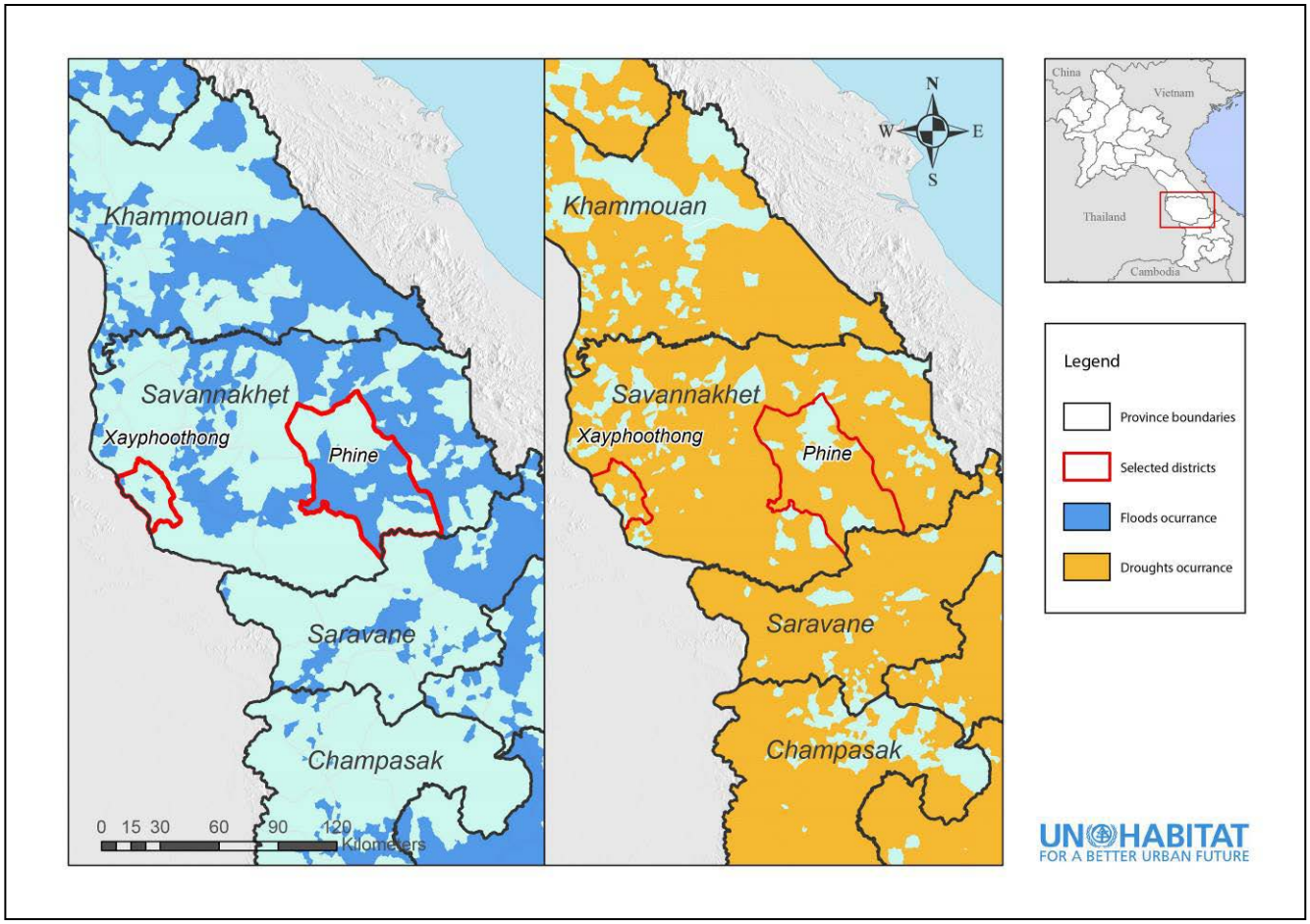


Figure 3 - Flood and Drought Locations

The consultations carried out in the development of this concept note revealed increasing issues with sourcing safe water. This is due to a range of factors including climate change and hazards, poverty and the increasing population in urbanising areas. It has been shown in other areas that the provision of uninterrupted, clean water brings health benefits and both direct and indirect economic benefits through enabling the operation of businesses such as restaurants and guesthouses, as well as improving productivity through improved health and fewer sick days.

Of concern in the target areas is the low level of understanding by authorities of climate change, related weather events and disaster risk reduction. It is also imperative that local authorities understand and implement best practices in terms of urban planning. The time for this to happen is now, since urbanisation is occurring and there is a need to act quickly before unplanned development destroys protective ecosystems and exacerbates the effect of extreme weather events. It is also considerably more difficult and expensive to 'retrofit' existing, poorly planned urban areas with climate-resilient infrastructure than it is to build it as these settlements grow. Capacity building in local authorities and water utilities is therefore of prime importance.

2. Project Objectives

Main objective

The proposed project's main objective is to build climate resilience in small towns along the east-west economic corridor in the central region of Lao PDR. This will be achieved through the provision of climate resilient infrastructure and the mainstreaming of climate change into urban planning. The targeted towns align with the government strategy to promote economic growth and build infrastructure in emerging and small towns.

To achieve the objective, a rapid vulnerability assessment has been carried out in each of the target settlements. This has formed the basis of an action plan. The vulnerability assessment will also feed into master plans which will be developed for each of the two towns. The master plans will demonstrate how to mainstream climate action into urban planning.

The planning and design of resilient systems will be carried out in a participatory manner, with input from all sectors of the community from government officials to marginalised groups such as women and minority ethnic groups. The process will include capacity building for authorities in working in a participatory and inclusive manner. A key component of the project is the construction of climate and disaster resilient infrastructure systems. An additional focus is climate action mainstreamed urban planning.

Specific objectives (also 'project components' in the following table):

Component 1:
Town level master plans developed which integrate climate change adaptation into socially inclusive infrastructure development, spatial planning and land-use, with capacity built at District, Provincial and National level to plan for climate resilient infrastructure development and to maintain and manage infrastructure.

This aligns with the following AF outcomes:
Outcome 1: Reduced exposure to climate-related hazards and threats
Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses
Outcome 3: Strengthen awareness and ownership of adaptation and climate risk reduction processes at local level.

Component 2:
Socially inclusive infrastructure built in target towns that protects people from climate change related impacts and provides continuous services despite current and anticipated future changes in the climate

This aligns with the following AF outcomes:

Outcome 4: Vulnerable development sector services and infrastructure assets strengthened in response to climate change impacts, including variability

Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas

Component 3:
Knowledge and awareness enhanced from national to local economic corridor wide levels, ensuring sustainability and influencing policy changes at the national level.

This aligns with the following AF outcomes:
Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level

Outcome 7: Improved policies and regulations that promote and enforce resilience measures

3. Project Components and Financing

Project Components	Expected Concrete Outputs	Expected Concrete Outcomes	Amount (US$)
Component 1 Develop town level master plans which integrate climate change adaptation into socially inclusive infrastructure, spatial planning and land-use management in and beyond the project area. Capacity built at District, Provincial and National level to plan for climate-resilient infrastructure development and to maintain and manage infrastructure	Output 1.1.1. Training provided to district, provincial and national government staff on resilient infrastructure design	Outcome 1.1. 40 government staff have increased capacity to design climate resilient urban infrastructure in small towns	**350,000**
	Output 1.2.1. Training provided to district, provincial and national government staff on climate action mainstreamed urban planning.	Outcome 1.2. 60 government staff have capacity to develop climate resilient town master plans and two master plans approved, that support the development of resilient infrastructure, serving 57,144 people.	
	Output 1.3.1. Two master plans developed, using knowledge generated by the project, to both provide sustainable adaptation benefits to the infrastructure designed under this project and to enable the government to better plan for adaptation in other infrastructure, beyond that in the project area		
Component 2 Socially inclusive infrastructure built in target towns that protects people from climate change related impacts and provides continuous services despite current and anticipated future changes in the climate	Output 2.1.1. New resilient infrastructure constructed in response to climate change impacts, including variability	Outcome 2.1 57,144 people who currently have inadequate water and/or protective infrastructure, have access to year-round, clean water and protective infrastructure despite current climate hazards and future changes in climate	**4,000,000**
Component 3	Output 3.1.1.	Outcome 3.1.	**237,557**

Knowledge and awareness enhanced from national to local levels along the economic corridor, ensuring sustainability and potentially leading to policy changes at the national level	Project activities and results are captured and disseminated through appropriate information for the beneficiaries, partners and stakeholders and the public in general. Output 3.2.1. Climate policy – especially the National Adaptation Plan and post-Paris agreement reporting – influenced to reflect the challenges of climate change adaptation in basic service and protective infrastructure	Project implementation is fully transparent. All stakeholders are informed of products and results and have access to these for replication.	

6. Project Execution cost	**US$481,567**
7. Total Project Cost	**US$5,069,124**
8. Project Cycle Management Fee charged by the Implementing Entity (if applicable)	**US$430,876**
Amount of Financing Requested	**US$ 5,500,000**

4. Projected Calendar:

Milestones	Expected Dates
Start of Project/Programme Implementation	06-2019
Project/Programme Closing	06-2023
Terminal Evaluation	12-2023

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Project components

The proposed project originated as a request from the government of Lao PDR, articulated through MoNRE, for further support based on the ongoing implementation of the Enhancing the Climate and Disaster Resilience of Rural and Emerging Human Settlements in Southern Lao PDR project, funded by the Adaptation Fund and implemented by UN-Habitat. In particular, the government of Lao PDR and UN-Habitat propose to build on the innovations of the first project to bring additional resilience benefits to other settlements in climate-vulnerable areas,

The project takes a long-term view on developing climate resilient infrastructure that will build climate and disaster resilience in two towns in central Lao PDR. To this end, soft measures including capacity development, urban planning and knowledge management are integrated with hard measures wherein physical infrastructure will be constructed in line with the specific needs identified in the vulnerability assessment of each town (see Annex 1).

As shown in Part 1, the target towns have high levels of vulnerability due to their exposure to floods, droughts, and storms and resultant water and vector borne disease. This combined with high levels of poverty, rapid urbanisation, almost no access to basic services, particularly continuous, clean water supply, limited knowledge of how climate change interplays with these issues, high numbers of indigenous people, and gender inequality. These factors combine to give a low adaptive capacity. The construction of infrastructure which is resilient to floods, droughts, landslides and storms will enable the target communities to have continued access to basic services, thereby mitigating the negative impacts which have been described in the section on expected impacts.

Consultations and vulnerability assessments were conducted in the preparation of this concept note. These were completed in the greatest detail that UN-Habitat resources allowed. Based on the findings from these assessments a menu of physical infrastructure interventions is proposed. Authorities and communities were unanimous in their prioritising of water treatment plants in the two towns, an action which aligns strongly with government policy. It is proposed, therefore, to construct a water treatment plant in each of the two towns to serve the surrounding communities.

At present, people in the two towns source their water primarily from open river sources or self-dug wells and boreholes. As a result, they are not guaranteed water year-round, and the quality of water they use is often poor because of turbidity and other forms of contamination. Water treatment is therefore an adaptation action because it will increase the ability of people to access clean water year-round, and the treatment plants will be designed to offer continued functionality despite storms, floods and droughts.

In alignment with the political structure in Lao PDR, capacity building will take place from the national level to the community level. At the national level, there is a need to increase capacity in planning for and implementing climate change adaptation actions in sectors outside the Ministry of Natural Resources and Environment (MoNRE) and integrate climate change planning into sectoral policies and plans. This then needs to be carried to provincial, district and community levels. It is important that all levels of government are in alignment with goals relating to climate change adaptation and disaster risk reduction so that adaptation actions are understood and funded. Capacity building will be carried out by national and provincial authorities at a district level and they will also oversee workshops at a community level. The two targeted sectors will be public works and urban planning.

UN-Habitat is currently implementing capacity building at the provincial and district level under its first Adaptation Fund proposal in Laos and will use the experience and lessons learned to strengthen capacity building proposed under this project. This will include further refining the Planning for Climate Change methodology, which is being used in Laos currently and has previously been used in the Philippines, Cambodia, Myanmar and elsewhere.

The principle of inclusivity is a key factor in the project. 27,649 of the project's 57,144 beneficiaries – almost 50% - are indigenous people, and 53.5% of beneficiaries are women. Amongst some ethnic groups, women are particularly marginalised and so it is important that representation of groups is inclusive of women and other marginalised groups such as the elderly, youth or the disabled. Quasi-governmental institutions such as the Lao National Front for Construction, the Lao Women's Union and the Lao Youth Union all have representatives at the village level and these representatives will be actively engaged in the project.

The project will draw from the People's Process approach, which sees people as active participants and the key resource rather than as objects of development. UN-Habitat has extensive experience of working in a participatory manner at the community level. Social mobilisation is a key step whereby communities organise to make decisions regarding their resilience, with technical and financial support from the project. This will occur in the context of the government's Samsang decentralisation policy, which sees provincial administration as a strategic unit, district administration as an integrated implementation unit and the village as a development activity unit. Samsang is in the process of being rolled out throughout the country, with support needed in its interpretation and implementation. It provides an avenue for local government institutions to take a lead in working with communities and other stakeholders in decision-making. UN-Habitat's current AF funded project is providing experience of implementing under Samsang and there is an opportunity now to build on the learning provided through the current project.

Innovation

The following aspects of the project show innovation.

1. Climate action will be mainstreamed into town level master plans. Urban planning in Lao PDR has a history of fragmentation and overlapping mandates amongst different authorities. Currently, there is a focus on economic development in urban planning, and there is scope to mainstream climate change action as well. Integrating climate action into town level master plans will ensure that adaptation is anchored in local policy and is prioritised in ongoing development actions.

2. Capacity building will be carried out in an area wider than the two towns targeted for infrastructure development and will be on towns along the economic corridor. Until the present time, the focus along the economic corridors has been on large-scale infrastructure development but a critical issue for sustainability is access to basic services, recognising that climate change will severely impact these services. Capacity building in urban planning throughout the economic corridor will enhance resilience and will complement Greater Mekong Sub-region infrastructure development measures so that Laos can derive more sustainable development benefits from the economic corridor.

3. a). Technically, the project will make use of pumps which have a dual power system, utilising solar power as their primary energy source with a backup of electricity from the grid (the initial assessment that grid electricity coverage is 95%, including in the areas the pumps would be located). The solar system will contribute to economic and environmental sustainability while the electric component will ensure that there is an alternative source of power, ensuring continued functionality.
   b). Sustainability will also be promoted through water source protection. This will include encouraging the local government to plan for the future construction of riverside embankments, while all infrastructure built by the project (which will be close to the river) will be protected from flooding UN-Habitat has an extensive knowledge of water supply projects in Laos, through its previous work in compiling a database of projects. There is no project in the database which has constructed an embankment to protect the water source. The embankments will lead to selected river front development initiatives as per discussion with local authorities and communities. These may include such land uses as public spaces or small businesses.

4. It is proposed to gather together all relevant stakeholders at the local level to contribute to the master planning process. In Laos, agencies normally operate independently of one another and so the involvement of all concerned agencies is a new idea. The Department of Public Works and Transport will lead the master planning exercise under their mandate for urban planning.

The project comprises three components:

Component 1. Developing plans and capacity building

Capacity built at District, Provincial and National level to plan for climate-resilient, socially inclusive infrastructure development and to maintain and manage infrastructure

Develop two town level master plans which integrate climate change adaptation into infrastructure, spatial planning and land-use management in and beyond the project area

The following activities will be included in Component 1:

- Developing two town level master plans integrating climate resilience building into land-use, water management and infrastructure.
- Developing a project tool specifically for use in urbanising areas (with guidelines for assessment and planning, resilient infrastructure, technical standards, environmental and social safeguards and community participatory planning tools.) This will be partly based on the first Adaptation Fund project in Laos, but with greater focus on rapidly growing urban areas.
- Training at the Provincial and district level on building climate resilience by developing action plans and utilising Vulnerability Assessments, using tailored guidelines.
- Developing guidelines for land-use planning and planning, constructing, operating and maintaining climate and disaster resilient infrastructure systems which are appropriate for growing towns.
- Providing a national stakeholder workshop on resilience building in urbanising areas.
- Providing a national training of trainers' workshop.
- Providing district level workshops for roll out of the project, to prepare district level stakeholders for the implementation of the project (including hard activities under Component 2 and the Environmental and Social Management Plan.)
- Community-level workshops to raise awareness and mobilise support and ownership of the vulnerability assessment and planning process, including decision making and prioritising interventions. There will also be at least 1 provincial/district level training.

While the increase in extreme weather such as floods and tropical storms is visible to people already, long term changes in rainfall and increases in temperature are not so obvious in all districts.

The basic vulnerability assessment data gathered so far in the development of this proposal (and which will be elaborated further when the full proposal is developed) will inform the town-level master plans and will be used as a basis for training government officials at the sub-national level. This will contribute to building their capacity to

incorporate current and future climate information into sub-national infrastructure and urban planning

Capacity building will ensure that all stakeholders gain an understanding of the short term and long-term needs associated with climate change threats and that they are able to plan for the severest potential scenarios and prioritise adaptive actions including land-use planning, and the provision of basic services infrastructure. Community members will be mobilised to work alongside the local authorities in building resilience, thereby strengthening the partnership between local authorities and their communities.
In line with Adaptation Fund Outcome 3 and ongoing priorities under Lao PDR planning (See Section D), Component 1 will increase understanding and ownership of the climate change adaptation process in local government (district and town level) and communities, with a view to strengthening capacity in infrastructure planning, construction and maintenance as well as land use.

Building capacity in climate-resilient infrastructure development and maintenance will involve a range of stakeholders, from local government authorities, especially the Department of Public Works and Transport, water utilities, and the Department of Planning and Investment to community members. The capacity building work will respect and strengthen the existing government agencies and structure. However, these agencies will work increasingly work together under the project. The proposed hard infrastructure investments in Component 2 will also feature in the master plans, and the capacity building activities will ensure that the provincial and district government officials have the capacity to perform ongoing maintenance, as well as planning for additional actions to be implemented in the future to adapt to climate change.

Sustainability is critical to the infrastructure design. Water utilities will be particularly involved in the operation of the water treatment plants and piped water supply, which require a different approach from rural water supply infrastructure. To enhance the financial sustainability of the infrastructure, and to increase ownership, a pro-poor tariff will be levied on users. This tariff will be set in consultation with government partners and communities, including women and indigenous people, but in UN-Habitat's experience such a tariff could be set as low as 2,500 kip per cubic litre. The project will develop comprehensive implementation guidelines that will be aimed specifically at emerging and small towns to take account of the particular issues which they encounter. They will cover not only the technical aspects of planning, constructing and maintaining infrastructure but also management and financial skills.

Component 2: Physical infrastructure

Socially inclusive infrastructure built in towns that protects people from climate change related impacts and provides continuous services despite current and anticipated future changes in the climate

In line with AF outcomes 4, 5 and 6 and Lao PDR priorities (see policy section), this component will focus on providing access for 57,144 people to climate and disaster

resilient water treatment plants and piped water supply services, in addition to protecting and/or enhancing local natural assets through effective land-use planning. Considerable consultation has taken place in the preparation of this concept note and prioritisations have been made in each of the target towns. Component 2 will include:

- Ensuring the environmental and social management plan is in full compliance with the Environmental and Social and Gender Policy of the Adaptation Fund, by conducting awareness campaigns (sensitive to the needs and local language of indigenous people), establishing the grievance and disclosure mechanism, and capacity building for project staff and those involved in maintenance and construction of infrastructure to be built under the project.
- Develop and construct a water climate resilient water supply system that serves all 48,188 residents of Sayphouthong and 8,956 residents of Sethamouak Towns. This includes the following actions:
    - o Build a water treatment plant in each town, capable of treating up to 3,600 cubic metres of water per day and associated river bank protection/stabilisation
    - o As part of the design, include pre-sedimentation, flocculation, sedimentation, rapid gravity filtration, a backwash tank and chlorination facilities, 200 m^3 clear water reservoir, detention ponds, plant office, workshop, store and a small water testing laboratory.
    - o Construct the distribution network with up to 60 kilometres of pipelines
    - o Construct a pumping station.

- Develop management systems for the new infrastructure:
    - o Set up a district coordination unit to oversee and implement the construction of the project
    - o Establish a Nam Papa State Enterprise (NPSE)[44] in Sayphouthong and Sethamouak Towns to manage the completed infrastructure in each district. NPSE will oversee tariff setting, engineering and operation and maintenance (see Part II Section E, National Technical Standards for an explanation of how this complies with the governance structure of water supply in Laos)
    - o Establish and build the capacity of village resilient water and sanitation groups to implement and monitor the project. These groups will monitor use, conduct very basic repairs (such as preventing leaks) and report problems to NPSE.
    - o Undertake Environmental and Social Safeguarding measures, including holding specific consultations with women and indigenous people, including, where necessary, consultations in indigenous languages

Consultations conducted in the preparation of this concept note revealed that water supply at the household level is a top priority for the target communities. There is no

[44] NPSEs are autonomous water utilities. See Section E, below, for a description of the role of NPSEs under Laos's legal and governance framework.

water treatment plant in either Sayphouthong or Phine Districts. A water treatment plant is the foundational step on which water supply and sanitation rely. It is therefore proposed to construct two water treatment plants, one in Sayphouthong and the second in Phine District, benefitting the residents of Sethamouak Town. Experience has shown that in times of flooding and droughts, the continued functionality of water supply infrastructure plays a large role in public health as well as livelihood maintenance and so it makes a key contribution to climate change resilience. During droughts there is insufficient water to flush latrines, meaning they don't function properly and become unhygienic, while there is also inadequate water supply for people to meet their daily water needs.

The technical design of infrastructure will comply with all relevant national technical standards, as outlined in Section II, Part E and the Environmental and Social Policy of the Adaptation Fund, as discussed further in Part II Section K of this concept note. Previous experience has built institutional knowledge within UN-Habitat regarding cost-effective infrastructure which is resilient to the weather and climate hazards experienced in Lao PDR. As much as possible, community members will be upskilled so that there is the expertise within the community to construct and maintain infrastructure.

A feasibility study for the proposed infrastructure in Sayphouthong Town has been included in this concept note, and is presented in Annex 2. A similar feasibility study for the smaller system (because it serves fewer people) in Sethamouak Town will be conducted as the full proposal is being prepared. A picture that gives the overview of the system is included at the end of this section. In Sayphouthong Town, several additional climate change adaptation and environmental and social safeguard features have been incorporated into the infrastructure design. Water will be supplied from the Mekong River, which flows year-round, so water supply is guaranteed. The construction of the infrastructure in Sayphouthong will also include riverbank protection. This has three primary functions; as a safeguard measure to ensure that the infrastructure does not destabilise the riverbank, an adaptation measure to ensure that flood waters from the Mekong River do not damage the infrastructure, and a public space function so that people can benefit from urban green/public space. The latter is especially important, considering the increasing propensity of the Mekong to floods during the rainy season (2018 has seen extensive flooding in areas close to the Mekong. Prior to this, floods also occurred in 2013 and 2011). The storage reservoir will also be elevated. This prevents flood waters from breaching the reservoir and affecting water quality. It also prevents illegal usage of water. The pumps used in the infrastructure will have a dual power source; primarily relying on solar power and only using electricity when solar power is not available.

These features can be seen in the picture, below.

The specific adaptation benefits of the infrastructure to be constructed in Sethamouak Town – ***over and above*** the adaptation benefits provided by continuous clean piped water supply (as opposed to household-dug wells and boreholes) will be identified in detail at full proposal stage. However, at this stage it is clear that the water will be

sourced from the Houaysakhoang Natural Reservoir and the Xe Thamoauk River, both of which are close to Sethamouak Town.

Component 3: Advocacy, Monitoring and Knowledge Management

Knowledge and awareness enhanced from national to local levels, ensuring sustainability and leading to policy changes at the national level

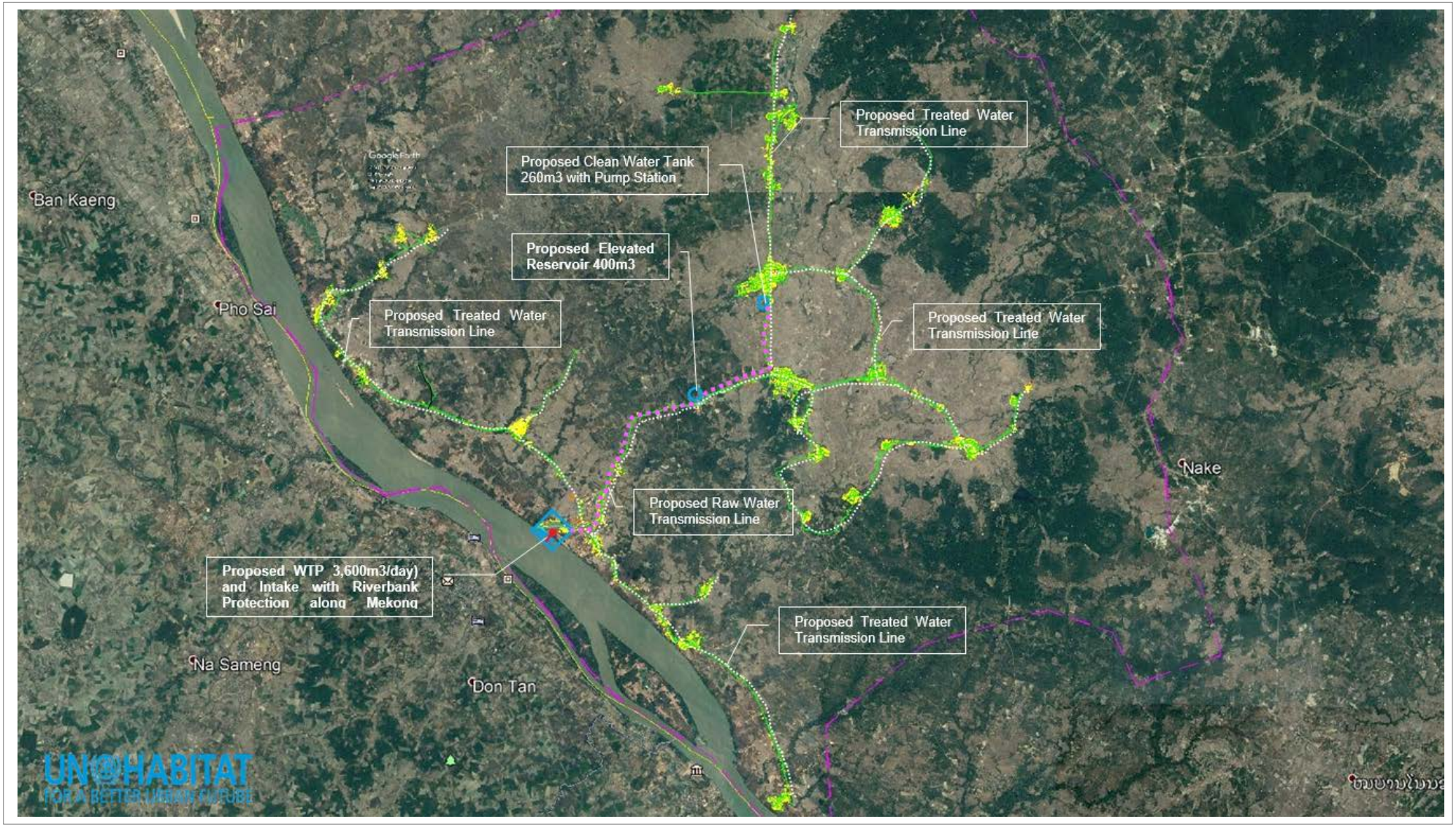
Knowledge management will ensure that the project implementation is fully transparent, and all stakeholders are informed of outputs and results and have access to these for replication. Monitoring will be carried out according to AF guidelines. This component will include:

- Capturing and disseminating lessons learned and best practices both within the target area and further afield, to national level.
- Advocacy carried out at the national level in partnership with other stakeholders working on local level climate change adaptation.
- Building capacity in government authorities and other relevant stakeholders such as water utilities for monitoring, evaluation and learning, with oversight and final evaluations completed by UN-Habitat.
- Establish a database/management platform in conjunction with MoNRE to improve information on climate-related projects throughout Lao PDR.

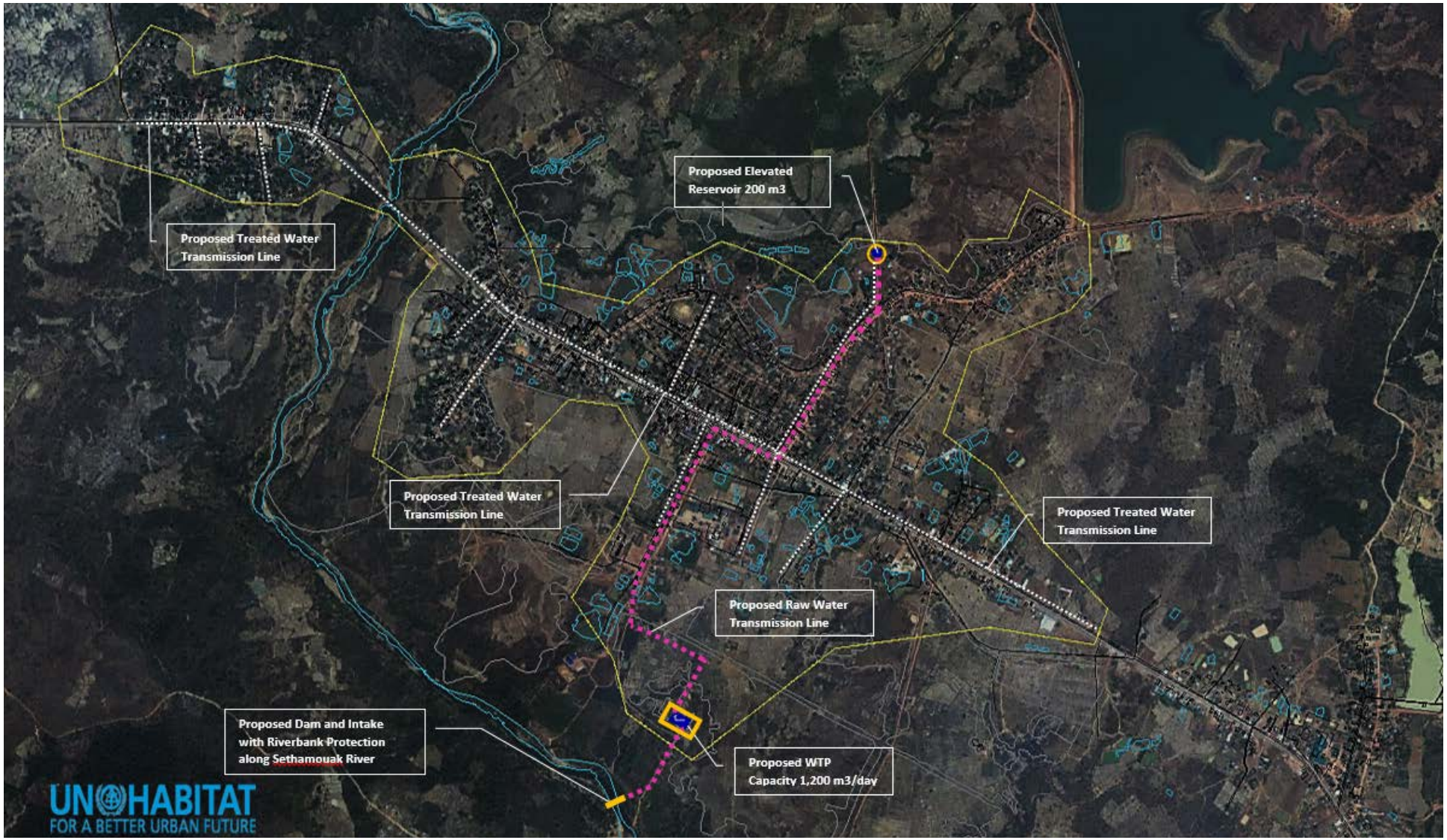
The capacity of government at all levels will be increased through training workshops and learning by doing. The project will add to the institutional knowledge of government authorities and other relevant stakeholders concerning climate resilience at the level of small and emerging towns. Stakeholders will also gain knowledge and experience in monitoring and evaluation. This is an area in which the government has acknowledged weaknesses at all levels of government with regard to sector–level monitoring and evaluation of the National Socioeconomic Development Plan[45]. There is an increasing realisation of the importance of monitoring.

To further ensure that climate action knowledge is not lost, a national level platform will be developed as a repository for learning on both climate change adaptation and mitigation. The lessons from this project will be uploaded to the platform and will be accessible to all relevant stakeholders.

[45] 8th National Socioeconomic Development Plan



Proposed climate resilient water supply system with capacity of 3,600m3/day in Sayphouthong Town



Proposed climate resilient water supply system with capacity of 3,600m3/day in Sethamouak Town

B. Economic, social and environmental benefits

The project will have a series of related economic, social and environmental benefits. Since the target towns are developing rapidly as part of the ongoing East-west Economic Corridor development, interventions are critical now to ensure that climate change resilience is integrated into the towns' development. This will lead to multiple long-term benefits through the avoidance or lessening of impacts of climate change and extreme weather events. Capacity building in local authorities along the economic corridor will mean that the benefits are experienced in a wider area than the two towns in which the physical infrastructure will be constructed.

The key issue to be addressed by the project is the inaccessibility of clean water, especially during the dry season (due to a lack of water availability) and the rainy season (due to water quality). Neither of the target settlements has a piped water supply system and extreme weather events such as floods, landslides and droughts often render alternative water sources useless. Water infrastructure is a critical area in building resilience, both in terms of health and livelihoods. Past experience in Lao PDR has shown that a reliable safe water supply not only makes people more resilient to climate change, it also enables people to start-up businesses such as guesthouses, restaurants, ice-making factories, gas stations, laundries, car washes, concrete factories and a PVC pipe factory[46], providing economic and social benefits to them. This in turn encourages more migrants to the area and a flow on effect in terms of economic activity.

The system constructed by the project will provide continuity of water supply, will result in economic and social benefits for everyone across the two towns. However, women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, which for some means walking long distances, are the primary users of water in the home, and the primary givers when people become sick with water-borne diseases.

The tools used and processes followed in implementing the project are designed to ensure that project benefits are shared by all members of communities. For example, the project will ensure that all groups are represented in consultations and decision making. This includes women from minority ethnic groups, many of whom do not traditionally have a major role in decision making. The inclusive nature of the consultations will ensure that the design of infrastructure meets the requirements of all groups. All financial aspects will be designed according to pro-poor principles to ensure that no people miss out on benefits through unaffordability.

The project will follow environmental safeguards in the design of water supply systems to ensure the sustainability of the source as well as the system. In addition, sanitation,

[46] Interviews carried out for the evaluation or sustainability check of UN-Habitat's MEK-WATSAN project revealed that the establishment of new businesses such as these was a common phenomenon.

wastewater and solid waste disposal systems will have an advantageous effect on local environments.

Table 6, below, provides more detail on the demographic breakdown of the settlements within the two towns.

Table 6 - Population Breakdown within the Target Settlements

Sayphouthong Village cluster	2017 Pop'n.	Women	Men	No. HH	Persons/ HH	M/F Ratio
Thadan	5,044	2,627	2,417	1,029	4.9	0.92
Thapo	5,573	2,980	2,593	1,102	5.2	0.87
Phoumachady	4,766	2,549	2,217	934	5.3	0.87
Mouangkay	6,796	3,634	3,162	1,296	5.3	0.87
Namphou	8,137	4,351	3,786	1,440	3.7	0.87
Nakham	7,259	3,882	3,377	1,114	4.2	0.87
Nabo	5,474	2,927	2,547	989	3.8	0.87
Vuenkheoun	5,139	2,748	2,391	1,004	3.4	0.87
TOTAL	**48,188**	**25,699**	**22,489**	8,908	4.5	**0.88**

Table 7 - Population Breakdown within the Target Settlements

Sethamuoak Village cluster	2018 Pop'n.	Women	Men	No. HH	Persons/ HH	M/F Ratio
Oudomxay	1,201	656	545	260	4.6	0.83
Xesavang	1,447	766	681	236	6.1	0.89
Xanamixay	882	493	389	118	7.5	0.79
Xaisomboun	1,444	783	663	227	6.4	0.85
Sibounheuang	2,028	1,102	926	338	6.0	0.84
Palek	490	265	225	94	5.2	0.85
Nonxay	1,464	800	664	260	5.6	0.83
TOTAL	8,956	4,868	4,088	1,533	5.9	0.84

Table 8: Town level economic, social and environmental benefits of AF interventions compared to baseline.

Type of benefits	Baseline	With/after the project
Economic benefits	Regular floods, droughts and landslides result in livelihood and economic and household losses. Regular droughts and floods challenge access to safe water and cause disease outbreaks. In the dry season, women often need to walk to rivers or other distant sources to collect water. During floods, open defecation practices lead to disease outbreaks, which decreases productivity. Mosquitoes also breed in and around stagnant, standing water, further damaging public health. Limited education and (especially in Phine District) low literacy levels means people have few specialist skills beyond subsistence agriculture and basic manual labour	New infrastructure in the form of water supply and treatment systems will improve public health, continuity of water supply, and therefore provide increased economic opportunities in the form of services (such as guesthouses and restaurants), agriculture, and small-scale industry, which in-turn will reduce poverty. Increased productivity and production and reduced health care costs benefits through improved access to safe water sources, increased hygiene and reduction of waterborne diseases. Increased resilience of natural livelihood capital, such as land and water, will improve the coping mechanisms of the most vulnerable people in the target area and reduce human and material losses during extreme weather events. Cotninued functionality of water supply and sanitation infrastructure, despite regular hazards like droughts, floods and storms, and their increasing frequency and intensity as a result of climate change means that people's incomes are less likely to be disrupted, and that household savings won't need to be invested in small scale repairs to water and santitation facilities (beyond small regular contributions to the improved infrastructure).
Social benefits	Lacking knowledge about climate related risks (e.g. floods, landslides, health) and resilient construction methods result in limited autonomous adaptation measures. Women, elderly, disabled people and ethnic groups are especially vulnerable to climate change because of dependence on climate related services (e.g. water and food), diseases, limited access to health care and information and remoteness Natural resources are not used and managed in a sustainable way.	Health benefits through improved access to safe water sources, resilient sanitation facilitations, reduction of waterborne diseases and improved hygiene standards. Adaptation benefits of the new infrastructure are shared equitably among women, youth, the elderly, the disabled and indigenous people. Women particularly benefit because as they are primarily responsible for providing care, which will be facilitated by having year-round access to clean water, and they will have to spend less time and money sourcing water. People in the two target towns are more aware of the risks of climate change impacts and the benefits of resilient infrastructure and have increased capacity to take autonomous adaptation actions. A planning approach sensitive to marginalized and vulnerable groups, indigenous peoples and gender will ensure sustainable access to resilient infrastructure that is ultimately replicated beyond the target area of the proposed project.
Environmental		The development of environmentally sensitive and

benefits		resilient land use, water resources, infrastructure and community plans will increase the sustainable use of natural resources and improve ecosystem resilience. The capacity development and planning process described earlier will ensure that the infrastructure provided by the project will be resilient to climate change. The ESMP will further ensure the application of resilient technologies.

C. Cost effectiveness

This project will continue in the tradition of cost-effective project implementation that UN-Habitat has built in Lao PDR. Lessons learned from previous project implementation – especially the ongoing Enhancing the Climate and Disaster and Climate Resilience of the most Vulnerable Settlements project, funded by the Adaptation Fund will be incorporated into the project along with principles from UN-Habitat's tools such as the People's Process and Planning for Climate Change.

Synergy with partners and communities

A key feature of UN-Habitat's modality of working is the partnership with government agencies and sector stakeholders such as department of public works and water utilities. For this proposed project, all the land for the water intakes, elevated water towers, pump houses and substations will be government land contributed to the project.

UN-Habitat will ensure that the project employs local engineers who are working with the government institutions such as provincial Departments of Public Works and Transport. Through working on projects under the technical oversight of UN-Habitat, the capacity of local people is strengthened. This modality significantly reduces the cost of projects since there is a need for far fewer international/national consultants. Partnering with local agencies produces effective working relationships that have outlasted specific projects and has enabled a synergy in terms of planning and investment. Thus, there has been significant cash support from sector budgets through the alignment of plans and budgets. In addition, working with local agencies and building their capacity leads to a longer-term cost effectiveness in management and the operation and maintenance of infrastructure systems.

Community contribution

As well as working with partner agencies, UN-Habitat works closely with communities. Past experience has shown that the community can contribute in certain ways to infrastructure. Their involvement not only contributes to the sustainability of the project because they are so involved during the construction period, but it also reduces project costs. This is due to community contributions, often in the form of labour. Community members contribute to tasks such as digging trenches, laying pipes and general labour with all protective gear and training provided by the project. While there are many people willing to contribute unskilled labour, certain community members are trained and contracted to provide more

skilled services. This will be the case for Component 2 of the project, involving the construction and maintenance of infrastructure.

Technical Know-how

UN-Habitat has the technical know-how to be able to guide the process with in-house expertise, which it will use to pass on to and guide the executing partner. This means there is not a dependence on expensive international consultants to carry out technical aspects of the project. Of particular relevance to this proposed project is the Laos office's experience in designing climate and disaster resilient physical infrastructure which is suited to Lao conditions. All designs will thus be done in-house, by a joint team comprising UN-Habitat and its executing partner. This also ensures that the executing partner retains, improves capacity, and is more effective in capacity building than hiring external consultants, whose knowledge is often not passed on or retained in-country in the longer term.

Selection of cost-effective investments

While the two primary infrastructure investments proposed by this project have a high initial financial cost, they are cost effective because they will benefit a large number of people. The total number of beneficiaries of the investments is 57,144 people. That means that the cost per beneficiary of the investments is US$72. Furthermore, the maintenance costs are relatively low at US$5,000 per year per town. While the proposal does not complete a full cost benefit analysis at this stage, the expected benefits, in terms of public health and sustainable economic growth are likely to make the investment cost effective. Furthermore, the timing is cost effective, as the two towns are growing rapidly, and investment now will be significantly lower cost than future attempts to retrospectively design and build infrastructure.

Cost-effective implementation

The People's Process implementation method has been shown to be highly cost-effective, reducing costs through community contributions and through the procurement of local materials wherever possible. UN-Habitat's past water supply systems in Lao PDR have been implemented at a cost which is 40-50% cheaper than the typical cost of a system implemented by an International Financial Institution. An example of cost-effectiveness in Lao PDR is UN-Habitat's MEK-WATSAN programme, which was demonstrated by an external evaluator to have been implemented very cost-effectively. The ongoing Enhancing the climate and disaster resilience of the most vulnerable emerging human settlements project in Laos, funded by the Adaptation Fund, is also using a 'People's Process' model to enhance cost effective delivery across 189 villages in three nearby provinces, and the implementation of the proposed project can learn from this and enhance its cost-effective approach.

Cost-effectiveness due to technical considerations

There is a price to be paid for resilience and resilient forms of infrastructure come at a higher price than non-resilient forms. However, resilient infrastructure is predicted

to be in use for at least twice the length of time as non-resilient infrastructure, since it will remain useable after storms, floods and droughts.

Contribution to productivity

The lack of basic services infrastructure has a cost to the Lao economy. A 2009 study found the annual cost of poor sanitation and hygiene alone to be equivalent to 5.6% of GDP[47]. Even without damage and loss from storms, floods, landslides and droughts, there is an economic cost from the lack of water and sanitation facilities in the form of healthcare costs to treat conditions such as diarrhoea, dengue, skin infections and other water-borne diseases. There is also a cost due to lesser productivity because of more time spent collecting water, and more sick days taken. When the loss is multiplied in times of extreme weather events, and non-resilient infrastructure is damaged or destroyed, there is a high cost to pay. By providing resilient water and sanitation infrastructure, as proposed in the preliminary consultations, the project will eliminate these costs, thereby lifting productivity. The boost to productivity by expected new businesses opened because of the project will further boost the economy.

Table 9: Cost effectiveness analysis of adaptation options proposed through Rapid Vulnerability Assessments

Proposed Action	Cost effectiveness criteria		Alternative action	Cost effectiveness criteria	
Developing two town level master plans integrating climate resilience building into land-use, water management and infrastructure.	Future cost of climate change	✓	Land-use Planning without Integrating Disaster Risk Management	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/Feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	✓		Environmental and social safeguarding risks	More risk
Training at the Provincial and district level on building climate resilience by	Future cost of climate change	✓	Conducting training or planning without considering future climate	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✓

[47] Economic Impacts of Sanitation in Lao PDR, Research Report May 2009, Water and Sanitation Program, World Bank.

conducting and utilising Vulnerability Assessments and action plans, using tailored guidelines	Community involvement	✓	change and climate vulnerability	Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and Social Safeguard Risks	✓		Environmental and social safeguard risks	✓
Develop and construct a water climate resilient water supply system that serves all 48,188 residents of Sayphouthong and 8,956 residents of Sethamouak Towns	Future cost of climate change	✓	Extending existing systems by digging more boreholes and wells	Future Cost of Climate Change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✓
	Cost/feasibility	✓		Cost/feasibility	✓
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
	Environmental and social safeguarding risks	Less risk			
Water source management Integrating with water conservation demand management (WCDM)	Future cost of climate change	✓	Alternative livelihoods	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✓
	Cost/feasibility	✓		Cost/feasibility	✗
				Environmental and social	Less

	Environmental and social safeguarding risks	Less risk		safeguarding risks	risk
Establishing Nam Papa State Enterprises in Sayphouthong and Sethamouak Towns to operate and maintain the infrastructure and providing training on the basic maintenance, in accordance with the Environmental, Social and Gender Management Plan	Future cost of climate change	✓	Relying on existing government structures to manage the infrastructure in the absence of an Environmental, Social and Gender Plan	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk

D. Consistency with national or sub-national sustainable development strategies

National and sub-national sustainable development strategies have been considered in the formulation of this project.

The pivotal development plan in Lao PDR is the 8th National Socio-economic Development Plan which covers the period 2016 – 2020. A long-term goal which is included in the 8th NSEDP is the graduation from Least Developed Country status by 2020. The plan has an emphasis on continued economic growth with harmonisation between economic development, socio-cultural development and environmental protection.

Lao PDR's First National Communication was completed in 2000. This was followed by the National Adaptation Plan of Action (NAPA) in 2009, the Second National Communication in 2013, the National Climate Change Action Plan 2013-2020 in 2013 and the Intended Nationally Determined Contribution (INDC) in 2015 (since ratified). In 2010, the National Strategy on Climate Change (NSCC) was approved. The strategy identified seven priority areas for adaptation and mitigation of which the two most relevant to this project are urban development and public health. The priority areas in the INDC were reduced to five in number, these being agriculture, forestry & land use, water resources, transport & urban development and public health. The focus in the transport and urban development sector was to be increasing the resilience of urban development and infrastructure to climate change. The NDC identifies two focus areas for the public health sector, the first of which is increasing the resilience of public health infrastructure and water supply systems to

climate change. The foci of both these sectors are directly relevant to the proposed project with its plan to provide resilient infrastructure, including water supply infrastructure. Table 10 shows national climate change and disaster management priorities, with those most relevant to this project in red.

The proposal does not assess alignment with Lao PDR's forthcoming National Adaptation Plan. At present, consultations are underway around the formulation of NAP. UN-Habitat is in regular dialogue with both the Ministry of Natural Resources and the Environment and the UN Environment, which is supporting the development of NAP in Laos. At this stage it is too early to conclude what the priority actions will be. However, as NAP is developed the project will proactively seek to align with its focus and priorities, if it begins while NAP is being formulated, influence its direction to include rapidly developing urban areas and resilient infrastructure.

The project is in alignment with provincial and district 5-year socio-economic development plans. These are due to be updated in 2019. This means that the proposed project will be able to provide input on climate change priorities in the updated plans.

For further information on how the proposed project interventions align with water supply policies and tariff regulations, please see below in Part II, Section E.

Table 10: National socio-economic, climate change and disaster management priorities.

Measure	8th Five Year National Socio-economic Plan	National Strategy on Climate Change	Climate change action plan 2013-2020	National Adaptation Programme of action	Nationally Determined Contribution	National Disaster Management Plan
Developing two town level master plans integrating climate resilience building into land-use, water management and infrastructure.	x	x	x	X	x	
Training at the Provincial and district level on building climate resilience by conducting and utilising Vulnerability Assessments and action plans, using tailored guidelines	x		x	X	x	x
Develop and construct a water climate resilient water supply system that serves all 48,188 residents of Sayphouthong and 8,956 residents of Sethamouak Towns	x	x	x	X	X	X
Establishing Nam Papa State Enterprises in Sayphouthong and Sethamouak Towns to operate and maintain the infrastructure and providing training on the basic maintenance, in accordance with the Environmental, Social and Gender Management Plan	x	X			X	

E. Compliance with relevant national technical standards while maintaining compliance with the Environmental and Social Policy of the ESP

Compliance will be ensured with all national technical standards as well as UN-Habitat and Adaptation Fund Environmental and Social, and Gender Policy requirements.

Table 11: Compliance with relevant national technical standards and tools

Expected Output or intervention	Relevant rules, regulations, standards and procedures	Compliance, procedure and authorities involved	Screening against AF ESP Principles
Output 1.1.1. Training provided to district, provincial and national government staff on resilient infrastructure design ***Output 1.2.1***. Training provided to district, provincial and national government staff on climate action mainstreamed urban planning. ***Output 1.3.1.*** Two master plans developed, using knowledge generated by the project, to both provide sustainable adaptation benefits to the infrastructure designed	Lao PDR Urban Planning Law. No.: 03-99/NA, dated 1999 Planning for climate change guidelines Government's '3-build' or 'Samsang' process of decentralisation 8th National 5-year socio-economic development plan. Provincial and district socio-economic development plans (which are in line with the 8th National 5-year socio-economic development plan; Lao PDR Water and Resource Law. No.: 02-99/NA, dated 1996. The Water and Water Resources Law was updated and approved by the National Assembly in 2017.	The project will train government officials on climate change mainstreamed urban planning in compliance with the Urban Planning Law, which is overseen by the Ministry of Public Works and Transport, the proposed executing partner of this project. In this component, the project will work closely with, and train representatives from, the Provincial Department of the Land Management Authority, under the Ministry of Natural Resources and Environment, as this is the government body responsible for land use planning. The proposed planning will also align to the the government's 'Samsang' (or '3-build') process, particularly district and provincial development plans, in conjunction with the Department of Planning and Investment. In addition, the project will also use Participatory Land Use Planning (PLUP) principles, as well as context specific means to consult with people in the target areas, considering the high number of indigenous people.	All principles will be considered when providing training. In conducting consultations under Output 1.3.1, principles 2, 3, 4, 5, 7, 8, 9 and 14 will be of particular importance, as these are the most likely to be affected by investment projects. All trainees will complete a component of training on the Environmental, Social and Gender Plan of the project. Output 2 will trigger safeguarding actions under the following principles: Principle 2, 3, 5, 6, 7, 9, 10,

under this project and to enable the government to better plan for adaptation in other infrastructure, beyond that in the project area ***Output 2.1.1.*** New resilient assets constructed in response to climate change impacts, including variability	Lao PDR Hygiene Law. No.: 08/NA, dated 2004 Lao PDR Water Supply Law. Law No.: 04/NA, dated 2009 (See further explanation of this in the text below the table) National Standard on Quality management for drinking water and household water supply. Decision No. 1371/MoH, dated 2005 Lao PDR Construction Law. No.: 159/LPDR, dated 2009 The Lao National Unexploded Ordnance Programme, which follows IMAS – International Mine Action Standards, under the National Regulatory Authority (NRA) for the UXO/Mine Action and UXO Lao, which adopted SOPs – Standard Operating Procdures Lao PDR Initial Environmental Examination (IEE) and Environmental and Social Impact Assessment (ESIA): Article 21 of the Law on Environmental Protection (Amended) No. 29/NA, dated 18 December 2012; and the Government Decree on the Establishment and Function of the Ministry of Natural Resources and Environment No. 435/PM, dated 28 November 2011. Government Decree on	The project will supply water in compliance with the water supply law, the Hygiene Law, the National Standard on Quality management for drinking water and household water supply and MDG/SDG technical standards for water supply. Water supply is overseen by the executing partner of the project – the Water Supply Department of the Ministry of Public Works and Transport. The project will also ensure that its implementation is in-line with the Construction Law, Building Codes and Building Control, the oversight for which is provided by Ministry of Public Works and Transport. Because the project also works in an area with risk from Unexploded Ordinance, UN-Habitat will work with UXO Lao and the National Regulatory Authority for UXO, to ascertain whether there is a risk from UXOs in the target villages. If necessary, UN-Habitat will survey the target areas and clear the risk areas. The project has been submitted to MoNRE for further consideration of the measures required. Under the IEE, Investment Projects and Activities that are anticipated to cause insignificant or minimal environmental and social impacts are required to conduct an Initial Environmental Examination (category: Group 1 as per the ESIA). An Environmental and Social Impact assessment is only required for projects that are anticipated to cause significant or major environmental and	12, 13, 14 and 15. Further information is provided in the Environmental, Social, Gender and Youth Plan. No environmental and

Output 3.1.1. Climate policy – especially the National Adaptation Plan and post-Paris agreement reporting – influenced to reflect the challenges of climate change adaptation in basic service and protective infrastructure	Environmental Impact Assessment No. 112/PM, dated 16 February 2010. The Instruction on Initial Environmental Examination (IEE) of the Investment Projects and Activities No.8029/MONRE dated 17 December 2013, and Instruction on Environment and Social Impact Assessment of the Investment Projects and Activities No.8030/MONRE dated 17 December 2013. There are no laws governing these activities, *per se.* However, these activities will be in-line with updated climate change policy as it is developed. This could be NDC monitoring, the National Adaptation Plan (under formulation) or a potential third national communication	social Impacts (category: Group 2 as per the ESIA)	social principles are expected to be triggered as a result of this action.

It should also be noted that the proposed system in Sayphouthong Town is of sufficient size that it is required to undergo an Initial Environmental Examination, according to the law, and as described above in Table 11. This examination was conducted and has been presented in Annex 3 in Lao Language (as required by the law). In summary, the IEE finds that the project's environmental impacts are insignificant, and meet the **ADB category B classification** (Also a category **B: Medium risk under the Environmental and Social Policy of the Adaptation Fund**). Therefore, the project is judged to be eligible for inclusion in the Project. No further environmental assessment is required beyond the detailed review of the ESMP during implementation of the infrastructure works.

Water supply in Laos is governed by the Water Supply Law, 2009, and the Enterprise Law 2005. The former formalises several existing directives, described below, while the latter enshrines into law the system of Nam Papa State Enterprises that oversee water supply in urban areas, and that operate as autonomous provincial-level state owned companies. In effect, Nam Papas (NPSEs) are water utilities, responsible for water supply in urban areas. However, not all urban areas in Laos, including the two towns targeted by this proposal, have NPSEs yet. Establishing an NPSE is essential in effectively supplying and managing water in accordance with the law.

Among the previous directives formalised by the Water Supply Law 2009 is Prime Minister Decision No.37/PM on Management and Development of Water Supply and Wastewater Sector (1999), that targets providing 24-hour access to safe water for the 80% of urban population by 2020. This directive was complemented by a Sector Investment Plan (SIP), which was updated in 2004 to reflect the Government's increasing emphasis on equitable development by improving the small towns, particularly those in the poorest districts. The SIP 2004 covers the period 2005-2020 and supports the Government's policies of equitable development for all regions of the country, and poverty reduction through economic growth.

In 2017 the Department of Water Supply was established to set and re-confirm targets and directions for water supply and sanitation as follows; (i) 80% coverage of the urban population with piped water supply by 2020, climbing to 90% by 2030; (ii) promotion of public-private partnerships; (iii) improvement in the management of water supply enterprises so that they can become sustainable businesses with the capacity to sanitation services as well; (iv) effective technical and financial regulation of the water supply sector; and (v) improving the water quality and coverage of the rural population by 2020.

Water tariffs are governed by Ministerial Decision No. 5336/MPWT on Water Supply Tariff Policy, 2004. Under this decision, the Water Supply Regulatory Committee (WSRC) has a mandate to endorse the Tariff Determination Guidelines and Tariff Review prepared by Water Supply Regulatory Office (WASRO) under the Ministry of Public Works. However, any recommended tariff must be approved by local government administration. In compliance with Prime Ministerial Decision No 37/PM, water tariffs should be set to generate sufficient revenue to meet the cost recovery for all water

supply, but this tariff should be within the constraints of affordability and willingness to pay of consumers. To this end, tariffs should be set at no greater than 3% of average household income. UN-Habitat's research shows that water supply through Nam Papa (under the above rules) is a much lower cost option for households. When water supply is not available, households often buy bottled water which can is between 5-20 times more expensive than formal water supply (and quality is still not guaranteed). This means that formal, piped water, which be provided by the project, will be a ***lower cost*** option for the beneficiary families, as well as guaranteeing year-round supply, irrespective of weather conditions and extreme events.

However, the Ministerial Decision also states that no system shall have a tariff less than that required meeting all recurrent costs including operating and maintenance costs. Where necessary, tariffs should be set to generate surplus revenue in order to meet a proportion of depreciation or debt service and block tariffs are an option. In this regard, NPSEs supply water on a full cost recovery basis.

F. Duplication with other funding sources

The target towns for this project were selected in consultation with stakeholders. Key criteria included a high level of vulnerability and need. The target sites do not, therefore, have similar activity being carried out by other development partners. UN-Habitat is in regular contact with the relatively small development partner community in Laos and will continue to liaise with other development partners to ensure that, if other activities are to take place in the target area, information-sharing and coordination can take place.

UN-Habitat will work with national and local government institutions who will provide in-kind contributions to the project. As well, alignments will be made between the project and other ongoing infrastructure developments in the target towns.

In terms of climate change, there are several other current projects in the country focussing on green and resilient cities, either at national level or in areas other than those targeted for this project. Lao PDR has received funding from the Green Climate Fund to strengthen the capacity of the National Designated Authority (MoNRE) and to develop a country programme. Ongoing consultations with MoNRE will ensure alignment of this project with the country programme. In another initiative, an Urban Low Emissions Development Strategy (Urban LEDS) will be developed in Lao PDR. This will deliver emissions reductions and adaptation co-benefits and is a programme of UN-Habitat and ICLEI Local Governments for Sustainability. In Oudomxay Province, the World Bank is supporting urban flood risk management, as well as more reliable hydro-meteorological services across the country. The Global Green Growth Institute (GGGI), an intergovernmental organization founded to support and promote green growth, is implementing a green city pilot study in Vientiane in collaboration with its Green Growth Planning & Implementation division. The project is focussed on solid waste management in Vientiane. UN Environment has proposed a project on Ecosystems and Urban Adaptation in Vientiane and the secondary cities of Savannakhet and Luang

Prabang to the Green Climate Fund. UN-Habitat is in communication with MoNRE to ensure harmonisation with all other projects.

Table 12: Relevant major projects focused on governance and capacity building

Implementing Agency	Project, Funding Amount and Donor (if known)	Timeline	Additional Information
ADB	Water Supply and Sanitation Sector[48]	2013 - 2022	
	Strengthening resilience to CC in health sector[49]	2015 - 2018	Complete project
World Bank	Mainstreaming disaster and climate risk management in investment decisions[50]	2011 - 2016	Complete project
	Building Resilience to Natural Hazards[51]	2013 - 2016	Complete project
UNDP	Effective Governance for Small Scale Rural Infrastructure and Disaster Preparedness in a Changing Climate, $5.5m, GEF-LDCF	2013-2017	Complete project, worked in nearby Saravan and Sekong projects
	Building the Capacity of the Lao PDR Government to Advance the National Adaptation Planning Process, $3.5m, GEF-LDCF	Expected to begin in 2018	Capacity building project – no hard component
UN-Habitat	Water Governance Mekong Region Water and Sanitation Initiative (MEK-WATSAN) Water for Asian Cities (WAC)	2014 – 2017 2009 – 2017 2009 – 2017	Complete projects
UN-Habitat	Climate and Disaster Resilience in emerging human settlements project	2017 - 2021	Ongoing project funded by the Adaptation Fund in Attapeu, Sekong and Saravan Provinces
ICLEI	Urban LEDS II €6m (across 8 countries, of which Laos is 1)	2017-2021	Works in Savannakhet and Pakse cities, but not the target districts
UN-Environment	Building climate resilience of urban systems through Ecosystem-based Adaptation (EbA) in the Asia-Pacific region $6 million ($1.5 million in Laos), GEF	2018 – 2022	Working in Oudomxay and Phongsaly Provinces, in the north of Laos
UN-Environment	Urban Ecosystems-based Adaptation, Green Climate Fund	Unknown	This project is thought to be forthcoming. It does not work in the targeted towns of this proposal

[48] Link to project document: http://www.adb.org/projects/45301-002/main
[49] Link to project document: http://www.adb.org/projects/47143-001/main
[50] Link to project document: http://www.worldbank.org/projects/P129182/lao-pdr-mainstreaming-disaster-climate-risk-management-investment-decisions?lang=en
[51] Link to project document: http://www.worldbank.org/projects/P144268?lang=en

G. Learning and Knowledge Management

The capture of knowledge and dissemination of lessons learned is seen as a key component of the project in order to provide maximum value for the investment of time, funding and labour. If the proposed project passes to full proposal development phase, a detailed schedule will be developed identifying key groups for whom lessons learned would be relevant, and the most effective ways of disseminating knowledge to them.

UN-Habitat has built up substantial knowledge based on its long history of working in Laos, and especially on the Enhancing the climate and disaster resilience of the most vulnerable emerging human settlements project, funded by the Adaptation Fund. Based on this experience, UN-Habitat will be able to work with executing partners to build knowledge through adapting existing tools and methodologies. UN-Habitat's use of the People's Process means of implementation also build communities' knowledge of how to operate and maintain aspects of their infrastructure and develops new skills in terms of construction.

The project will build on the institutional linkages and knowledge management practices of the first Adaptation Fund project in Lao PDR, implemented by UN-Habitat. This will include, for example, utilising and refining the village-level vulnerability assessment infographics[52] developed to easily convey complex information at the town or settlement level and adapting and replicating guidelines produced for quick and effective use. The project will combine with the first Adaptation Fund project in Lao PDR to prepare a broader body of knowledge on climate change adaptation in rapidly growing towns, smaller towns and remote settlements.

At the national level, lessons learned will be made available in the form of tools and guidelines to provide support to other provinces in the building of resilient infrastructure in small and emerging towns. The tools and guidelines will initially be disseminated to relevant stakeholders such as line ministries at provincial and district levels, and ministries at national level, at workshops held as part of the project. The project resources will be available after the close of the project and it is expected that they will be shared at other fora involving relevant stakeholders.

There is a national database of water treatment plant designs suitable for towns of varying sizes and with different types of water source. This database was developed to support water utilities in selecting appropriate designs for particular towns, thereby reducing costs by lessening the need to employ external consultants. The project will contribute to the database by depositing the designs for the water treatment plants constructed for the project. This means that any water utility in Lao PDR can access the designs for use in their area.

UN-Habitat will take advantage of opportunities provided to share lessons learned from the project at the international level so that climate change adaptation may be supported in other vulnerable locations. A relevant platform is the Knowledge Centre on Cities and Climate Change which focuses on Climate Change and Human Settlements.

[52] http://www.lao-canvas.com/UNHInfographics/HTML/index.php

This is an effective way of making lessons learned available to all. The UN-Habitat website will also share knowledge and lessons learned. UN-Habitat will use any other opportunity which presents itself to disseminate knowledge from the project, including sharing through networks and presenting at relevant workshops or conferences. In order to make knowledge accessible, the languages of resource materials in Lao PDR will be Lao. At the international level, the language used will be English. When working with indigenous communities, consultations will be held in the local, indigenous language, and in the Lao Language. It should be noted that many indigenous languages in Laos don't have a written tradition, so discussions must be held with these communities, with written documentation in Lao.

Working with indigenous communities whose native language does not have a written tradition and who do not speak the Lao language (or only have a basic grasp of Lao) presents challenges, and specific procedures are required to ensure fairness, due process and equal access and representation with these communities. Almost 50 per cent of the proposed beneficiaries of this project belong to indigenous groups, and we cannot assume that all the beneficiaries can speak, read and write the Lao Language.

The first step in consultation with indigenous people who don't speak Lao is the Village Chief. In Laos, the village is the most local level of administration (even urban areas are organised into villages, as shown above in Tables 6&7), and village chiefs in predominantly indigenous areas are usually fluent in both Lao and the indigenous language. In this case Village Chiefs can translate discussions to indigenous communities and also seek their opinions and inputs. Secondly, as beneficiaries in the proposed project are 'active' rather than 'passive' (in that they will participate in construction and basic maintenance), specific indigenous beneficiaries who are bilingual (in Lao and the ethnic language) will be identified to act as leaders who can both benefit from training and written material in the Lao Language and who can then disseminate this information orally to beneficiaries who speak only the indigenous language. If it is the case that they are unwilling or unable to act as translators, the project will hire translators to work with the communities.

It is important that the project works directly with the indigenous beneficiaries, in parallel with the village chiefs. While the Village Chiefs are the formal mechanism to represent **all** community members, there is a small risk that power structures may exist in the village that prevent people from airing grievances through the village chief. Therefore, identifying indigenous beneficiaries who will work directly with the project provides a complementary mechanism to ensure that the benefits of the project reach those at risk of marginalisation and that the risk of exclusion is greatly reduced. This approach will be used throughout the project, ensuring that the voices of indigenous people and other potentially marginalised groups are heard at every stage of the project's implementation.

UN-Habitat has experience of a similar process in the ongoing Enhancing the climate and disaster resilience of the most vulnerable rural and emerging urban human settlements in Lao PDR project, also funded by the Adaptation Fund. In that project,

there are 20 ethnic groups, most of which have their own language. In some areas of that project, literacy rates in the Lao language are as low as 50 per cent. That project is more logistically complex than this proposed project, because it covers 189 villages over a much larger and more remote area. That project used a more basic version of the consultation model described above; questions were posed to village chiefs and then a bi-lingual discussion was conducted where village chiefs translated questions into the indigenous language and feedback was sought in whichever language the villagers chose to speak in. This process led to the generation of 189 village level vulnerability assessments, which can be viewed in their provisional form, in English, here.

In the proposed project, this approach will be augmented by working directly with the villagers. By having this parallel structure (working with village chiefs and directly with villagers), the project both respects the formal governance system in Lao PDR (where the village chief represents the people), while mitigating any risks that the Village Chief may exclude indigenous or marginalised people, or people with opposing views.

H. The Consultative Process

The consultations undertaken in the formulation of this concept note were built on the experience and relationships that UN-Habitat has built over 12 years implementing community-based interventions in Lao PDR. The interventions have focused on a range of issues including climate change, disaster response, renewable energy, land management and the decentralisation of basic services. UN-Habitat has also been involved in a supportive role with integrative urban planning and institution building for local authorities.

Through its ongoing work, UN-Habitat has developed effective working relationships with several ministries, including Public Works and Transport; Health, Planning and Investment, and Agriculture and Forestry; and Natural Resources and Environment, as well as with their respective departments in the provinces and districts in which UN-Habitat has implemented projects. UN-Habitat has built an extensive institutional knowledge of ongoing developments in basic services provision, climate change, disaster risk reduction and urban issue, and this institutional knowledge has informed this project. Similarly, informal conversations over an extended time period have contributed to the project plan.

In addition to government authorities, UN-Habitat has also worked closely with other multilateral and development partners, including sister UN organisations and non-governmental organisations. There have been several partnerships focusing on climate change issues and improving the resilience of communities through design and structural improvements to water and sanitation infrastructure, schools, health facilities and houses.

UN-Habitat's previous experience and relationships have fed into the development of this project, forming the basis on which specific project consultations were held. A preparation mission for the development of this concept note took place in early 2018, following discussions with ministry officials as to the most appropriate towns and districts for the project in terms of vulnerability, feasibility and alignment with government priorities. The mission visited all eight potential towns and met with the following people/organisations in each town to carry out a rapid vulnerability assessment to determine the two priority towns:

1. District Governor or Deputy District Governor
2. District chief cabinet
3. District Public Works and Transport office
4. District Natural Resource and Environment office
5. District Planning and Investment office
6. District Public Health office
7. District Education office
8. Village chiefs
9. Lao Women's Union
10. Lao Youth Union
11. Community members

An overview of the consultations conducted is shown in Table 13.

Initial consultations with MoNRE confirmed the scope of the proposed project. In particular, discussion centred on national priorities, and the need for harmonisation by complementing rather than duplicating other initiatives. To this end, the two target locations were selected. Discussion also covered vulnerabilities in the target districts and the relevance of lessons being learned in UN-Habitat's current project on enhancing climate resilience.

Discussions with MPWT focussed on implementation arrangements. Agreements were reached with the Department of Water Supply, since water supply is a key priority to the government in climate and disaster resilience. The importance of integrating climate change adaptation into district action plans was discussed and a consensus was reached on including this in the project. It was decided to use government processes for coordinating with the state-owned enterprise water utilities, including funding local initiatives.

At the local level, consultations were held with government officials from relevant departments. Target sites were further clarified, and discussions were held on the hazards and resulting vulnerability in the target areas. Discussion with community members sought to ascertain community concerns and priorities. It was felt that a greater input is required from the community and this will be a priority during the Component 1 implementation of the project.

As explained in Part II Section A of this concept note, the consultations which have been held and the rapid vulnerability assessments which have been conducted are initial consultations only. The parameters of the project have been agreed on and the three components have been planned. Further consultations and additional data gathering will take place during the full proposal stage of this project development to re-confirm the actions described here and discuss in more detail the project's targets, indicators and implementation modality.

However, it should be noted that the all consultations, and especially those around generating the information in the rapid vulnerability assessments of the two towns (presented in Annex 1) placed emphasis on understanding the needs of marginalised and potentially vulnerable groups, such as women and indigenous people, and to design infrastructure that, from the outset, could be designed and eventually constructed with as few environmental and social risks as possible. The findings of the consultations will be re-visited as further consultations are undertaken in the development of the full proposal, especially regarding minimising environmental and social risks.

Table 13: Stakeholder consultations

Stakeholder, including roles & functions	Consultation objective	Outcome	Remark
Ministry of Natural Resources and Environment (MoNRE) Department of Disaster Management and Climate Change	• Re-confirm focal point willingness • Establish preferred target areas • Ensure coordination with other, ongoing adaptation activities and policy alignment	• MoNRE has agreed to support the project formulation • The target areas named in this concept note were agreed • Information was exchanged on existing and planned initiatives in the target area	MoNRE as the designated authority will approve the project
Ministry of Public Works and Transport (MPWT) Department of Water Supply (DWS) Nam Papa State-owned Enterprise (NPSEs)	• Establish DWS interest in being an executing entity • Agree in principle the modality for channelling funds to the local level • Gain understanding on integrating climate change adaptation into commune and district level plans • Understanding existing technical standard, rules, and regulations	• DWS agrees to be an executing entity • Funding for local investments would be channelled through the NPSEs mechanism • The project contains provisions to mainstream climate change into district action plan • The project follows DWS's Technical Guidelines	DWS will also provide written agreement to be an executing entity
Local districts officials in 8 small towns in Bolikhamsay/Khammouane/Savannakhet/ Champassack Provinces	• Agree on target sites, including narrowing the focus down from 8 towns to the 2 selected towns presented in this proposal. • Understand climate change vulnerability and highlight possible adaptation investments	• Target sites agreed • A clear picture of vulnerability and proposed actions established • Particularly vulnerable groups and specific local vulnerabilities discussed.	Rapid vulnerability assessment (RVA) conducted with the proposal of the intervention of the project (see in Annex 1)
Communities consultations	• Understand the local climate change impacts/ effects per community and (the lack of) community coping mechanisms/barriers to	• Insufficient data and relevant documents were collected	Rapid vulnerability assessment (RVA) conducted with the proposal of the intervention of the project (see

	building resilience • Understand specific resilience building needs and interest as well as concerns		in Annex 1)

Annex 1 contains the rapid vulnerability assessments which were produced as a result of the formulation mission. In each target town, the following data was collected:

- Contextual data
  - Current and projected populations
  - Number of households
  - Poverty rates
  - Sources of income
  - Ethnicity distribution
  - Medical facilities
  - Educational institutions
  - Water sources
  - Sanitation coverage
  - Water and vector-borne diseases

- Climate change and disaster risks
  - Temperature change
  - Rainfall change
  - Floods
  - Storms
  - Droughts
  - Landslides

- Environmental risks
  - Deforestation
  - Hydropower activity
  - Mining
  - UXOs

On the basis of the data, stakeholders then prioritised the town's needs and interventions were proposed to meet the needs. These interventions were later costed for budgeting purposes.

The rapid vulnerability assessments confirm and support the secondary information presented in Part I of this proposal. In Sethamouak Town (Phine District), the vulnerability assessment confirms a high level of vulnerability. Floods affected the town in 2005, 2009, 2011, 2012 and 2017, while droughts occurred in each of 2013, 2014, and 2015. It was hit by Tropical Storms Hima, Ketsana, Nokten and Doksuri in 2005, 2009, 2013 and 2017, respectively.

Adding to this high exposure, people primarily on self-dug wells or the river for their water source (depending on their exact location), while only 43% of households have a latrine. Water and vector borne diseases were highlighted by stakeholders as being problematic. Agriculture, livestock and casual labour provide the main sources of income.

Consistent, year-round climate resilient water supply was the most commonly requested action, according to the vulnerability assessment. This is because there are no water treatment facilities in the Sethamouak Township. Wealthier households buy bottled water at US$15/m3 about 100 times higher than the average tariff for formalized system. Secondary requests from people included improved sanitation and access to healthcare facilities. The activities designed however, to be implemented in Sethamouak Town will also improve the sanitation outcomes of the population.

In Sayphouthong District, where 100% of the 48,188 inhabitants live in the urban area, exposure to hazards is very high. Residents report annual flooding, and more than one flood per year in many cases. Meanwhile, drought occurs approximately once every three years. Moreover, residents perceived that rainfall has significantly decreased in recent years, which, in line with projections for Laos that suggest a longer, drier dry season, will heighten the risk of severe droughts occurring more frequently in the future. In both districts, the feasibility study indicated that women are likely to experience a greater benefit, as they will have to spend less time and energy to source water, and the burden of care would be reduced because of fewer incidences to water-borne disease.

Sensitivity is also high. There is no water treatment, of formalised water supply system in Sayphouthong. Wealthier households also buy bottled water at US$15/m3. The rest of the population relies on various means of sourcing water from the river, or from self-dug wells, in areas further away. Meanwhile, according to the rapid vulnerability assessment, about 65 per cent of households use some form of ‘improved sanitation’.

Health and education outcomes are poor, though not as critical as in Sethamouak Town. Dengue Fever and water borne diseases remain common, especially in the rainy season, while participation in the formal education system is still low, with 17.6% of children attending high school. Poverty is high, at 27 per cent.

As in Sethamouak, the stakeholders consulted prioritised a regular, year-round supply of clean water that is resilient to climate hazards and future changes in climate as the first level priority. As second level priorities, the stakeholders proposed 700-800 metres of riverbank protection and improved, year-round sanitation.

I. Justification for funding requested

The proposed project contributes significantly to meeting the needs for building resilience in very vulnerable communities in Lao PDR, as prioritised in the national and provincial development and climate change policies, strategies and plans. The project aligns with six of the Adaptation Fund’s outcomes as stated in the Adaptation Fund

results framework. The project's hard component will result in 57,144 people being provided with physical infrastructure that is resilient to floods, storms, droughts and their knock-on effects, such as disease outbreaks. The infrastructure will be designed to accommodate rapid future population growth, which the towns are likely to continue experiencing, so that the number of beneficiaries will increase in the coming years. The soft components complement the hard component through building the capacity of at least 100 government officials from the district, provincial and national level, as well as raising the awareness of thousands, and ensuring the continued functionality of the infrastructure in the future.

It is significant that the target towns are evolving into urban landscapes. This presents new challenges to many of the local officials who do not have a knowledge of urbanisation issues. Different ministries have responsibility for land management depending on the classification of the land. As urban areas grow, the need for capacity in land use planning in urban areas is crucial. It is also critical that action is taken now to climate-proof infrastructure. The alternative is that, through lack of knowledge and resources, unplanned infrastructural development will occur which will not be resilient to climate related hazards.

The project is designed to instil ownership in the beneficiary communities so that they play an active role in ensuring the sustainability of the infrastructure and the planning processes which the project will set up. The table below provides a justification for funding requested, focusing on the full cost of adaptation reasoning, by showing the impact of AF funding compared to no funding (baseline) related to expected project outcomes.

Table 14: Impact of Adaptation Fund funding compared to no funding

Activity	Vulnerability Baseline	Adaptation Benefit Resulting from the Project	Alternative Scenario
Developing two town level master plans integrating climate resilience building into land-use, water management and infrastructure.	There are currently no coherent master plans and no plans that mainstream climate change. The lack of planning for climate change increases the long-run vulnerability of people living in the two target towns.	National and sub-national government has the capacity and master plans are in place that will guide infrastructure planning and investment in a way that makes it and people who benefit from it more resilient to climate change. Plans will also support the towns to cope with the rapid population increases they are expected to see in the coming years. This will also reduce vulnerability as rapid population growth without supporting infrastructure will make a greater number of people more vulnerable	National and local government develops plans, but they do not consider climate change and they do not take into account expected rapid changes in population.
Training at the Provincial and district level on building climate resilience by conducting and utilising Vulnerability Assessments and action plans, using tailored guidelines	National and sub-national governments and other organisations in Laos have very limited capacity to assess future vulnerability to climate change or make decisions based on climate change information	By having the necessary skills to gather and analyse climate data and related socio-economic and infrastructure information, national and sub-national government officials are better able to plan infrastructure and services that are resilient to climate change.	Local officials continue to plan in a way that does not consider climate change and future population growth.
Planning, construction and	People do not have access to year-round,	57,144 people have year-round clean	Water supply facilities are

maintenance of resilient water treatment plants and piped water supply systems	clean water supply. In the dry season, people suffer from water shortages of water, while in the rainy season water is often turbid or unfit for drinking with other contaminants. Climate change is enhancing the risks in the future as the dry season is projected to become longer and dryer, while the rainy season is projected to become shorter and more severe. Some of the poorest and most vulnerable people in Lao PDR will continue to suffer (health issues/mortality; costs caused by health issues and loss of assets) due to climate change impacts, also negatively affecting national development goals.	water supply with continued functionality irrespective of extreme events, future climate change and continued population growth.	eventually constructed that do not consider climate change or future population growth. These facilities then do not function properly, or not provide service to the entire population through times of drought, floods and storms, and their sustainability is not guaranteed because of the
Water source management Integrating with water conservation demand management (WCDM)	People in the two target towns have limited capacity to manage water, resulting in water shortages during the dry season	People have greater adaptive capacity to cope with lower levels of water availability which could occur in the future if, as projected, Laos's dry season becomes longer and dryer.	Water facilities are constructed but people are not made aware of how to manage water, and pressure on water sources grows as the dry season becomes dryer and
Establishing Nam Papa State Enterprises in Sayphothong and Sethamouak Towns to operate and maintain the infrastructure and providing training on the basic	There are currently no water management structures in place and no means to ensure that women, indigenous people or any potentially marginalised groups have equitable access to water	The project will ensure equity for all in continued supply of clean water	Water facilities are constructed but are not accompanied by management systems that consider the needs of women, indigenous people or other potentially marginalised groups,

maintenance, in accordance with the Environmental, Social and Gender Management Plan			potentially leading to inequity in access to water

J. Sustainability of the project

The project has been designed to be embedded into the fabric of governance and operations in the towns in which it is implemented. Sustainability is seen as a crucial factor and, as such, is built into the project design in terms of technical, financial, institutional, social and environmental sustainability.

Institutional sustainability

The philosophy throughout all phases of the project will be one of partnership with government mandated agencies, from the national to the community level. This will involve capacity building with the aim of increasing the relevant entities' capacity to independently operate and sustain services. Capacity needs include planning, management, financial literacy and customer service as well as technical knowledge. A key organisation will be the Lao Women's Union, whose goals align with those of the project and who are expected to play a key role in mobilising women to participate in the project. The aim of the capacity building is not to just implement this project but to provide the skills so that agencies can continue to plan for climate change and build resilience in their communities. The project design also enables for scaling up and replication in other vulnerable provinces.

Social sustainability

The People's Process methodology has been shown to bring together different groups at the local level, building trust and relationships between government authorities, water utilities, women's and youth organisations and community members. As a community, ownership in the project is engendered and this unity of purpose plays a large role in social sustainability. The inclusive nature of the project, whereby all groups, including marginalised groups such as some ethnic minority groups, participate, contributes further to social sustainability.

Environmental sustainability

The development of plans and maps will provide local governments with data and direction on how to go about planning resilience building measures that will protect the environment. Training in land-use planning will also play a key part in ensuring that there is not further degradation of local environments. The project's safeguarding procedures will emphasise the protection of water resources and other natural assets.

Financial sustainability

Financial sustainability is most relevant to the ongoing operation of the hard component of the project. In particular, the operation of water supply systems will incur the greatest expense. In terms of finance, the sustainability of the water utilities will be considered as well as affordability of the services provided for beneficiaries. Experience has shown that beneficiaries are able to afford to pay for services when a well-designed, pro-poor

tariff system is in place. The financial benefits of having access to safe, piped water contribute to a household's ability to pay. The design of an appropriate tariff will be carried out as part of the project, with community participation.

In UN-Habitat's experience, pro-poor tariffs can be levied as low as 2,500 Lao Kip (about US$0.30) per cubic litre. This means that poor households are not excluded from service as 'willingness to pay' data will be generated, ensuring that a balance is found between setting a tariff that is affordable to all households, and full cost-recovery of the infrastructure. Initial willingness to pay data has been generated in the preparation of this project proposal and can be found in the Annex. This indicates that many families could feasibly pay up to 20,000 kip per month (about US$2.40).

Overall, both the water infrastructure and the water supply will be managed by Nam Papa State Enterprise (NPSE). There is currently an NPSE in Savannakhet Province, but not in either Sayphouthong District or Phine District (including in Sethamouak Town). As such, new branches of NPSE would have to be established by the project to manage the infrastructure, water supply, and to oversee tariffs.

Technical sustainability
The project will utilise UN-Habitat's technical know-how in designing climate-resilient infrastructure for Lao conditions to ensure that infrastructure withstands floods, storms, landslides and droughts. Capacity building will take place in local communities and government institutions to provide them with the knowledge and skills for planning, construction and maintenance, thereby ensuring technical sustainability. The rapid growth of the project towns has been considered and infrastructure will be designed accordingly to serve increasing numbers of people. Water user groups will be established to deal with maintenance and call the water utility if there is an operational issue. The water user groups will comprise at least 40% women to ensure that women have a voice.

K. Environmental and social impacts and risks

The proposed project seeks full alignment with the Adaptation Fund's Environmental and Social Policy (ESP) and will also be screened according to UN-Habitat's 2016 Environmental and Social Safeguards policy once this concept note reaches full proposal stage. This section briefly describes the initial analysis of environmental and social impacts of the project based on the Environmental, Social and Gender Plan.

Components 1 and 3 of the project, around capacity building and planning, and knowledge management, respectively, consist of soft activities, and have therefore been classified as Category C' activities which will not cause direct, indirect, transboundary or cumulative impacts to environment or society, as defined by the Adaptation Fund Environmental and Social Policy.

The activities under Component 2 of the project are hard activities which, without adequate safeguarding, have the potential to impact negatively on the environment or

on society. The construction of water treatment and supply systems in both towns, both carry some risks. Although these systems are each to serve a town, they are nevertheless not likely to cause "significant adverse environmental or social impacts that are for example diverse, widespread, and irreversible[53]". In addition, the water supply systems will be managed by local people, insofar as possible, by forming resilient WATSAN groups at the community level who report quality issues, maintenance problems and can even conduct very basic repairs. Communities are therefore incentivised to take greater interest in protecting their local environment and society. The capacity building will highlight environmental and social safeguards. In our assessment therefore, the project is extremely unlikely to cause transboundary or cumulative impacts. The potential for direct impact is small and localised. Due to the reasons outlined above regarding Component 2, the project should be considered a Category B project for environmental and safeguards purposes.

The checklist shown below has been prepared based on preliminary consultations. In accordance with the Adaptation Fund Environmental and Social Policy, and UN-Habitat's Environmental and Social Standards, an environmental and social management plan will be prepared as part of the full proposal. Table 16 identifies risks and potential mitigation measures associated with AF Social and Environmental Principles.

Table 15: Checklist of environmental and social principles

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	X	
Access and Equity		X
Marginalized and Vulnerable Groups		X
Human Rights	X	
Gender Equality and Women's Empowerment		X
Core Labour Rights		X
Indigenous Peoples		X
Involuntary Resettlement	X	
Protection of Natural Habitats		X
Conservation of Biological Diversity		X
Climate Change		X
Pollution Prevention and Resource Efficiency		X
Public Health		X
Physical and Cultural Heritage		X
Lands and Soil Conservation		X

[53] AF ESP Policy, p.3, this defines projects which should be categorised as Category A.

Table 16: ESP risks and possible mitigation measures

Adaptation Fund Environmental and Social Principle	Possible Risks AND Significance	(Further) assessment procedure and preventive and mitigation measures
Compliance with the Law	The project has assessed that there is no realistic risk under any of the project's proposed activities because the interventions are to be built by government, on public land, and in compliance with the laws outlined in Part II, Section 5 of this proposal	The main water supply facilities such as the major part of a dam, intake, water treatment plant, and reservoir will be located on public land; the transmission and distribution mains and reticulation pipes will be laid within road rights-of-way. Engagement with Department of Land Management under the Provincial Department of Natural Resources and the Environment, Urban Planning and Construction under PWT at the provincial level Integrating legal compliance into all training and awareness. Continued monitoring throughout the project
Access and Equity	That certain groups are denied access to infrastructure, or that preferential access is given to others. This risk is of medium significance for construction activities under component 2. This is because there is a high number of indigenous people (see below)	Community management with rules ensuring that equal access is guaranteed
Marginalised and Vulnerable Groups	According to the feasibility study and IEE in the preparation of this concept note, 62 per cent of the residents of Sethamouak Town and 49 per cent of Sayphouthong District are indigenous people. In each case, they come from the Phoutong, Katang and Mangkone ethnic groups (all of which have languages from the Thai-Kadai ethnolinguistic family. In total, 27,649 (49.8 per cent) of the beneficiaries are indigenous people. In both towns, women substantially outnumber men. In total, the project has 57,144 beneficiaries, of which 30,567 will be women, meaning that 53.5% of the project's beneficiaries are women. Approximately 30% of households are considered poor throughout the project area. Given the presence of marginalised and vulnerable groups, there is medium risk under the proposed activities under component 2 to them as a result of the project, however, they are the intended beneficiaries	Community management with rules ensuring that equal access is guaranteed, including for indigenous populations. This means that all consultations and meetings should be made accessible in indigenous languages, where people cannot, or do not wish to communicate in the Lao Language. The domestic tariff is a rising 3-block structure to ensure affordability by the low-income group (LIG), this special tariff measures will be created to ensure that poor households have continued access to water supply, despite their low incomes. See Section G, Learning and Knowledge Management for more information on how the project proposes to engage with indigenous people – especially those who do not speak the Lao Language (as a significant minority is unlikely to be literate in Lao).
Human Rights	Human rights breaches can arise from denying access to water and other basic services, or from land conflicts, for example. However, the risk of this is very low, under the proposed activities under component 2, as the project (and its supporting structures)	See measures of other risk categories

	are being created to provide continuity of clean water supply to people.	
Gender Equality and Women's Empowerment	Women could be denied access to infrastructure or prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2.	Quotas for female participation in decision making at all levels. Engagement throughout the project with the Lao Women's Union and the Women's representative which exists in every village.
Core Labour Rights	The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2.	All community contracts must be scrutinised to ensure they comply with both national law and international standards
Involuntary Resettlement	Possible eviction arising from conflicts over land ownership. However, this is very unlikely. All infrastructure investments are being made on land currently owned by the government. No land acquisition is required by the project.	See above for compliance with the law
Indigenous People	See 'Marginalised and Vulnerable Groups, above'	See 'Marginalised and Vulnerable Groups, above'
Protection of Natural Habitats	Damage to local ecosystems, including forests, and rivers from infrastructure construction. This risk is low significance, under the proposed activities under component 2, but not impossible, considering that water the be supplied will be sourced from the river in both towns.	Incorporating protection of habitats and ecosystems into action planning. Designing infrastructure so that it complements nature
Conservation of Biological Diversity	See Protection of Natural Habitats	See Protection of Natural Habitats
Pollution Prevention and Resource Efficiency	Construction of infrastructure generates waste, as part of the activities under component 2. However, as waste generation will be highly localised, and systems in place for proper disposal, this is low significance	Incorporating waste management and disposal into design and operating procedures for the construction
Public Health	Water infrastructure could be open to contamination, spreading water-borne diseases	Incorporating public health considerations (Especially relating to water contamination) into training under Component 2
Lands and Soil Conservation	See Protection of Natural Habitats	See Protection of Natural Habitats

PART III: Implementation Arrangements

A. Arrangements for project management

The following mechanisms for project execution, coordination and oversight have been agreed in close consultation with the Ministry of Natural Resources and the Environment (MoNRE), as the national designated authority to the Adaptation Fund, the Ministry of Public Works and Provincial Stakeholders in Savannakhet Province, including the Nam Papa State Enterprise (NPSE).

The Ministry of Public Works and Transport (MPWT) at the national level and the Provincial Department of Public Works and Transport at the Provincial Level will be responsible for executing Component 1. The NPSE for Savannakhet Province will be responsible for executing Component 2. MoNRE, at the national level and the Provincial Department of Natural Resources and Environment at the Provincial Level will be responsible for executing Component 3. MoNRE will also have a responsibility, as the focal point Ministry for the UNFCCC, for coordination across the government system. Meanwhile, MoNRE and MPWT will help to coordinate the overall project by co-chairing the Project Management Committee, as detailed below.

Meanwhile, In the Laos government system, under the 'samsang' or 3-build decentralisation process, provincial level units of government are responsible for managing implementation at the sub-national level. In accordance with Samsang, NPSE will execute the physical works under Component 2 of the project. NPSEs are autonomous enterprises, but are under the overall responsibility of MPWT. Therefore, MPWT will provide guidance and oversight to ensure that the project is implemented in accordance with Laos' laws, the Environmental and Social Management Plan of the Project and according to the specifications laid down in this project document.

UN-Habitat is the multilateral implementing entity of the project and will then provide project management support, oversight, management of fund flow and executing partners' delivery, and secretariat of the Project Management Committee. UN-Habitat will have three Agreements of Cooperation (AoCs); one each to execute Components 1, 2 and 3 respectively. The AoCs will create accountability with the executing entities, requiring them to deliver their activities in accordance with the project budget, workplan and in compliance with the Project's Environmental and Social Management Plan (see Annex 6).

Legal and Financial Arrangements
UN-Habitat and MoNRE will sign a joint Memorandum of Understanding as a legal commitment to implement the project.

As above, UN-Habitat will sign three Agreements of Cooperation for US$350,000 with MPWT to execute Component 1 in its entirety, US$4,000,000 with NPSE Savannakhet

to execute Component 2 in its entirety and US$237,557 with MoNRE to execute Component 3 in its entirety. AoCs are the legal basis to transfer funds from the multilateral implementing entity (UN-Habitat) to the executing entities. They also provide the contractual basis to ensure timely delivery, compliance with the designs specified in this project document and the Environmental and Social Management Plan.

The respective Directors General of MPWT and MoNRE will work closely with their provincial counterparts and NPSE Savannakhet to oversee the contractual agreements and authorize payments under Components 1&3 respectively, while the Provincial Director of NPSE will authorize payments under Component 2, upon recommendation from the Project Manager. The UN-Habitat country office for Laos will provide an oversight function, as well as guidance upon request from the executing entities.

Project Governance

At the national level, the Project will be supported by a **Project Management Committee** (PMC). The PMC will be formed to oversee and keep abreast of project progress and facilitate the implementation of the project, including overseeing and cooperating with the project team, the technical advisory group, the local steering committees and the project oversight group.

The PMC will be co-chaired by Directors General, MoNRE and MPWT, with NPSE Savannakhet as vice-chair. UN-Habitat will provide the secretariat function of the PMC. A representative of the UN-Habitat Regional Office for Asia and the Pacific will also be a member of the PMC. Other members of the PMC are as follows: a technical level representative of MoNRE and MPWT, a technical level representative of Ministry of Planning and Investment, provincial level representatives of these three ministries and Lao Women's Union.

The PMC will: (1) approve annual work plans and review key project periodical reports; (2) will review and approve the contractual agreements, including workplans, with a particular emphasis on environmental and social safeguards, budgets and payment schedules; (3) review any deviations and consider amendments to workplans and contractual arrangements.

The PMC will meet at least once per year throughout the project implementation and whenever needed to fulfil the above functions. The PMC will also convene *adhoc* meetings to address serious Environmental and Social safeguard risks, if these arise.

Project Oversight

Project oversight is incorporated into the PMC. In UN-Habitat, the implementation is led by the responsible officer in UN-Habitat's Regional Office for Asia and the Pacific and supported by Project Management Officers (financial management and administration) at the country level by a Chief Technical Advisor and support staff and UN-Habitat's headquarters' Monitoring and Evaluation Unit, the Programme Division, including the Climate Change Planning Unit and the External Relations Division (particularly with

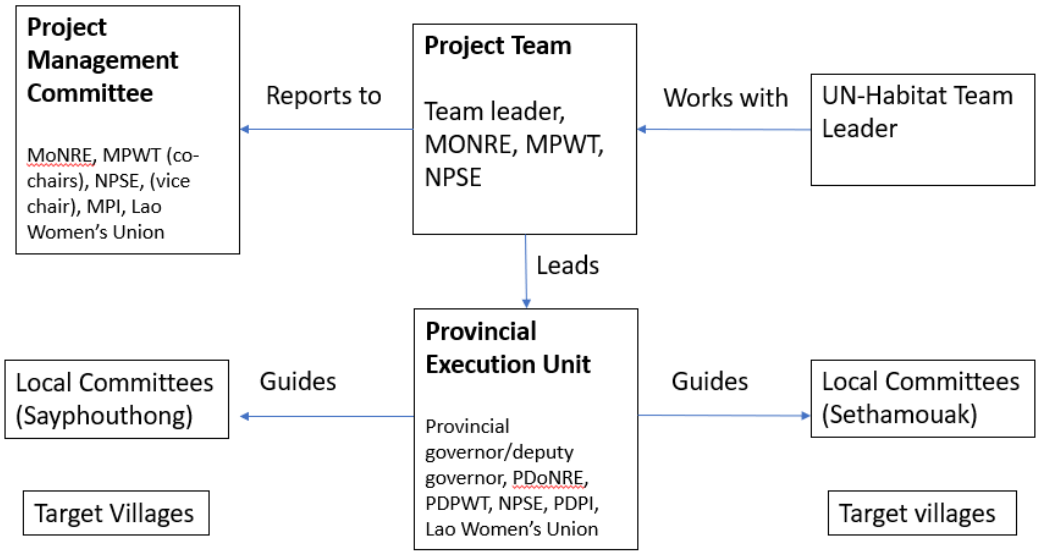
regard to advocacy, outreach and communications), will ensure project management compliance in accordance with UN-Habitat standards and requirements, particularly with regard to financial management, timely delivery and the Environmental and Social Management Plan.

The National level **Project Team** will be comprised of the Team Leader (who will be contracted by MPWT/NPSE Savannakhet), and technical level staff from MoNRE and MPWT. There will also be an engineer based in Savannakhet who will oversee works under Component 2. The project team will be responsible for managing project activities and ensuring compliance with all commitments contained in the project document, particularly the ESMP and compliance with the 15 principles of the Adaptation Fund Environmental and Social Policy, as well as providing day-to-day support to the executing entities. The project team will also take the lead in monitoring through periodic visits to the intervention sites in Sayphouthong and Sethamouak Districts and generating learning from the project. The Project Team will develop a Monitoring and Evaluation Plan during the project's inception phase, which will be distributed to target stakeholders and reported to the PMC.

There will then be a local **Project Execution Unit** to manage day-to-day execution of activities in the field sites. This unit will be especially active in implementing the activities under Component 2 of the Project. This unit will include a provincial level coordinator who will oversee the day-to-day running of activities underway in each district. The Project Exectuion Unit will count on support from technical level representatives of NPSE Savannakhet, The Provincial Departments of Public Works and Transport; Natural Resources and Environment; and Planning and Investment.

At the community level, an equally gender balanced selection of village representatives will for, a **Local Oversight Committee**. This will also include village chiefs from the target villages and district level NPSE representatives.

Organigram of the Project



B. Measures for financial and project risk management

The status of financial and project risks, including those measures required to avoid, minimize, or mitigate these risks, will be monitored throughout the project (as discussed in Section D: arrangements for monitoring, reporting and evaluation).

Table 17 - Financial and project management risks, significance of risks and measures to manage/mitigate risks.

	Category and risk	Rating: Impact/ Probability 1: Low 5: High	Management/mitigation Measure
1.	Environmental/social: Current climate and seasonal variability and/or hazard events result in infrastructure construction delays or undermine confidence in adaptation measures by local communities	Impact: 3 Prob: 2	❑ Current climatic variability has been taken into account in the planning and design of project activities, particularly in the designs of the infrastructure to be built under Component 2: The detailed project designs provided in Annexes 2 & 4 provide evidence of considering climate change, variability and possible future extremes ❑ Both investments under Component 2 have been extensively consulted with communities, local officials, government staff at the sub-national and national level. Indeed, NPSE Savannakhet especially has been closely involved
2.	Institutional: Loss of government support (at all levels) for the project (activities and outputs) may result in lack of prioritization of AF project activities.	Impact: 4 Prob: 1	❑ Establishment of a project management committee and the overall participatory and inclusive project design will improve national, provincial and beneficiary level ownership throughout and thus enhance government support for project implementation. ❑ UN-Habitat will enter into legal agreements (MoUs and AoCs) with the MoNRE (MoU and AoC), MPWT (AoC) NPSE Savankhet (AoC) to ensure that the executing entities will deliver all project activities and outputs in a timely manner and in accordance with the project's ESMP. ❑ Government staff working on climate change, environment, disaster management, infrastructure and provision of water supply will be strongly integrated into the project's structure (See Part III, Section A) ❑ The formulation of The Local Level Committee will ensure that there is strong institutional support for the project at the grassroots/implementation level, and will also ensure that local level stakeholders have a means to raise any grievances or problems.
3.	Institutional: Capacity constraints of local institutions may limit the effective	Impact: 2 Prob: 1	❑ The project has a strong capacity building and training component, particularly under Output 1.1.1 and 1.2.1, which will promote effectiveness and sustainability at the district, provincial and national levels. The project also

	implementation of interventions		has a policy component under Output 3.2.1 that will strengthen the national government.
4.	Institutional/social Lack of commitment/buy-in from local communities may result in delay at intervention sites.	Impact: 2 Prob: 1	❑ Community stakeholders have been consulted extensively during both the concept note and full project development phase to ensure their buy-in into this project ❑ A bottom-up approach integrating the community into the AF project's implementation phases – including community contracting in line with the People's Process - will be followed. ❑ Where possible, the community will have an active role through the 'People's Process' that ensures ownership of the project particularly through community participation in project implementation and monitoring
5.	Institutional/social: Disagreement amongst stakeholders with regards to adaptation measures (infrastructure) and site selection.	Impact: 3 Prob: 2	❑ The adaptation measures proposed in Component 2 of the project and their selected locations have been decided using extensive and detailed criteria, and through several rounds of in-depth consultation with communities and local and national government stakeholders. ❑ There will be a participatory approach to the construction of the infrastructure to be built under Component 2, through the People's Process, which employs the beneficiaries directly in the construction of their infrastructure
6.	Institutional: Communities may not adopt activities during or after the AF project, including infrastructure maintenance	Impact: 2 Prob: 2	❑ The interventions will be institutionalized MoNRE and MPWT, their line departments at provincial level, NPSE Savannakhet and the target communities in Sayphouthong and Sethamouak, to ensure sustainable delivery of (post-) project implementation, including formal agreements for infrastructure maintenance (at national level) and O&M structures at the sub-national level with NPSE Savannakhet. Given the commitment of the national government and the policy alignment of this project, and the direct reporting mechanisms of local government to national government, it can be assumed that such agreements will be honoured. ❑ Officials at the sub-national (provincial, district and village level will support the participating communities beyond the project implementation ensuring community level governance support as well as support for maintenance. ❑ Capacity building and training of communities will be undertaken to improve their awareness and understanding of the benefits of the activities, including infrastructure maintenance (Component 1). ❑ Communities will be involved in project implementation/decision making throughout the project. In particular, they will take ownership of the construction of the infrastructure where unskilled labour is required.

7.	Financial: Complexity of financial management and procurement. Certain administrative processes could delay the project execution or could lack integrity	Impact: 3 Prob: 2	❑ Financial management arrangements have been defined during project preparation. The detailed budget is provided in Part III, Section G, The payment schedule is provided in Part III, Section H, while the management arrangements are outlined in Part III, Section A. ❑ UN-Habitat's control framework, under the financial rules and regulations of the UN secretariat, ensure documentation of clearly defined roles and responsibilities for management, internal auditors, the governing body, other personnel and demonstrates prove of payment / disbursement. These rules are Annexed to AoC agreements ❑ Procurement will be done by the executing entities as agreed through Agreements of Cooperation. The project manager and the project team have a certifying role (for key procurements / expenditures). All expenditures/costs/payments will be documented in USD. In Laos, procurement of high-value good often takes place in USD rather than Lao Kip (the local currency)
8.	Institutional: Delays in project implementation, and particularly in the development of infrastructure interventions	Impact: 1 Prob: 2	❑ The ownership by the Government has been high during the project preparation phase which will reduce this risk. ❑ The project includes extensive planning and capacity building under Component 1. While the investments under Component 2 have been fully identified, improved planning capacity will help to make the implementation smoother and reduce the risk of delays. ❑ Lessons learned from other relevant projects under multilateral climate finance institutions, UN agencies, and involving the three key government partners are described in Part II, Section F.
9.	Institutional: A lack of coordination between and within national government Ministries and Departments.	Impact: 1, Prob:2	❑ The Project Management Committee under the joint leadership of MPWT and MoNRE is to ensure coordination. Should UN-Habitat observe coordination problems, the agency will try to resolve issues directly with concerned parties and or the PMC.
10.	Legal Delays or barriers in gaining approval for infrastructure and housing due to delays in the development process or due to land tenure issues.	Impact 4 Prob 1	❑ No legal issues are foreseen. See Part II, Section E and the ESMP for further evidencing of the legal compliance of the project. ❑ The PMC and the LCC are tasked to ensure close collaboration with the provincial line departments of Public Works and Transport, Natural Resources and the Environment, NPSE Savannakhet and Planning and Investment.

C. Measures for the management of environmental and social risks and complinace with the gender policy of the Adaptation Fund

Part II, Section E and Section K outline the screening and assessment process that has been done based on analysis of the law and consultations to identify the project's potential for risks. Part II, Section H describes the consultation process that has been undertaken to ensure *inter alia* inclusion of potentially marginalised groups (including women and indigenous people). These consultations and analysis are reflected throughout the project design.

Based on a screening against the principles environmental and social policy of the Adaptation Fund, the project has been categorised as a "B" category project in terms of the environmental and social risks it poses.

An Environmental and Social Risk Management Plan (ESMP) has been developed (See Annex 6) to ensure that risks are avoided and that, where this is not the case, they are identified and mitigated in a timely manner. The ESMP identifies all the potential risks and the preventative and mitigation measures that the project proposes to take to reduce potentially adverse environmental and social risks to acceptable levels. The plan also identifies roles and responsibilities for monitoring risks. The ESMP also covers risk management arrangements, risk reduction and the project's grievance mechanism.

D. Arrangements for monitoring, reporting and evaluation in complinace with the environmental and social and gender policies of the Adaptation Fund

The proposed project will comply with formal guidelines, protocols and tools issued by the Adaptation Fund and UN-Habitat and all legal requirements of the government of Laos. A Monitoring and Evaluation Framework, based on the targets and indicators outlined in the Project Results Framework will be developed before implementation commences (see below, Part III, Section E).

In addition, the status of identified environmental and social risks and the project's ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks, will be monitored throughout the project (at the activity level and through annual project performance, mid-term and terminal reports). The same applies to financial and project management risks and mitigation measures. Annex 8 also highlights the roles and responsibilities of AoC partners in Monitoring and Evaluation.

Monitoring and Evaluation Framework

UN-Habitat will ensure the timeliness and quality of project implementation. The

oversight and general guidance of the project will be provided by the Project Management Committee. UN-Habitat will ensure that the project team and the key national executing partners are fully briefed on the M&E requirements.

The audit of the project's financial management will follow UN finance regulations and rules and applicable audit policies.

The M&E plan will be implemented as outlined in the Table 18 below.

Table 18 - Outline Monitoring and Evaluation Plan.

Type of M&E Activities	Responsible Parties	Time Frame	Reporting
Inception Workshop and Report	National Project Manager Project Management Committee UN-Habitat ROAP	Workshop: within first two months of start Report: within first quarter	Inception Report
Periodic status/ progress reports	National Project Manager	Annual, mid term	Annual report, Mid-term review/report
Final Evaluation	National Project Manager UN-Habitat ROAP Project Management Committee External Consultants	Final: At least three months before the end of project implementation	Final Evaluation Report
Project Terminal Report	National Project Manager UN-Habitat ROAP Local consultant	At least three months before the end of the project	Terminal Report
Community consultations / workshops / training	National Project Manager	Within one week after each event	Documentation
Visits to field sites	UN-Habitat ROAP Project Management Committee Government representatives	At least every six months	Field Report

For the M&E budget and a breakdown of how implementing entity fees will be utilized in supervision of M&E tasks, please see the detailed budget in Part III, Section G. For related data, targets and indicators, please see the project proposal results framework in Part III, Section E.

Participatory monitoring mechanisms (involving different levels of government and communes) will be put in place for the collection and recording of data to support the M&E of indicators. The project proposal formulation has gathered demographic data, vulnerability assessment and climate data, as well as maps and infrastructure designs. All of this information will be made available to the PMC for use in the project, including its monitoring.

The target villages will be involved in further data collection. This will allow beneficiary communes to work directly with the project's M&E mechanism, to highlight issues in

project delivery and to strengthen adaptation benefits, including in replication and sustaining the project's gains. Data collected will include marginalized groups (e.g. women) aggregated (if possible). Project site visits will be jointly conducted based on an agreed schedule to assess project progress first hand.

The Project Manager will refine the M&E Plan during the project's inception phase which will be distributed and presented to all stakeholders during the initial workshop. The emphasis of the updated M&E plan will be on (participatory) outcome/result monitoring, project risks (financial & project management risks and environmental social safeguard risks) and learning and sustainability of the project. Periodic monitoring will be conducted through visits to the intervention sites.

UN-Habitat will ensure that all executing partners are fully briefed on the M&E requirements to ensure that baseline and progress data is fully collected and that a connection between the Knowledge Management component and M&E is established. The Agreements of Cooperation will also reflect these.

An Annual Project Performance Review (PPR) will be prepared to monitor progress made since the project's start and in particular for the previous reporting period. The PPR includes, but is not limited to, reporting on the following:

- Progress on the project's objective and outcomes – each with indicators, baseline data and end of project targets (cumulative);
- Project outputs delivered per project outcome (annual);
- Lessons learned/good practice;
- Annual Work Plan and expenditure;
- Annual management;
- Environmental and social risks (i.e. status of implementation of ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks. The reports shall also include, if necessary, a description of any corrective actions that are deemed necessary;
- Project financial and management risks (same as per above).

A **Terminal Evaluation** will take place as the last activity before the operational closure of the project in accordance with Adaptation Fund guidance and following UN-Habitat practices based on the OECD DAC framework. The terminal evaluation will focus on the delivery of the project's results, as initially planned and then reflected in the M&E framework, including the implementation environmental and social mitigation measures The terminal evaluation will assess the impact and sustainability of results, including their contribution to capacity development and the achievement of adaptation benefits.

The **reports** that will be prepared specifically in the context of the M&E plan are:

(i) the M&E plan,
(ii) the project inception report,
(iii) the Annual, and terminal project performance reports and
(iv) the technical reports.

E. Project proposal results framework

Table 19 - Project Results Framework

Expected Result	Indicators	Baseline data	Targets	Risks & assumptions	Data collection method	Fre-quency	Res-ponsibility
Project objective:							
Project component 1: Develop town level master plans which integrate climate change adaptation into socially inclusive infrastructure, spatial planning and land-use management in and beyond the project area. Capacity built at District, Provincial and National level to plan for climate-resilient infrastructure development and to maintain and manage infrastructure							
Outcome 1.1 40 government staff have increased capacity to design climate resilient urban infrastructure in small towns	Level of capacity at the subnational level increased	Capacity to autonomously plan adaptation projects at the sub-national level is limited	5 New adaptation projects prepared by sub-national staff	R Limited time means government staff have to prioritise other day-to-day tasks A There will be continued government support to develop new adaptation projects	Review of new projects developed	Baseline, mid-term and end	Executing entities (MPWT)
Output 1.1.1 Training provided to district, provincial and national government staff on resilient infrastructure design	Number of government staff trained	There is constrained capacity for government staff to plan for new resilient infrastructure	40 government officers trained	R Time constraints mean other government activities will take priority A There will be continued government support to develop new adaptation projects	Training reports	On completion	Executing entities (MPWT)

Outcome 1.2 60 government staff have capacity to develop climate resilient town master plans and two master plans approved, that support the development of resilient infrastructure, serving 57,144 people.	Comprehensive adaptation action plans in place for Sayphouthong and Sethamouak Towns	No such plans developed or in place	Sayphouthong and Sethamouak Towns have comprehensive adaptation action plans in place that consider infrastructure, as well as economic, social and environmental adaptation actions beyond the life of this project.	R New infrastructure projects are planned centrally that don't consider climate change A Plans will facilitate further climate finance and investment	Approved plans	Upon completion of plans	Executing Entities (MPWT) and UN-Habitat
Output 1.2.1 Training provided to district, provincial and national government staff on climate action mainstreamed urban planning.	No. of staff trained	There is very limited capacity at all levels to plan for climate change adaptation actions	60 staff trained	R Time constraints mean other government activities will take priority A There will be continued government support to develop new adaptation projects	Training reports	Mid-term	Executing entities (MPWT)
Output 1.3.1 Two master plans developed, using knowledge generated by the project, to both provide sustainable adaptation benefits to the infrastructure designed under this project and to enable the government to better plan for adaptation in other infrastructure, beyond that in the project area	Developed adaptation plans	There are currently no adaptation plans and no training has been provided on developing such plans	60 staff trained. 2 masterplans developed	R New infrastructure projects are planned centrally that don't consider climate change A Plans will facilitate further climate finance and investment	Training and workshop reports relating to the development of the master plans	Mid-term	Executing Entities (MPWT)
Activities 1.1.1 Define trainee group 1.1.2 Baseline knowledge/training needs assessment 1.1.3 Prepare the exact nature of the training materials based on the specific requirements of the trainee group				Milestones Activities begin by month 6 All trainings complete by month 24 Plans developed by month 30 Complete by month 36			

1.1.4 Provide the trainings and mentorship of the trainee group through a mixture of training workshops and 'on the job' type training 1.1.5 Monitor the achievement of the output of the training 1.2.1 Define trainee group (note that this is a different group from that trained under Output 1.1) 1.2.2 Baseline knowledge/training needs assessment 1.2.3 Prepare the exact nature of the training materials based on the specific requirements of the trainee group 1.2.4 Provide the trainings and mentorship of the trainee group through a mixture of training workshops and 'on the job' type training 1.2.5 Monitor the achievement of the output of the training 1.3.1 Identify key vulnerabilities by re-confirming those presented in this proposal 1.3.2 Define objectives for the planning process 1.3.3 Define shortlist of proposed future adaptation actions through further multi-criteria analysis, cost-benefit analysis and applying environmental and social safeguards 1.3.4 Write up draft plans for review and approval 1.3.5 Approve draft plans							
Project Component 2: Socially inclusive infrastructure built in target towns that protects people from climate change related impacts and provides continuous services despite current and anticipated future changes in the climate							
Outcome 2 57,144 people who currently have inadequate water and/or protective infrastructure, have access to year-round, clean water and protective infrastructure despite current climate hazards and future changes in climate	The target population has access to clean, year-round water supply, which is able to withstand current and anticipated future climate extremes	Neither town has access to reliable water supply, nor capacity to adapt to future changes in climate conditions	57,144 people have access to affordable, clean and climate-resilient water supply	R People are unwilling to pay for water and/or unwilling to switch away from traditional practices of sourcing water A There will be continuous water supply from the river	Site visits, photographs, testimony from communities	Mid-term, end	UN-Habitat, NPSE Savankhet
Output 2.1. New resilient infrastructure constructed in response to climate change impacts, including variability	Physical infrastructures and connections in place	There is no adaptive water supply infrastructure in place at present in the two towns	2 water supply systems constructed that are able to continue functionality in present and anticipated future	R Construction delays A Capacity building efforts proposed in this project will be sufficient to ensure that the	Plans, site visits, photos	Mid-term, end	UN-Habitat, NPSE Savannakhet

			climate conditions	construction takes place on time, to budget			
Activities • Re-confirm designs by engineer • Further public consultation • Procure materials • Hire local communities through the People's Process • Begin construction • Monitor (including under ESMP) • Complete				Milestones ▪ Construction underway by Month 9 ▪ Complete by month 42			
Project component 3: Knowledge and awareness enhanced from national to local levels along the economic corridor, ensuring sustainability and potentially leading to policy changes at the national level							
Outcome 3 Project implementation is fully transparent. All stakeholders are informed of products and results and have access to these for replication.	Level of awareness at the local and national level of climate change adaptation actions and potential for replication	Awareness of the need to take adaptation actions and the potential for replication remains very low aside from specialists in climate change adaptation	At least 100 government staff are aware of the project's activities and have improved knowledge and capacity to replicate its benefits	R Competing priorities and the long-term nature of climate change mean that other short-term actions A There will be incentives to develop adaptation projects in the future	Training reports	Mid-term, end	MoNRE, UN-Habitat

Output 3.1. Project activities and results are captured and disseminated through appropriate information for the beneficiaries, partners and stakeholders and the public in general.	No. of knowledge products generated by the project (knowledge products could be newspaper articles, published case studies and tools or guidelines).	Information-sharing is typically limited, and there is no institutionalised mechanism to capture project results	At least 20 knowledge products generated by the project by its end (see indicators column)	R Limited capacity to consume such knowledge products in a country with numerous aid projects ongoing A Knowledge products are an essential catalyst of replication actions	Knowledge products	Mid-term, end	MoNRE
Output 3.2 Climate policy – especially the National Adaptation Plan and post-Paris agreement reporting – influenced to reflect the challenges of climate change adaptation in basic service and protective infrastructure	NAP and post-Paris climate policies and reporting reflect urban adaptation and basic service provision priorities	National Climate change related policies show some consideration of urban infrastructure adaptation	NAP and all post-Paris climate policy thoroughly reflects urban and basic service adaptation priorities	R Competing priorities at the national level A There is continued political level support for the prioritisation of urban and basic service infrastructure adaptation at the national level	Policy documents, NAP	End	MoNRE
Activities 3.1.1 Develop case studies, and other appropriate good practice documentation. 3.1.2 Establish contact with national newspapers and write semi-regular articles about project successes 3.1.3 Based on training, develop local language guidance and tools 3.1.4 Develop video, fliers and other KM products, as appropriate and under the guidance of the PMC 3.2.1 Engage in regular dialogue with NAP stakeholders and those engaged in Post-				Milestones • Activities under 3.1 will be implanted regularly throughout the project • Activities under output 3.2 will be implemented on-demand, in alignment with the NAP and climate policy process			

Paris work 3.2.2. Conduct alignment workshops with NAP Stakeholders 3.2.3 Provide support to NAP team and other stakeholders involved in Post-Paris policy work to integrate urban and basic service adaptation considerations	

Table 20 - Activities and Milestones

Output	Year 1				Year 2				Year 3				Year 4			
Output 1.1. Training provided to district, provincial and national government staff on resilient infrastructure design		X		X		X		X								
Output 1.2. Training provided to district, provincial and national government staff on climate action mainstreamed urban planning		X		X		X		X								
Output 1.3. Two master plans developed, using knowledge generated by the project, to both provide sustainable adaptation benefits to the infrastructure designed under this project and to enable the government to better plan for adaptation in other infrastructure, beyond that in the project area				X				X				X				
Output 2.1. New resilient infrastructure constructed in response to climate change impacts, including variability			X	X	X	X	X	X	X	X	X	X	X	X		
Output 3.1 Project activities and results are captured and disseminated through appropriate information for the beneficiaries, partners and stakeholders and the public in general.			X			X		X		X		X		X		X
Output 3.2 Climate policy – especially the National Adaptation Plan and post-Paris agreement reporting – influenced to reflect the challenges of climate change adaptation in basic service and protective infrastructure			X			X		X		X		X		X		X

F. Project alignment with the Adaptation Fund results framework

Table 21 – Project Alignment with AF Priorities

Project Outcome	Project Outcome Indicator	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Outcome 1.1 40 government staff have increased capacity to design climate resilient urban infrastructure in small towns **Outcome 1.2** 60 government staff have capacity to develop climate resilient town master plans and two master plans approved, that support the development of resilient infrastructure, serving 57,144 people.	Level of capacity at the subnational level increased Comprehensive adaptation action plans in place for Sayphouthong and Sethamouak Towns	**Outcome 2:** Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks	**$125,000** **$225,000**
Outcome 2 57,144 people who currently have inadequate water and/or protective infrastructure, have access to year-round, clean water and protective infrastructure despite current climate hazards and future changes in climate	The target population has access to clean, year-round water supply, which is able to withstand current and anticipated future climate extremes	**Outcome 4:** Increased adaptive capacity within relevant development and natural resource sectors	4.2. Physical infrastructure improved to withstand climate change and variability-induced stress	**$4,000,000**

Outcome 3 Project implementation is fully transparent. All stakeholders are informed of products and results and have access to these for replication.	Level of awareness at the local and national level of climate change adaptation actions and potential for replication	**Outcome 1:** Reduced exposure at national level to climate-related hazards and threats and **Outcome 7:** Improved policies and regulations that promote and enforce resilience measures	Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis 7. Climate change priorities are integrated into national development strategy	**$237,557**
Project Output	**Project Output Indicator**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Output 1.1. Training provided to district, provincial and national government staff on resilient infrastructure design	Number of government staff trained	***Output 2.1***: Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	**$125,000**
Output 1.2. Training provided to district, provincial and national government staff on climate action mainstreamed urban planning.	Number of staff trained	***Output 2.1:*** Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	**$125,000**
Output 1.3. Two master plans developed, using knowledge generated by the project, to both provide sustainable adaptation benefits to the infrastructure designed under this project and to enable the government to better plan for adaptation in other infrastructure, beyond that in the project area	Developed adaptation plans	***Output 2.2:*** Targeted population groups covered by adequate risk reduction systems	2.2.1. Percentage of population covered by adequate risk-reduction systems	**$100,000**

Output 2.1. New resilient infrastructure constructed in response to climate change impacts, including variability	Physical infrastructures and connections in place	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	**$4,000,000**
Output 3.1 Project activities and results are captured and disseminated through appropriate information for the beneficiaries, partners and stakeholders and the public in general.	No. of knowledge products generated by the project (knowledge products could be newspaper articles, published case studies and tools or guidelines).	***Output 1:*** Risk and vulnerability assessments conducted and updated at a national level	1.1. No. and type of projects that conduct and update risk and vulnerability assessments	**$170,000**
Output 3.2 Climate policy – especially the National Adaptation Plan and post-Paris agreement reporting – influenced to reflect the challenges of climate change adaptation in basic service and protective infrastructure	NAP and post-Paris climate policies and reporting reflect urban adaptation and basic service provision priorities	***Output 7:*** Improved integration of climate-resilience strategies into country development plans	7.2. No. or targeted development strategies with incorporated climate change priorities enforced	**$67,557**

Adaptation Fund Core Indicators	Indicative Targets	Comments
1 Number of Beneficiaries	57,144 beneficiaries	This only counts the direct beneficiaries of the infrastructure works in the two towns. It does not count government staff who will benefit from training or people who will benefit from improved infrastructure that will ultimately emerge from the training, master-planning or policy enhancement components of the project.
2. Early Warning Systems	0	The project does not target early warning systems
3. Assets Produced, Developed, Improved, or Strengthened	2	The project strengthens two water supply systems in Sayphouthong and Sethamouak Towns
4. Increased income, or avoided decrease in income	All beneficiaries	All beneficiaries will have access to affordable, clean water. This means that, as water becomes more scarce and therefore more expensive as a result of climate change, the beneficiaries will have continued water supply as a result of the project.
5. Natural Assets Protected or Rehabilitated	2	The project will also strengthen and protect the riverbank and nearby riparian ecosystems

G. Detailed Budget

Table 21 – Detailed Budget

Programme component	Outputs	Activities	Total budget	Year 1	Year 2	Year 3	Year 4
Develop town level master plans which integrate climate change adaptation into socially inclusive infrastructure, spatial planning and land-use management in and beyond the project area. Capacity built at District, Provincial and National level to plan for climate-resilient infrastructure development and to maintain and manage infrastructure	**Output 1.1.1** Training provided to district, provincial and national government staff on resilient infrastructure design	1.1 Define trainee group 1.2 Baseline knowledge/training needs assessment 1.3 Prepare the exact nature of the training materials based on the specific requirements of the trainee group 1.4 Provide the trainings and mentorship of the trainee group through a mixture of training workshops and 'on the job' type training 1.5 Monitor the achievement of the output of the training	$125,000	$50,000	$75,000	0	0
	Output 1.2.1 Training provided to district, provincial and national government staff on climate action mainstreamed urban planning.	2.1 Define trainee group (note that this is a different group from that trained under Output 1.1) 2.2 Baseline knowledge/training needs assessment 2.3 Prepare the exact nature of the training materials based on the specific requirements of the trainee group 2.4 Provide the trainings and mentorship of the trainee group through a mixture of training workshops and 'on the job' type training 2.5 Monitor the achievement of the output of the training	$125,000	$50,000	$75,000	0	0

	Output 1.3.1 Two master plans developed, using knowledge generated by the project, to both provide sustainable adaptation benefits to the infrastructure designed under this project and to enable the government to better plan for adaptation in other infrastructure, beyond that in the project area	1.3.1 Identify key vulnerabilities by re-confirming those presented in this proposal 1.3.2 Define objectives for the planning process 1.3.3 Define shortlist of proposed future adaptation actions through further multi-criteria analysis, cost-benefit analysis and applying environmental and social safeguards 1.3.4 Write up draft plans for review and approval 1.3.5 Approve draft plans	$100,000	$25,000	$50,000	$25,000	
	Project component total		**$350,000**	**$125,000**	**$200,000**	**$25,000**	
Socially inclusive infrastructure built in target towns that protects people from climate change related impacts and provides continuous services despite	**Output 2.1** New resilient infrastructure constructed in response to climate change impacts, including variability	• Re-confirm designs by engineer • Further public consultation • Procure materials • Hire local communities through the People's Process • Begin construction • Monitor (including under ESMP) • Complete	$4,000,000	$400,000	$1,500,000	$1,800,000	$300,000
	Project component total		**$4,000,000**	**$400,000**	**$1,500,000**	**$1,800,000**	**$300,00**
Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	**Output 3.1** Project activities and results are captured and disseminated through appropriate information for the beneficiaries, partners and stakeholders and	3.1.1 Develop case studies 3.1.2 Establish contact with national newspapers and write semi-regular articles about project successes 3.2.3 Based on training, develop local language guidance and tools	$170,000	$15,000	$50,000	$50,000	$55,000

	the public in general.						
	Output 3.2 Climate policy – especially the National Adaptation Plan and post-Paris agreement reporting – influenced to reflect the challenges of climate change adaptation in basic service and protective infrastructure	3.2.1 Engage in regular dialogue with NAP stakeholders and those engaged in Post-Paris work 3.2.2. Conduct alignment workshops 3.2.3 Provide support to NAP team and other stakeholders involved in Post-Paris policy work to integrate urban and basic service adaptation considerations	$67,557	$10,000	$10,000	$30,000	$17,557
	Project component total		**$237,557**	**$25,000**	**$60,000**	**$80,000**	**$72,557**
Project Activities Total			**$4,587,557**	**$550,000**	**$1,760,000**	**$1,905,000**	**$372,557**
Programme execution		Chief Technical Advisor (part-time)	$290,000	$41,250	$103,750	$103,750	$41,250
		Office staff and technical support	$60,000	$7,500	$22,500	$22,500	$7,500
		Office facilities	$66,567	$16,642	$16,642	$16,642	$16,641
		Travel related to execution	$80,000	$10,000	$10,000	$10,000	$10,000
		End-Term Evaluation	$25,000				$25,000
Programme execution total			**$481,567**	**$75,392**	**$152,892**	**$152,892**	**$100,391**
Total Programme Cost			**$5,069,124**	**$625,392**	**$1,912,892**	**$2,057,892**	**$472,948**
Programme cycle management		PSC 7 Percent (on total operational budget including components below) approx. 7,1 percent	$363,362	$35,000	$70,000	$200,000	$58,362
		Evaluation support cost (HQ)	$10,000	$1,500	$2,800	$3,900	$1,800

	Project Support Costs (ROAP) - Project Management Committee Meetings - IE staff salary / supervision of reports etc. - Project supervision missions	$57,514	$7,500	$12,000	$30,000	$8,014
Programme cycle management total		**$430,876**	**$44,000**	**$84,800**	**$233,900**	**$68,176**
Amount of Financing Requested		**$5,500,000**	**$669,392**	**$1,997,692**	**$2,291,792**	**$541,124**

H. Disbursement Schedule

	Year 1	Year 2	Year 3	Year 4	Total
	1st disbursement – upon agreement signature	2nd disbursement – One Year after project start ▪ Upon First Annual Report ▪ Upon financial report indicating disbursement of at least 70% of funds	3rd disbursement - Two years after project start ▪ Upon Second Annual Report ▪ Upon financial report indicating disbursement of at least 70% of funds	4th disbursement – Third Year after Project Start ▪ Upon Third Annual Report ▪ Upon financial report indicating disbursement of at least 70% of funds	
Milestone	Milestones (by end of year) - Inception workshop report - Initial training provided on resilient infrastructure design - Initial training provided on climate mainstreamed urban planning. - Designs re-confirmed by engineer and procurement underway - Advocacy materials (project brochure, social media) developed	Milestones (by end of year) - All training complete under Outputs 1.1 and 1.2 - Masterplans developed in draft - Infrastructure construction advanced - PMC meeting - Advocacy materials developed and distributed - Climate policy alignment workshop conducted	Milestones (by end of year) - All masterplans complete, with new adaptation investments developed - Infrastructure constructed or in a highly advanced stage. - Advocacy materials all developed - PMC meeting - Climate policy alignment workshop conducted and alignment identified	Milestones (by end of year) - All infrastructure complete, functional and providing services - Final evaluation - Climate policy update completed	

Schedule date	October 2019 Or Upon Signing	October 2020	October 2021	October 2022	TOTAL
A. Project Funds (US$)	$670,000	$2,000,000	$1,705,000	$212,557	$4,587,557
B. Programme Execution	$80,392	$162,892	$152,892	$85,391	$481,567
C. Programme Cycle Mgt	$54,000	$94,800	$233,900	$48,176	$430,876
TOTAL	**$804,392**	**$2,257,692**	**$2,091,792**	**$346,124**	**$5,500,000**

Part IV: endorsement by government and certification by the Implementing Entity

A. Record of endorsement on behalf of the government[54] Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

Mr. Syamphone SENGCHANDALA Deputy Director General Department of Climate Change (DCC) Ministry of Natural Resources and Environment Designated National Authority for the Adaptation Fund of Lao PDR	Date: 31st December, 2018 (Note, this is the main endorsement letter)
Mr. Phomma Veovaranh, Director General, Water Supply Department, Ministry of Public Works & Transport	Date 26th December 2018 (Note, this is a supporting letter)

Please see letters scanned on the following page

1. [6.] Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Ministry of Natural Resources and Environment (MONRE)
Department of Climate Change (DCC)

No. 1028 - - - /DCC
Vientiane Capital, 31. December 2018

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for "Building climate and disaster resilience capacities of vulnerable small towns in Lao PDR".

Dear Sir or Madam

In my capacity as the National Designated Authority for the Adaptation Fund in Lao PDR, I confirm that the aforementioned project proposal is in accordance with the government of Lao PDR's national priorities in implementing climate change adaptation actions to reduce the impacts caused by the adverse effects of climate change. A final discussion took place in December 2018 between UN-Habitat, the Multilateral Implementing Entity and the proposed executing entities, including MoNRE, at which all stakeholders agreed to give support to the project.

Accordingly, I am delighted to endorse the aforementioned project and request the Adaptation Fund to give it due consideration. If approved, the project will be implemented by UN-Habitat, and executed by MoNRE, the Ministry of Public Works and Transport and the Nam Papa State Enterprise of Savannakhet Province. Several other government ministries and agencies will also be important stakeholders for the implementation of the project.

Sincerely,

Mr. Syamphone Sengchandala
Deputy Director General
Department of Climate Change (MoNRE)
Designed Authority for the Adaptation Fund of Lao PDR

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Ministry of Public Works and Transport
Department of Water Supply

No.: 515 /DWS
Date: 26 DEC 2018

To: Mr. Syamphone Sengchandala
Deputy Director General
Department of Climate Change (MoNRE)
Designed Authority for the Adaptation Fund of Lao PDR

Subject: Clearance Letter for the proposal on "Building climate and disaster resilience capacities of vulnerable small towns in Lao PDR".

Dear Mr. Syamphone,

In my capacity as Director General of Department Water Supply at Ministry of Public Works and Transports (MPWT) that currently working as Executing Entity with UN-Habitat on implementation for the Adaptation project in Lao PDR on "Enhancing the climate and disaster resilience of the most vulnerable rural and emerging urban human settlements in Lao PDR" with referring to the MoU signed between UN-Habitat and MPWT dated 28th April 2017, please be informed that the ongoing project's to enhance the climate and disaster resilience of the most vulnerable human settlements in Southern Laos by increasing sustainable access to basic infrastructure systems and services, emphasizing resilience to storms, floods, droughts, landslides and disease outbreaks by providing a comprehensive approach which strengthens national and local government capacities, policies and legal frameworks, enhances community capacities and facilitates processes that responds to current and future needs and provides a strong mix of soft and hard interventions it is anticipated that local resilience at the household, community and human settlements level is sustainably strengthened.

Whilst the planned interventions are strongly rooted in national and local priorities, in particular Sustainable Development Goal 11 (and several of its targets), Make cities and human settlements inclusive, safe, resilient and sustainable as well as Goal 6 (and its targets), Ensure availability and sustainable management of water and sanitation for all will be addressed by the project.

This initiatives are already piloting and demonstrating innovative approaches, developing institutional capacities of the national government and local authorities to increase the resilience of human settlements and infrastructure systems; enabling communities to improve their well-being/health conditions by developing local capacities and resilience strategies for their settlements and infrastructure systems; enhancing climate and disaster resilient infrastructure systems in human settlement; and as a module to scaling up to the another regional parts of Lao PDR.

I confirm that the above national project/programme proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Lao PDR.

As you are aware that Department of Water Supply, MPWT, and UN-Habitat with your support and endorsement, had submitted a 2nd concept note to the Adaptation Fund, entitled *"Building climate and disaster resilience capacities of vulnerable small towns in Lao PDR"*. We are delighted that this concept note has been approved by the Adaptation Fund Board at its meeting in October 2018.

UN-Habitat has now developed the full proposal in consultation with my department and the provincial/district authorities. The scope of work and activities in the proposal are in line with our Ministry's strategy and overall strategy of the NSEDP.

Accordingly, I am pleased to confirm to you, Mr. Syamphone Sengchandala, the National Focal Point for Adaptation Fund of Lao PDR, that we agree with the contents of the document and we would like you to kindly endorse the above project/programme proposal so as to receive support from the Adaptation Fund.

Grateful if you could kindly issue an endorsement letter please.

Sincerely,

Mr. Phomma Veoravanh
Director General of Department Water Supply
Ministry of Public Works and Transports

Implementing Entity Certification

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans, including Laos's National Socio-economic Development Plan, and its Second National Communication under the UNFCCC, and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the implementing entity will be fully (legally and financially) responsible for the implementation of the project/programme.
For Rungthong OIC. Raf Tuts, Director, Programme Division, UN-Habitat
Date: January 3rd , 2019 — Tel and email: +254-20-762-3736, raf.tuts@un.org
Project Contact Person: Bernhard Barth, Human Settlements Officer, Regional Office for Asia and the Pacific,
Tel+ 81-92-724-7121
Email: bernhard.barth@un.org

Annex 1 – Rapid Vulnerability Assessments (RVA) from Sayphouthong and Sethamouak Towns

RAPID VULNERABILITY ASSESSMENT (RVA)		
1314	**SAYPHOUTHONG**	**SAVANNAKHET PROVINCE, LAO PDR**
Population of District (2017)		48,188
Population of District Town (2017)		48,188
Population Growth Rate		1.65% annum
Population of District Town (2025)		54,929
Population of District Town (2032)		61,596

One of the small towns in Lao PDR proposed for inclusion in the Adaptation Fund programme is **Sayphouthong** District in Savannakhet Province. Savannakhet Province is the most populated province in Lao PDR with the total population of 970,478 persons.

The Province comprises of 15 districts of which four including Sayphouthong are officially classified as poor districts. The district of Sayphouthong is located in the Mekong lowlands in the western portion of Savannakhet province.

Sayphouthong District is the urban settlement located in the East-West Economic Corridor along Mekong river with the border with Thailand, the second friendship bridge across the

RAPID VULNERABILITY ASSESSMENT (RVA)		
1314	SAYPHOUTHONG	SAVANNAKHET PROVINCE, LAO PDR

Mekong at Savannakhet to Moukdahan (Thailand) and the already upgraded Highway No. 9 together with measures being taken to facilitate cross-border transportation created new opportunities to the community living along the Corridor. While Lao PDR is essentially a rural country, Sayphouthong District town of Savannakhet and other urban centers are playing an increasingly important role in the country's economic and social development.
In view of the above, the Government of Lao PDR considers as of high priority the improvement of social and physical basic infrastructures of small towns along the Corridor in order to realize the expected benefits. Subsequently, Sayphouthong District Town with comparable advantage in terms of ***"Climate action into urban planning to build resilient communities along an economic corridor in Lao PDR".***

Sayphouthong District Town is composed of 39 core villages in 8 village clusters with a total 2017 population of 48,188 persons. In 2015, 100% of survey respondents belong to Tai-Kadai linguistic group (consisting of 73% Lao and 27% Phoutay) that form the majority of the national population. There are in total households, of which 8,908 households (27%) are considered as poor households.

CLIMATE CHANGE & DISASTER RISKS	
TEMPERATURE	Significant increase
RAIN	Significant Decrease
FLOOD	Years: every year
STORM	Hima/Ketsana/Nokten/Songka
DROUGHT	Years: every 3-4 years
LANDSLIDE	Along Mekong River
ENVIRONMENTAL ISSUES	
DEFORESTATION	No deforestation activity
HYDROPOWER	No hydropower dam
MINING	No mining activity
UXO	None
SOURCES OF INCOME	
AGRICULTURE	65%
LIVESTOCK	20%
HANDICRAFT	5%
CASUAL LABOR	10%
EDUCATION	
PRIMARY SCHOOL	36
SECONDARY SCHOOL	28
FULL SECONDARY SCHOOL	17
HEALTH	
HOSPITAL	1
DISPENSARY	30
WATER-BORNE	Yes
VACTOR-BORNE	Dengue
WASH	
WATER	Dug well/deep bore well/Mekong river
SANITATION	65% households have latrine
PRIORITIZED NEEDS	
WATER SUPPLY	First priority
HOUSEHOLD LATRINE	First priority
SCHOOL LATRINE	Second priority
HOSPITAL SANITATION	Second priority
WASTEWATER (DEWATS)	
FLOOD PROTECTION	Bank protection of Mekong river (length: 700-800 m)
LANDSLIDE PROTECTION	
WATER SOURCE MANAGEMENT	Mekong river
SHELTER PROTECTION	
ISSUES/PROBLEM OF URBAN BASIC SERVICES	

RAPID VULNERABILITY ASSESSMENT (RVA)		
1314	**SAYPHOUTHONG**	**SAVANNAKHET PROVINCE, LAO PDR**
- Water Supply		The Mekong River is the main water resource in Sayphouthong district. Its catchment accounts for 9% of the country's land area. According to a draft National Water Resource profile, the flow in the Mekong river varies from a minimum of 2,000 m^3/s in the dry season to several thousand m^3/s in the wet season, with an average of 15,000 m^3/s. While the river is reportedly very high turbidity in the raining season, it carries large quantities of sediment in the wet season. The Mekong river is extensively used for irrigation. There are no water treatment facilities in the Sayphouthong District Town. Wealthier households buy bottled water at US$15/m3 about 100 times higher than the average tariff for formalized system. The majority of the population in the town relies on untreated water from open dug wells of over 40 meters deep, boreholes using hand pump and electric pump. Surface water (Sethamouak river) is also used during the rainy season although the turbidity is high. Water shortage in the dry season is a serious threat to the health of the population, particularly the poor households who could not afford to dig wells of over 35-40 meters deep. Present water supply coverage: **0%**
- Wastewater/Drainage/Sanitation		The issue of wastewater and the sanitation in Sayphouthong is not different from other small towns in the country: uncontrolled disposal of domestic wastewater, no drainage ditches in the public place such as markets, bus stations, schools or hospitals etc. Some households still have no sanitary latrine. Present sanitation coverage: **65%**
- Solid Waste		Solid waste is disposed in barren land without any control. Used plastic bags can be seen in areas around market places. Drainage ditches are provided only along the main urban road.
- Capacity Building		Strengthening the capacity of the NSPE-Savannakhet aiming to ensure efficient and cost-effective management and operation, improved services to customers.
PROPOSED INTERVENTIONS		
- Integrating Disaster Risk Management (DRM) in Urban Planning of Sayphouthong District		• Improve understanding of the role of urban planning in disaster risk reduction; • Highlight importance of incorporating disaster risk information in urban planning; • Provide guidance on how to incorporate disaster risk information in urban planning; and • Identify enabling factors for incorporating disaster risk information in urban planning
- 24/7 Water Supply with water treatment system 3,600m 3 /day		Proposed a water supply system 24/7 using surface water from Mekong river including: • Construction of intake involves construction of land disintegration prevention system by utilizing the Gabion Box system. Water will be pumped through

RAPID VULNERABILITY ASSESSMENT (RVA)		
1314	SAYPHOUTHONG	SAVANNAKHET PROVINCE, LAO PDR
		submerging pump and transmitted through DN 150 mm pipeline to the Pre-Sedimentation tank/Flocculation, Sedimentation Tank/Filters Tank/Clear Water Reservoir Tank/Pump House/Chlorine House/Elevated Reservoir 400 m3/Pump station with clear water tank 260 m3/Pipe Laying System and Sewage System inside the plant/Collection Pipe./Distribution Pipe network; and • Household 24/7 water connection
- Sanitation		• Improvement/new construction of latrines for poor households
- Capacity Building		• Develop institutional capacities of the local authorities the disaster resilience of human settlements and infrastructure systems; and • Capacity of the water supply utility improved resulting in more efficient and cost effective management and operation, and better service to the population
Expected Outcomes		
- Water Supply		Improved water supply 24/7 to 54,929 people by 2025, including the poor and vulnerable; and • Improved community health, disaster resilience and family income levels
- Sanitation		• Increased sanitation coverage to remaining poor people; and • Greater awareness of the need for improved wastewater/drainage/ sanitation, leading to a cleaner urban environment.
- Solid Waste disposal		• Organize solid waste collection to promote a cleaner urban environment
- Capacity building		• Increase institutional capacities of the local authorities the disaster resilience of human settlements and infrastructure systems; • More efficient and cost-effective management and operation; and • Improve revenue generation, leading to sustainable improvements
COST OF INTERVENTIONS (US Dollars)		
	Urban Planning	100,000
	Water Supply	3,200,000
	Sanitation	80,000
	Capacity building	50,000
	Total	**3,430,000**
Impact on building climate and disaster resilience capacities of vulnerable small town		Increase institutional capacities of the local authorities the disaster resilience of human settlements and infrastructure systems (as such water supply coverage and wastewater/drainage/sanitation conditions, particularly for the population living in area officially classified as poor and vulnerable district): • Establish water supply24/7 for 48,188 peoples, including the poor and vulnerable; • Pilot rainwater harvesting to promote the conservation rainwater and mitigate the flood; • Increase sanitation coverage in the low-

RAPID VULNERABILITY ASSESSMENT (RVA)		
1314	SAYPHOUTHONG	SAVANNAKHET PROVINCE, LAO PDR
		income and flood prone areas for the 16,865 remaining peoples; and • Enable communities in the small town to improve their well-being/health conditions by developing local capacities and resilience strategies for their settlements and infrastructure systems
RAPID VULNERABILITY ASSESSMENT PICTURES		
Meeting with District governor Dated 19/07 /2018		
Meeting with stakeholder: DoNRE/DoL/DoH/DPWT/ NPSE-Savannakhet Dated 19/07 /2018		
Data collection		
Consultation with communities		

RAPID VULNERABILITY ASSESSMENT (RVA)		
1314	SAYPHOUTHONG	SAVANNAKHET PROVINCE, LAO PDR

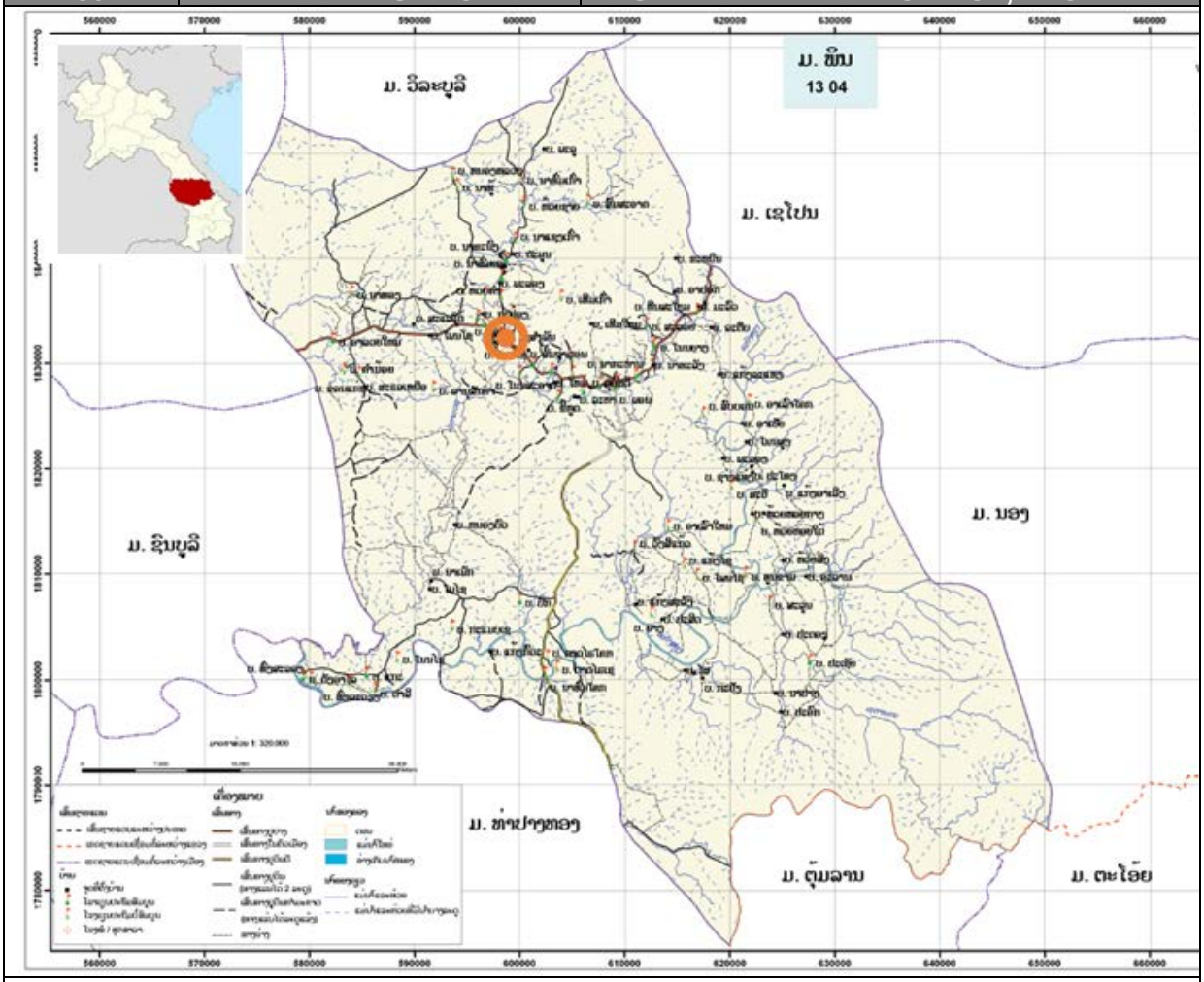
Field visit with District governor:
To select the location for Intake & WTP
At Mekong river

Field visit:
Location for Elevated reservoir

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR

Population of District (2018)	64,634
Population of District Town (2018)	8.956
Population Growth Rate	2.5% annum
Population of District Town (2025)	10,288
Population of District Town (2030)	11,358

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR



One of the small towns in Lao PDR proposed for inclusion in the Adaptation Fund programme is **Sethamouak** the District Town of Phine in Savannakhet Province. Savannakhet Province is the most populated province in Lao PDR with the total population of 970,478 persons. The Province comprises of 15 districts of which four including Phine are officially classified as poor districts. Phine District is the third largest urban settlement located in the East-West Economic Corridor, on the junction between the highway No 9 linking the North East of Thailand to the central Part of Viet Nam and the highway No. 23 providing access to the South-East hinder land provinces (Saravane, Attapeu and Sekong).

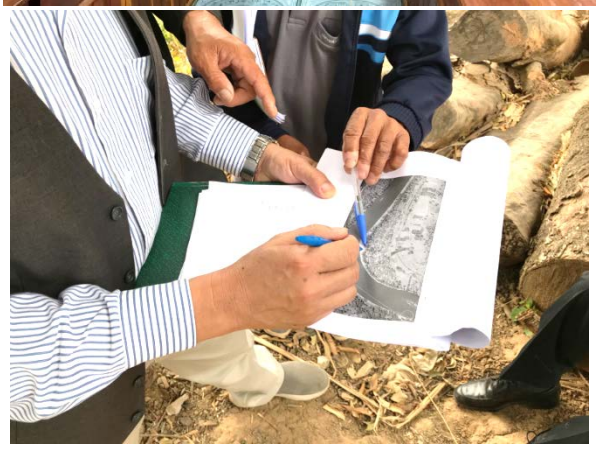
In view of the above, the Government of Lao PDR considers as of high priority the improvement of social and physical basic infrastructures of small towns along the Corridor in order to realize the expected benefits. Subsequently, Sethamouak District Town of Phine District with comparable advantage in terms of ***"Climate action into urban planning to build resilient communities along an economic corridor in Lao PDR".***

Sethamouak Town is composed of 7 villages with a total 2018 population of 8,956 persons. About sixty two (62) percent of the population are "Phouthai, Katang and Mangkone", three of the minority ethnic groups in Lao PDR. There are in total 1,533 households, of which 541 households (35%) are considered as poor households.

CLIMATE CHANGE & DISASTER RISKS	
TEMPERATURE	Significant increase
RAIN	Significant Decrease
FLOOD	Years: 2005/2009/2011/2012/2017
STORM	Hima/Ketsana/Nokten/Doksuri
DROUGHT	Years: 2013/2014/2015
ENVIRONMENTAL ISSUES	

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
DEFORESTATION	No deforestation activity	
HYDROPOWER	No hydropower dam	
MINING	No mining activity	
UXO	None	
SOURCES OF INCOME		
AGRICULTURE	55%	
LIVESTOCK	25%	
HANDICRAFT	5%	
CASUAL LABOR	15%	
EDUCATION		
PRIMARY SCHOOL	6	
SECONDARY SCHOOL	6	
FULL SECONDARY SCHOOL	5	
HEALTH		
HOSPITAL	1	
DISPENSARY	6	
WATER-BORNE	Yes	
VACTOR-BORNE	Dengue	
WASH		
WATER	Hand dug well/deep bore well/Xetamouak river	
SANITATION	43% households have latrine	
PRIORITIZED NEEDS		
WATER SUPPLY	First priority	
HOUSEHOLD LATRINE	First priority	
SCHOOL LATRINE	Second priority	
HOSPITAL SANITATION	Second priority	
WASTEWATER (DEWATS)		
FLOOD PROTECTION	Bank protection of Sethamouak river (length: 80 m)	
LANDSLIDE PROTECTION		
WATER SOURCE MANAGEMENT	Sethamouak river	
SHELTER PROTECTION		
ISSUES/PROBLEM OF URBAN BASIC SERVICES		
- Water Supply	There are no water treatment facilities in the Sethamouak District Town. Wealthier households buy bottled water at US$15/m3 about 100 times higher than the average tariff for formalized system. The majority of the population in the town relies on untreated water from open hand dug wells of over 40 meters deep, boreholes using hand pump and electric pump. Owners of private boreholes sell the water by drums of 200 litres at a cost of US$0.2 to US$0.3 per drums that is affordable to those who have substantial income such as those engaged in trade and service sectors. Surface water (Sethamouak river) is also used during the rainy season although the turbidity is high. Water shortage in the dry season is a serious threat to the health of the population, particularly the poor households who could not afford to dig wells of over 40 meters deep. Some have to rely on water confined in depression areas of river bed. Present water supply coverage: **0%**	
- Wastewater/Drainage/Sanitation	The issue of wastewater and the sanitation in Phine is not different from other small towns in the country: uncontrolled disposal of domestic wastewater, no drainage ditches in the public place such as markets, bus stations, schools or hospitals etc. Some households still have no sanitary latrine. Present sanitation coverage: **43%**	

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
- Solid Waste	Solid waste is disposed in barren land without any control. Used plastic bags can be seen in areas around market places. Drainage ditches are provided only along the Highway No. 9	
- Capacity Building	Strengthening the capacity of the NSPE-Savannakhet aiming to ensure efficient and cost-effective management and operation, improved services to customers.	
PROPOSED INTERVENTIONS		
- Integrating Disaster Risk Management (DRM) in Urban Planning of Phine District	• Improve understanding of the role of urban planning in disaster risk reduction; • Highlight importance of incorporating disaster risk information in urban planning; • Provide guidance on how to incorporate disaster risk information in urban planning; and • Identify enabling factors for incorporating disaster risk information in urban planning	
- 24/7 Water Supply with water treatment system	Proposed a water supply system 24/7 using surface water from Sethamouak river including: • Construction of Dam approx. 65 m length; • Construction of intake involves construction of land disintegration prevention system by utilizing the Gabion Box system. Water will be pumped through submerging pump and transmitted through DN 150 mm pipeline to the Pre-Sedimentation tank/Flocculation, Sedimentation Tank/Filters Tank/Clear Water Reservoir Tank/Pump House/Chlorine House/Elevated Reservoir 200 m3/Pipe Laying System and Sewage System inside the plant/Collection Pipe./Distribution Pipe network; and • Household 24/7 water connection	
- Sanitation	• Improvement/new construction of latrines for poor households	
- Capacity Building	• Develop institutional capacities of the local authorities the disaster resilience of human settlements and infrastructure systems; and • Capacity of the water supply utility improved resulting in more efficient and cost effective management and operation, and better service to the population	
Expected Outcomes		
- Water Supply	• Improved water supply 24/7 to 10,288 people by 2025, including the poor and vulnerable; and • Improved community health, disaster resilience and family income levels	
- Wastewater/Drainage/Sanitation	• Increased sanitation coverage to remaining poor people; and • Greater awareness of the need for improved wastewater/drainage/ sanitation, leading to a cleaner urban environment.	
- Solid Waste disposal	• Organize solid waste collection to promote a cleaner urban environment	
- Capacity building	• Increase institutional capacities of the local authorities the disaster resilience of human settlements and infrastructure systems;	

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
	• More efficient and cost-effective management and operation; and • Improve revenue generation, leading to sustainable improvements	
COST OF INTERVENTIONS (US Dollars)		
Urban Planning	50,000	
Water Supply	750,000	
Sanitation	30,000	
Solid Waste disposal	20,000	
Capacity building	30,000	
Total	**880,000**	
Impact on building climate and disaster resilience capacities of vulnerable small town	Increase institutional capacities of the local authorities the disaster resilience of human settlements and infrastructure systems (as such water supply coverage and wastewater/drainage/sanitation conditions, particularly for the population living in area officially classified as poor and vulnerable district): • Establish water supply 24/7 for 8,956 peoples, including the poor and vulnerable; • Pilot rainwater harvesting to promote the conservation rainwater and mitigate the flood; • Increase sanitation coverage in the low-income and flood prone areas for the 5,104 remaining peoples; and • Enable communities in the small town to improve their well-being/health conditions by developing local capacities and resilience strategies for their settlements and infrastructure systems	
RAPID VULNERABILITY ASSESSMENT PICTURES		
Meeting with District governor/DoNRE/DPWT/ NPSE-Savannakhet Dated 13/12 /2017		
Data collection		

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR

Consultation with communities

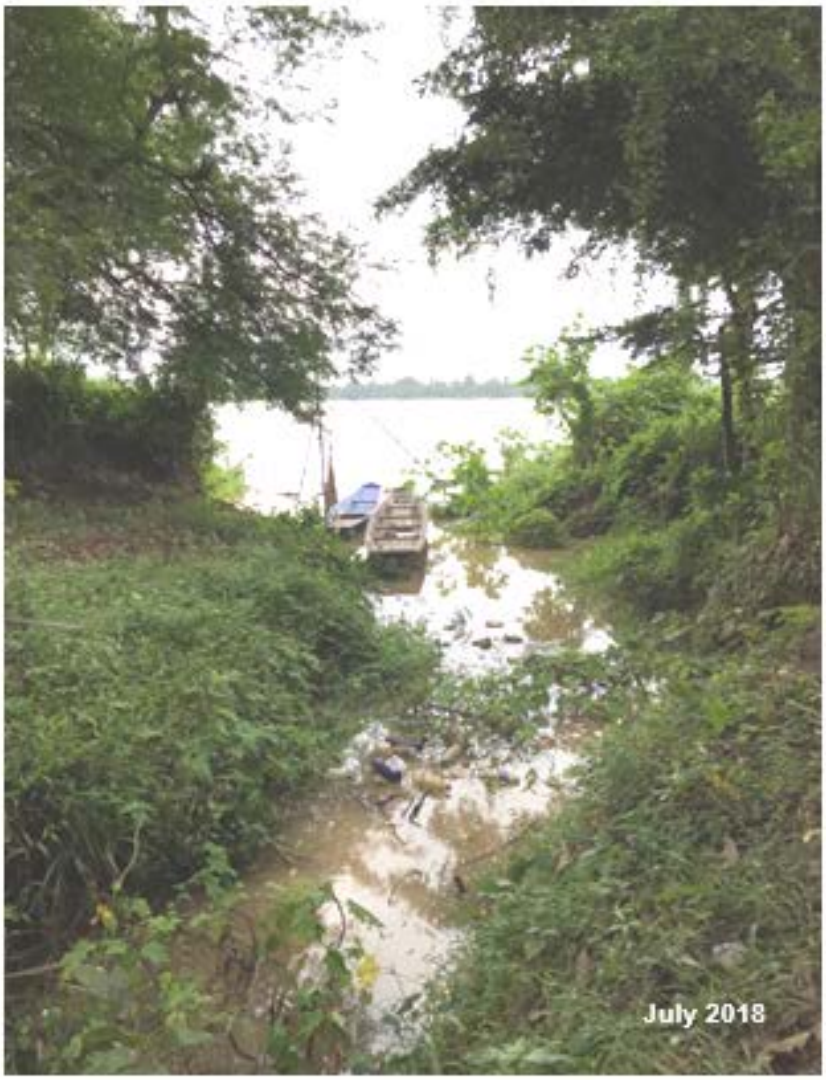
Field visit: Sethamouak river (at downstream)

Field visit: Sethamouak river (at uptream)

Annex 2 – Feasibility Study of Implementation for Sayphoutong Town

LAO PEOPLE'S DEMOCRATIC REPUBLIC
MINISTRY OF PUBLIC WORKS AND TRANSPORT
DEPARTMENT OF WATER SUPPLY

FEASIBILITY STUDY FOR SAYPHOUTHONG TOWN



UN HABITAT
FOR A BETTER URBAN FUTURE

Prepared by
UN-Habitat in association with NPSE-Savannakhet

TABLE OF CONTENTS

ABBREVIATIONS AND EQUIVALENTS

(i) ADB (ii) Asian Development Bank
(iii) AFD (iv) Agence Francaise de Developpement
(v) AIEC (vi) Average Incremental Economic Cost
(vii) AIFC (viii) Average Incremental Financial Cost
(ix) AP (x) Affected Persons
(xi) BNP (xii) Branch Nam Papa
(xiii) BPO (xiv) Business Promotions Office
(xv) BTC (xvi) Belgian Technical Cooperation
(xvii) CAP (xviii) Community Actions and Participation
(xix) CEDAW (xx) Convention of the Elimination of all forms of Discrimination against
(xxi) CIPP (xxii) Community Information and Participation Program
(xxiii) CDP (xxiv) Capacity Development Program
(xxv) CPI (xxvi) Committee for Planning and Investment
(xxvii) DHUP (xxviii) Department of Housing and Urban Planning
(xxix) DI (xxx) Ductile Iron
(xxxi) DMS (xxxii) Detailed Measurement survey
(xxxiii) DN (xxxiv) Pipe Nominal Diameter (in mm)
(xxxv) DPACS (xxxvi) Department of Public Administration and Civil Service (of the Prime
(xxxvii) DPWT (xxxviii) Department of Public Works and Transport
(xxxix) DRC (xl) District Resettlement Committee
(xli) EA (xlii) Executing Agency
(xliii) EARF (xliv) Environmental Assessment and Review Framework
(xlv) EIA (xlvi) Environmental Impact Assessment
(xlvii) EIRR (xlviii) Economic Internal Rate of Return
(xlix) EL (l) Enterprise Law
(li) EMP (lii) Environmental Management Plan
(liii) EOCC (liv) Economic Opportunity Cost of Capital
(lv) FIRR (lvi) Financial Internal Rate of Return
(lvii) GAP (lviii) Gender Action Plan
(lix) GOL (lx) Government of Lao PDR
(lxi) GPOBA (lxii) Global Program of Outputs Based Aid
(lxiii) GRID (lxiv) Gender Resource Information and Development Centre
(lxv) GS (lxvi) Galvanized Steel
(lxvii) HH (lxviii) Households
(lxix) HRD (lxx) Human Resources Development
(lxxi) ICB (lxxii) International competitive bidding
(lxxiii) IEC (lxxiv) Information, Education and Communication
(lxxv) IEE (lxxvi) Initial Environmental Examination
(lxxvii) IEM (lxxviii) Independent External Monitoring
(lxxix) IOL (lxxx) Inventory of losses
(lxxxi) IPS (lxxxii) Improved PNP Sustainability
(lxxxiii) KOICA (lxxxiv) Korean Aid Agency
(lxxxv) Lao (lxxxvi) Lao People's Democratic Republic
(lxxxvii) L (lxxxviii) Land Acquisition and Resettlement
(lxxxix) LACF (xc) Land acquisition and compensation framework (plan)
(xci) LECS (xcii) Lao Expenditure and Consumption Surveys

(xciii) LFNC (xciv) Lao Front for National Reconstruction

ABBREVIATIONS AND EQUIVALENTS (continued)

(xcv)

(c) LWU (ci) Lao Women's Union
(cii) M. (ciii) Muang
(civ) M&E (cv) Monitoring and evaluation
(cvi) MDGs (cvii) Millennium Development Goals
(cviii) MIS (cix) Management Information System
(cx) MOH (cxi) Ministry of Health
(cxii) MPWT (cxiii) Ministry of Public Works and Transport
(cxiv) Nam (cxv) The National Center of Environmental Health and Water Supply
(cxvi) NCB (cxvii) National competitive bidding
(cxviii) NCRW (cxix) Northern and Central Regions Water Supply and Sanitation Sector
(cxx) NDF (cxxi) Nordic Development Fund
(cxxii) NGO (cxxiii) Non-Government Organization
(cxxiv) NGPE (cxxv) National Growth and Poverty Elimination Strategy
(cxxvi) NORA (cxxvii) Norwegian Agency for Development Cooperation
(cxxviii) N (cxxix) Nam Papa Lao
(cxxx) NPNL (cxxxi) Nam Papa Nakhonluang
(cxxxii) NPV (cxxxiii) Nam Papa Vientiane
(cxxxiv) N (cxxxv) Nephelometric Turbidity Units
(cxxxvi) N (cxxxvii) National Waterworks Technical Training Center (Thailand)
(cxxxviii) C (cxxxix) Office of Housing and Urban Planning (of DPWT at provincial
(cxl) OOE (cxli) Office of Education
(cxlii) OOH (cxliii) Office of Health
(cxliv) OPWT (cxlv) Office of Public Works and Transport
(cxlvi) O&M (cxlvii) Operation and Maintenance
(cxlviii) PCU (cxlix) Project Coordination Unit
(cl) PDR (cli) People's Democratic Republic
(clii) PE (cliii) Polyethylene
(cliv) PIA (clv) Project Implementation Assistance
(clvi) PIB (clvii) Public Information Booklet
(clviii) PIR (clix) Poverty Impact Ratio
(clx) PIU (clxi) Project Implementation Unit
(clxii) PN (clxiii) Pipe Pressure Class
(clxiv) PNP (clxv) Provincial Nam Papa
(clxvi) PPIAF (clxvii) Public-Private Infrastructure Advisory Facility
(clxviii) PPP (clxix) Public Private Partnership
(clxx) PPME (clxxi) Project Performance Monitoring and Evaluation
(clxxii) PPSC (clxxiii) Provincial Project Steering Committee
(clxxiv) PSA (clxxv) Poverty and Social Analysis
(clxxvi) PSC (clxxvii) Project Steering Committee
(clxxviii) P (clxxix) Private Sector Participation
(clxxx) PVC (clxxxi) Polyvinyl Chloride
(clxxxii) R (clxxxiii) Replacement Cost Survey
(clxxxiv) R (clxxxv) Right of Way
(clxxxvi) S (clxxxvii) Socio-Economic Survey

(clxxxviii) S (clxxxix) Second Generation Imprest Account
(cxc) SIP (cxci) Sector Investment Plan
(cxcii) SOE (cxciii) State Owned Enterprise

ABBREVIATIONS AND EQUIVALENTS (continued)

(cxciv)
(cxcv) SSIP (cxcvi) Small Scale Independent Provider
(cxcvii) STEA (cxcviii) [Former] Science Technology and Environmental Agency
(cxcix) STDP (cc) Small Towns Development Sector Project
(cci) STWSP (ccii) Small Towns Water Supply and Sanitation Sector Project
(cciii) TA (cciv) Technical Assistance
(ccv) TOR (ccvi) Terms of Reference
(ccvii) TDG (ccviii) Tariff Determination Guidelines
(ccix) UDAA (ccx) Urban Development Administration Authority
(ccxi) UFW (ccxii) Unaccounted-for-water
(ccxiii) VEI (ccxiv) Village Environmental Improvements
(ccxv) VIP (ccxvi) Ventilated improved latrine
(ccxvii) VRC (ccxviii) Village Resettlement Committee
(ccxix) WACC (ccxx) Weighted Average Cost of Capital
(ccxxi) WASA (ccxxii) Water Supply Authority
(ccxxiii) V (ccxxiv) Water and Sanitation Unit
(ccxxv) WB (ccxxvi) World Bank
(ccxxvii) V (ccxxviii) World Food Program
(ccxxix) V (ccxxx) Water Resources and Environmental Agency (created 23 July 2007)
(ccxxxi) V (ccxxxii) Water Supply Authority Regulatory Committee
(ccxxxiii) V (ccxxxiv) Water Supply Division
(ccxxxv) V (ccxxxvi) Water Supply Investment Plan
(ccxxxvii) V (ccxxxviii) Water and Sanitation Program for East Asia and the Pacific
(ccxxxix) V (ccxl) Water Supply and Sanitation Sector Project
(ccxli) WSTP (ccxlii) Water Supply Tariff Policy
(ccxliii) WTTC (ccxliv) Waterworks Technical Training Center (Lao PDR)
(ccxlvi) (ccxlvii)
(ccxlviii) **UNITS**

(ccxlix) ha (ccl) Hectare
(ccli) Lpcd (cclii) Liters per capita per day
(ccliii) L/s (ccliv) Liters per second
(cclv) m (cclvi) Meter
(cclvii) mg/L (cclviii) Milligrams per Liter
(cclix) mm (cclx) Millimeter
(cclxi) m^3/day (cclxii) Cubic meters per day

- **EXECUTIVE SUMMARY**

Project Description

Sayphouthong District is the urban settlement located in the East-West Economic Corridor along Mekong river with the border with Thailand, the second friendship bridge across the Mekong at Savannakhet to Moukdahan (Thailand) and the already upgraded Highway No. 9 together with measures being taken to facilitate cross-border transportation created new opportunities to the community living along the Corridor. While Lao PDR is essentially a rural country, Sayphouthong District town of Savannakhet and other urban centers are playing an increasingly important role in the country's economic and social development.

In view of the above, the Government of Lao PDR considers as of high priority the improvement of social and physical basic infrastructures of small towns along the Corridor in order to realize the expected benefits.

Sayphouthong is one of the small towns in Lao PDR proposed for inclusion in the Adaptation Fund programme. The proposed Sayphouthong district town aims to mainstream **"*Climate action into urban planning to build resilient communities along an economic corridor in Lao PDR*"**, to provide safe, reliable and affordable 24/7 piped water supplies and village environmental improvements in small towns along an economic corridor. It has been formulated as a community-based project and in line with "Samsang" (3 level development), requiring the towns and their provincial authorities to demonstrate their commitment to the project and its associated reforms, thus encouraging a demand-driven approach. The project has a strong community participation focus, reinforced by environmental and social safeguard, health and sanitation awareness.

Rationale

Background

While Lao PDR is essentially a rural country, Sayphouthong district town and other urban centers are playing an increasingly important role in the country's economic and social development. Over the past decade, substantial investments have been made in the urban water supply sector; however the majority of investment has focused on Vientiane capital and the four secondary towns, which represent only about 47% of the country's urban population. The remaining small towns with populations ranging from 4,000 to 20,000 were largely neglected until the UN-Habitat's project MEKWATSAN.

Inadequate water supply and poor environmental conditions in Sayphouthong town and other small towns deter socio-economic development and restrict the ability of the towns to serve as centers for economic activity and delivery of social services for their surrounding rural areas.

Project Supports Government Policy

The Project will build on the Government's policy of developing small towns as centers of marketing and agricultural processing, as economic links between rural, national and international markets, and as places offering non-farm employment to the rural poor. By developing these small urban centers, the Government is also seeking to reduce

poverty through economic growth and improve geographical equity in urban social infrastructure development. The Project supports Government of Lao PDR's (GOL's) water supply sector goal which is to provide 24-hour per day access to safe drinking water for 80% of the urban population by the year 2020.

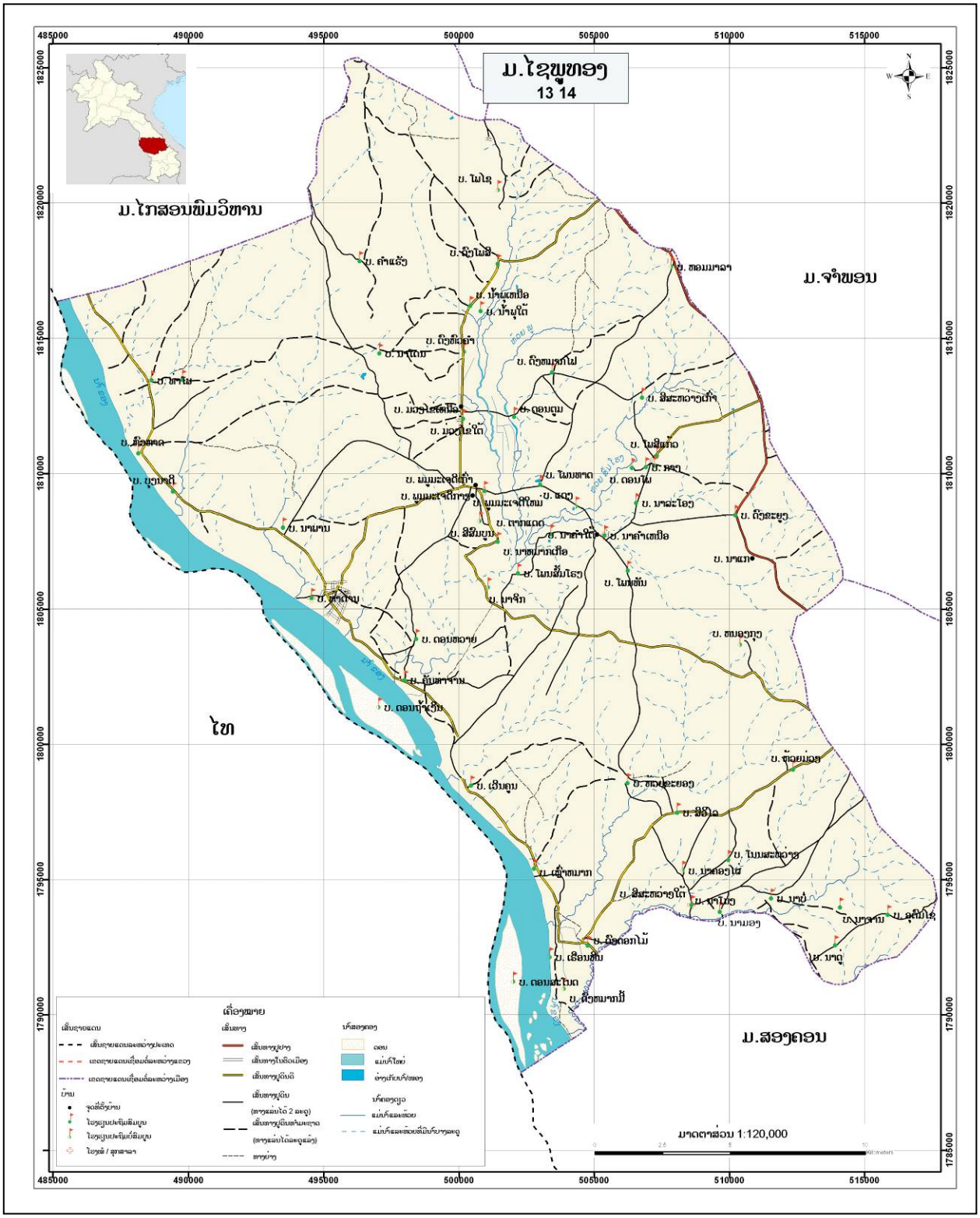
Project Impact and Outcome

The expected impact of the Project is to build resilience to climate change in communities along an economic corridor in the central region of Lao PDR. This will be achieved by the provision of climate resilient infrastructure and the mainstreaming of climate action into urban planning. To achieve this objective, the project focuses its actions on highly vulnerable settlements along the economic corridor in the province of Savannakhet and also to improve quality of life of small town residents in Lao PDR and enhanced role of the small towns as economic, market, services, and manufacturing centers for their surrounding rural areas.

These outcomes will be achieved by:

- Mainstreaming climate action into urban planning to build resilient communities along an economic corridor in Lao PDR;
- Establishing new optimally sized water supply systems using appropriate innovation technologies;
- Motivating public participation in water and sanitation infrastructure development to improve the environment; and
- Strengthening the urban water supply sector planning, managing, and regulating capacity

Figure Error! No text of specified style in document.**-4 - Location of Project: Sayphouthong District Town in Savannakhet Province**



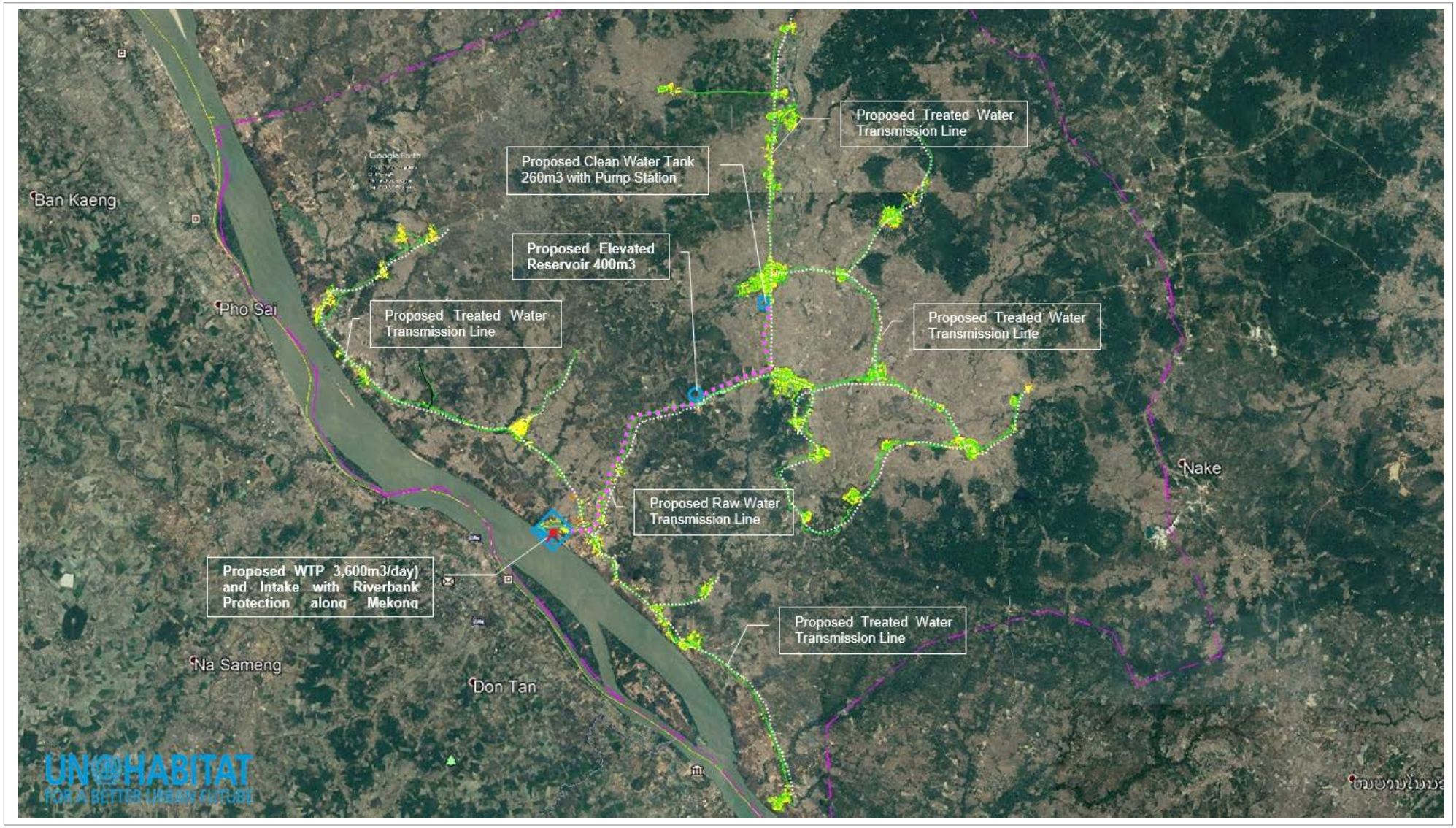


Figure Error! No text of specified style in document.**-5 Location Plan of Proposed Sayphouthong Water Treatment Plan**

- **PROJECT DESCRIPTION**

Project Description

The Project has four outputs, namely:

Output 1: Mainstreamed climate action into urban planning to build resilient communities along an economic corridor in Lao PDR;

Output 2: Established new optimally sized water supply systems using appropriate innovation technologies;

Output 3: Motivated public participation in water and sanitation infrastructure development to improve the environment; and

Output 4: Strengthened the urban water supply sector planning, managing, and regulating capacity

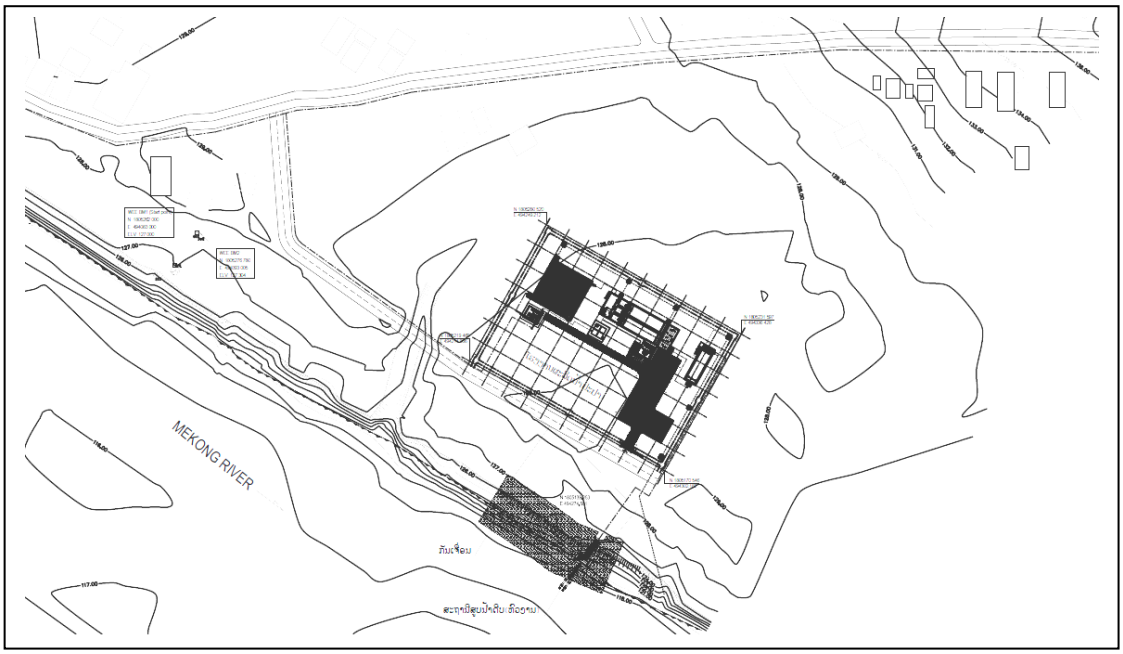
This Feasibility Study Report focuses on Outputs 2 and 4. The outputs are as follows:

Output 2 - Water Supply Development

The project will develop a new 24/7 water supply system with individual house hold connections in Sayphouthong's 39 core villages, having a base Y2017 population of about 48,188.

The proposed water supply system will include:

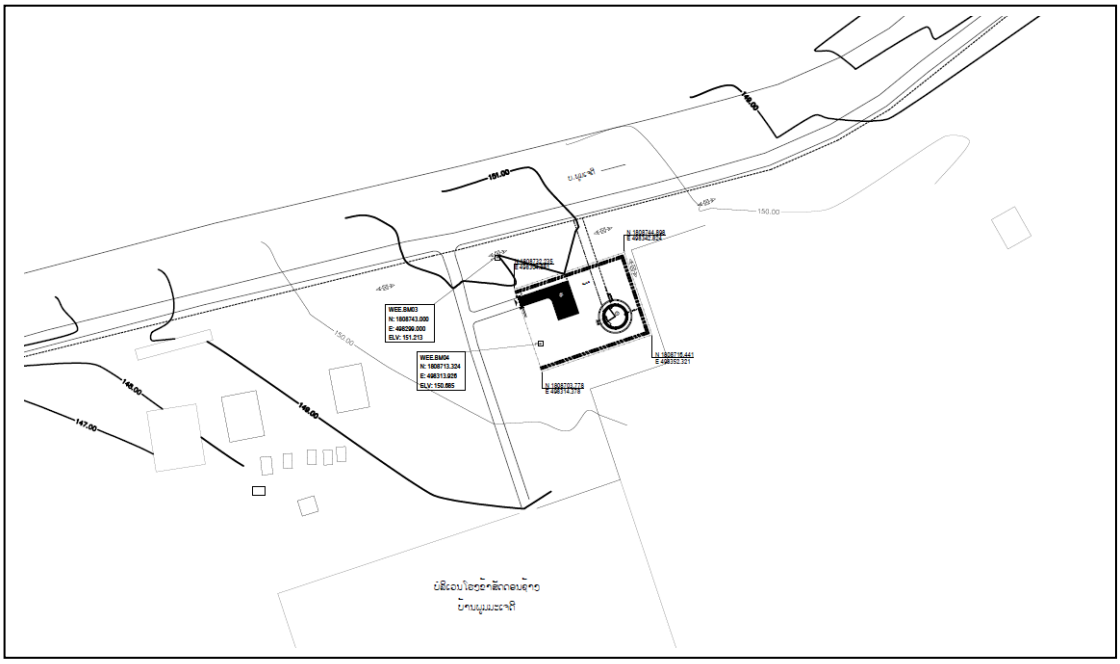
- on the Mekong river a 3,600 m3/day water treatment plant (WTP) with a water intake and riverbank protection located at Thadan village;

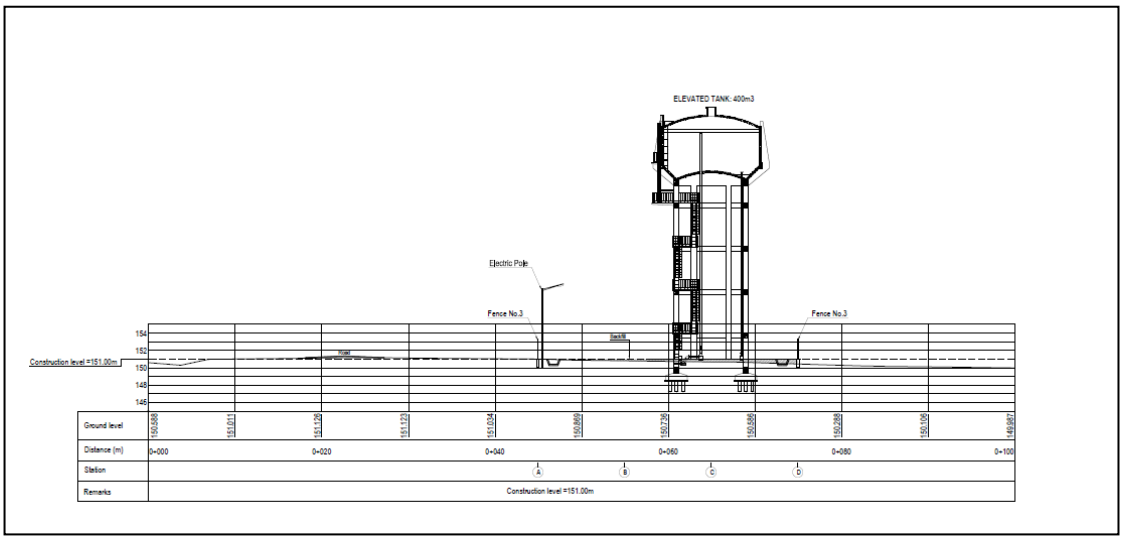


- The WTP located near the district center will include pre-sedimentation, flocculation, sedimentation, rapid gravity filtration, a backwash tank and

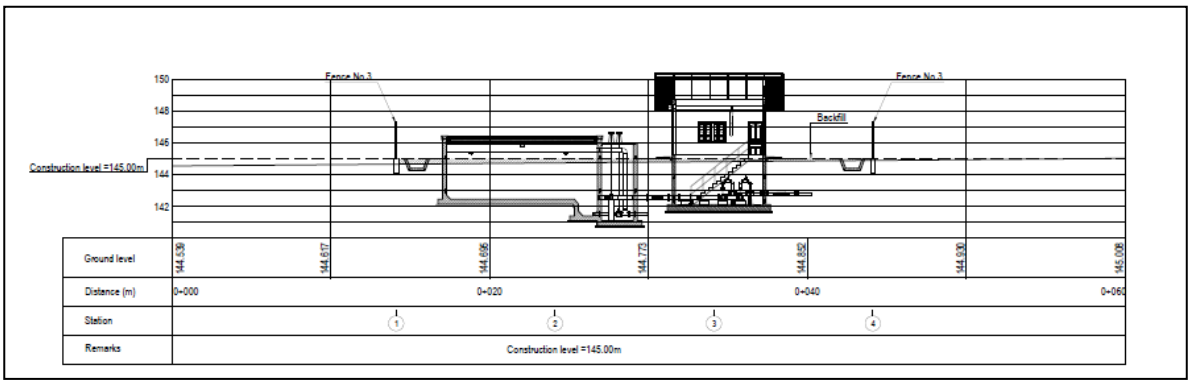
chlorination facilities, 200 m^3 clear water reservoir, detention ponds, plant office, workshop, store and a small water testing laboratory. The distribution and reticulation network will include about 60 km of pipelines, and 50mm rider mains in population centers. A branch Nam Papa (BNP) office will be constructed in the district center;

- a raw water transmission main line supply to 400 m3/day elevated reservoir at Phoumachedy village;





- a lift transmission pumping station with 260 m3 clear water tank at Mouangkay village to supply the treated water to the distribution network for the 39 core villages in 8 village clusters in Sayphouthong District Town; and



- Equipment for operation and maintenance (O&M) of the water supply systems will be procured for the Sayphouthong branch Nam Papa (BNP), including basic tools, laboratory equipment and office equipment. Households that apply to connect during the construction period will not be required to pay any up-front connection charges. This measure will assist poor and low income groups to participate in the piped water supply system, encourage new connections and enhance PNP financial sustainability. Marketing and awareness campaigns will inform communities about the Project's connections policies and the benefits of connecting to PNP piped water supply.

Output 4 – Improved Capacity for Project Implementation and O&M

This output includes project implementation assistance, capacity development for O&M and incremental administration support.

Project Implementation Assistance (PIA): will provide consulting services and training to assist the provincial project coordination unit (PCU) each District project implementation unit (PIU) to implement the project. It will also enhance the capacities of PIUs, and village water and sanitation units (WATSANs) to implement and monitor the project.

Capacity Development for O&M: will help to develop more efficient systems in the town to manage urban services in a sustainable manner, by building the capacities of the provincial and branch Nam Papa (BNP) and district PWT. It will also provide support to village water and sanitation units (WATSANs) and communities to enhance their capacities to operate and maintain village infrastructure and their on-site water and sanitation facilities.

Cost Estimate

- **The Sayphouthong project cost is estimated at $3.543 million equivalent, including taxes and duties. Table 4-1 provides a summary of the Sayphouthong project cost estimate.**

- **Table** Error! No text of specified style in document.**-4: Sayphouthong project Cost Estimate (USD)**

No.	Output	Total Cost (USD)
1	Urban Planning	100,000
2	Water Supply Development	3,200,000
3	Sanitation Improvements	80,000
4	Capacity Building	50,000
	TOTAL BASE COST	3,430,000
5	Physical and Price Contingencies	343,000
	TOTAL ESTIMATED PROJECT COST	3,543,000

(cclxiii) ***Notes:*** *Cost estimates based on July 2018 prices, including taxes and duties*

(cclxiv)

Executing Agency and Implementation Arrangements

Project implementation arrangements are expected to be similar to the ongoing Adaptation Project phase I of UN-Habitat in 3 southern provinces of Lao PDR. MPWT will be the Executing Agency (EA) for the project. A national project steering committee (PSC), which was established for the project, will also oversee this project, give overall direction and provide policy guidance. The same PCU/PIU that were established for the project in the Department of Water Supply (DWS) of MPWT will also be responsible for overall planning, coordination and management of this project.

PIUs will be established under the DPWT in each Project province. With assistance from the consultants and PCU/PIU will be responsible for day-to-day coordination and supervision of project implementation in the Project district. A provincial project steering committee (PPSC) will be established in each province to coordinate provincial and district agencies and make key decisions on behalf of the provincial government. At the district level, the district governor or vice governor will oversee the project, monitor progress, review quality of the work, coordinate the project with the PIU and local communities, and report on progress to the PPSC.

Implementation Period

The Project will be implemented over a four-year period from fourth quarter 2019 until fourth quarter 2023. The detailed implementation will be governed by an agreement of cooperation between UN-Habitat and NPSE Savannakhet. For further information on the implementation arrangements, please see Part III, Section A.

Procurement

Goods, works and services financed under the loan will be procured in accordance with *AF's Procurement Guidelines.* International Competitive Bidding (ICB) procedures will be

used for major civil works contracts estimated to cost over $1.0 million, and for supply contracts valued over $500,000. Procurement of civil works valued at less than $1.0 million equivalent will be undertaken through national competitive bidding (NCB). Shopping procedures will be followed for materials and equipment packages or works estimated to cost less than $100,000 equivalent. Local procurement procedures will be used for the small village level civil works and supply contracts. To the extent possible, for local procurement, quotations will be invited from at least three suppliers or contractors.

The PIU in each province will be responsible for procurement. Installation of water meters and service connections will be carried out by the construction contractor under the main water supply construction contract for each town.

Consulting Services

Consultants whose services are provided under Bank financing have been selected and engaged in accordance with the Bank's Guidelines on the Use of Consultants. The main consulting services are provided through a consortium of two national companies and one international, using quality-and cost-based selection (QCBS).

Tariff and Affordability

The financial objectives of the sector are: (i) fully recover utility wide operation and maintenance (O&M) costs; (ii) recover utility wide debt service; (iii) maintain a utility wide debt service ratio of at least 1.2; (iv) gradually recover an increasing proportion of annual depreciation expense of the utility wide fixed assets; and (v) maintain its accounts receivable at less than 90 days of annual sales. To meet the agreed upon financial objectives of the sector, the projected utility wide tariffs shall be increased at a minimum of 20% every three years to keep pace with inflation. The domestic tariff is a rising 3-block structure to ensure affordability by the low-income group (LIG).

The percentages of monthly household income spent on water, inclusive of the monthly meter rental and turnover tax, by the average household and LIG are below 5% in 2014 and 2018. Based on generally accepted principle that the expenditure on water should not exceed 5% of household income, the projected water tariffs are considered affordable.

The results of the socio-economic survey revealed that households are willing to pay an average of about Kip 12,300 per month for piped water supply with 81% of respondents willing to pay at least Kip 10,000 per month. These figures are highly suspect, and are not consistent with findings on other similar projects. Further, it was noted that asset ownership, such as motorcycles, is also very evident in the town. However, the analysis above shows that the average monthly water bill in 2014 and 2018, inclusive of the monthly meter rental and turnover tax, are higher than the households' willingness to pay. However, affordability seems to be a far more reliable indicator. In addition, it has been found that the few poor families who either cannot afford or are unwilling to pay for water, regulate their consumption to meet their particular circumstances. During this transition period, the PNPs forgive unpaid bills. In addition, it is recommended that the minimum 5m^3/month be eliminated, so that the poor only pay for what they actually use.

Project Benefits and Beneficiaries

The project will benefit an estimated **61,596 residents (Y2032)** in the 39 core villages of Sayphouthong DistrictTtown by providing safe, reliable piped water supplies and improved urban environments that will have a direct impact on the health and living conditions of the town communities. Health and hygiene promotion activities will improve the health status of the target communities.

The town's economy will benefit from enhanced productivity as a result of health improvements, time savings in collecting water, as well as from increased urban efficiency arising from improved sanitation. Many residents will benefit from lower water costs and from savings in health care costs.

Sayphouthong There are in total households, of which 8,908 households (27%) households classified as poor. Nevertheless, all project interventions will either directly or indirectly benefit the poor. About 150 urban poor (Y2015) or 27% of the urban population will benefit from: (i) greater access to safe water supplies and sanitation which will improve health profiles, and; (ii) from improved sanitation that will enhance the poor's mobility and access to income-earning activities and government facilities such as schools and hospitals.

Both men and women will benefit from project activities, but women will be the major beneficiaries of the piped water supply system through timesaving, drudgery avoidance, and improved family health. Women will also benefit from the sanitation improvements.

Land Acquisition and Resettlement (LAR)

The LAR impacts in Sayphouthong District Town are insignificant, or **AF category B2-Midium Risk**. There are no severely affected households. The main water supply facilities such as the major part of the intake, water treatment plant, and reservoir will be located on public land; the transmission and distribution mains and reticulation pipes will be laid within road rights-of-way, with minor impacts on land, property or crops.

Environmental Impacts

This subproject will improve the current water supply and sanitation facilities of Sayphouthong town. This improved supply of piped drinking water will lead to better public health and general living conditions.

The Sayphouthong project will not cause any adverse permanent impacts on water and land resources. Temporary negative impacts during the construction phase will be managed through mitigation measures, while already existing constraints during operation will be avoided or limited through complementary or new preventive operation and maintenance related procedures of the new water supply system and existing sanitation scheme. The Environmental Safeguards Management Plan (ESMP) has included relevant counter measures, and recommends, in addition, the preparation of a Health, Safety & Environmental Plan (HSEP) as complementary step for minimizing disturbances to nature and people as they occur typically for construction sites of a water supply and sanitation scheme of small towns.

There is no specific environmental issue that would require high attention by the project so that standard implementation of an ESMP and HSEP should meet environmental conditions of national and international laws, guidelines and regulations. The identified mitigation is expected to bring negative temporary impacts during construction phase to acceptable levels with focus on the new intake construction site. Positive impacts on public health, quality of life and economic development during operation phase will be highly significant through the expansion of safe water supply to the Sayphouthong town's population.

Environmental monitoring of river flows and of quality of raw and treated water should continue during operation by Provincial Nam Papa.

As the project's environmental impacts in Sayphouthong town (see Annex 2: IEE Sayphouthong Town) are insignificant, and meet the **AF category B2-Midium Risk**, no further environmental assessment is required beyond the detailed review of the ESMP during implementation the infrastructures works, and the preparation of a HSEP.

- **PROFILE OF SAYPHOUTHONG AREA**

Town Location and Profile

Sayphouthong District is the urban settlement located in the East-West Economic Corridor along Mekong river with the border with Thailand, the second friendship bridge across the Mekong at Savannakhet to Moukdahan (Thailand) and the already upgraded Highway No. 9 together with measures being taken to facilitate cross-border transportation created new opportunities to the community living along the Corridor. While Lao PDR is essentially a rural country, Sayphouthong District town of Savannakhet and other urban centers are playing an increasingly important role in the country's economic and social development.

In view of the above, the Government of Lao PDR considers as of high priority the improvement of social and physical basic infrastructures of small towns along the Corridor in order to realize the expected benefits. Subsequently, Sayphouthong District Town with comparable advantage in terms of ***"Climate action into urban planning to build resilient communities along an economic corridor in Lao PDR".***

Sayphouthong District Town is composed of 39 core villages in 8 village clusters with a total 2017 population of 48,188 persons. In 2015, 100% of survey respondents belong to Tai-Kadai linguistic group (consisting of 73% Lao and 27% Phoutay) that form the majority of the national population. There are in total households, of which 8,908 households (27%) are considered as poor households.

The district town is the administrative, commercial and social center of the district, with many of the government offices, community and commercial facilities. Cluster 1 contains 7 primary schools and 1 secondary school; 10 pharmacies/dispensaries, 4 health clinics and 1 hospital; a market, and; nearly 200 businesses including restaurants, guesthouses, shops, garages, etc. The district administration offices and a bus station are also located in Cluster 1. In Cluster 2, there are 5 primary schools and 2 secondary schools; 5 pharmacies/dispensaries and 1 hospital; a market and about 50 small businesses.

Natural Features

Topography

The town's 12 core villages are situated on the Mekong lowlands, about 25km northeast of the Mekong River. Songkhone district is bisected by the Xe Banghieng river, a major tributary of the Mekong. The Xe Banghieng originates at the Vietnam border some 200km northeast of Songkhone and joins the Mekong about 50km downstream of the town. The elevation of the core villages vary from about 140m at the Xe Banghieng riverbank, to 180m at Paksong near the district center. The town is surrounded by low-lying land and swamps which are transected by numerous intermittent streams.

Geology and Soils

Soils in Sayphouthong district consist of alluvial deposits of sand and sandy clay, underlain by sandstones. Nam Sa'at bore logs indicate 10m of soils and weathered rock overlying fissured sandstone. Sandstone outcrops are exposed at the lower end of the proposed water treatment plant site at Thadan Village and sandstone is likely to be

encountered at river bed level near the proposed intake site where the Mekong river has formed a “hairpin” bend.

Lao PDR has a tropical monsoon climate which features a pronounced dry season (November to February) and wet season (May to October). The dry season is generally cooler, though temperatures rise significantly in March and April prior to the onset of the rains. Rainfall data for Savannakhet province indicate that maximum monthly rainfall occurs in July and August, averaging 322mm in July over the past decade.

Average annual temperature is about 28^{o}C, varying from a low of 18^{o}C in December-February to a maximum of 35 ^{o}C in April. Monthly maximum temperatures are above 30 ^{o}C for most of the year. Evaporation averages 94mm/month, ranging from 60mm in August and September to more than 100mm from November until April.

Surface water

The Mekong River is the main water resource in Sayphouthong district. Its catchment accounts for 9% of the country’s land area. According to a draft National Water Resource profile, the flow in the Mekong River varies from a minimum of 2,000 m^3/s in the dry season to several thousand m^3/s in the wet season, with an average of 15,000 m^3/s. While the river is reportedly very high turbidity in the raining season, it carries large quantities of sediment in the wet season. The Mekong River is extensively used for irrigation.

Groundwater

Groundwater is used extensively for domestic water supply throughout Sayphouthong’s core villages, which contain over 3,216 pumped wells. Savannakhet Nam Saat advised that, prior to 1995, the water table in Sayphouthong was at about 12m depth, but is now much lower because of increasing groundwater use which has affected the reliability of the wells. Household bores in Sayphouthong consist of two main types: typically 18m deep bores with hand pumps that yield about 0.3L/s, and 40-50m deep bores with electric pumps that yield about 0.5L/s. Nam Sa’at bore logs indicate that the deep bores take water from fissures within the underlying sandstone, which are rapidly depleted in the dry season.

Population and Household Characteristics

In 2017, the total population of the 39 core villages in 8 cluster villages was 48,118 people. Women account for 46% of household members (male/female ratio of 0.88); overall, they head approximately 7.8% of households in the town. Sixty-six point seven percent of the population is working age (15-60 years).

Table Error! No text of specified style in document.**-5: Sayphouthong Population Characteristics**

No	Core Villages	2017 Pop’n.	No. HH	Persons/ HH	M/F Ratio
1	Naphane	1,484	299	5.0	0.91
2	Thadan	1,868	353	5.3	0.86
3	Khanthacham				

No	Core Villages	2017 Pop'n.	No. HH	Persons/ HH	M/F Ratio
		1,058	248	4.3	0.94
4	Doneway	634	129	4.9	1.06
	Total Cluster 1-THADAN	**5,044**	**1,029**	**4.9**	**0.92**
1	Somsaat	848	168	5.0	0.93
2	Thapho	2,738	577	4.7	0.89
3	Houahad	1,284	206	6.2	0.79
4	Bungnady	703	151	4.7	0.85
	Total Cluster 2-THAPHO	**5,573**	**1,102**	**5.2**	**0.87**
1	Phoummachedy	1,549	356	4.4	0.93
2	Namakkeua	1,095	212	5.2	0.89
3	Phonsomhong	1,059	188	5.6	0.79
4	Phonthad	1,063	178	6.0	0.85
	Total Cluster 3-PHOUMMACHADY	**4,766**	**934**	**5.3**	**0.87**
1	Mouangkhay	3,139	631	5.0	0.93
2	Dontoum	702	189	3.7	0.89
3	Dongmakphay	1,979	331	6.0	0.79
4	Sysavangneua	976	145	6.7	0.85
	Total Cluster 4-MOUANGKHAY	**6,796**	**1,296**	**5.3**	**0.87**
1	Khamsan	1,245	200	6.2	0.93
2	Khouadam	1,043	190	5.5	0.89
3	Khamheng	1,270	222	5.7	0.79
4	Dongphosy	1,637	300	5.5	0.85
5	Namphou	2,198	375	5.9	0.85
6	Nadon	744	153	4.9	0.85
	Total Cluster 5-NAMPHOU	**8,137**	**1,440**	**3.7**	**0.87**

No	Core Villages	2017 Pop'n.	No. HH	Persons/ HH	M/F Ratio
1	Takded	511	88	5.8	0.93
2	Phosykeo	1,618	205	7.9	0.89
3	Nakham	1,886	316	6.0	0.79
4	Nalaong	813	131	6.2	0.85
5	Khamsensay	1,485	220	6.8	0.85
6	Phonthan	946	154	6.1	0.85
	Total Cluster 6-NAKHAM	**7,259**	**1,114**	**4.2**	**0.87**
1	Namoong	703	128	5.5	0.93
2	Sysavangtay	793	129	6.1	0.89
3	Houaymouang	1,285	291	4.4	0.79
4	Nadou	612	105	5.8	0.85
5	Nabo	879	145	6.1	0.85
6	Nachane	1,202	191	6.3	0.85
	Total Cluster 7-NABO	**5,474**	**989**	**3.8**	**0.87**
1	Houakhangong	1,162	247	4.7	0.93
2	Veunkhoun	878	169	5.2	0.89
3	Laomakhoud	732	149	4.9	0.79
4	Donesanod	285	60	4.8	0.85
5	Dongdokmay	1,432	238	6.0	0.85
6	Heunhinh	650	141	4.6	0.85
	Total Cluster 8-VEUNKHOUN	**5,139**	**1,004**	**3.4**	**0.87**
	TOTAL	**48,188**	**8,908**	**4.5**	**0.88**

Ethnicity

In 2010, 100% of survey respondents belong to Tai-Kadai linguistic group (consisting of 73% Lao and 27% Phoutay) that form the majority of the national population. There are no members of minority ethnic groups.

Population Growth and Migration

Between 2001 and 2006, the overall population of the core villages in Sayphouthong declined about 0.8%, possibly because of emigration of residents to work in Thailand. Sayphouthong is a well-established community. The 2007 data indicates that the average length of residency is more than 20 years. The population of the 39 core villages is forecast to grow at 1.65% p.a. with a projected population in 2032 of 61,596. (Section 4 describes the basis for population projections)

Education

In Sayphouthong, approximately 8% of the population has never attended school. Of those who have attended school about 44.6% lower secondary level and only 0.21% have completed higher secondary respectively. About 20.7% have attended grade 1 to 4 of primary school and almost 19.8% have completed primary school.

Health and Hygiene Conditions

The Sayphouthong 2015 survey results for '*incidence of water-related disease by HH'* did not highlight any disease for the last 6 months.

Land and House Tenure

The majority of the interviewed households own their house and land (92%). Approximately 89.6% of those who owned the land and house obtained the ownership documents and most households said that they are allowed to sell their property.

Occupations and Livelihoods

The main occupation of the population in Sayphouthong is farming (65%). Around 38% are the dependents including the children, the old age or disable people and the students who cannot contribute to the income of the family. Government officers and the teachers represent about 4% and 2% respectively. Based on data from surveyed households, the majority (60%) of women living in Sayphouthong core villages are economically active.

Income and Poverty Levels

An attempt was made to ascertain the average monthly cash income and expenses of households. On analysis, it was found that figures provided were generally an estimation of the respondents. As with any study/survey one has to be extremely cautious. The monthly income per person is calculated dividing the yearly HH income by the average HH size in Sayphouthong (4.5), giving us an average monthly income of Kip 558,000 per person.

The new decree of the government issued in October 2009 has been applied to assess the proportion of poor households in Sayphouthong. The new criterion on poverty determined the limit of poverty: households with the monthly income less than Kip

180,000 per person regardless of age and gender are considered to be the poor households. The analysis of monthly income per capita has revealed that 4% of the households in the proposed service area live under poverty line of which 0.6% live in the poorest condition with the monthly income per capita less than Kip 80,000 on average per person/month.

Existing Water Supply and Sanitation

Water Supply

The Mekong River is the main water resource in Sayphouthong district. Its catchment accounts for 9% of the country's land area. According to a draft National Water Resource profile, the flow in the Mekong River varies from a minimum of 2,000 m^3/s in the dry season to several thousand m^3/s in the wet season, with an average of 15,000 m^3/s. While the river is reportedly very high turbidity in the raining season, it carries large quantities of sediment in the wet season. The Mekong River is extensively used for irrigation. There are no water treatment facilities in the Sayphouthong District Town. Wealthier households buy bottled water at US$15/m3 about 100 times higher than the average tariff for formalized system. The majority of the population in the town relies on untreated water from open dug wells of over 40 meters deep, boreholes using hand pump and electric pump. Surface water (Mekong River) is also used during the rainy season although the turbidity is high. Water shortage in the dry season is a serious threat to the health of the population, particularly the poor households who could not afford to dig wells of over 35-40 meters deep.

Present water supply coverage: **0%**.

On-Site Sanitation

The issue of wastewater and the sanitation in Sayphouthong is not different from other small towns in the country: uncontrolled disposal of domestic wastewater, no drainage ditches in the public place such as markets, bus stations, schools or hospitals etc. Some households still have no sanitary latrine.
The town does not have a sludge collection tanker or septage disposal facilities.

Present sanitation coverage: **65%**

Other Infrastructure

Roads and Drains

The Sayphouthong district center has about 7.2 km of bitumen sealed road. Other roads in the core villages comprise about 11km of urban and district roads with gravel pavement, and 17km of village access roads with dirt pavements. About 50% of urban gravel roads also have side drains, but village access roads lack side drains and are often boggy in the wet season. The terrain is relatively flat. Primary drains for the district center discharge to adjoining swamp areas and have limited outlets and poorly defined connecting channels, so that stormwater backs up in the wet season, causing minor flooding of the town.

Electricity

About 95% of households in the core villages are connected to the electricity grid, which provides 24-hour supply.

- **POPULATION GROWTH AND WATER DEMAND FORECASTS**

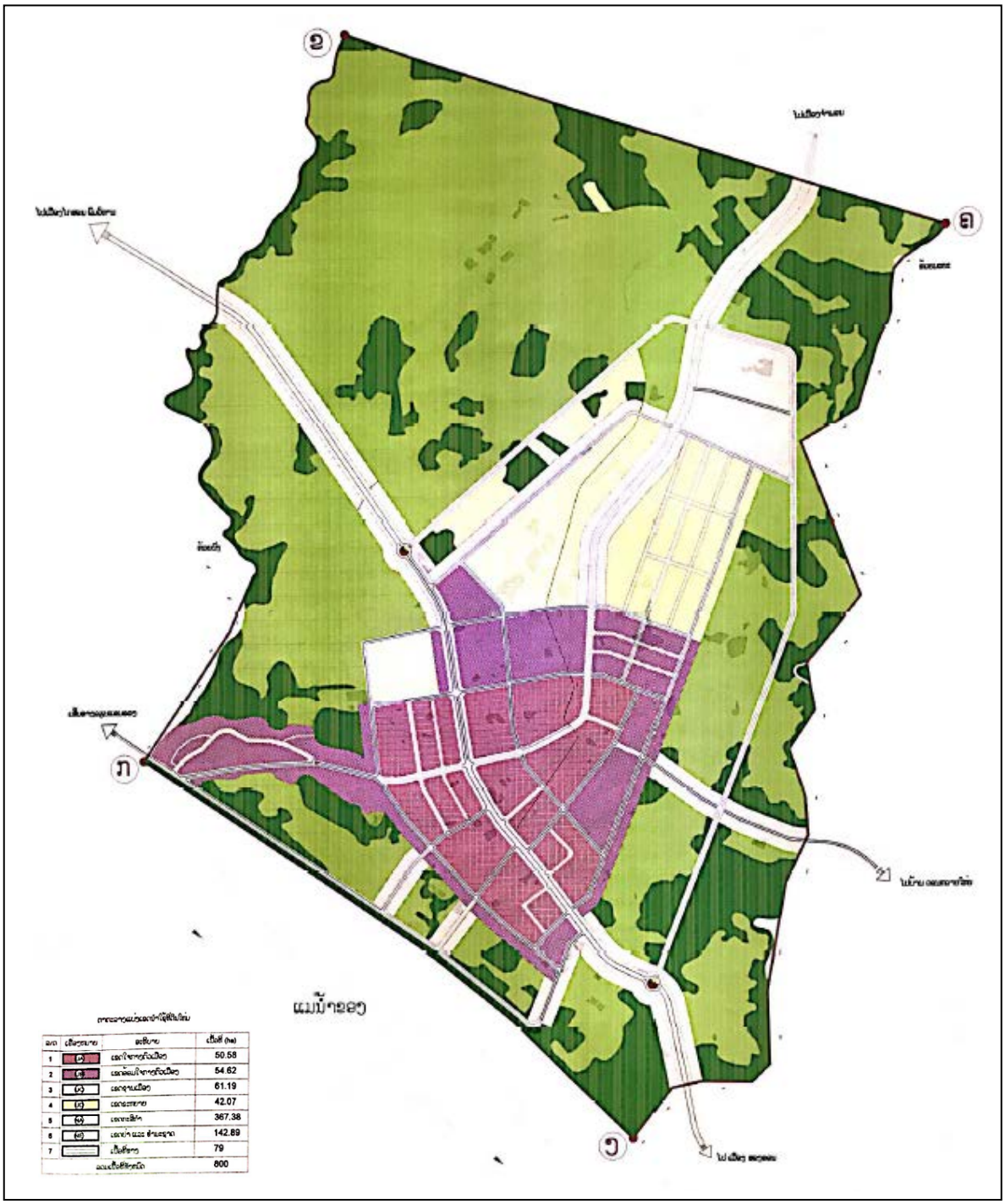
General

Sayphouthong town is the center of services, trade and agriculture in Sayphouthong district, which is one of the largest districts along Mekong River in Savannakhet province. It is located on National Road 13, which links two main population centers – the provincial capital, Kaysone about 35km to the north of Sayphouthong, the capital of Champasak province about 166km to its south. Rice, water melons and soy beans are Sayphouthong's main agricultural products and provide more than 50% of the province's annual export production. At present there is no agro-processing or industrial development in Sayphouthong.

The district Governor in Sayphouthong has identified diversification and strengthening of agricultural production as the principal priority for economic development in the district. Future development is based on expanded rice cultivation. Although there are no plans for non-agricultural or industrial development, the district government encourages local and foreign investment in agricultural food processing, and is also promoting handicraft production.

Urban Master Plan

The Urban Master Plan for Sayphouthong was prepared by the MPWT's Urban Research Institute in June 2010, and was approved by the provincial governor in August 2010. The Master Plan is essentially a land use plan, but is based on the following orientation for future development:



The existing urban area of Sayphouthong will continue to serve as the administrative and commercial center of the town.

Population Projections

The population of Sayphouthong's 39 core villages was 48,188 in 2017, with population growth rate of 1.65% over the five year period 2001-2017. The Urban Master Plan for the town does not provide population projections. Accordingly, population projections were made using population statistics for the province, modified to take account of local factors.

The population projections are set out in Table 4-3. Within the core villages, total population is forecast to increase from about 48,188 in 2017 to about 61,596 in 2032.

Table Error! No text of specified style in document.**-6: Population Projections for Sayphouthong's Core Villages**

Year 2017 Population	Growth Rate %	Forecast Population 2020	Forecast Population 2025	Forecast Population 2032
48,188	**1.65**	**50,613**	**54,929**	**61,596**

Water Demand Forecasts

General Approach

Water demand forecasts for the Sayphouthong subproject were prepared by making separate projections of each component of demand, including:

Demand for domestic use (based on per capita consumption, coverage targets and population projections);

Demand for industry (based on a % of domestic use, and specific allowances for large industries);

Demand for services (based on a % of domestic use, and specific allowances for large services areas);

Unaccounted-for-water[55] (ufw) as a % of total demand, excluding the demand of large industrial zones.

Production losses in treatment plant (based % of total demands).

Domestic Consumption

Water demand and consumption data for other provincial and district towns in Lao PDR show that domestic consumption accounts for about 90% of total demand. Per capita consumption figures for urban water supply systems in Lao PDR vary widely. For 52 water supply systems throughout the country (excluding Vientiane capital), per capita consumption ranges from 36 to 191 lpcd, with an average of 135 lpcd, while for 31 small town water supply systems, the corresponding figures are 11 to 145 lpcd, with an average of 79 lpcd. (WSD Statistics for PNPs, 2006).

Per capita consumption for Sayphouthong's three piped water supply systems (PNP and two private systems) varies from 46 to 88 lpcd, however customers supplement the piped supplies with bottled water and with rainwater in the wet season, so actual consumption is likely to be higher. According to the household surveys, householders estimate that their consumption varies from 38 to 260lpcd, with an average of 130lpcd.

[55] Unaccounted-for-water is the difference between water production and authorized consumption.

Based on Sayphouthong household survey results and experience from other projects, per capita consumption for drinking and cooking is about 10lpcd, while water for bathing and washing is in the order of 50 lpcd. About 4-16 lpcd will be required to operate a pour-flush toilet[56], so per capita consumption for a typical household with pour flush toilet is estimated at 64-76lpcd. Experience in other towns in Lao PDR indicates that piped connections directly to the house will usually increase water consumption over time. On the other hand, some residents in Sayphouthong will continue to use existing pumped wells and free sources of supply such as rainwater to minimize their overall water supply costs. To account for Sayphouthong having relatively low poverty levels, and a growing number of private businesses, this Feasibility Study has adopted a per capita consumption figure of 80 lpcd, 50m^3/day for backwashing filters, plus 10% for non-domestic use and 15% for unaccounted for water (ufw).

Water Demand Forecasts

Table 4-4 summarizes the demand forecasts and design criteria for the Sayphouthong subproject. By 2032, the average daily water production at the water treatment plant is expected to be 3,600m^3/d, comprising 78% domestic consumption, with the remaining 22% being for institutions, public use, services, handicraft and small industries, and allowances for NRW and backwashing the filters.

[56] In general, pour flush toilets require 1-4 liters of water per flush, including water for washing. Assuming that each member of the household uses the facility 4 times per day, consumption varies from 4-16 lpcd.

Table Error! No text of specified style in document.**-7: Water Demand Forecasts for Sayphouthong Town**

No.	Items	Unit	Forecasts			
			2017	2020	2025	2032
A.	Domestic Demand					
1	Growth Rate	%	1.65	1.65	1.65	1.65
2	Population in Core Area		48,188	50,613	54,929	61,596
3	Population in Extension Area	No.				
4	Total Population	No.	48,188	50,613	54,929	61,596
5	Coverage in Core Area	%	-	80	80	80
6	Coverage in Extension Area	%	-	80	80	80
7	Percentage Coverage	%	-	80%	80%	80%
8	Population with Piped Water	No.	-	17,668	19,175	21,502
9	Per Capita Consumption	l/c/d	-	100	100	100
10	Total Domestic Demand	m^3/d	-	1,767	1,917	2,150
B.	Non Domestic Demand					
1	Services, Small Industry, Institutions, Public (% Dom)	%	-	*20*	*20*	*20*
2	Total Non domestic demand	m^3/d	-	353	383	430
C.	Subtotal Water Demand All Categories	m^3/d	-	2,120	2,301	2,580
D.	Non Revenue Water (NRW) in Distribution system					
1	NRW as % Average Daily Water Production	%	-	*15*	*15*	*15*
2	NRW (physical losses only-pipelines and WTP)	m^3/d	-	318	345	387
E.	Average Daily Water Production (C+D) rounded	m^3/d	-	2,440	2,650	2,970
F.	Peak Daily Water Demand					
1	Peak Daily Water Demand		-	1.2	1.2	1.2
2	Peak Daily Water Demand (PDD)	m^3/d	-	2,928	3,180	3,564
3	Peak Daily Water Demand	l/s	-	33.9	36.8	41.3
G.	Required Treatment Plant Output (rounded)	m^3/d	-	2,930	3,180	3,560
H.	Treatment Plant Backwashing					
1	Backwashing as % of Treatment Plant Output	%	-	*5*	*5*	*5*
2	Treatment Plant Backwashing	m^3/d	-	147	159	178
I.	Raw Water System					
1	Required Capacity of Source & Raw Water System	m^3/d	-	3,077	3,339	3,738
2	Required Source Capacity (rounded)	m^3/d	-	3,080	3,340	3,740
3	Required Source Capacity	l/s	-	35.6	38.7	43.3
J.	Peak Hourly Demand (Distribution System)					
1	Peak Hourly Factor	%	-	1.5	1.5	1.5
2	Peak Hourly Demand (KhxPDD/86.4)	l/s	-	53.5	58.0	64.9

- **DESIGN & TECHNOLOGY CHOICE**

Introduction

This section outlines design and planning criteria for the Sayphouthong water supply system. It also discusses water treatment technology.

Design and Planning Periods

The Project is scheduled for implementation in the period 2019-2023. Sayphouthong project the planning has considered development to 2032 (15 year design life), to ensure that: (i) adequate provisions are made in the Project for future expansion; (ii) facilities are optimally sized, and; (iii) adequate land areas are reserved for future facilities. The proposed design horizons for intakes, raw water transmission and water treatment plants were determined by least cost analyses, while design periods for other parts of the system were determined by practical considerations. (e.g. problems and risks associated with future land acquisition and upgrading operating water supply systems in growing urban areas).

The adopted design periods for various parts of the water supply system are as follows:

Table Error! No text of specified style in document.**-8: Recommended Design Periods**

Component	Design Approach
Intake and raw water transmission mains	Design for Y2032 demands
Water treatment plant	Design for Y2032 demands, with provision (e.g. adequate hydraulic capacity) for plant uprating. Acquire adequate land to enable plant duplication in future.
Treated water transmission and	Design for Y2032 demands, including provision for future extension to non-core areas.
Pumping Stations	Design mechanical plant for Y2032 demands, with provision for pump (or impeller) replacement with larger capacity units after 2025. Acquire adequate land to enable pumping station duplication in future.
Distribution and reticulation	Design for Y2032 demands
Service reservoirs	Design and construct for 2032 demands. Acquire adequate land to enable reservoir duplication in future.

Water Treatment Technology

The choice of water treatment technology for Sayphouthong is dictated primarily by the raw water quality, operator capacity and financial resources to ensure sustainability. Wet season turbidity of the Mekong River is high, and is subject to rapid fluctuations. Slow

sand filters and rapid sand filters were considered for possible use in Sayphouthong. Although slow sand filters are relatively simple to operate, they require a large land area and require presedimentation and/or sedimentation processes to operate with highly turbid waters. Limited land is available in Sayphouthong and the raw water is very turbid. Slow sand filters are not therefore a viable option. Rapid sand filters are the most appropriate system.

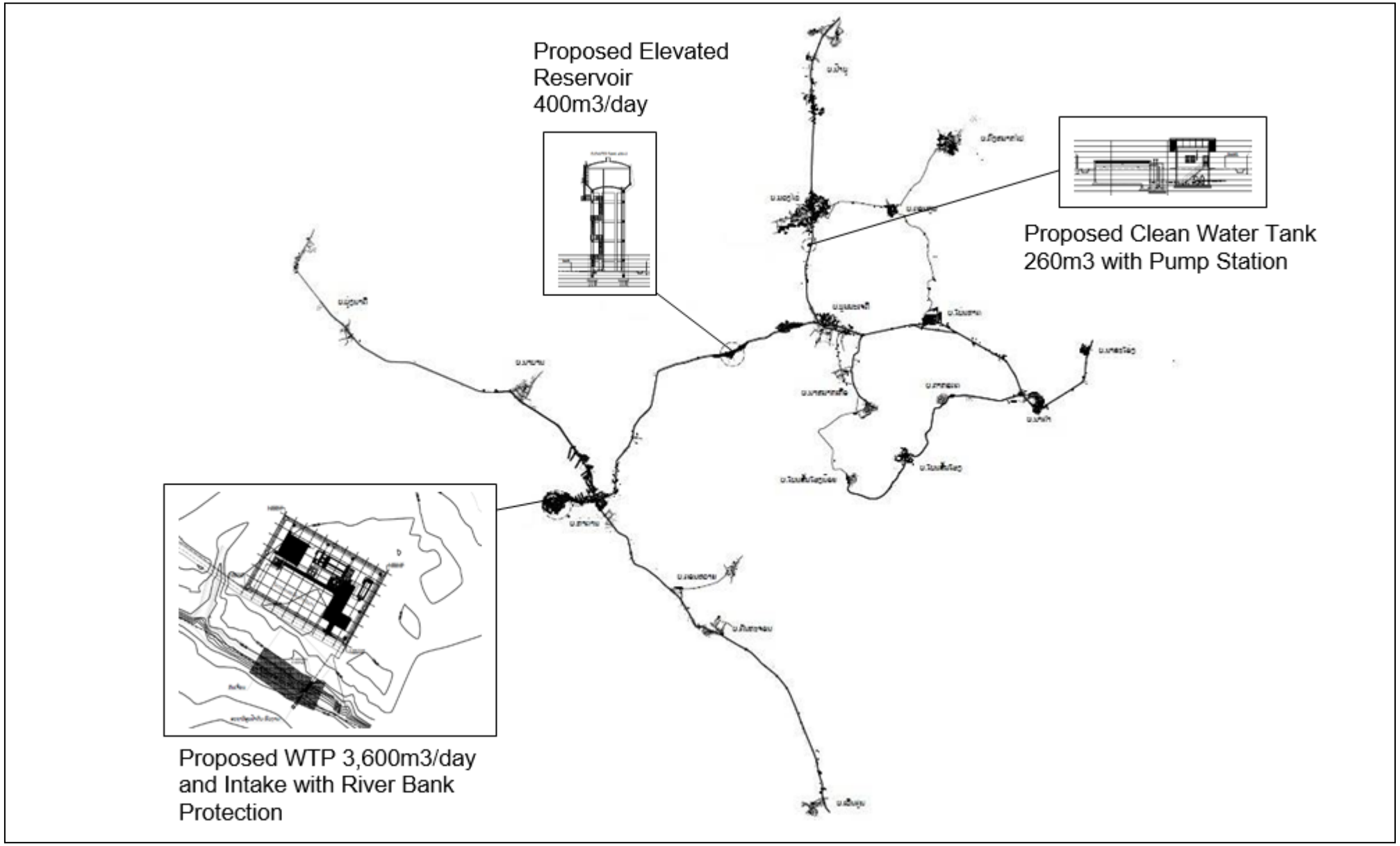


Figure Error! No text of specified style in document.**-1 Proposed Sayphouthong Water Treatment Plan Conceptual Design**

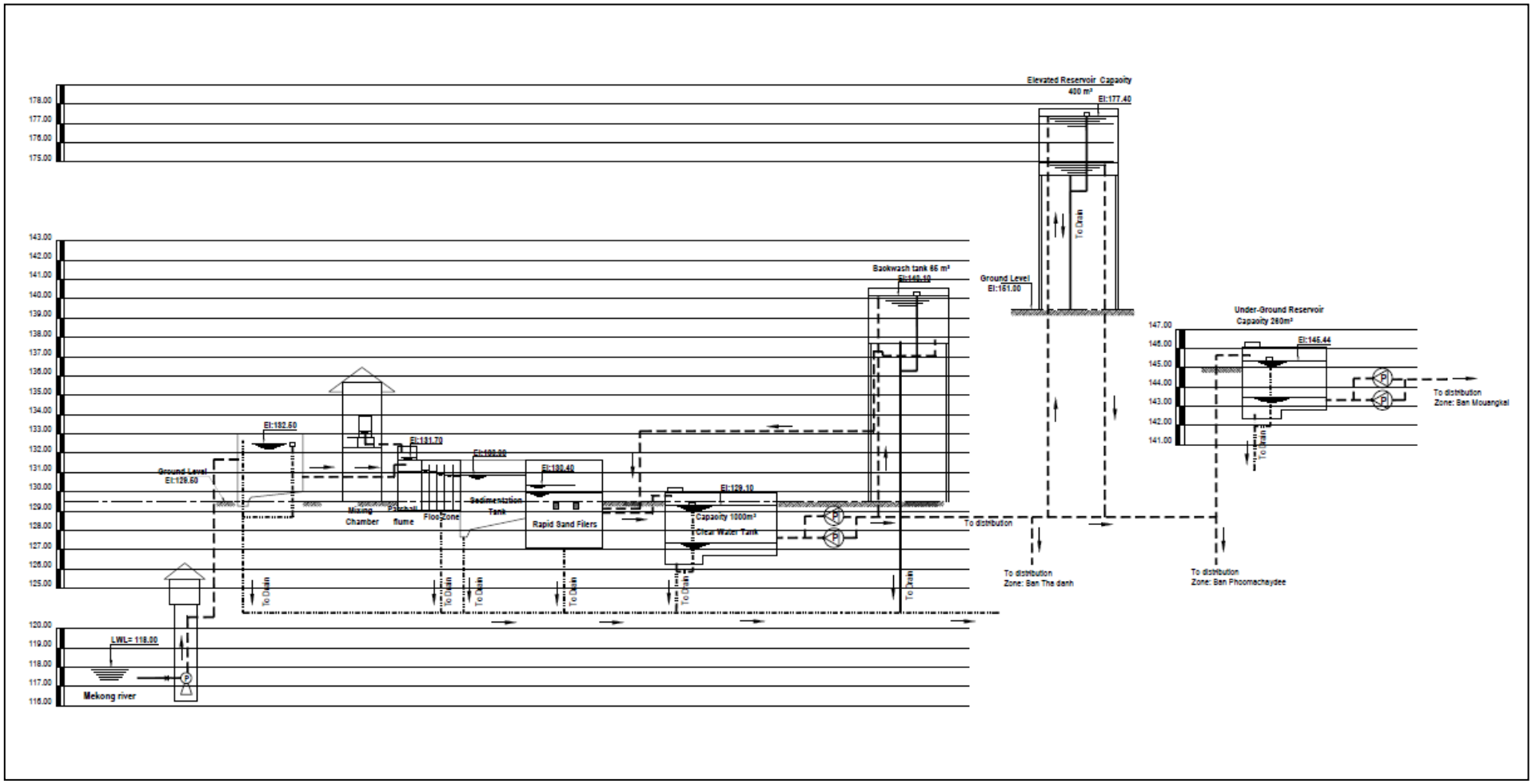


Figure Error! No text of specified style in document.**-2 Proposed Sayphouthong WTP Conceptual Desig**

Management Arrangements

The BNP will be responsible for managing, operating and maintaining the new or rehabilitated water supply systems. The PNP in the provincial capital will provide ongoing technical and managerial support to the PNP following commissioning of the new water supply system. It will process/print water bills in the provincial office, and coordinate BNP staff training. The PWT will be responsible for managing the new or improved sanitation systems.

The Project will procure essential O&M equipment for the BNP and PWT, as shown in Tables 6-1 and 6-2.

Table Error! No text of specified style in document.**-9: O&M Equipment for PNP and Sayphouthong BNP**

Item No	Description of Item	No
(cclxv)		
(cclxvi) 1	1 tonne Flatbed truck	1
(cclxvii) 2	Set of furniture for water treatment plant, including desks, chairs, and work benches.	1
(cclxviii) 3	Basic laboratory equipment for water quality testing	1
(cclxix) 4	Standard software programs such as standard accounting (assumes billing will be centralized at the PNP provincial office)	1
(cclxx) 5	Workshop tools such as pipe cutting, threading and tapping machines; lathe; pedestal drill; grinder; workbench and complete tool chest with spanners, wrenches etc.	1
(cclxxi) 6	Field tools and equipment for O&M of water supply system, such as valve keys; wheel barrows, shovels, picks and crow bars, portable lighting, small dewatering pump, soil compactor, powered weed / grass cutter, and other minor construction/ repair equipment.	1

Table Error! No text of specified style in document.**-10: O&M Equipment for OPWT**

Item No	Item	No
1	Set of minor office equipment including fax and A4 photocopier)	1
2	Computer and printer for management, administration, accounting and engineering	2
3	Standard software programs such as MS office	1
4	Minor field tools and equipment for O&M of drains and public sanitation facilities, such as powered weed / grass cutter, soil compactor, wheel barrows, shovels and picks, portable lighting, small dewatering pump, and other minor construction/ repair equipment.	1

- **Calculation of Water Tariffs**

Project-Specific Tariff

The project-specific tariff was determined using the Average Incremental Financial Cost (AIFC) approach, which is regarded as an approximation of the long-run marginal cost. The average tariff required for full cost recovery of the subproject is Kip 4,551 / m^3. The average tariff required to cover the subproject's full O&M cost and 30% of capital cost is Kip 2,438 / m^3. The long run utility wide average tariff, which will also be applied to the subproject, is Kip 4,997 / m^3 at 2010 price level. The use of utility wide tariff for the subproject does not result to a subsidy for subproject consumers.

Affordability and Willingness to Pay

An affordability analysis was undertaken to ensure that domestic consumers, particularly those in LIG, can afford the projected water tariff levels that meet the financial objectives of the sector. The affordability analysis was done for year 2017, two years after the project is assumed to be operational, and year 2024.

The results of the socio-economic survey revealed that households are willing to pay an average of about Kip 20,000 per month for piped water supply with 43% of respondents willing to pay between Kip 11,000 to Kip 70,000 per month. The analysis above shows that the average monthly water bill in 2017 and 2024, inclusive of the monthly meter rental and turnover tax, are higher than the households' willingness to pay. During this transition period, the PNPs forgive unpaid bills. In addition, it is recommended that the minimum 5m^3/month be eliminated, so that the poor only pay for what they actually use.

- **PROJECT ECONOMIC ANALYSIS**

General

The economic analysis was carried out for the water supply and sanitation component of the subproject in accordance with the Bank's Guidelines for the Economic Analysis of Projects (1997) and the Bank's Guidelines for the Economic Analysis of Water Supply Projects (1998). The analysis was conducted over a period of 25 years with no salvage value assumed.

Capital costs and incremental operation and maintenance (O&M) costs of the water supply and sanitation system have been considered. Economic costs have been derived from the financial project costs. All costs were expressed in constant (2010) prices. Taxes and duties have been excluded from base costs. Economic costs were valued using the domestic price numeraire and expressed in local currency. Tradable components have been adjusted to economic prices using shadow exchange rate factors (SERF) and non-traded components are valued at domestic market prices. A shadow wage rate factor (SWRF) for unskilled labor has been used to reflect its opportunity costs in the context of wide availability of labor in Lao PDR.

Demand Forecast

Water demand in the subproject town was derived from the current population within the planned service area, population growth, current and future domestic water consumption levels, and a provision for non-domestic water consumption. Reliable data on the amount

of water presently consumed by households without piped-water connection in the subproject town is not available. Households typically utilize a variety of water sources and do not measure or assess their consumption. However, based on the socio-economic household survey result as well as observations of water use behavior in the subproject town during the field visits, it is estimated that average daily demand from existing sources of non-piped water ranges between 40 and 70 liters per capita per day (lpcd) depending on the effort and resources needed to acquire the water, and on income levels. Internationally accepted lifeline consumption requirement was estimated to be 40 lpcd.

Per capita water consumption is expected to increase after construction of the piped water supply system, due primarily to (i) the reduced cost of acquiring water, (ii) improved water quality, and (iii) greater convenience and reliability of the piped water supply system. Demand is also a function of changes in price and household income and estimated price and income elasticity were incorporated in the demand forecasts.

- **PROJECT BENEFITS AND IMPACTS**

Expected Beneficiaries and Benefits

In Sayphouthong, the subproject will provide direct and indirect benefits for all people living and working in the 39 core villages of the town. Specifically, this will include up to 54,929 people in 2025 and 61,596 people in 2032.

For people living in Sayphouthong, the principal benefits derive from the development of a system of piped, treated water. They include improved convenience and reliability of water supplies for domestic uses in all core villages, as well as increased quantities of water and improved water quality.

Health benefits will result from the provision of safe water and improved household sanitation conditions that reduce the incidence of diarrhea, dysentery, kidney stones and other water-related illness. Other health benefits will include reduced costs for health care and a reduction in work time lost.

The availability of treated water and reliable water supplies may also support the development of economic activities in Sayphouthong. For example, it can improve the opportunities to establish hotels, guesthouses, restaurants and other entertainment venues, if demand increases as a result of the town's location on main Road 13. Home-based and other enterprises that produce rice wine, rice noodles and other processed foods will benefit from access to treated water.

Over 60% of surveyed households in Sayphouthong purchase bottled water for drinking. All households rely partially or entirely on other sources of water for household drinking water, for example, by boiling well water. The availability of treated piped water may result in modest reductions in household expenditures for households that buy water, although this may be offset by increased consumption of water as well as continued purchase of bottled water due to, for example, taste preferences.

Poverty Reduction

The incidence of poverty is very low in the core villages in Sayphouthong. Therefore, the poverty reduction benefits are minimal due to the development of the water supply system.

In the case of the small number of poor households in the subproject area, the Project policies help to ensure equitable benefits. Specifically, poor households are entitled to (i) no upfront charges for connection to the water supply system regardless of when they connect, on condition that they pay for a minimum amount of water use; (iii) progressive tariffs based on consumption levels (to be confirmed); and, (iii) financial assistance to construct or upgrade their sanitation facilities.

The direct benefits of piped water to the house and hygienic latrines that may contribute to reducing poverty levels of poor households include (i) reduced costs for health care due to the availability of clean water and proper sanitation; and, (ii) reduced costs for drinking water, if households substitute boiled piped water for purchased bottled water; and, (iii) increased opportunities for income-generating activities that require a water source (e.g., food processing or a small restaurant) and/or increased profitability of existing activities.

Gender

Everyone surveyed in core villages agreed that the water supply system offers significant benefits for adult women, as well as for men. In addition to improved health, people believe that women and men will both enjoy time savings and reduced workload. That is, the time and effort to get water will be less compared with current practices of getting water from wells or, in villages close to the Mekong River, going to the river to wash clothes or bathe. The majority felt that access to piped, treated water would result in greater income-generating opportunities, although the benefit for men was seen to be slightly higher than for women. More than half of respondents indicated that as a result of the water supply system, both girls and boys would have reduced workloads and more time for education.

Women and men in Sayphouthong are almost equally involved in community affairs, measured as the percentages of households with active members. Men tend to be involved in activities of the Youth Union, while women participate through the Lao Women's Union. The objective of the Project gender strategy is to build on the interests and strengths of both women and men to be involved in the proposed village-level activities, and to ensure that the views of both groups are taken into consideration in making decisions. Therefore, the following specific gender actions will be undertaken for the Sayphouthong project.

Minority Ethnic Groups

Sayphouthong District Town is composed of 39 core villages in 8 village clusters with a total 2017 population of 48,188 persons. In 2015, 100% of survey respondents belong to Tai-Kadai linguistic group (consisting of 73% Lao and 27% Phoutay) that form the majority of the national population. There are in total households, of which 8,908 households (27%) are considered as poor households.

Environment

Annex 3 contains an initial environmental examination (IEE) for the Sayphouthong District Town, whose main results are as follows:

- Environmental Impacts and Mitigation Measures
  All the subproject activities during construction and operation phase will take place in both residential and non-residential areas.

  Concerning key areas of environmental relevance, the IEE (i) does not indicate site/design related negative effects, (ii) does not expect permanent adverse impacts on surface and groundwater resources (new intake at right bank of Mekong River), and/or land resources (new water treatment component mainly within the existing WTP compound, connecting new intake to existing main system mainly on governmental land in and closed to school compound and partly along road (Right-of-Way).

  Monitoring of the raw water source should be continued during the operation phase by PNP.

- Environmental Management

  The IEE shows that the implementation of this project will not cause any adverse permanent impacts on the environment during construction and operation in the short-, medium- and long term. The minor impacts that are associated with construction and operation of the subproject's water supply system and sanitation facilities can be mitigated without difficulty through proper engineering design and incorporation or application of recommended mitigation measures and procedures at all stages in accordance with the Environmental Safeguards Management Plan (ESMP) and Health, Safety & Environment Plan (HSEP) both to be included in contract documents as pay-items. There are no risks for human health expected during the construction and operational phases.

  Implementation related costs for the ESMP and HSEP during the construction phase are covered by the available project budget. Operation related monitoring costs will have to be allocated in future PNP financial planning.

- Conclusion and Recommendations

The project's environmental impacts are insignificant, and meet the AF category B2 – Medium risk classification. Therefore, the subproject is judged to be eligible for inclusion in the Project. No further environmental assessment is required beyond the detailed review of the ESMP during implementation the infrastructure works, and the preparation of a HSEP.

Annex 3 – Initial Environmental Examin ation of Infrastructure to be constructed in Sayphouthong Town

ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ
ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນາຖາວອນ
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ພະແນກ ໂຍທາທິການ ແລະ ຂົນສົ່ງ
ລັດວິສະຫະກິດ ວິສະວະກຳນ້ຳ ແລະ ສິ່ງແວດລ້ອມ
ໂທ: (856-21) 255 430. P.O Box 2571
ແຟັກ: (856-21) 264815

ເລກທີ 1499 /ວຍສ
ລົງວັນທີ: 02 OCT 2017

INITIAL ENVIRONMENTAL EXAMINATION

ໂຄງການກໍ່ສ້າງ ລະບົບນ້ຳປະປາ ເມືອງ ໄຊພູທອງ ແຂວງ ສະຫວັນນະເຂດ ດ້ວຍກຳລັງການຜະລິດ 3,600 ມ^3/ມື້

ຖະໜົນ ໄຊເສດຖາທິລາດ, ບ້ານ ເຕົ້າຍອດ
ເມືອງ ສີສັດຕະນາກ, ນະຄອນຫຼວງວຽງຈັນ, ສປປ ລາວ
ໄປສະນີ: 4041

ກັນຍາ 2017

ສາລະບານ

ສາລະບານຕາຕະລາງ

ສາລະບານຮູບ

1 ພາກສະເໜີ.

1.1 ປະຫວັດຄວາມເປັນມາຂອງໂຄງການ.

ໂຄງການນ້ຳປະປາ ເມືອງ ໄຊພູທອງ ແຂວງສະຫວັນນະເຂດ, ແຜນການລົງທຶນຂອງລັດ ປີ 2017 ທີ່ໄດ້ຮັບການອະນຸມັດຂອງກົມນ້ຳປະປາ, ກະຊວງໂຍທາທິການ ແລະ ຂົນສົ່ງ. ໂດຍມອບໃຫ້ພະແນກໂຍທາທິການ ແຂວງສະຫວັນນະເຂດ ເປັນຜູ້ດຳເນີນການຈັດຊື້ ຈັດຈ້າງ ວຽກສຶກສາຄວາມເປັນໄປໄດ້ ແລະ ສຳຫຼວດ-ອອກ ແບບລະບົບນ້ຳປະປາ ໃນການສະໜອງນ້ຳສະອາດໃຫ້ແກ່ປະຊາຊົນເຂດ ເມືອງທ່າປາງທອງ ປະຈຸບັນນີ້ຍັງບໍ່ທັນມີ ລະບົບນ້ຳປະປາ, ດ້ວຍເຫດນີ້ ຜູ້ທີ່ຜັກອາໄສຢູ່ທີ່ພົບກັບຄວາມຫຍຸ້ງຍາກ ໃນການນຳ ເອົານ້ຳມາບໍລິໂພກໃນ ຄອບຄົວສ່ວນໃຫຍ່ແມ່ນໃຊ້ນ້ຳສ້າງ ຕື້ນຊຶ່ງມີຄວາມເລິກ ແຕ່ 7-10 ແມັດ, ສ້າງບາດານ ແລະ ໃຊ້ນ້ຳຫ້ວຍ ນ້ອຍ.

ເພື່ອຜັນຂະຫຍາຍແຜນພັດທະນາເສດຖະກິດສັງຄົມຂອງລັດຖະບານ, ໂດຍສະເພາະແຜນພັດທະນາ ເສດຖະກິດສັງຄົມຂອງແຂວງ ແລະ ວຽກສາມສ້າງໄດ້ຖືກປະຕິບັດເທື່ອລະກ້າວ ໂດຍສະເພາະວຽກງານກໍ່ສ້າງ ພື້ນຖານໂຄງລ່າງ ດ້ານນ້ຳປະປາ.

ໂຄງການນ້ຳປະປາຈະມີຄວາມສາມາດຕອບສະໜອງນ້ຳສະອາດໃຫ້ແກ່: ບັນດາບຸກຄົນທີ່ດຳລົງຊີວິດຢູ່ໃນ ເຂດພື້ນທີ່ໂຄງການ ແລະ ເຂດບໍລິເວນໃກ້ຄຽງລວມມີ 16 ໝູ່ບ້ານ ລວມທັງສະຖານທີ່ລາດຊະການ, ສະຖານທີ່ ທ່ອງທ່ຽວ ແລະ ເຂດບ້ານພັກທີ່ທັນສະໄໝ.

- ອີງຕາມ ແນວທາງຂອງພັກ ແລະ ລັດຖະບານທີ່ເລັ່ງໃສ່ການພັດທະນາທຸກເຂດແຂວງ, ຕົວເມືອງ ແລະ ທ້ອງຖິ່ນໃນທົ່ວປະເທດ ໃຫ້ຫລຸດພົ້ນອອກຈາກຄວາມທຸກຍາກແລະຫຼຸດພົ້ນອອກຈາກປະເທດດ້ອຍ ພັດທະນາໃນປີ 2020.
- ອີງຕາມ ທິດທາງຄາດໝາຍສູ້ຊົນແຕ່ນີ້ຮອດປີ 2020 ຂອງພັກແລະລັດຖະບານໃຫ້ປະຊາຊົນແຕ່ລະຕົວ ເມືອງໃນຂອບເຂດທົ່ວປະເທດ 80% ໃຫ້ໄດ້ຊົມໃຊ້ນ້ຳປະປາ.

2 ວິທີການສຶກສາ

ວິທີການສຶກສາ ເພື່ອສ້າງບົດລາຍງານການສຶກສາເບື້ອງຕົ້ນ ກ່ຽວກັບ ຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ຂອງ ໂຄງການ ກໍ່ສ້າງລະບົບນ້ຳປະປາເມືອງ ປະກອບດ້ວຍ: ກະກຽມແບບຟອມເກັບກຳຂໍ້ມູນ, ສ້າງແຜນການ, ວັດຖຸ ອຸປະກອນທີ່ຈຳເປັນ.

ການລົງສຳຫຼວດ ແລະ ເກັບກຳຂໍ້ມູນສຳພາດ ດ້ານເສດຖະກິດ-ສັງຄົມ ແລະ ສະພາບແວດລ້ອມທຳມະ ຊາດ ຂອງພື້ນທີ່ໂຄງການ.ກຳນົດຈຸດຄວບຄຸມ ຄ່າພິກັດ (Coordinate) ແລະ ຄ່າລະດັບ (Elevation) ເພື່ອ ນຳໃຊ້ເຂົ້າໃນການຄິດໄລ່, ອອກແບບ ແລະ ປັກໝຸດໝາຍກໍ່ສ້າງ.

ເກັບກຳຂໍ້ມູນ ສະພາບພູມປະເທດ (Topographic) ຕາມທາງຮາບ, ຂໍ້ມູນຕັດຍາວ, ຂໍ້ມູນຕັດ ຂວາງ ແລະ ຂໍ້ມູນ ທໍລະນີສາດ ຂອງພື້ນທີ່ ທີ່ຕັ້ງໂຄງການເຊັ່ນ :ໂຄງສ້າງ ,ອາຄານ ແລະ ອົງປະກອບອື່ນໆ ທີ່ມີ ຢູ່ແລ້ວ ພ້ອມດ້ວຍສະ ພາບພື້ນທີ່ ທີ່ຈະຂະຫຍາຍຕື່ມ ຫຼືຈຸດທີ່ຕ້ອງການສ້ອມແປງ ຢ່າງລະອຽດ. ເພື່ອນຳໃຊ້ ເຂົ້າໃນການຄິດໄລ່ ຈັດວາງແຜນຜັງ, ວິເຄາະໂຄງສ້າງ ແລະ ອອກແບບ.

ອຸປະກອນສຳຫຼວດປະກອບມີ:

- ເຄື່ອງວັດແທກ ຄ່າພິກັດ ແລະ ຄ່າລະດັບ (GPS Garmin 60CSx)
- ກ້ອງ Total station Leica TS02

- ກ້ອງ Leveling instrument SOKKIA
- ແມັກ Measuring tape
- ວິສາວະກອນສຳຫຼວດ

ການຈັດວາງຂໍ້ມູນ, ວິເຄາະຄົດໄລ່ ແລະ ແຕ້ມແບບ ແມ່ນນຳໃຊ້ Excel, Auto Land development ແລະ AutoCAD program.

ສະນັ້ນ ,ຈຶ່ງສາມາດປະເມີນຜົນກະທົບ ລະບຸ ,ປະເມີນ ແລະ ກຳນົດມາດຕະການຫຼຸດຜ່ອນຜົນກະທົບຂອງໂຄງການ

3 ສະພາບສິ່ງແວດລ້ອມທຳມະຊາດ ແລະ ສັງຄົມໃນປັດຈຸບັນ

3.1 ທາງກາຍຍະພາບ

3.1.1 ສະພາບອາກາດ

ສປປ ລາວ ຢູ່ໃນພູມອາກາດຂອງເຂດຮ້ອນ, ມີລົມມໍລະສຸມ ແຕ່ບໍ່ມີພາຍຸ, ສຳລັບເຂດພູດອຍພາກເໜືອ ແລະ ເຂດສາຍພູຫຼວງອາກາດ ມີລັກສະນະເຄິ່ງຮ້ອນເຄິ່ງໜາວ ອຸນຫະພູມສະລີ່ຍ ສະເລ່ຍປະຈຳປີສູງເຖິງ 15-30 ອົງສາເຊ, ການຜັດປ່ຽງອຸນຫະພູມລະຫວ່າງກາງເວັນ ແລະ ກາງຄືນມີປະມານ 10 ອົງສາເຊ. ຈຳນວນຊົ່ວໂມງ ທີ່ມີແສງແດດຕໍ່ປີປະມານ 2,300-2,400 ຊົ່ວໂມງ (ປະມານ 6.3-6.5 ຊົ່ວໂມງຕໍ່ມື້), ຄວາມຊຸ່ມຊື່ນ ສຳພັດຂອງອາກາດ ມີປະມານ 70 - 85%, ປະລິມານ ນ້ຳຝົນໃນປີນີ້ແຫ່ກໄດ້ 1,076.8 ມມ.

ຕາຕະລາງ1: ຄວາມຊຸ່ມຊື່ນສະເລ່ຍ ສູງສຸດ-ຕ່ຳສຸດໃນແຕ່ລະປີ.

	ສະຖານີອຸຕຸນິຍົມ							
	Meteorology Station							
ປີ	ຫຼວງພະບາງ		ນຄ. ວຽງຈັນ		ສະຫວັນນະເຂດ		ປາກເຊ	
Year	Luangprabang		Vientiane Capital		Savannakhet		Pakse	
	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ
	Max	Min	Max	Min	Max	Min	Max	Min
2010	33.40	20.70	32.20	22.90	32.30	21.30	33.10	23.90
2011	31.38	20.07	30.83	22.37	30.72	20.56	31.89	22.64
2012	32.78	21.05	32.04	23.68	31.99	21.95	32.98	23.64
2013	32.10	20.40	31.80	23.10	31.50	21.70	32.60	23.00
2014	32.60	20.40	32.10	23.10	32.00	21.90	32.60	22.90

ແຫລ່ງຂໍ້ມູນ : ກົມອຸຕຸນິຍົມ ແລະ ອຸທົກກະສາດ, ກະຊວງ ຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ(http://www.lsb.gov.la/Meteorology14.php)

ຕາຕະລາງທີ 2: ຈຳນວນຊົ່ວໂມງແສງແດດ ໃນແຕ່ລະປີ.

	ສະຖານີອຸຕຸນິຍົມ							
	Meteorology Station							
ປີ	ຫຼວງພະບາງ		ນຄ. ວຽງຈັນ		ສະຫວັນນະເຂດ		ປາກເຊ	
Year	Luangprabang		Vientiane Capital		Savannakhet		Pakse	
	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ
	Max	Min	Max	Min	Max	Min	Max	Min
2010	95.00	49.00	90.00	55.33	94.00	56.00	85.00	53.00
2011	95.67	54.45	90.00	57.55	94.00	58.62	85.57	54.67
2012	95.74	52.65	89.94	58.02	93.66	57.01	87.25	54.84
2013	96.00	63.00	89.00	58.00	94.00	56.00	88.00	52.00
2014	95.00	48.00	89.00	56.00	94.00	57.00	88.00	55.00

ແຫລ່ງຂໍ້ມູນ : ກົມອຸຕຸນິຍົມ ແລະ ອຸທົກກະສາດ, ກະຊວງ ຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ (http://www.lsb.gov.la/Meteorology14.php)

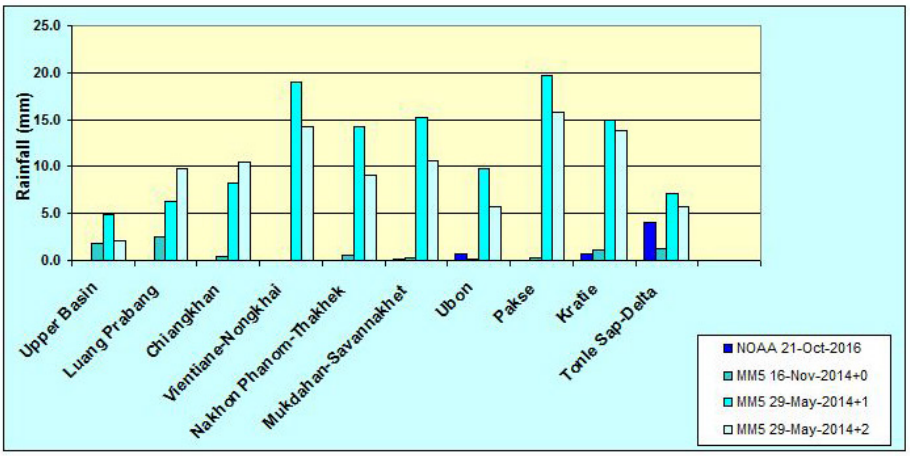
3.1.2 ພູມສັນຖານ

ເມືອງ ໄຊພູທອງ ເປັນເມືອງໜຶ່ງໃນ 15 ເມືອງແຂວງ ສະຫວັນນະເຂດ, ເປັນເມືອງທີ່ງພຽງທີ່ຕັ້ງຢູ່ ທິດໃຕ້ຂອງແຂວງ ສະຫວັນນະເຂດ ຊຶ່ງຫ່າງຈາກເທດສະບານແຂວງ ປະມານ 46 ກມ , ມີເນື້ອທີ່ທັງໝົດ 638,37 ກມ^2, ທິດເໜືອຕິດກັບເມືອງ ໄກສອນ, ທິດໃຕ້ຕິດກັບເມືອງ ສອງຄອນ, ທິດຕາເວັນອອກຕິດກັບ ເມືອງ ຈຳພອນ, ທິດຕາເວັນຕົກຕິດກັບນ້ຳຂອງ

ຮູບທີ 1: ລັກສະນະພູມສັນຖານບໍລິເວນໂຄງການ

3.1.3 ປະລິມານນ້ຳຝົນ

ແຂວງ ສະຫວັນນະເຂດ ແມ່ນນອນຢູ່ໃນເຂດພູມອາກາດລົມມໍລ໌ຸມ ເຊິ່ງປະກອບມີ 2ລະດູແຕກຕ່າງ ກັນ ເຊັ່ນ :ລະດູແລ້ງ ແລະ ລະດູຝົນ ,ລະດູແລ້ງເລີ່ມແຕ່ເດືອນທັນວາ ແລະ ສຸດລົງໃນເດືອນເມສາ ,ລະດູຝົນ ເລີ່ມແຕ່ເດືອນມິຖຸນາ ຫາ ເດືອນຕຸລາ ສ່ວນເດືອນພຶດສະພາ ຫາ ເດືອນພະຈິກ ເປັນເດືອນຂ້າມຜ່ານຈາກລະດູ ໜຶ່ງ ຫາ ອີກລະດູໜຶ່ງ .ໃນຊ່ວງລະດູແລ້ງອາກາດມີການປ່ຽນແປງ ແລະ ແຕກຕ່າງກັນຫຼາຍ ລະຫວ່າງເດືອນ ທັນວາ ຫາ ເດືອນກຸມພາ ພູມອາກາດຈະໜາວເຢັນ ຫຼັງຈາກນັ້ນອາກາດຈະຮ້ອນເອົ້າຈົນຮອດຕົ້ນເດືອນ ພຶດສະພາ. ສະເລ່ຍປະລິມານນ້ຳຝົນ ໄດ້ສະແດງໄວ້ໃນກຣາຟຶກລຸ່ມນີ້:



ແຫຼ່ງຂໍ້ມູນ: http://ffw.mrcmekong.org/stations/sav.htm

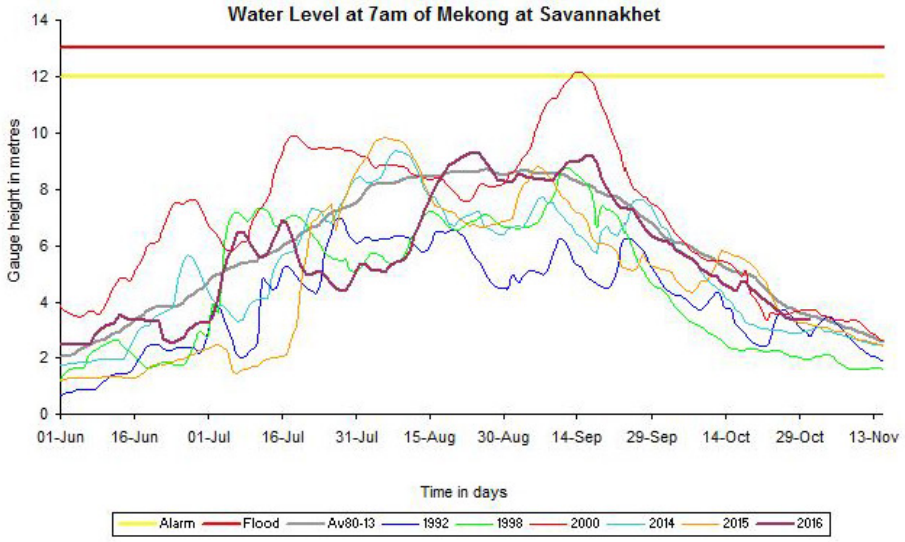
ຮູບທີ 2: ກຣາຟສະແດງປະລິມານນ້ຳຝົນ

3.1.4 ແຫຼ່ງນ້ຳ

ແຫຼ່ງນ້ຳທຳມະຊາດໃນບໍລິເວນໂຄງການປະກອບດ້ວຍນ້ຳໜ້າດິນ ແລະ ນ້ຳໃຕ້ດິນ. ແຕ່ເຖິງຢ່າງໃດກໍ ຕາມ ແຫຼ່ງນ້ຳທີ່ສຳຄັນໃນບໍລິເວນໂຄງການແມ່ນນ້ຳໜ້າດິນກໍຄືນ້ຳຂອງ.

3.1.4.1 ນ້ຳໜ້າດິນ

ຈາກການລົງສຳຫຼວດເກັບກຳຂໍ້ມູນຕົວຈິງ ໃນເຂດໂຄງການສຳລັບແຫຼ່ງນ້ຳດິບທີ່ຈະປ້ອນເຂົ້າໂຮງງານ ຜະລິດນ້ຳປະປາແມ່ນ ມີ 1 ແຫຼ່ງນ້ຳຄື: ນ້ຳຂອງ ທີ່ສາມາດສະໜອງນ້ຳໄດ້ຕະຫຼອດປີ. ນ້ຳຂອງ ແມ່ນແມ່ນ້ຳສາຍ ຫຼັກ, ເປັນບ່ອນຫາອາຫານຂອງປະຊາຊົນ ແລະ ເປັນແມ່ນ້ຳທີ່ໃຫ່ຍ ໄຫຼຕະຫຼອດປີແຕ່ເໜືອຮອດໃຕ້, ມີປະລິມານ ນ້ຳພຽງພໍ, ໃສສະອາດ, ປະລິມານຂອງນ້ຳບໍ່ຍົກແຫ້ງ ເຊິ່ງເໝາະທີ່ຈະໃຊ້ ເປັນແຫຼ່ງນ້ຳດິບເພື່ອປ້ອນເຂົ້າໂຮງງານ ຜະລິດນ້ຳປະປາ, ເພື່ອໃຫ້ປະຊາຊົນໄດ້ໃຊ້ນ້ຳທີ່ສະອາດ ແລະ ປອດໄພ. ເຊິ່ງລ່າສະເລ່ຍລະດັບນ້ຳຂອງ ໄດ້ສະແດງ ໄວ້ໃນເສັ້ນສະແດງລຸ່ມນີ້:



ແຫຼ່ງຂໍ້ມູນ: http://ffw.mrcmekong.org/stations/sav.htm

ຮູບທີ 3: ເສັ້ນສະແດງລະດັບນ້ຳຂອງ

3.1.5 ອັດຕາການໄຫຼຂອງນ້ຳ

ແມ່ນ້ຳຂອງ ໃນຊ່ວງ ນີ້ ມີປະລິມານ ຕ່ຳສຸດ ແມ່ນ ປະມານ 2,000ມ³ຕໍ່ວິນາທີ ໃນທ້າຍ ເດືອນ ເມສາ ຫາຕົ້ນເດືອນ ພຶດສະພາ ຂອງທຸກໆປີ ຕະລອດເວລາ ຂອງການວັດແທກ ຄົບຮອບ 10ປີ ເຊິ່ງ ມີ

ປະລິມານສູງສຸດ ປະມານ 25,000ມ³ຕໍ່ວິນາທີ ໃນຊ່ວງລະຫວ່າງທ້າຍເດືອນ ສິງຫາ ຫາ ກໍລະກົດ ຂອງທຸກໆ ປີ.

3.1.6 ຄຸນນະພາບນ້ຳ

ຈາກຜົນວິໄຈຕົວຢ່າງນ້ຳ (ນ້ຳຂອງ) ເຫັນໄດ້ເຖິງຄຸນນະພາບຂອງນ້ຳເຊິ່ງມີຄວາມຂຸ່ນ 61.3 NTU ຄ່າ pH=7.90 ເຊິ່ງຕາມມາດຕະຖານແລ້ວຄ່າ pH ທີ່ຍອມຮັບໄດ້ແມ່ນ pH= 5-9 ນັ້ນສະແດງໃຫ້ເຫັນວ່າ ຄຸນນະພາບຂອງນ້ຳຂອງແມ່ນມີສັກກະຍະພາບ ແລະ ມີປະລິມານນ້ຳພຽງພໍສາມາດສະໜອງນ້ຳໃຫ້ໂຮງງານຜະລິດນ້ຳປະປາໄດ້ຕະຫຼອດປີ.

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05 JUL 2017

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity
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Water Analysis report:

Vientiane Capital City
NamPaPa Nakhonluang
Chinaimo Water Treatment Plant Laboratory
Tel.:312564 or Mobile 2204693

Sampling Place: ລັດວິສະຫະກິດນ້ຳແລະສິ່ງແວດລ້ອມ
Location: ເມືອງ ທ່າປາງທອງ ແລະ ເມືອງ ໄຊພູທອງ
ແຂວງ ສະຫວັນນະເຂດ.

Testing Date: 6/6 ~ 5/7/2017.

N.	Description of analysis	units	Results			Surface water Quality Standards
	Sampling of Number		N.1	N.2	N.3	
	Sampling Name		[illegible]	[illegible]	ນ້ຳຂອງ ເມືອງ ໄຊພູທອງ	
1.	Turbidity	NTU	375.0	140.0	61.3	N'
2.	Color	CU	266.0	90.0	X	N'
3.	Odor	-	soil	soil	X	N'
4.	pH(value)	-	8.07	7.95	7.90	5~9
5.	M. Alkalinity ($CaCO_3$)	mg/l	x	x	90.0	-
6.	Ammonia ion (NH_4^+)	mg/l	x	x	1.30	-
7.	Total Hardness ($CaCO_3$)	mg/l	86.0	98.0	X	-
8.	E.Coli	MPN /100ml	5/5	5/5	5/5	-
9.	Total Suspended Solids(TSS)	mg/l	294.0	274.0	X	-
10.	Calcium (Ca)	mg/l	19.2	36.0	x	-

Remarks:. N.D= Non Detection.

Laboratory: Ms Khoncsavanh.K

Chief Chinaimo WTP: ຄຳເພື່ອງ ມະນີວັນ

General Manager NPNL: ວຽງທອງ ວັນນະລາດ

3.1.7 ລະບົບນິເວດ

ຂອບເຂດຂອງໂຄງການຢູ່ພາຍໃຕ້ການສະໜັບສະໜູນ ແລະ ສິ່ງເສີມ ການພັດທະນາການທ່ອງທ່ຽວທາງທຳມະຊາດ, ທາງປະຫັວດສາດ ນອກຈາກນັ້ນ ບັນດາໜອງນ້ຳ, ຫ້ວຍ ຕ່າງໆທີ່ຢູ່ໃນເຂດດັ່ງກ່າວຍັງສາມາດນຳໄປໃຊ້ໃນການເພີ່ມການຜະລິດນ້ຳ ແລະ ປ່າທີ່ມີຢູ່ຕາມລະບົບນິເວດໃຫ້ມີການເຕີບໃຫຍ່, ການປົກປັກຮັກສາຢ່າງລະມັດລະວັງເຊິ່ງເປັນຜົນດີ ຕໍ່ກັບການປະມົງ ແລະ ການພັດທະນາການທ່ອງທ່ຽວ.

~ 6 ~

ສຳລັບການປົກປັກຮັກສາສິ່ງແວດລ້ອມ, ນ້ຳເປື້ອນ ແລະ ຂີ້ເຫຍື້ອຈະຕ້ອງມີການຄວບຄຸມຢ່າງເຄັ່ງຄັດໃນ ຂະບວນການບຳບັດກ່ອນທີ່ຈະມີການປ່ອຍອອກສູ່ສິ່ງແວດລ້ອມ.

3.2 ຊັບພະຍາກອນທຳມະຊາດ

3.2.1 ຊັບພະຍາກອນປ່າໄມ້

ສະຫວັນນະເຂດເປັນແຂວງໜຶ່ງທີ່ອຸດົມສົມບູນໄປດ້ວຍຊັບພະຍາກອນທຳມະຊາດ ພູຜາປ່າໄມ້. ນອກນີ້ຍັງ ມີປ່າສະຫງວນເຊັ່ນ: ປ່າສະຫງວນແຫ່ງຊາດດົງພູວຽງ, ປ່າສະຫງວນແຫ່ງຊາດເຊບັ້ງນອນ, ປ່າສະຫງວນແຫ່ງ ຊາດພູຊ້ຳງແຫ່. ພູຊ້ຳງແຮ່ເປັນສາຍພູຫີນ ແລະ ເປັນຖິ່ນຖານອາໄສຂອງຊາວຜູ້ໄທ, ດົງພູວຽງເປັນທີ່ຮູ້ຈັກກັນວ່າ ເປັນປ່າເກົ່າແກ່ທີ່ມຕົ້ນໄມ້ສູງໃຫ່ຍ, ບຶງສັກສິດ ແລະ ພະທາດອີ່ຮັງ. ນອກຈາກນັ້ນຍັງມີສັດທີ່ໃກ້ສູນພັນເຊັ່ນ: ໂອ່ງ, ຄ່າງເງິນ ແລະ ນົກແກ໋ງເຊິ່ງພົບເຫັນໄດ້ຍາກໃນເຂດປ່າສະຫງວນແຫ່ງອື່ນໆ.

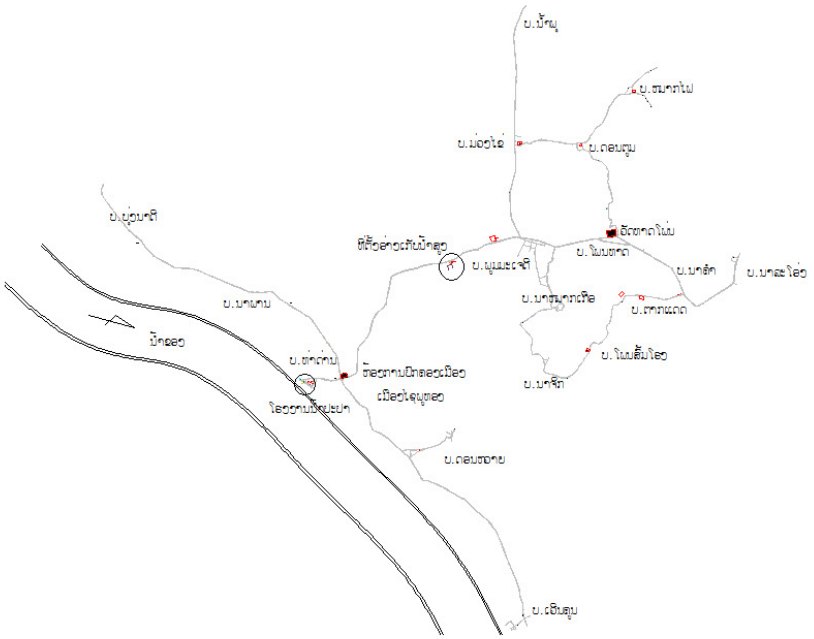
3.2.2 ຊີວະນາງພັນ-ສັດປ່າ ແລະ ພືດພັນທາຍາກ

ແຂວງ ສະຫວັນນະເຂດ ເປັນແຂວງ ທີ່ມີອາກາດຮ້ອນ ,ແຫ້ງແລ້ງ ເຊິ່ງເປັນສາເຫດອັນສຳຄັນທີ່ເຮັດໃຫ້ມີ ຜົນກະທົບຕໍ່ສິ່ງທີ່ມີຊີວິດ .ເຂດປ່າຜະລິດແມ່ນເປັນແຫຼ່ງຜະລິດອາຫານໃຫ້ແກ່ຊຸມຊົນເປັນການສ້າງຜົນກຳໄລໃຫ້ ແກ່ຄອບຄົວ ແລະ ທັງເປັນບ່ອນຫາຢູ່ຫາກິນຂອງປະຊາຊົນເປັນຕົ້ນແມ່ນ :ຫໍ່ໄມ້ ,ຜັກ ,ເຫັດ.....ໆລໆ ຕາມແຕ່ ລະຖຸການ.

4 ລາຍລະອຽດຂອງໂຄງການ

4.1.1 ທີ່ຕັ້ງ ແລະ ເຂດບໍລິການຂອງໂຄງການ

ໂຄງການນີ້ຕັ້ງຢູ່ເມືອງ ໄຊພູທອງ ແຂວງ ສະຫວັນນະເຂດ ມີຈຸດທີ່ຕັ້ງຂອງໂຮງງານຂຶ້ນກັບການປົກຄອງຂອງ ບ້ານ ທ່າດ່ານ ໂຄງການດັ່ງກ່າວພວກເຮົາໄດ້ສຶກສາຄວາມເປັນໄປໄດ້ທາງດ້ານເສດຖະກິດ-ສັງຄົມ, ທາງດ້ານ ເຕັກນິກຕ່າງໆ. ການຄັດເລືອກແຫຼ່ງນ້ຳແມ່ນໄດ້ສຶກສາເອົານ້ຳຂອງ ເຜາະນ້ຳຂອງມີປະລິມານນ້ຳທີ່ສາມາດຕອບສະ ໜອງໄດ້ຕະຫຼອດປີ ສ່ວນລະບົບໂຮງງານແມ່ນຕັ້ງຢູ່ບໍ່ໄກຈາກສະຖານີສູບນ້ຳນ້ຳທີ່ຜະລິດອອກຈາກລະບົບໂຮງງານ ແມ່ນປ່ອຍໃຫ້ນ້ຳໄຫຼເຂົ້າຫາອ່າງເກັບນ້ຳສະອາດ (ອ່າງເກັບນ້ຳໃຕ້ດິນ). ແລ້ວໃຊ້ປ້ຳສົ່ງຂຶ້ນຫາອ່າງນ້ຳສູງ ຫຼັງຈາກນັ້ນ ແມ່ນປ່ອຍຫາເຂດບໍລິການ ເຊິ່ງເຂດບໍລິການຂອງໂຄງການແມ່ນກວມເອົາ 16 ບ້ານຄື: ບ. ນາພານ, ບ. ທ່າດ່ານ, ບ. ດອນຫວາຍ, ບ. ຄັນທ່າຈານ, ບ. ເວີນຄຸນ, ບ. ພູມະເຈດີ, ບ. ນາໝາກເກືອ, ບ. ໂພນທາດ, ບ. ມ່ວງໄຂ່, ບ. ດົງໝາກໄຟ, ບ. ດອນຕຸ່ມ, ບ. ນ້ຳພຸ, ບ. ນາຄຳ, ບ. ຕາກແດດ, ບ. ໂພນສີ່ມໂຮງ, ບ. ນາລະໂອ່ງ.



ຮູບທີ4: : ພາບຈຸດທີ່ຕັ້ງ ແລະ ຂອບເຂດຂອງໂຄງການ

4.2 ອົງປະກອບ ແລະ ຂະບວນການຜະລິດ

ໂຄງການກໍ່ສ້າງລະບົບນ້ຳປະປາເມືອງ ໄຊພູທອງ ມີກຳລັງການຜະລິດ 3,600 ມ^3/ມື້. ເຊິ່ງມີອົງປະກອບ ແລະ ຂະບວນການຜະລິດ ດັ່ງນີ້ ການສົ່ງນ້ຳຈາກໂຮງງານໄປເຂດບໍລິການແມ່ນ ໃຊ້ນ້ຳສູບສົ່ງ, ຖ້າເຫຼືອໃຊ້ແມ່ນ ໃຫ້ຂຶ້ນໄປຝາກໄວ້ຢ່າງເກັບນ້ຳສູງ. ເພື່ອອຳນວຍຄວາມສະດວກການບໍລິການນ້ຳໃຫ້ທົ່ວເຖິງຈະໄດ້ສ້າງ Booster pump ເພື່ອສົ່ງນ້ຳໃຫ້ບ້ານທີ່ຢູ່ໄກເຊິ່ງຈະກວມເອົາ 04 ບ້ານຄື: ບ້ານ ມ່ວງໄຂ່ (ເປັນຈຸດຕັ້ງ Booster pump) , ບ້ານ ດົງໝາກໄຟ, ບ້ານ ນ້ຳພຸ ແລະ ບ້ານ ດອນຕຸ້ມ.

4.2.1 ລະບົບຫົວງານ

ສຳລັບການສ້າງສະຖານີສູບນ້ຳດິບ (ຫົວງານ) ແມ່ນຈະໄດ້ສຶກສາຢູ່ 03 ທາງເລືອກ ເພື່ອຊອກຫາທາງເລືອກທີ່ ເໝາະສົມສຳລັບການເລືອກສະຖານທີ່ຕັ້ງລະບົບຫົວງານ. ດັ່ງທີ່ໄດ້ສະເໜີໃນບົດສຶກສາຄວາມເປັນໄປໄດ້ຂອງໂຄງການ ເຊິ່ງໃນບົດສຶກສາແມ່ນໄດ້ເລືອກເອົາທາງເລືອກທີ 01 ເປັນສະຖານທີ່ຈະສ້າງເປັນສະຖານີສູບນ້ຳ.

ศอบ˜ผปในสิ่เหดตผ

ศอบ˜ผปในสิ่ศอบ˜ผศีฝฝ๊ฯ

ຮູບທີ 5: ທີ່ຕັ້ງໂຮງງານ ແລະ ສະຖານີສູບນ້ຳ

4.2.2 ຂະບວນການສ້າງຕະກອນ

ສຳລັບການອອກແບບ ລະບົບປະສົມໄວ ແມ່ນໄດ້ອອກແບບຕິດຕັ້ງ Parshall flume ຂະໜາດ ຄວາມກ້ວາງ ຂອງ ຊ່ວງຄອງ ເທົ່າກັບ 25 mm.

ນ້ຳດິບທີ່ໄຫຼຜ່ານຊ່ວງຄອງດັ່ງກ່າວນີ້ຈະເກີດມີການໄຫຼແບບມຸນວຽນ (Turbulent flow) ດ້ວຍ ຄ່າ ຂອງ G ປະມານ 700-1000/s.

ຂະບວນການສ້າງຕະກອນປະກອບດ້ວຍ 3 ອ່າງ ຄື ອ່າງຮັບນ້ຳດິບ (Receiving well), ອ່າງປະສົມໄວ (Rapid mixing tank) ແລະ ອ່າງກວນຊ້ຳ (Slow mixing tank).

ອ່າງຮັບນ້ຳດິບ (Receiving Well): ເປັນອ່າງທີ່ຖືກອອກແບບໃຫ້ຮັບນ້ຳທີ່ຖືກປ້ຳສົ່ງມາ ນ້ຳຂອງ ກ່ອນ ປ່ອຍເຂົ້າສູ່ໂຮງງານ ກ່ອນເຂົ້າສູ່ອ່າງປະສົມໄວ.

ອ່າງປະສົມ (Mixing tank): ອ່າງປະສົມນ້ຳດິບກັບສານສົ້ມທີ່ໄຫຼຜ່ານມາຈາກອ່າງຮັບນ້ຳດິບ ຊຶ່ງຈະໃຊ້ ລະບົບຕີດ້ວຍແຮງນ້ຳ.

ອ່າງກວນໄວ (Rapid Mixing Tank - Coagulation): ສານເຄມີ ທີ່ຊ່ວຍໃນການຕົກຕະກອນໄດ້ ຖືກຕື່ມເຂົ້າໃນອ່າງກວນໄວ ເພື່ອໃຫ້ຕະກອນທີ່ໄຫຼມານຳນ້ຳຈັບຕົວກັນເປັນຕະກອນທີ່ມີຂະໜາດໃຫຍ່ຂຶ້ນ. ອ່າງ ກວນໄວໄດ້ຖືກອອກແບບໃຫ້ເກີດການປະສົມແບບການໄຫຼທີ່ສົມລະວິນຂອງນ້ຳ (Hydraulic Mixer) ເພື່ອ ເຮັດໃຫ້ສານເຄມີປະສົມກັບນ້ຳຢ່າງສົມບຸນ. ການອອກແບບແມ່ນກຳນົດ ຄ່າ G = 700 – 1000 s^{-1} , t= 20 – 60 s ແລະ $\Delta H < 0.5$ ແມັດ ເພື່ອໃຫ້ລະບົບມີປະສິດທິພາບ.

ອ່າງກວນຊ້ຳ (Flocculation tank): ການອອກແບບ ອ່າງກວນຊ້ຳນີ້ ໄດ້ອອກແບບເປັນ ແບບນ້ຳໄຫຼ ລອດຮຸບແຜນກັ້ນເພື່ອຮັກສາຄວາມໄວຂອງການໄຫຼຈາກ 0.3 m/s to 0.45 m/s.

ສຳລັບໂຄງການນີ້ ເຮົາໄດ້ອອກແບບ ອ່າງກວນ ແບ່ງອອກເປັນ ທັງໝົດ 5 ຫ້ອງ ແລະ ຫ້ອງທີ່ 1 ມີ ລະບົບ ຝາໄມ້ກັ້ນ ຈຳນວນ 5 ຝາ, ຫ້ອງທີ່ 2 ມີ ຈຳນວນ 4 ຝາ, ຫ້ອງທີ່ 3 ມີຈຳນວນ 4 ຝາ, ຫ້ອງ ທີ່ 4 ມີ ຈຳນວນ 2 ຝາ ແລະຫ້ອງທີ່ 5 ບໍ່ມີ ໃດຍ ທີ່ ກຳນົດ ໃກ້ ຄ່າ ຂອງ G ຂອງແຕ່ລະຫ້ອງ ເລີ່ມແຕ່ 80 ຫາ 10 S^-1.

ຂະບວນການຕົກຕະກອນ: ເປັນຂະບວນການທີ່ໃຊ້ເພື່ອແຍກນ້ຳ ແລະ ຕະກອນອອກຈາກກັນໂດຍການ ຕົກຕາມແຮງດຶງດູດຂອງໜ່ວຍໂລກ ໃນການຜະລິດນ້ຳປະປາສ່ວນຫຼາຍຂະບວນການນີ້ຈະຖືກໃຊ້ເພື່ອແຍກຕະ ກອນທີ່ສາມາດຕົກລົງພື້ນອ່າງດ້ວຍນ້ຳໜັກຂອງຕົນເອງ (Settleable solids) ປະສິດທິພາບຂອງລະບົບຈະ ຂຶ້ນກັບຫຼາຍປັດໄຈເຊັ່ນ: ຄຸນນະພາບຂອງນ້ຳດິບ, ປະລິມານຂອງຕະກອນໃນນ້ຳ, ນ້ຳໜັກຂອງຕະກອນ, ຄຸນ ລັກສະນະສະເພາະຂອງອ່າງຕົກຕະກອນ.

ໃນກໍລະນີນີ້ ອ່າງຕົກຕະກອນໄດ້ອອກແບບໃຫ້ເປັນອ່າງສີ່ຫຼ່ຽມທີ່ມີການໄຫຼຕາມທາງນອນ, ໃນການ ອອກແບບຕ້ອງຊີ້ຫຼັກ Q/A (ປະລິມານການໄຫຼຕໍ່ເນື້ອທີ່ຕົກຂອງອ່າງ), ຄວາມສູງຂອງອ່າງ ແລະ ເວລາທີ່ ໃຊ້ໃນການຕົກຕະກອນ, ຄວາມໄວການໄຫຼຂອງນ້ຳຕາມທາງນອນ ຄ່າທີ່ໃຊ້ໃນການອອກແບບໄດ້ສະແດງໃນ ຕາຕະລາງລຸ່ມນີ້:

ຕາຕະລາງ : ການອອກແບບອ່າງຕົກຕະກອນ

ຕົວບົ່ງຊີ້	ຄ່າອອກແບບ
- Q/A ($m^3/m^2.d$)	- 20-60
- $H_{Horizontal}$ (m/min)	- 0.16-0.90
- H_{water} (m)	- 3-5
- T (Detention time, min)	- 120-240
- Q/A weir	- 100-200
- W:L	- 1:4

ຂະບວນການຕອງນ້ຳ: ຂະບວນການຕອງ ເປັນຂະບວນການຕອງຕະກອນທີ່ມີຂະໜາດນ້ອຍທີ່ຫຼົງເຫຼືອ ຈາກການຕົກຕະກອນໃນອ່າງນ້ຳນອນ, ຂະບວນການຕອງນ້ຳປະກອບມີ 02 ແບບຄື: ຕອງໄວ (Rapid sand filtration), ຕອງຊ້ຳ (slow sand filtration). ໃນກໍລະນີນີ້ ໄດ້ອອກແບບເປັນການຕອງໄວ ຍ້ອນ ວ່າຄວາມຂຸ່ນຂອງນ້ຳສູງ ແລະ ຕ້ອງການນ້ຳໄວ້ພື້ນທີ່ສຳລັບການກໍ່ສ້າງອ່າງຕອງ ອຍ.ຂໍ້ມູນລະອຽດໃນການອອກ ແບບໄດ້ສະແດງໄວ້ໃນຕາຕະລາງ:

ຕາຕະລາງ: ການອອກແບບອ່າງຕອງນ້ຳ

ຕົວຊີ້ບົ່ງ	ຄ່າອອກແບບ
- ອັດຕາການຕອງ ($m^3/m^2.h$)	- 5-15
- ຂະໜາດອ່າງຕອງ (m^2)	- < 100 ຊັ້ນຫີນ
- ຄວາມສູງຂອງອ່າງຕອງ (m)	- 0.7-1 ຊັ້ນຊາຍ
- ຂະໜາດເມັດທີ່ມີປະສິດທິພາບຂອງຊາຍ (mm)	- 0.6-1.2
- ຄ່າປະສິດການຈັດລຽງຕົວຂອງຊາຍ	- 1.5-1.7
- Head loss (m)	- $\Delta H \leq 0.3$
- ໄລຍະເວລາການດຳເນີນການ (ມື້)	- 1-2
- ວິທີການລ້າງອ່າງຕອງ	- ໃຊ້ການໄຫຼຂອງນ້ຳ
- ນ້ຳທີ່ໃຊ້ໃນການລ້າງ	- ໃຊ້ນ້ຳ ແລະ ອາກາດ (ບາງກໍລະນີອາດຈະມີ ການລ້າງຜິວໜ້ານ້ຳ)
- ເວລາທີ່ໃຊ້ໃນການລ້າງ (min)	- 3-6% ຂອງນ້ຳທີ່ຖືກຕອງ
	- 10

ອ່າງຕົກຕະກອນ (Sedimentation tank): ອອກແບບ ເປັນອ່າງນ້ຳນອນ ແບບ ສີ່ຫຼ່ຽມຍາວ ໃນ ອັດຕາ ຊັກສ່ວນ ລວງກວ້າງ ເທົ່າກັບ 3.5 ແມັດ ແລະ ລວງຍາວເທົ່າກັບ 14 ແມັດ ແລະ ລວງເລິກສະເລ່ຍຂອງ ອ່າງ ເທົ່າກັບ 3.3 ແມັດ ຈຳນວນ ສອງອ່າງ.

ເງື່ອນໄຂການອອກແບບ ໄດ້ກຳນົດ ເອົາ suface loading rate = $20m^3/m^2/day$. ພື້ນໃດ້ອອກ ແບບ ເປັນ ພື້ນທີ່ມີຄວາມລາດຊັນ ປະມານ 9% ຂອງລວງເລິກ. ລະອຽດມີບົດຄິດໄລ່ທາງດ້ານຊົນລະສາດໃນ

ຝາຍທີ່ຂອງຮັບນ້ຳໃສເຂົ້າຫາອ່າງຕອງ (Weir): ເລືອກໃຊ້ຮາງທີ່ຕັ້ງຢູ່ທ້າຍອ່າງນ້ຳນອນເພື່ອເກັບກັກເອົານ້ຳ ດ້ານເທິງທີ່ໄດ້ແລ້ວໄຫຼລົງໄປຕອງທີ່ອ່າງຕອງ.

4.2.3 ການຕອງນ້ຳ

ລະບົບຕອງຊາຍໄວ ໃນອັດຕາການຕອງ 5m3/m2/hr ໂຮງງານຜະລິດນ້ຳປະປາ 1,000 ມ^{3}ຕໍ່ຊົ່ວໂມງ ເນື້ອທີ່ ຕອງຊາຍທັງໝົດ 16,10 m^2 ແບ່ງເປັນສອງອ່າງ ທີ່ມີຂະໜາດ 2.30m x 3.5m. ແຜ່ນຕອງໄດ້ອອກແບບກຳນົດໃຫ້ນຳໃຊ້ ຊະນິດຫົວຕອງ ແບບ Nozzles.

ຮ່ອງລະບາຍນ້ຳລ້າງ: ເປັນຮ່ອງທີ່ຢູ່ເຄິ່ງກາງອ່າງຕອງເພື່ອຮອງຮັບການລະບາຍນ້ຳທີ່ເປື້ເປື້ອນອອກໃນເວລາທີ່ລ້າງອ່າງຕອງແຕ່ລະຄັ້ງ.

4.2.4 ອ່າງເກັບນ້ຳສະອາດ

ອ່າງເກັບນ້ຳສະອາດ (ClearWaterTank and ForWardingPump): ອ່າງເກັບນ້ຳສະອາດແມ່ນອ່າງທີ່ເກັບນ້ຳໄວ້ບໍລິການ ແລະ ໃສ່ຢາຂ້າເຊື້ອການຂ້າເຊື້ອແມ່ນໃຊ້ແຄນຊຽມໄຮໂປຄຼໍໄຣ (Calcium Hypochlorite, $Ca(ClO)_2$) .ອອກແບບເວລາເກັບກັກ 8 ຊົ່ວໂມງ ແລະ ແບ່ງອອກເປັນ 02 ອ່າງຄື: ອ່າງເກັບນ້ຳສະອາດຢູ່ໂຮງງານ 1,000 ມ^3 ແລະ 300 ມ^3. ທັງສອງອ່າງເປັນແບບອ່າງສີ່ຫຼ່ຽມມົນທີນ ໂຄ້ງສ້າງຄອນກຣີດເມີມເຫຼັກ.

4.2.5 ອ່າງເກັບນ້ຳສູງ (Elevated Tank):

ອ່າງເກັບນ້ຳສູງ (Elevated Tank): ອ່າງເກັບນ້ຳສູງ ຂະໜາດ 400 ມ^3 ຊຶ່ງຕັ້ງຢູ່ຈຸດທີ່ສູງ , ມີລະດັບດິນທຳມະຊາດ 1164 ແມັດ ເປັນອ່າງບໍລິການນ້ຳໃຫ້ຜູ້ຊົມໃຊ້ນ້ຳ ຢູ່ເຂດບໍລິການຂອງໂຄງການ, ອ່າງດັ່ງກ່າວ ປະກອບດ້ວຍອຸປະກອນຕ່າງໆເຊັ່ນ: ລະບົບທໍ່ນ້ຳເຂົ້າ-ອອກ, ທໍ່ນ້ຳລົ້ນ, ທໍ່ລະບາຍ, ປະຕູນ້ຳ, ລຸກລອຍ ແລະ ອຸປະກອນອື່ນໆທີ່ຈຳເປັນ. ອ່າງເກັບນ້ຳສູງ ຈະສູງ 25 ແມັດ, ເປັນສະຖານີບໍລິການນ້ຳຕະຫຼອດ 24 ຊົ່ວໂມງ ໃຫ້ຜູ້ຊົມໃຊ້ນ້ຳຢູ່ໃນເຂດບໍລິການຂອງໂຄງການດັ່ງກ່າວ ດ້ວຍການປ່ອຍໃຫ້ນ້ຳໄຫຼແບບທຳມະຊາດ.

4.2.6 ລະບົບສາຍທໍ່ແຈກ

ທໍ່ ແລະ ອຸປະກອນຕ່າງໆ ທີ່ອອກແບບເພື່ອຕິດຕັ້ງຢູ່ໂຮງງານຜະລິດນ້ຳແມ່ນ ໄດ້ອອກແບບໃຫ້ນຳໃຊ້ວັດສະດຸປະເພດ HDPE ເພື່ອຮັບປະກັນອາຍຸການໃຊ້ງານໃຫ້ຍາວນານ. ອຸປະກອນທີ່ໃຊ້ປະກອບມີ ປະຕູນ້ຳ, ຂໍ້ຕໍ່ລຶກ ແລະ ຂໍ້ງໍ 90, 45 ແລະ ອື່ນໆ. ລາຍລະອຽດ ໄດ້ກຳນົດ ມາດຕະຖານເຕັກນິກ ໄວ້ດັ່ງລຸ່ມນີ້:

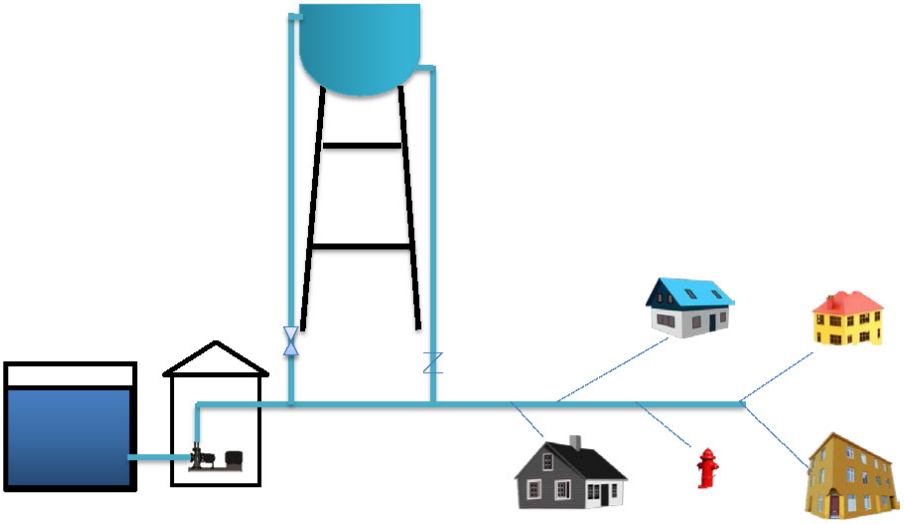
- ທໍ່ HDPE PN10
- DCI K9

ອຸປະກອນ ຂໍ້ຕໍ່ທຸກປະເພດ

- HDPE PN10
- DCI, K12
- DCI PN10, K12

ປະຕູນ້ຳທຸກໆ ຊະນິດ

- DCI PN10



5 ການປະເມີນຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ

5.1 ການປະເມີນຜົນກະທົບໂດຍລວມ

ຕາຕະລາງ 3: ການປະເມີນຜົນກະທົບໂດຍລວມ

ກິດຈະກຳ	ປະເພດຂອງຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ		ລະດັບຄວາມສຳຄັນ	ຄວາມຖີ່/ໄລຍະເວລາ	ລະດັບຜົນກະທົບຕໍ່ການດຳລົງຊີວິດ	ປະເພດຂອງຜົນກະທົບ (ບວກ/ລົບ)
ໄລຍະກໍ່ສ້າງ						
ການກະກຽມສະຖານທີ່	ທຳມະຊາດ	ການບຸກເບີກເນື້ອທີ່ດິນທຳມະຊາດ ແລະ ປ່າໄມ້ ທີ່ເປັນທຳມະສິດຂອງໂຄງການເຊັ່ນ: ການປຸກສ້າງທີ່ພັກເຊົ່າຊົ່ວຄາວໃຫ້ທຳມະກອນ ແລະ ຜູ້ທີ່ເຮັດວຽກໃນໂຄງການ, ລະບົບຫ້ອງການ, ລະບົບໂຮງງານ ແລະ ລະບົບແຈກຈ່າຍນ້ຳ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ການປ່ຽນແປງລະບົບນິເວດດິນ ຈາກການບຸກເບີກຜືນທີ່ຂຸດໜອງເກັບກັກນ້ຳ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ການປ່ຽນແປງລະບົບນິເວດນ້ຳໃຕ້ດິນເນື່ອງຈາກການບຸກເບີກຜືນທີ່ຂຸດເຈາະບໍ່ລິເວນກໍ່ສ້າງ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ເກີດມົນລະພິດທາງອາກາດເຊັ່ນ ຄວັນຂີ້ (ຈາກລົດ ແລະ ເຄື່ອງຈັກ ທີ່ໃຊ້ໃນການບຸກເບີກຜືນທີ່) ແລະ ຂີ້ຝຸ່ນຈາກການບຸກເບີກ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
	ສັງຄົມ	ການສັບຈອນເພີ່ມຂຶ້ນເນື່ອງຈາກການນຳລົດ ແລະ ເຄື່ອງຈັກມາຮັບໃຊ້ໃນການບຸກເບີກຜືນທີ່.	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ການເພີ່ມຂຶ້ນຂອງປະຊາກອນໃນບໍລິເວນໂຄງການເນື່ອງຈາກການຍົກຍ້າຍເຂົ້າມາຂອງກຳມະກອນ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
		ການຄ້າຂາຍ ແລະ ທຸລະກິດຂະໜາດນ້ອຍຂຶ້ນໃນບໍລິເວນໂຄງການ.	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ບວກ
ການນຳໃຊ້ຜາຫະບະ ແລະ ເຄື່ອງຈັກຕ່າງໆ	ທຳມະຊາດ	ນ້ຳເປື້ອນຈາກການລ້າງລົດ ແລະ ເຄື່ອງຈັກຢູ່ພື້ນທີ່ໂຄງການອາດຈະຊຶມລົງໄປຍັງເປືອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ຕ່ຳ	ລົບ

		ນ້ຳເປື້ອນຈາກການຮົ່ວໄຫຼຂອງ ນ້ຳມັນລົດ ແລະ ເຄື່ອງຈັກອາດຈະຊຶມລົງໄປປົນເປື້ອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ຕ່ຳ	ລົບ
	ສັງຄົມ	ເກີດສຽງດັງລົບກວນໃນເວລານຳໃຊ້ພາຫະນະ ແລະ ເຄື່ອງຈັກໃນເວລາກໍ່ສ້າງ	ກາງ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
ການຍົກຍ້າຍເຂົ້າມາບໍລິເວນໂຄງການຂອງກຳມະກອນ ແລະ ຜູ້ທີ່ເຮັດວຽກໃນໂຄງການ	ທຳມະຊາດ	ຂາດແຄນບ່ອນເກັບ ແລະ ການຈັດການ ຂີ້ເຫຍື້ອຈາກການຊົມໃຊ້ຂອງຜູ້ທີ່ຍ້າຍເຂົ້າມາ ແລະ ສິ່ງເສດເຫຼືອຈາກການກໍ່ສ້າງ (ຂີ້ເຫຍື້ອ ແລະ ນ້ຳເປື້ອນ).	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ນ້ຳເປື້ອນຈາກການຊົມໃຊ້ໃນຊີວິດປະຈຳວັນ (Grey water) ຂອງຜູ້ທີ່ຍົກຍ້າຍເຂົ້າມາ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ນ້ຳເປື້ອນທີ່ປະກອບດ້ວຍ ສານອາຫານ (Nutrients) ແລະ ຈຸລິນຊີເຊັ່ນ Faecal coliform ແລະ Escherichia coli(Micro-organism) ຈາກວິດຖ່າຍຜູ້ທີ່ຍົກຍ້າຍເຂົ້າມາ (Black water) ອາດຈະຊຶມລົງດິນແລ້ວປົນເປື້ອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ກາງ	ລົບ
		ນ້ຳເປື້ອນທີ່ເກີດຈາກຂີ້ເຫຍື້ອ, ສິ່ງເສດເຫຼືອຈາກການກໍ່ສ້າງ ແລະ ນ້ຳເປື້ອນຈາກວິດຖ່າຍ ເກີດການປົນເປື້ອນກັບນ້ຳຝົນ ແລ້ວໄຫຼໄປຫາແຫຼ່ງນ້ຳໜ້າດິນ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
	ສັງຄົມ	ນ້ຳເປື້ອນສິ່ງກິ່ນເໝັນລົບກວນຜູ້ທີ່ອາໄສຢູ່ບໍລິເວນໂຄງການ	ສຳຄັນ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
		ການຈະລາຈອນເພີ່ມຂຶ້ນເນື່ອງຈາກພາຫະນະເພີ່ມຂຶ້ນຕາມຈຳນວນຄົນທີ່ຍົກຍ້າຍເຂົ້າມາ	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
ວຽກຂຸດເຈາະ (Excavation works)		ເກີດສຽງດັງລົບກວນໃນເວລານຳໃຊ້ພາຫະນະ ແລະ ເຄື່ອງຈັກຂຸດເຈາະໃນເວລາກໍ່ສ້າງ	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ມີຜົນກະທົບທາງອາກາດເຊັ່ນ ຂີ້ຝຸ່ນ ຈຳນວນຫຼວງຫຼາຍທີ່ເກີດຈາກການຕັດດິນ, ຂຶນດິນ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
ການສ້າງສະຖານີສູບນ້ຳ	ທຳມະຊາດ	ເກີດການປົນເປື້ອນກັບນ້ຳຝົນເນື່ອງຈາກການລົບກວນຊັ້ນດິນ	ກາງ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ເກີດມີການເຊາະເຈື່ອນຂອງດິນໃນບໍລິເວນທີ່ມີການກໍ່ສ້າງ	ສຳຄັນ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
	ສັງຄົມ	-	-	-	-	-

ກິດຈະກຳ		ປະເພດຂອງຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ	ລະດັບຄວາມສຳຄັນ	ຄວາມຖີ່/ໄລຍະເວລາ	ລະດັບຜົນກະທົບຕໍ່ການດຳລົງຊີວິດ	ປະເພດຂອງຜົນກະທົບ (ບວກ/ລົບ)
ໄລຍະດຳເນີນການ						
ຂະບວນການຜະລິດ	ທຳມະຊາດ	ເຮັດໃຫ້ລັກສະນະຂອງດິນມີການປ່ຽນແປງ ເນື່ອງມາຈາກການປ່ອຍນ້ຳເສຍຈາກການທຳຄວາມສະອາດອ່າງ ເຊິ່ງມີການເຈື່ອປົນຂອງສານສິ່ມມານຳ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
		ການປ່ອຍນ້ຳເສຍທີ່ມີສານສິ່ມເຈື່ອປົນເຮັດໃຫ້ດິນມີລັກສະນະແຂງ ແລະ ເຮັດໃຫ້ເກີດມີຄ່າ PH ສູງ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
	ສັງຄົມ	ເຮັດໃຫ້ປະຊາຊົນເກີດຄວາມກັງວົນໃນການປ່ອຍນ້ຳເສຍຂອງໂຮງງານໃນ ເວລາທີ່ມີການທຳຄວາມສະອາດອ່າງ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
ການທຳງານຂອງປ໊ຳ	ທຳມະຊາດ	ການຮົ່ວຊຶມຂອງນ້ຳມັນຈາກເຮືອນປ໊ຳອາດຈະກະທົບຕໍ່ນ້ຳໃຕ້ດິນໃນເວລາທີ່ມີຝົນຕົກໜັກ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
	ສັງຄົມ	ການທຳງານຂອງປ໊ຳສູບນ້ຳເຮັດໃຫ້ເກີດສຽງດັງ.	ກາງ	ຖາວອນ	ຕ່ຳ	ລົບ
ດ້ານເສດຖະກິດ	ສັງຄົມ	ຈະກໍ່ໃຫ້ເກີດຜົນກະທົບທາງດ້ານບວກຕໍ່ກັບສະພາບເສດຖະກິດ ແລະ ສັງຄົມ ຂອງຊຸມຊົນເຮັດໃຫ້ເກີດຄວາມຈະເລີນໃນທ້ອງຖິ່ນ ສາມາດຍົກລະດັບຄຸນນະພາບຊີວິດຂອງປະຊາຊົນ ໃຫ້ດີຂຶ້ນເຮັດໃຫ້ເສດຖະກິດໃນຄອບຄົວດີຂຶ້ນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
		ພ້ອມທັ້ງມີລາຍໄດ້ເພີ່ມຂຶ້ນຈາກນັກທ່ອງທ່ຽວ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ

		ຜົນກະທົບໃນດ້ານເສດຖະກິດ ແລະ ສັງຄົມ ຂອງຊຸມຊົນໃນຊ່ວງດຳເນີນການຂອງໂຄງການ ຈຶ່ງເປັນຜົນກະທົບທາງບວກຫຼາຍກວ່າເຊັ່ນ: ຊ່ວຍໃຫ້ເກີດການພັດທະນາດ້ານການຊົມໃຊ້ນ້ຳສະອາດ, ຫຼຸດຜ່ອນການເຈັບເປັນອັນເນື່ອງຈາກການນຳໃຊ້ນ້ຳເຂົ້າໃນກິດຈະກຳຕ່າງໆ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
ດ້ານການທ່ອງທ່ຽວ	ສັງຄົມ	ພາຍຫຼັງການສຳເລັດ ຈະກໍ່ໃຫ້ເກີດຜົນກະທົບທາງດ້ານບວກຕໍ່ກັບສະພາບເສດຖະກິດ ດ້ານການທ່ອງທ່ຽວ ສາມາດສ້າງລາຍຮັບດ້ານການບໍລິການ ທີ່ພັກ-ຮ້ານອາຫານ ເພີ່ມຂຶ້ນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
		ສ້າງຄວາມເຊື່ອໝັ້ນໃຫ້ນັກທ່ອງທ່ຽວ ດ້ານສຸຂະອາໄນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
ດ້ານສາທາລະນະສຸກ	ສັງຄົມ	ພາຍຫຼັງສຳເລັດ ຈະມີການເປີດບໍລິການນ້ຳສະອາດໃຫ້ປະຊາຊົນໄດ້ໃຊ້ ເປັນການຫຼຸດຜ່ອນການເກີດພະຍາດທີ່ມາກັບນ້ຳ ເຊັ່ນ: ພະຍາດຖອກທ້ອງ ເປັນຕົ້ນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
		ໂຮງໝໍ ແລະ ສຸກສາລາ ຈະມີນ້ຳສະອາດໄວ້ໃຊ້ , ບໍລິການໃຫ້ປະຊາຊົນທີ່ມາປິ່ນປົວ ແລະ ຍັງເປັນການສ້າງຄວາມເຊື່ອໝັ້ນ ດ້ານສຸຂະອນາໄມໃຫ້ກັບຄົນເຈັບ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ

5.2 ການປະເມີນຜົນກະທົບດ້ານລົບ ແລະ ມາຕະການຫຼຸດຜ່ອນ

ລະບົບການຜະລິດຂອງໂຄງການນີ້ ແມ່ນມີສານເຄມີໜ້ອຍທີ່ສຸດທີ່ຈະປ່ອຍສູ່ທຳມະຊາດ, ເນື່ອງຈາກວ່າ ຄຸນະພາບນ້ຳດິບ ແລະ ວິທີການອອກແບບລະບົບໂຮງງານຜະລິດນ້ຳປະປາ ແມ່ນນຳໃຊ້ວິທີແບບພື້ນຖານ ຈຶ່ງບໍ່ອາດ ຈະເກີດເຫດບັງເອີນທີ່ຈະກະທົບຕໍ່ສິ່ງແວດລ້ອມໄດ້. ເຖິງຢ່າງໃດກໍ່ຕາມ, ໃນຊ່ວງໄລຍະເວລາໃນການກໍ່ສ້າງ, ຈະມີ ຜົນກະທົບທາງດ້ານລົບບາງຢ່າງຕໍ່ກັບສະພາບແວດລ້ອມດັ່ງນີ້:

- ການຂົນສົ່ງອຸປະກອນຕ່າງໆໃນການກໍ່ສ້າງ ຫຼື ຂຸດຮ່ອງເພື່ອວາງທໍ່ຈະເປັນສາເຫດເຮັດໃຫ້ມີຝຸ່ນ, ສຽງດັງ, ລົດ ຕິດ. ເຖິງຢ່າງໃດກໍ່ຕາມຜົນກະທົບດັ່ງກ່າວນີ້ກໍ່ຈະບໍ່ເປັນອັນຕະລາຍ, ມັນກໍ່ຍັງມີຄວາມຈຳເປັນທີ່ຈະຕ້ອງໄດ້ ຈຳກັດຜົນກະທົບຂອງພວກມັນທີ່ມີຕໍ່ສະພາບແວດລ້ອມ.
- ຂີ້ເຫຍື້ອທີ່ເກີດຈາກວຽກງານການກໍ່ສ້າງຕ່າງໆ ທີ່ປ່ອຍອອກສູ່ສິ່ງແວດລ້ອມຈະເປັນຜົນກະທົບທາງດ້ານລົບ ນອກຈາກວ່າຈະມີການຄວບຄຸມສິ່ງເສດເຫຼືອເຫຼົ່ານັ້ນຢ່າງຈິງຈັງ.
- ໃນລະຫວ່າງການດຳເນີນງານຂອງສະຖານີສູບນ້ຳ ແລະ ລະບົບການຂ້າເຊື້ອພະຍາດ, ມັນມີຄວາມຈຳເປັນທີ່ຈະ ຕ້ອງປະຕິບັດຕາມກົດລະບຽບການປ້ອງກັນການລະເບີດ ແລະ ໄຟໄໝ້ ເຊັ່ນ ໄຟຮົ່ວ ຫຼື ທໍ່ສົ່ງນ້ຳແຕກຊຶ່ງເປັນ ສາເຫດເຮັດໃຫ້ເກີດມົນລົດຕິດ ແລະ ສິ່ງຜົນກະທົບ ຕໍ່ກັບສະພາບການດຳລົງຊີວິດ ແລະ ການຜະລິດຂອງ ປະຊາຊົນໃນເຂດດັ່ງກ່າວ.

5.3 ການປະເມີນຜົນກະທົບດ້ານບວກ ແລະ ມາດຕະການເພີ້ມ

ການກໍ່ສ້າງລະບົບສະໜອງນ້ຳປະປາ ໃນເຂດໂຄງການນີ້ ຈະມີຜົນກະທົບດ້ານບວກ ຕໍ່ການພັດທະນາ ເສດຖະກິດ-ສັງຄົມຂອງໝົດທຸກຂົງເຂດຢູ່ໂດຍສະເພາະແມ່ນຢູ່ເຂດບ້ານທີ່ຢູ່ພື້ນທີ່ບໍລິການ ລະບົບດັ່ງກ່າວ ຍັງມີ ສ່ວນໃນການປັບປຸງ ມາດຕະຖານການດຳລົງຊີວິດຂອງປະຊາຊົນ, ຮັບປະກັນການປັບປຸງດ້ານສາທາລະນະສຸກຂອງ ປະຊາຊົນ ຊຶ່ງມີຜົນຢ່າງຍິ່ງຕໍ່ການພັດທະນາດ້ານການທ່ອງທ່ຽວ ແລະ ຍັງເປັນການສົ່ງເສີມການລົງທຶນເຂົ້າໃນ ຂົງເຂດດັ່ງກ່າວ.

ຫຼັງຈາກໂຄງການນີ້ສຳເລັດລົງ, ວຽກງານການປົກປັກຮັກສາສິ່ງແວດລ້ອມຈະບໍ່ພຽງແຕ່ສຸມໃສ່ສະພາບແວດ ລ້ອມທາງນ້ຳເທົ່ານັ້ນ, ແຕ່ຍັງຈະສຸມໃສ່ສິ່ງແວດລ້ອມທາງດ້ານດິນ ແລະ ສິ່ງແວດລ້ອມທາງອາກາດນຳອີກ. ສິ່ງ ເຫລົ່ານີ້ແມ່ນປັດໃຈພື້ນຖານ ໃນການດຳເນີນວຽກງານຕ່າງໆຂອງການປົກປັກຮັກສາສະພາບແວດລ້ອມໂດຍລວມ ເຊິ່ງມັນຈະເຮັດໃຫ້ເປັນເຂດທີ່ບໍລິສຸດ ແລະ ເປັນເຂດທີ່ດຶງດູດຜູ້ຄົນ, ເພາະຈະມີສະຖານທີ່ທ່ອງທ່ຽວທາງທຳມະຊາດ , ເປັນບ່ອນພັກຜ່ອນຢ່ອນໃຈ. ນອກຈາກນັ້ນ, ໂຄງການສະໜອງນ້ຳສະອາດແມ່ນປັດໃຈສຳຄັນອັນດັບໜຶ່ງ ແລະ ເປັນພື້ນຖານສຳລັບການພັດທະນາໂຄງການອື່ນໆກ່ຽວກັບ ໂຄງລ່າງພື້ນຖານດ້ານເຕັກນິກ ແລະ ສະພາບແວດລ້ອມ ຂອງບ້ານກໍ່ຄືສະພາບແວດລ້ອມຂອງຕົວເມືອງ.

ມາດຕະຖານການດຳລົງຊີວິດຂອງປະຊາຊົນຈະໄດ້ຮັບການປັບປຸງໃນທາງທີ່ດີຂຶ້ນ, ມີນ້ຳປະປາຊົມໃຊ້, ພະຍາດຕ່າງໆຈະມີການຫຼຸດຜ່ອນ ຊຶ່ງສິ່ງເລົ່ານີ້ ແມ່ນມີຄວາມໝາຍຢ່າງຍິ່ງເພາະຂໍ້ມູນທາງສຸຂະຖິຕິ ໃນປະຈຸບັນ ໄດ້ສະແດງໃຫ້ເຫັນວ່າພະຍາດທ້ອງຫຼາຍທີ່ມາກັບນ້ຳຄົດໄລ່ເປັນອັດຕາທີ່ມີຄວາມສ່ຽງສູງ ຢູ່ພາຍໃນກຸ່ມເຊື້ອພະຍາດ ທີ່ຮູ້ຈັກກັນດີເຊັ່ນ: ພະຍາດຖອກທ້ອງ ແລະ ອື່ນໆ.

6 ຜົນກະທົບໄລຍະຍາວ

6.1 ດ້ານບວກ

- ຊ່ວຍໃຫ້ແຜນຜັດທະນາພື້ນຖານໂຄງລ່າງຂອງລັດຖະບານ ,ເມືອງ, ແຂວງ ,ພື້ນທີ່ໂຄງການໄດ້ຮັບການຈັດຕັ້ງ ປະຕິບັດ ເທື່ອລະກ້າວໂດຍສະເພາະແມ່ນລະບົບສາທາລະນຸປະໂພກ ,ສ້າງເງື່ອນໄຂອຳນວຍຄວາມສະດວກໃນ ການຮັກສາສຸຂະອານາໄມ ,ເປັນພື້ນຖານໃຫ້ແກ່ການພັດທະນາ ດ້ານການຄ້າ ,ດ້ານອຸດສາຫະກຳ ,ດ້ານການ ບໍລິການ ແລະ ການທ່ອງທ່ຽວ ໃນອານາຄົດ .
- ຊ່ວຍໃຫ້ ຊີວິດການເປັນຢູ່ຂອງປະຊາຊົນໄດ້ຮັບການປັບປຸງດີຂຶ້ນ ,ເພາະວ່າ ນ້ຳປະປາເປັນສິ່ງທີ່ຈຳເປັນ ແລະ ເປັນປັດໃຈໜຶ່ງທີ່ຂາດບໍ່ໄດ້ໃນການດຳລົງຊີວິດຂອງປະຊາຊົນເພື່ອມາອຸປະໂພກ ແລະ ບໍລິໂພກ .ນອກນີ້ຍັງໄດ້ ນຳໃຊ້ເປັນວັດຖຸດິບຜະລິດເປັນສິນຄ້າ ແລະ ໃຊ້ໃນຂະບວນການການຜະລິດ ສິນຄ້າອຸດສາຫະກຳ ແລະ ອື່ນໆ.
- ຊ່ວຍໃຫ້ພື້ນທີ່ໂຄງການ ເປັນພື້ນທີ່ສີຂຽວເຊັ່ນ :ສະຖານທີ່ສາທາລະນະ ,ສະຖານທີ່ທ່ອງທ່ຽວ ແລະ ສະຖານທີ ສຳຄັນຕ່າງໆ .

6.2 ດ້ານລົບ

ການຊົມໃຊ້ນ້ຳປະປາ ໃນຂະແໜງການອຸດສາຫະກຳ ນ້ຳສ່ວນຫຼາຍ ຈະກາຍເປັນນ້ຳເສຍ, ເປື້ເປື້ອນ ຖ້າຫາກບໍ່ ມີວິທີກຳຈັດທີ່ຖືກຕ້ອງຈະສົ່ງຜົນກະທົບຕໍ່ສະພາບແວດລ້ອມ ແລະ ແຫຼ່ງນ້ຳທຳມະຊາດໄດ້. ສຳລັບໂຄງການນີ້ແລ້ວ ເຫັນວ່າ ເຂດພື້ນທີ່ໂຄງການ ຍັງບໍ່ທັນມີ ໂຮງຈັກ, ໂຮງງານເທື່ອ, ມີແຕ່ນ້ຳເສຍຈາກຄົວເຮືອນ ແຕ່ກໍ່ມີຈຳນວນ ໜ້ອຍ.

ການດຳເນີນການຜະລິດ ສຽງຂອງເຄື່ອງຈັກ, ການສັ່ນສະເທືອນຢູ່ ສະຖານີສຸບນ້ຳຂອງ ຈະມີຜົນກະທົບຕໍ່ ສັດນ້ຳໃນບໍລິເວນດັ່ງກ່າວເລັກນ້ອຍ. ນ້ຳເສຍຈາກການລ້ຳງອ່າງໂຮງງານ, ລ້ຳງອ່າງເຄມີ (ອ່າງນ້ຳຫີນສົ້ມ ແລະ ອ່າງ ຢາຂ້າເຊື້ອພະຍາດ) ມີຈຳນວນນ້ອຍ ແມ່ນມີວິທີການ, ມາດຕະການປ້ອງກັນໃຫ້ຢູ່ໃນຂອບເຂດ.

7 ການພິຈາລະນາທາງສະພາບແວດລ້ອມໃນລະຫວ່າງການກໍ່ສ້າງ

7.1. ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ມາດຕະການຫຼຸດຜ່ອນ ໃນໄລຍະກໍ່ສ້າງ

ຕາຕະລາງ 4 :ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ມາດຕະການຫຼຸດຜ່ອນ ໃນໄລຍະກໍ່ສ້າງ

ຜົນກະທົບສິ່ງແວດລ້ອມ	ມາດຕະການປ້ອງກັນ ແລະ ແກ້ໄຂຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ.
ຄຸນນະພາບນ້ຳໜ້າດິນ ແລະ ນ້ຳໃຕ້ດິນ	-ດຳເນີນການກໍ່ສ້າງຊ່ວງໃນລະດູແລ້ງ ແລະ ລະດູຝົນທີ່ບໍ່ມີຝົນຕົກເພື່ອຫຼີກການ ເຊາະເຈື່ອນຂອງດິນລົງສູ່ແຫຼ່ງນ້ຳ.
ການຄົມມະນາຄົມຂົນສົ່ງ	- ແຈ້ງແຜນການກໍ່ສ້າງໃຫ້ກັບໜ່ວຍງານ ແລະ ຊຸມຊົນທີ່ກ່ຽວຂ້ອງໃຫ້ຮັບຮູ້ ລ່ວງໜ້າຢ່າງໜ້ອຍຕ້ອງ 1 ອາທິດກ່ອນດຳເນີນງານ. -ຕ້ອງບໍ່ວາງກອງວັດສະດຸທີ່ມີຄວາມຈຳເປັນໃນການໃຊ້ວຽກງານກີດຂວາງ ການຈະລາຈອນ ແລະ ຕ້ອງຂົນຍ້າຍວັດສະດຸອຸປະກອນທີ່ບໍ່ໄດ້ໃຊ້ວຽກງານ ອອກຈາກຂອບເຂດພື້ນທີ່ກໍ່ສ້າງ ຫຼື ເສັ້ນທາງເຂົ້າອອກຂອງຊຸມຊົນໃນພື້ນທີ່. - ຕ້ອງເລັ່ງການປັບປຸງ ແລະ ຄືນສະພາບພື້ນທີ່ກໍ່ສ້າງ ແລະ ສັນທາງການ ສັນຈອນຖ້າເກີດກໍລະນີທີ່ໄດ້ຮັບຜົນກະທົບຈາກກິດຈະກຳການກໍ່ສ້າງໃຫ້ຢູ່ສະ ພາບເດີມຫຼືດີກວ່າເກົ່າ.

ການປ້ອງກັນຊັບພະຍາ ກອນປ່າໄມ້ ແລະ ສັດປ່າ	ຝ່າຍເຈົ້າຂອງໂຄງການຕ້ອງໃຫ້ຄຳແນະນຳຜູ້ຮັບເໝົາໃນການຮັກສາຕົ້ນໄມ້ໃຫ່ຍໄວ້ ກໍລະນີທີ່ບໍ່ມີຜົນກະທົບຕໍ່ສິ່ງກໍ່ສ້າງ ແລະ ລະບົບຜະລິດນ້ຳເພື່ອຮັກສາຄວາມຊຸ່ມຊື່ນ.
ເສດຖະກິດ-ສັງຄົມ.	- ກຳນົດໃຫ້ຜູ້ຮັບເໝົາກໍ່ສ້າງແຈ້ງແຜນການກໍ່ສ້າງໃຫ້ອຳນາດການປົກຄອງທ້ອງຖິ່ນ ແລະ ປະຊາຊົນຮັບຮູ້ຢ່າງທົ່ວເຖິງ. - ຜູ້ຮັບເໝົາກໍ່ສ້າງຕ້ອງກຳນົດນະໂຍບາຍຈ້າງແຮງງານທ້ອງຖິ່ນຕາມຄວາມເໝາະສົມ. - ຜູ້ຮັບເໝົາກໍ່ສ້າງຕ້ອງຄວບຄຸມດູແລກຳມະກອນກໍ່ສ້າງໃຫ້ຢູ່ໃນກິດລະບຽບບໍ່ສ້າງຄວາມວຸ້ນວາຍໃຫ້ກັບປະຊາຊົນໃນຂອບເຂດພື້ນທີ່ໂຄງການ. - ອົບຮົມໃຫ້ກຳມະກອນມີຄວາມຮູ້, ຄວາມເຂົ້າໃຈໃນລະບຽບ ແລະ ເທັກນິກການກໍ່ສ້າງ, ການປ້ອງກັນ ແລະ ອະນຸລັກຊັບພະຍາກອນທຳມະຊາດລວມທັງສ້າງຄວາມເຂົ້າໃຈໃນວັດທະນາທຳຮີດຄອງປະເພນີຂອງທ້ອງຖິ່ນເພື່ອປ້ອງກັນການປະຕິບັດຕົນທີ່ອາດຂັດແຍ້ງກັບວັດທະນາທຳຂອງທ້ອງຖິ່ນ. - ດຳເນີນການປະຊາສຳພັນການກໍ່ສ້າງໂຄງການກໍ່ສ້າງລະບົບນ້ຳປະປາ ໃຫ້ແກ່ປະຊາຊົນໃນພື້ນທີ່ໂຄງການໄດ້ຮັບຮູ້ເພື່ອຮ່ວມປະສານງານ ແລະ ຮ່ວມຕິດຕາມການກວດການປະຕິບັດວຽກງານຂອງເຈົ້າໜ້າທີ່ໃນພື້ນທີ່.
ສາທາລະນະສຸກ ແລະ ຄວາມປອດໄພ.	- ປ້ອງກັນ ແລະ ກວດການການເສບຢາເສບຕິດຂອງກຳມະກອນ. - ຝຶກອົບຮົມ ແລະ ທົບທວນມາດຕະການດ້ານຄວາມປອດໄພເປັນແຕ່ລະໄລຍະເພື່ອເປັນການປ້ອງກັນການເກີດອຸປະຕິເຫດຈາກການເຮັດວຽກລວມທັງຜູ້ທີ່ສັນຈອນໄປມາໃນພື້ນທີ່ກໍ່ສ້າງ.

7.2. ການຕິດຕາມກວດກາ ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ການຫຼຸດຜ່ອນ.

ບາດກ້າວໃນການປະຕິບັດ ໂຄງການກໍ່ສ້າງລະບົບນ້ຳປະປາ ຕ້ອງເປັນໄປຕາມຂັ້ນຕອນຕາມສັນຍາທີ່ໄດ້ຕົກລົງກັນໄວ້ ແລະ ປະຕິບັດຕາມກົດໝາຍທີ່ກ່ຽວຂ້ອງຂອງ ສປປ ລາວ ຢ່າງເຂັ້ມງວດ ແລະ ເຈົ້າຂອງໂຄງການພາກສ່ວນທີ່ກ່ຽວຂ້ອງຕ້ອງໄດ້ມີສ່ວນຮ່ວມໃນການປະຕິບັດ ເຊິ່ງນັບແຕ່ການເລີ່ມໂຄງການ ໄລຍະປະຕິບັດໂຄງການ ແລະ ພາຍຫຼັງທີ່ໂຄງການສຳເລັດກໍ່ຕ້ອງມີແຜນການປະເມີນຜົນເປັນໄລຍະຕາມແຜນການທີ່ວາງໄວ້. ສຳລັບການຕິດຕາມກວດກາສາມາດແບ່ງອອກເປັນ ການຕິດຕາມ:

- ພື້ນທີ່ການກໍ່ສ້າງ
- ກິດຈະກຳການກໍ່ສ້າງ
- ການກຳຈັດສິ່ງເສດເຫຼືອຈາກການກໍ່ສ້າງ
- ການເຮັດວຽກຂອງກຳມະກອນ
- ການຂົນສົ່ງ

ເຂດກໍ່ສ້າງພື້ນທີ່ໂຮງງານ ,ສະຖານີສຸບນ້ຳ ແລະ ເຂດກໍ່ສ້າງວາງແລວສາຍທໍ່, ຂຸມຊີ້ນ, ກຳມະກອນຕ້ອງໄດ້ມີຄວາມຮັບຮູ້ທາງດ້ານ ການປ້ອງກັນເຫດການທີ່ຈະເກີດຂຶ້ນທາງດ້ານອຸປະຕິເຫດເປັນຕົ້ນແມ່ນ ການເກີດອຸປະຕິເຫດຕາມທ້ອງຖະໜົນ, ການກໍ່ສ້າງ, ການໄຟມາ ແລະ ອື່ນໆ ທີ່ຈະເກີດຂຶ້ນພ້ອມດຽວກັນນັ້ນຂຸມຊີ້ນກໍ່ຕ້ອງໄດ້ຮັບຂໍ້ມູນຂ່າວສານ, ການສັນຈອນໄປມາ, ມີເຄື່ອງໝາຍເຕືອນບອກການປ້ອງກັນອຸປະຕິເຫດ, ສ່ວນກຳມະກອນກໍ່ຕ້ອງໄດ້ມີການປ້ອງກັນໃນການອອກແຮງງານຢ່າງເໝາະສົມ ແລະ ໄດ້ຮັບການຝຶກອົບຮົມກ່ອນຈະໄດ້ເຂົ້າມາເຮັດວຽກງານ ແລະນອກຈາກນັ້ນກໍ່ຍັງຈະຕ້ອງໄດ້ມີການຮັກສາສຸຂະພາບຂອງເຂົາເຈົ້າໃນທຸກດ້ານນຳອີກດ້ວຍ.

8 ລະບຽບການຈັດຕັ້ງປະຕິບັດ ແລະ ຕິດຕາມ

ລະບຽບການຈັດຕັ້ງປະຕິບັດ ລະບຸກຳນົດ ແລະ ບົດບັນຍັດ ແມ່ນຢູ່ພາຍໃຕ້ກົດໝາຍທີ່ເປັນຂໍ້ຈຳກັດ ແລະ ພັນທະຂອງເຈົ້າຂອງໂຄງການ ເພື່ອຄຸ້ມຄອງ ແລະ ຕິດຕາມ ສິ່ງແວດລ້ອມ ສັງຄົມ ແລະ ທຳມະຊາດ. ການຈັດຕັ້ງປະຕິບັດ ແມ່ນ ໃຫ້ເປັນໄປຕາມ:

1. ຄຳແນະນຳ ຂະບວນການສຶກສາເບື້ອງຕົ້ນ ກ່ຽວກັບຜົນກະທົບສິ່ງແວດລ້ອມ ຈາກໂຄງການການລົງທຶນ ແລະ ກິດຈະການຕ່າງໆ 7ກະຊວງຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ເລກທີ 8029/ກຊສ, ນະຄອນຫຼວງວຽງຈັນ (ລົງວັນທີ 17 ທັນວາ 2013).
2. ກົດໝາຍວ່າດ້ວຍທີ່ດິນ (ສະບັບເລກທີ 04/ສພຊ ລົງວັນທີ 21 ຕຸລາ 2003)
3. ກົດໝາຍວ່າດ້ວຍສັດນ້ຳ ແລະ ສັດປ່າ (ສະບັບເລກທີ 07/ສພຊ ລົງວັນທີ 24 ທັນວາ 2008)
4. ກົດໝາຍວ່າດ້ວຍນ້ຳ ແລະ ຊັບພະຍາກອນແຫຼ່ງນ້ຳ (ສະບັບເລກທີ 02-96/ສພຊ ລົງວັນທີ 11 ຕຸລາ 1996)
5. ຂໍ້ຕົກລົງວ່າດ້ວຍມາດຕະຖານສິ່ງແວດລ້ອມແຫ່ງຊາດ ສະບັບເລກທີ 2734/ນຍ, ກຊຜສ (ລົງວັນທີ 7 ທັນວາ 2009). ແລ້ວສິ່ງໃຫ້ພະແນກຊັບພະຍາກອນຂອງ ແຂວງ ເປັນຜູ້ກວດກາ, ອອກໃບຢັ້ງຢືນໃຫ້ ແລະ ຕິດຕາມກວດກາ.

9 ແຜນການຈັດການ ແລະ ກວດກາ ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ການຫຼຸດຜ່ອນ

ຕາຕະລາງທີ ໄດ້ສະແດງໃຫ້ເຫັນຕົວຊີ້ວັດທີ່ສິ່ງຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ, ຄວາມຖີ່ໃນການຕິດຕາມ, ຜູ້ທີ່ມີຄວາມຮັບຜິດຊອບໃນການຕິດຕາມ ແລະ ກວດກາເພື່ອຫຼຸດຜ່ອນຜົນກະທົບທີ່ເກີດຂຶ້ນໃນໂຄງການຕະຫຼອດການກຳນົດມູນຄ່າໃນແຕ່ລະຜົນກະທົບ.

ຕາຕະລາງ 5: ແຜນການຕິດຕາມ, ກວດກາ ແລະ ມາດຕະການຫຼຸດຜ່ອນຜົນກະທົບ

ຜົນກະທົບທີ່ຕ້ອງໄດ້ຕິດຕາມ	ລາຍລະອຽດຂອງການຕິດຕາມ	ເວລາການກໍ່ສ້າງ			ເວລາດຳເນີນການຜະລິດ		
		ຄວາມຖີ່	ຕົວແທນຮັບຜິດຊອບ	ມູນຄ່າກຳນົດປະຈຳປີ	ຄວາມຖີ່	ຕົວແທນຮັບຜິດຊອບ	ມູນຄ່າກຳນົດປະຈຳປີ
ຄຸນນະພາບ ນ້ຳ	ການປ່ຽນແປງຄຸນນະພາບ ນ້ຳທີ່ຂອງທີ່ສິ່ງຜົນກະທົບຕໍ່ ການຂຸມຊຶມ				ໜຶ່ງຄັ້ງຕໍ່ປີ	ນ້ຳປະປາ ເມືອງ ໄຊຟອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳ ເນີນຜະລິດປະຈຳປີ
	ການກວດສອບຄຸນະພາບ ນ້ຳດິບກ່ອນເຂົ້າໂຮງງານ (ໃນປີທຳອິດ ຫຼື ໄລຍະການ ຜະລິດ)	ຕາມການກຳນົດ ຂອງ ມາດຕະຖານ ຄຸນະພາບນ້ຳດິບ ຂອງ ຄຸນະພາບນ້ຳ ໜ້າດິນ ຕາມມາດ ຕະຖານສິ່ງແວດ ລ້ອມ ແຫ່ງ ສປປ ລາວ (2009)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງ ການກໍ່ສ້າງ			
	ການກວດສອບຄຸນະພາບ ນ້ຳສະອາດກ່ອນອອກຈາກ ໂຮງງານ (ໃນປີທຳອິດ ຫຼື ໄລຍະການຜະລິດ)	ຕາມການກຳນົດ ຂອງ ມາດຕະຖານ ຄຸນະພາບນ້ຳ ຂອງ WHO (2014)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງ ການກໍ່ສ້າງ			
	ການກວດສອບຄຸນະພາບ ນ້ຳດິບກ່ອນເຂົ້າໂຮງງານ				ຕາມການກຳນົດຂອງ ມາດຕະຖານຄຸນະພາບ ນ້ຳດິບ ຂອງຄຸນະພາບ ນ້ຳໜ້າດິນ ຕາມມາດ ຕະຖານສິ່ງແວດລ້ອມ ແຫ່ງສປປລາວ(2009)	ນ້ຳປະປາ ເມືອງ ໄຊຟອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳ ເນີນຜະລິດປະຈຳປີ

	ການກວດສອບຄຸນະພາບ ນ້ຳສະອາດກ່ອນແຈກຈ່າຍ ໃຫ້ຊຸມຊົນ				ຕາມການກຳນົດຂອງ ມາດຕະຖານຄຸນະພາບ ນ້ຳຂອງ WHO (2014)	ນ້ຳປະປາ ເມືອງ ໄຊຜຸ ທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳ ເນີນຜະລິດປະຈຳປີ
	ການກວດສອບນ້ຳເປື້ອນ ທີ່ ອອກຈາກໂຮງງານຜະລິດນ້ຳ ໃນໄລຍະດຳເນີນການ				ຕາມການກຳນົດຂອງ ມາດຕະຖານການປ່ອຍ ນ້ຳເປື້ອນ ໃນມາດຕະ ຖານສິ່ງແວດລ້ອມແຫ່ງ ສປປ ລາວ (2009)	ນ້ຳປະປາ ເມືອງ ໄຊຜຸ ທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳ ເນີນຜະລິດປະຈຳປີ
ປະລິມານ ນ້ຳປະປາທີ່ຜຽງຜ່	ການກວດສອບປະລິມານ ນ້ຳກ່ອນເຂົ້າໂຮງງານດ້ວຍ ເຄື່ອງວັດແທກການໄຫຼ ແລະ ເຄື່ອງວັດແທກ ຄວາມດັນ (ໃນໄລຍະທົດ ລອງ)	ປະຈຳວັນ	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງ ການກໍ່ສ້າງ			
	ການຕິດຕາມໃນເວລາດຳ ເນີນການ				ປະຈຳວັນ	ນ້ຳປະປາ ເມືອງ ໄຊຜຸ ທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳ ເນີນຜະລິດປະຈຳປີ
ມົນລະພິດທາງ ອາກາດ	ການກວດສອບຕົວຊີ້ວັດທີ່ ເປັນອັນຕະລາຍຕໍ່ຊຸມຊົນ	ຕາມການກຳນົດ ຂອງ ມາດຕະຖານ ການປ່ອຍມົນລະພິດ ທາງອາກາດ ຂອງ ມາດຕະຖານ ສິ່ງແວດລ້ອມ ແຫ່ງ ສປປ ລາວ(2009)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງ ການກໍ່ສ້າງ			
ມົນລະພິດທາງສຽງ	ການກວດສອບຄວາມແຮງ ຂອງສຽງທີ່ສິ່ງຜົນກະທົບຕໍ່ ຊຸມຊົນ	ຕາມການກຳນົດ ຂອງ ມາດຕະຖານ ການປ່ອຍມົນລະພິດ ທາງສຽງຂອງ	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງ ການກໍ່ສ້າງ			

		ມາດຕະຖານສິ່ງແວດລ້ອມ ແຫ່ງ ສປປ ລາວ(2009)					
	ການກວດສອບຄວາມແຮງຂອງສຽງຈາກເຮືອນປັ໊ມ ແລະ ຂະບວນການຜະລິດທີ່ສິ່ງຜົນກະທົບຕໍ່ຊຸມຊົນ				ຕາມການກຳນົດຂອງມາດຕະຖານການປ່ອຍມົນລະພິດ ທາງສຽງຂອງມາດຕະຖານສິ່ງ ແວດລ້ອມ ແຫ່ງ ສປປ ລາວ (2009)	ນ້ຳປະປາ ເມືອງ ໄຊຜູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
ສິ່ງເສດເຫຼືອ	ການຈັດການຂີ້ເຫຍື້ອຈາກການກໍ່ສ້າງ	ໜຶ່ງຄັ້ງຕໍ່ອາທິດ ຫຼື ຖີ່ກວ່າ	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການຈັດການຂີ້ເຫຍື້ອຈາກການຜະລິດ				ໜຶ່ງຄັ້ງຕໍ່ອາທິດຖີ່ກວ່າ	ນ້ຳປະປາ ເມືອງ ໄຊຜູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
	ການຈັດການຕະກອນຈາກການຜະລິດ				ໜຶ່ງຄັ້ງຕໍ່ປີ	ນ້ຳປະປາ ເມືອງ ໄຊຜູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ

10 ສະຫຼຸບ

ໂຄງການນ້ຳປະປາເມືອງ ໄຊພູທອງ ແມ່ນໄດ້ມີການສຶກສາຜົນກະທົບເບື້ອງຕົ້ນຕາມລະບຽບການຂອງ ກະຊວງຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ແລະ ພາຍໃຕ້ການຕິດຕາມຂອງ ພະແນກ ຊັບພະຍາກອນແຂວງ ສະຫວັນນະເຂດ ເປັນຜູ້ຈັດຕັ້ງປະຕິບັດ.

ຈາກການສຶກສາຜົນກະທົບເບື້ອງຕົ້ນຂອງໂຄງການ, ສາມາດສະຫຼຸບໄດ້ວ່າ ຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ ແມ່ນບໍ່ກະທົບຫຼາຍໃນໄລຍະຍາວ. ຜົນກະທົບໃນໄລຍະສັ້ນ ກໍຄືຜົນກະທົບໃນໄລຍະ ການກໍ່ສ້າງ ຕໍ ຄຸນະພາບ ນ້ຳ, ມົນລະພິດທາງອາກາດ, ສຽງ ແລະ ສິ່ງເສດເຫຼືອ ແມ່ນໄດ້ມີການກຳນົດມາດ ຕະການຫຼຸດຜ່ອນທີ່ຊັດເຈນເພື່ອປະຕິບັດຕາມ. ສຳລັບຜົນກະທົບໃນໄລຍະຍາວ ແມ່ນຜົນກະທົບດ້ານບວກຕໍ່ ສັງຄົມກໍ່ຄືການຂະຫຍາຍການສະ ໜອງນ້ຳສະອາດ ໃຫ້ແກ່ປະຊາຊົນ ແລະ ນັກທ່ອງທ່ຽວທີ່ເຂົ້າມາໃນເຂດ ບໍລິການຂອງໂຄງການນ້ຳປະປາ. ນອກຈາກນີ້, ການນຳໃຊ້ນ້ຳທີ່ໄດ້ມາດຕະຖານຈະຊ່ວຍຫຼຸດຜ່ອນການເກີດ ພະຍາດທີ່ມາຈາກນ້ຳໃນການນຳໃຊ້ ແລະ ດື່ມນ້ຳທີ່ໄດ້ມາດຕະຖານຂອງກະຊວງສາທາລະນະສຸກ ແລະ ອົງການ ສາກົນ WHO ໄດ້ວາງອອກ.

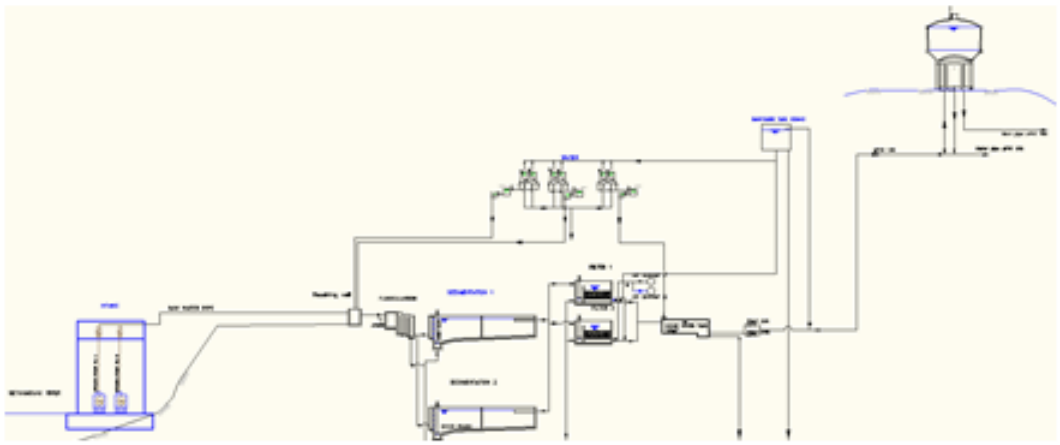
ຜູ້ອຳນວຍການ

ສີສະຫວ່ອນ ສີວິໄຈ

Annex 4 – Feasibility Study of Implementation for Sethamouak Town

LAO PEOPLE'S DEMOCRATIC REPUBLIC
MINISTRY OF PUBLIC WORKS AND TRANSPORT
DEPARTMENT OF WATER SUPPLY

FEASIBILITY STUDY FOR SETHAMOUAK TOWN



UN-HABITAT FOR A BETTER URBAN FUTURE

Prepared by

UN-Habitat in association with NPSE-Savannakhet

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FIGURES

ABBREVIATIONS AND EQUIVALENTS

(cclxxii) A	(cclxxiii) Asian Development Bank
(cclxxiv) A	(cclxxv) Agence Francaise de Developpement
(cclxxvi) A	(cclxxvii) Average Incremental Economic Cost
(cclxxviii) A	(cclxxix) Average Incremental Financial Cost
(cclxxx) A	(cclxxxi) Affected Persons
(cclxxxii) B	(cclxxxiii) Branch Nam Papa
(cclxxxiv) B	(cclxxxv) Business Promotions Office
(cclxxxvi) B	(cclxxxvii) Belgian Technical Cooperation
(cclxxxviii) C	(cclxxxix) Community Actions and Participation
(ccxc)CEDA	(ccxci) Convention of the Elimination of all forms of Discrimination against
(ccxcii) CIPP	(ccxciii) Community Information and Participation Program
(ccxciv) C	(ccxcv) Capacity Development Program
(ccxcvi) C	(ccxcvii) Committee for Planning and Investment
(ccxcviii) D	(ccxcix) Department of Housing and Urban Planning
(ccc) DI	(ccci) Ductile Iron
(cccii) DMS	(ccciii) Detailed Measurement survey
(ccciv) DN	(cccv) Pipe Nominal Diameter (in mm)
(cccvi) DPAC	(cccvii) Department of Public Administration and Civil Service (of the Prime
(cccviii) D	(cccix) Department of Public Works and Transport

(cccx)DRC (cccxi) District Resettlement Committee
(cccxii) EA (cccxiii) Executing Agency
(cccxiv) E (cccxv) Environmental Assessment and Review Framework
(cccxvi) E (cccxvii) Environmental Impact Assessment
(cccxviii) EI (cccxix) Economic Internal Rate of Return
(cccxx) EL (cccxxi) Enterprise Law
(cccxxii) E (cccxxiii) Environmental Management Plan
(cccxxiv) E (cccxxv) Economic Opportunity Cost of Capital
(cccxxvi) F (cccxxvii) Financial Internal Rate of Return
(cccxxviii) G (cccxxix) Gender Action Plan
(cccxxx) G (cccxxxi) Government of Lao PDR
(cccxxxii) G (cccxxxiii) Global Program of Outputs Based Aid
(cccxxxiv) G (cccxxxv) Gender Resource Information and Development Centre
(cccxxxvi) G (cccxxxvii) Galvanized Steel
(cccxxxviii) H (cccxxxix) Households
(cccxl) HRD (cccxli) Human Resources Development
(cccxlii) I (cccxliii) International competitive bidding
(cccxliv) I (cccxlv) Information, Education and Communication
(cccxlviii) I (cccxlix) Initial Environmental Examination
(cccl) IEM (cccli) Independent External Monitoring
(ccclii) IOL (ccccliii) Inventory of losses
(ccccliv) IPS (ccclv) Improved PNP Sustainability
(ccclvi) KOIC (ccclvii) Korean Aid Agency
(ccclviii) L (ccclix) Lao People's Democratic Republic
(ccclx) LAR (ccclxi) Land Acquisition and Resettlement
(ccclxii) L (ccclxiii) Land acquisition and compensation framework (plan)
(ccclxiv) L (ccclxv) Lao Expenditure and Consumption Surveys
(ccclxvi) L (ccclxvii) Lao Front for National Reconstruction
(ccclxviii) L (ccclxix) Lao Women’s Union
(ccclxx) M (ccclxxi) Muang
(ccclxxii) M (ccclxxiii) Monitoring and evaluation
(ccclxxiv) M (ccclxxv) Millennium Development Goals
(ccclxxvi) M (ccclxxvii) Management Information System
(ccclxxviii) M (ccclxxix) Ministry of Health
(ccclxxx) M (ccclxxxi) Ministry of Public Works and Transport
(ccclxxxii) M (ccclxxxiii) The National Center of Environmental Health and Water
(ccclxxxiv) M (ccclxxxv) National competitive bidding
(ccclxxxvi) M (ccclxxxvii) Northern and Central Regions Water Supply and Sanitation
(ccclxxxviii) M (ccclxxxix) Nordic Development Fund
(cccxc)NGO (cccxci) Non-Government Organization
(cccxcii) M (cccxciii) National Growth and Poverty Elimination Strategy
(cccxciv) M (cccxcv) Norwegian Agency for Development Cooperation
(cccxcvi) M (cccxcvii) Nam Papa Lao
(cccxcviii) M (cccxcix) Nam Papa Nakhonluang
(cd) NPV (cdi) Nam Papa Vientiane
(cdii) NTU (cdiii) Nephelometric Turbidity Units
(cdiv) NWTTI (cdv) National Waterworks Technical Training Center (Thailand)
(cdvi) OHUP (cdvii) Office of Housing and Urban Planning (of DPWT at provincial level)
(cdviii) OOE (cdix) Office of Education

(cdx) OOH (cdxi) Office of Health
(cdxii) OPWT (cdxiii) Office of Public Works and Transport
(cdxiv) O&M (cdxv) Operation and Maintenance
(cdxvi) PCU (cdxvii) Project Coordination Unit
(cdxviii) P (cdxix) People's Democratic Republic
(cdxx) PE (cdxxi) Polyethylene
(cdxxii) PIA (cdxxiii) Project Implementation Assistance
(cdxxiv) P (cdxxv) Public Information Booklet
(cdxxvi) P (cdxxvii) Poverty Impact Ratio
(cdxxviii) P (cdxxix) Project Implementation Unit
(cdxxx) PN (cdxxxi) Pipe Pressure Class
(cdxxxii) P (cdxxxiii) Provincial Nam Papa
(cdxxxiv) P (cdxxxv) Public-Private Infrastructure Advisory Facility
(cdxxxvi) P (cdxxxvii) Public Private Partnership
(cdxxxviii) P (cdxxxix) Project Performance Monitoring and Evaluation
(cdxl) PPSC (cdxli) Provincial Project Steering Committee
(cdxlii) PSA (cdxliii) Poverty and Social Analysis
(cdxliv) PSC (cdxlv) Project Steering Committee
(cdxlvi) PSP (cdxlvii) Private Sector Participation
(cdxlviii) P (cdxlix) Polyvinyl Chloride
(cdl) RCS (cdli) Replacement Cost Survey
(cdlii) ROW (cdliii) Right of Way
(cdliv) SES (cdlv) Socio-Economic Survey
(cdlvi) SGIA (cdlvii) Second Generation Imprest Account
(cdlviii) SIP (cdlix) Sector Investment Plan
(cdlx) SOE (cdlxi) State Owned Enterprise
(cdlxii) SSIP (cdlxiii) Small Scale Independent Provider
(cdlxiv) STEA (cdlxv) [Former] Science Technology and Environmental Agency
(cdlxvi) STDP (cdlxvii) Small Towns Development Sector Project
(cdlxviii) S (cdlxix) Small Towns Water Supply and Sanitation Sector Project
(cdlxx) TA (cdlxxi) Technical Assistance
(cdlxxii) T (cdlxxiii) Terms of Reference
(cdlxxiv) T (cdlxxv) Tariff Determination Guidelines
(cdlxxvi) U (cdlxxvii) Urban Development Administration Authority
(cdlxxviii) U (cdlxxix) Unaccounted-for-water
(cdlxxx) V (cdlxxxi) Village Environmental Improvements
(cdlxxxii) V (cdlxxxiii) Ventilated improved latrine
(cdlxxxiv) V (cdlxxxv) Village Resettlement Committee
(cdlxxxvi) W (cdlxxxvii) Weighted Average Cost of Capital
(cdlxxxviii) W (cdlxxxix) Water Supply Authority
(cdxc) WATS (cdxci) Water and Sanitation Unit
(cdxcii) WB (cdxciii) World Bank
(cdxciv) W (cdxcv) World Food Program
(cdxcvi) W (cdxcvii) Water Resources and Environmental Agency (created 23
(cdxcviii) W (cdxcix) Water Supply Authority Regulatory Committee
(d) WSD (di) Water Supply Division
(dii) WSIP (diii) Water Supply Investment Plan
(div) WSP- (dv) Water and Sanitation Program for East Asia and the Pacific
(dvi) WSSS (dvii) Water Supply and Sanitation Sector Project

(dviii) WSTP (dix) Water Supply Tariff Policy
(dx) WTTC (dxi) Waterworks Technical Training Center (Lao PDR)
(dxiii) (dxiv)
(dxv) **UNITS**

(dxvi) ha (dxvii) Hectare
(dxviii) Lpcd (dxix) Liters per capita per day
(dxx) L/s (dxxi) Liters per second
(dxxii) m (dxxiii) Meter
(dxxiv) mg/L (dxxv) Milligrams per Liter
(dxxvi) mm (dxxvii) Millimeter
(dxxviii) r (dxxix) Cubic meters per day

- EXECUTIVE SUMMARY

Project Description

Sethamouak is one of the small towns in Lao PDR proposed for inclusion in the Adaptation Fund programme. The proposed Sethamouak district town aims to mainstream ***"Climate action into urban planning to build resilient communities along an economic corridor in Lao PDR"***, to provide safe, reliable and affordable 24/7 piped water supplies and village environmental improvements in small towns along an economic corridor. It has been formulated as a community-based project and in line with "Samsang" (3 level development), requiring the towns and their provincial authorities to demonstrate their commitment to the project and its associated reforms, thus encouraging a demand-driven approach. The project has a strong community participation focus, reinforced by environmental and social safeguard, health and sanitation awareness.

Rationale

Background

Sethamouak Town is composed of 7 villages with a total 2018 population of 8,956 persons. About sixty two (62) percent of the population are "Phouthai, Katang and Mangkone", three of the minority ethnic groups in Lao PDR. There are in total 1,533 households, of which 541 households (35%) are considered as poor households.

Inadequate water supply and poor environmental conditions in Sethamouak town and other small towns deter socio-economic development and restrict the ability of the towns to serve as centers for economic activity and delivery of social services for their surrounding rural areas.

Project Supports Government Policy

The Project will build on the Government's policy of developing small towns as centers of marketing and agricultural processing, as economic links between rural, national and international markets, and as places offering non-farm employment to the rural poor. By developing these small urban centers, the Government is also seeking to reduce poverty through economic growth and improve geographical equity in urban social infrastructure development. The Project supports Government of Lao PDR's (GOL's)

water supply sector goal which is to provide 24-hour per day access to safe drinking water for 80% of the urban population by the year 2020.

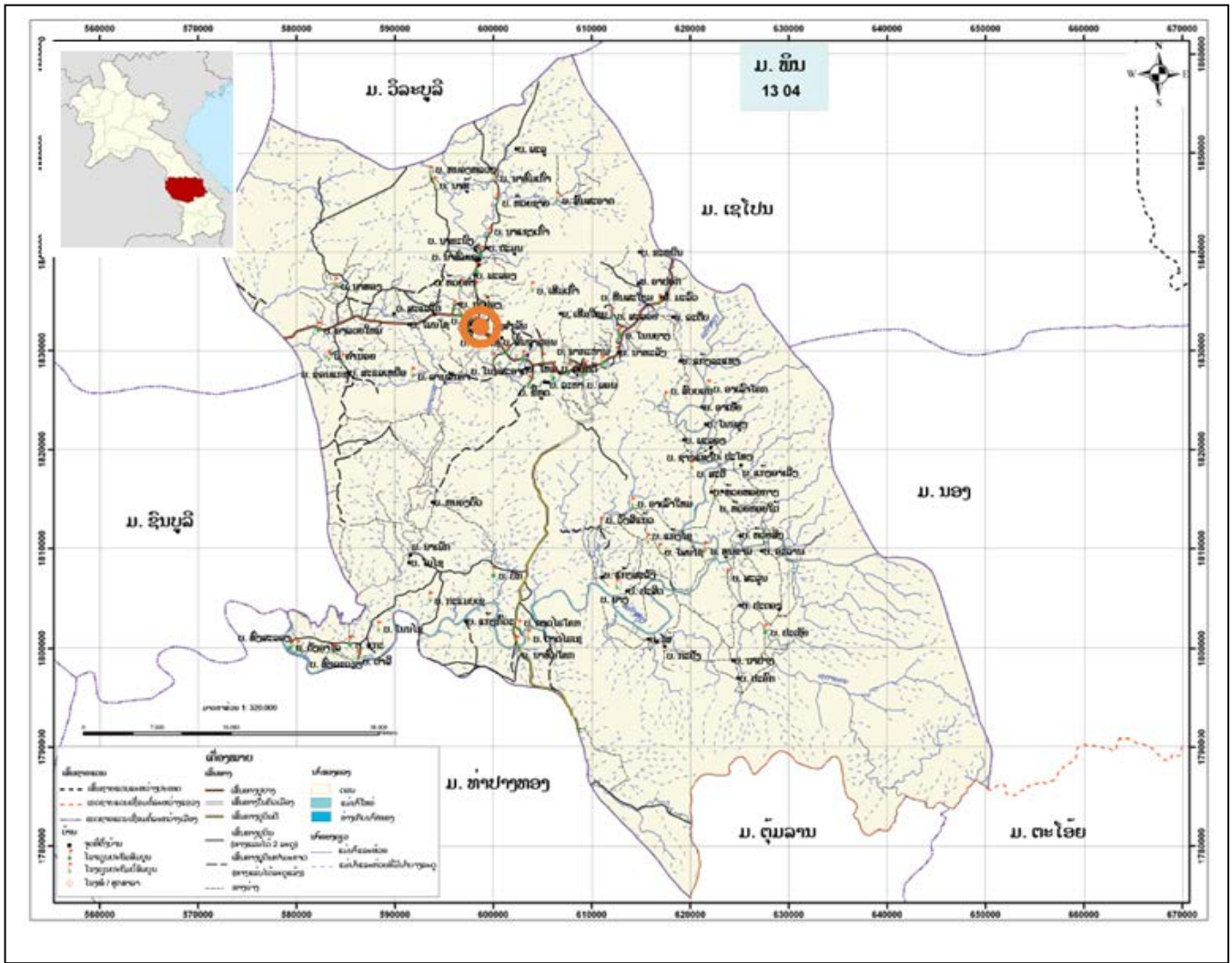
Project Impact and Outcome

The expected impact of the Project is to build resilience to climate change in communities along an economic corridor in the central region of Lao PDR. This will be achieved by the provision of climate resilient infrastructure and the mainstreaming of climate action into urban planning. To achieve this objective, the project focuses its actions on highly vulnerable settlements along the economic corridor in the province of Savannakhet and also to improve quality of life of small town residents in Lao PDR and enhanced role of the small towns as economic, market, services, and manufacturing centers for their surrounding rural areas.

These outcomes will be achieved by:

- Mainstreaming climate action into urban planning to build resilient communities along an economic corridor in Lao PDR;
- Establishing new optimally sized water supply systems using appropriate innovation technologies;
- Motivating public participation in water and sanitation infrastructure development to improve the environment; and
- Strengthening the urban water supply sector planning, managing, and regulating capacity

Figure 1-6: Location of Project: Sethamouak Town in Savannakhet Province



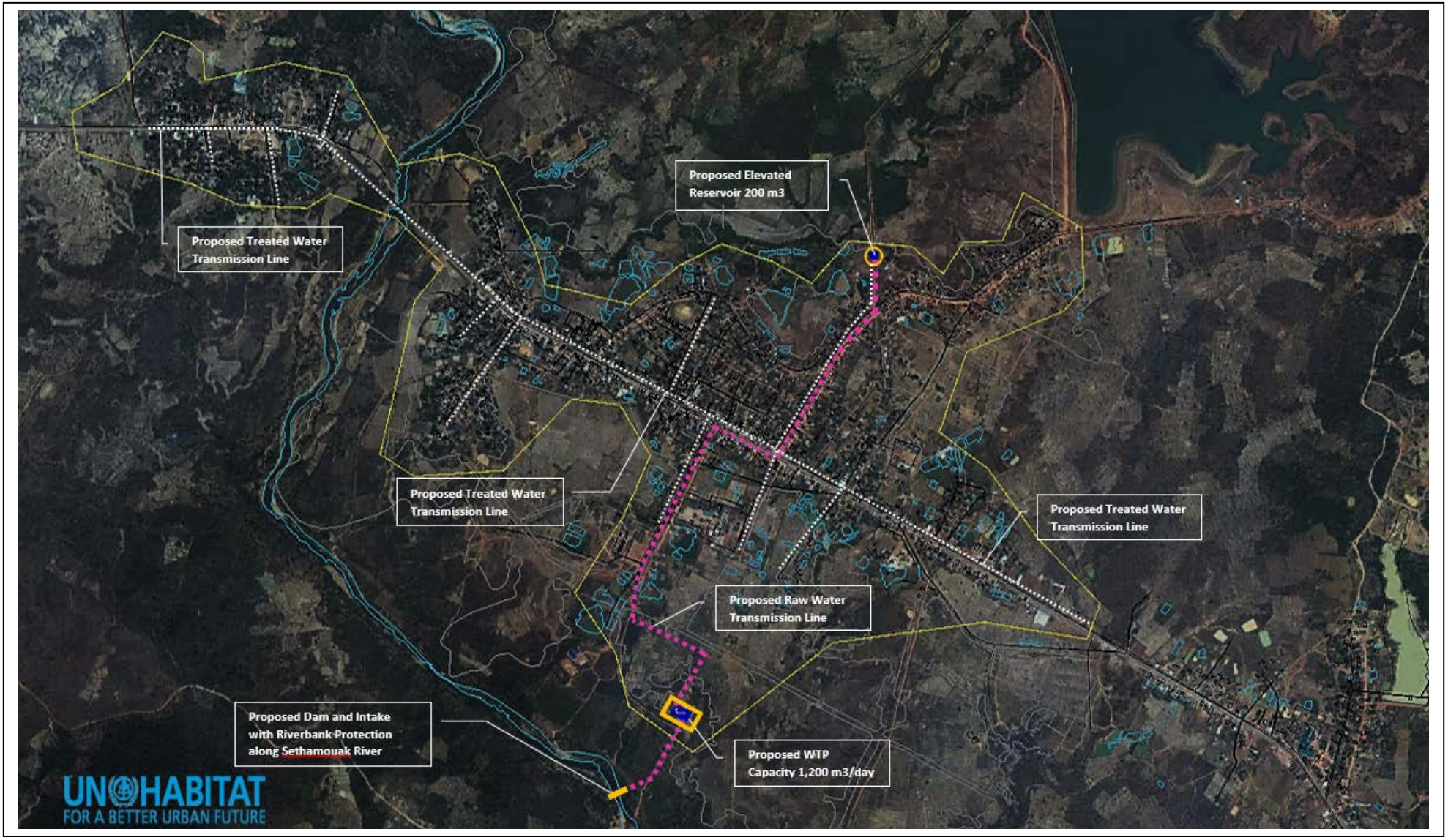


Figure 1-7: Location Plan of Proposed Sethamouak Water Treatment Plan

- PROJECT DESCRIPTION

Project Description

The Project has four outputs, namely:

Output 1: Mainstreamed climate action into urban planning to build resilient communities along an economic corridor in Lao PDR;

Output 2: Established new optimally sized water supply systems using appropriate innovation technologies;

Output 3: Motivated public participation in water and sanitation infrastructure development to improve the environment; and

Output 4: Strengthened the urban water supply sector planning, managing, and regulating capacity

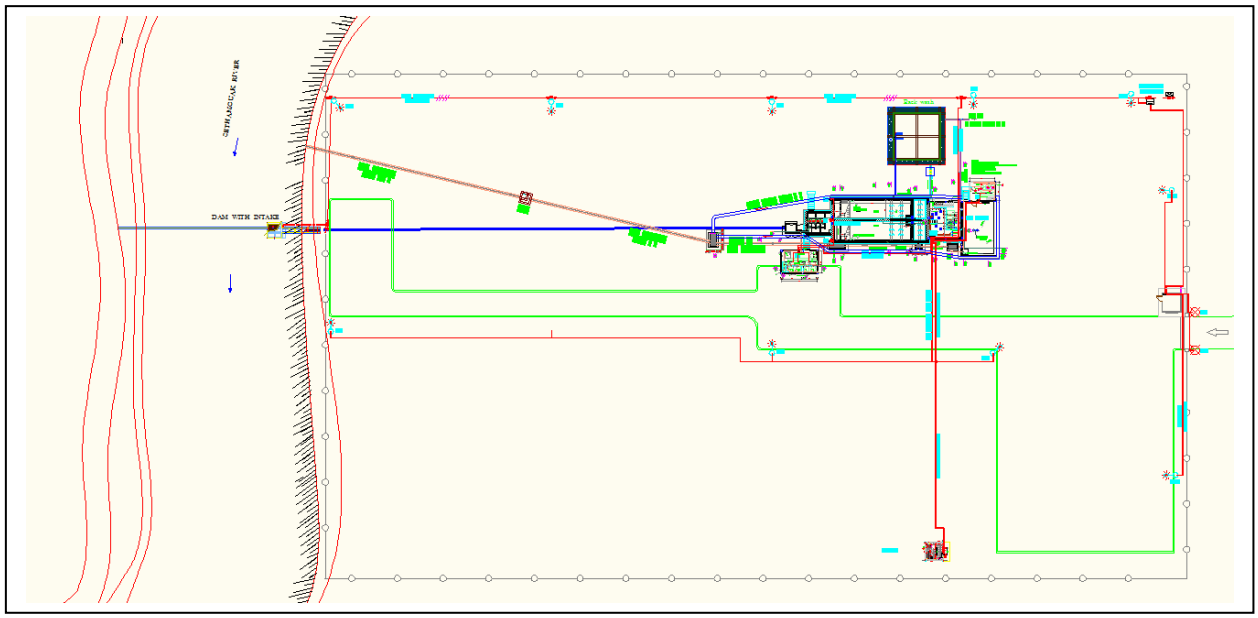
This Feasibility Study Report focuses on Outputs 2 and 4. The outputs are as follows:

Output 2 - Water Supply Development

The project will develop a new 24/7 water supply system with individual house hold connections in Sethamouak's 7 core villages, having a base Y2018 population of about 8,956.

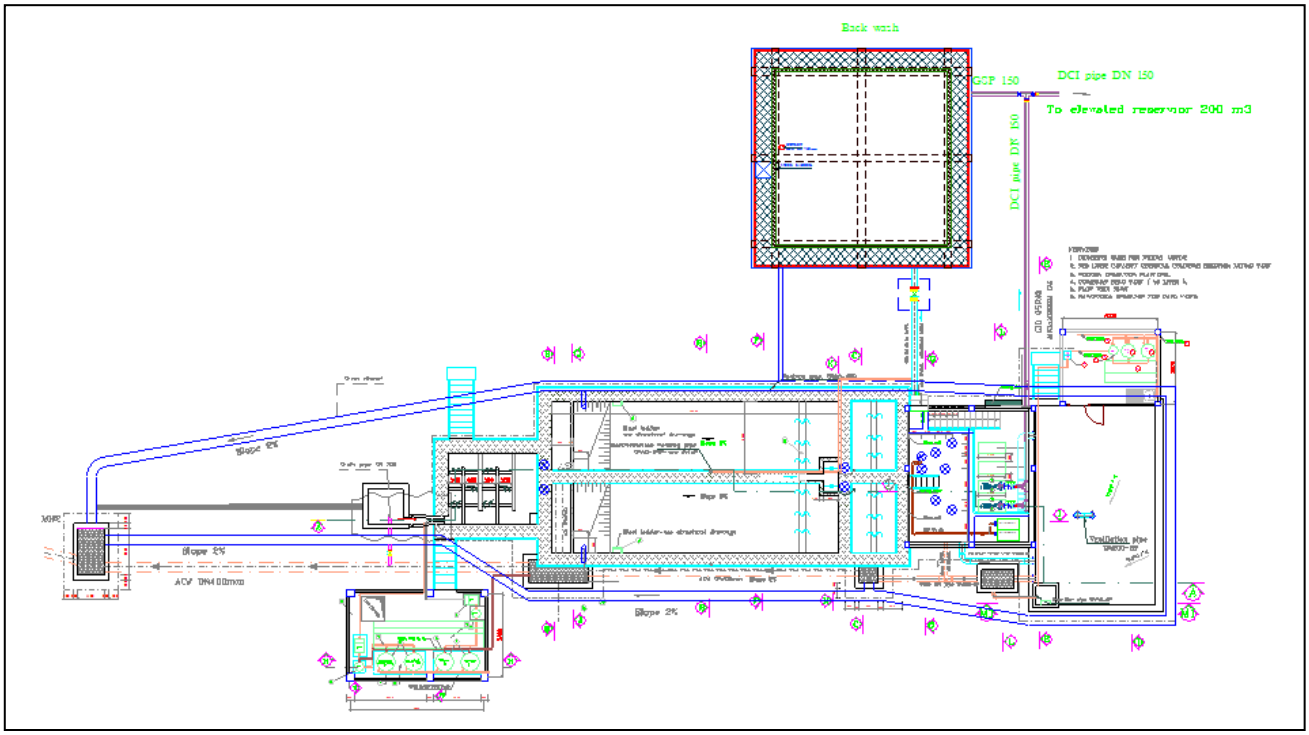
The proposed water supply system will include:

- on the Sethamouak river a 1,200 m3/day water treatment plant (WTP) with a dam and water intake located at Xaysomboun village;

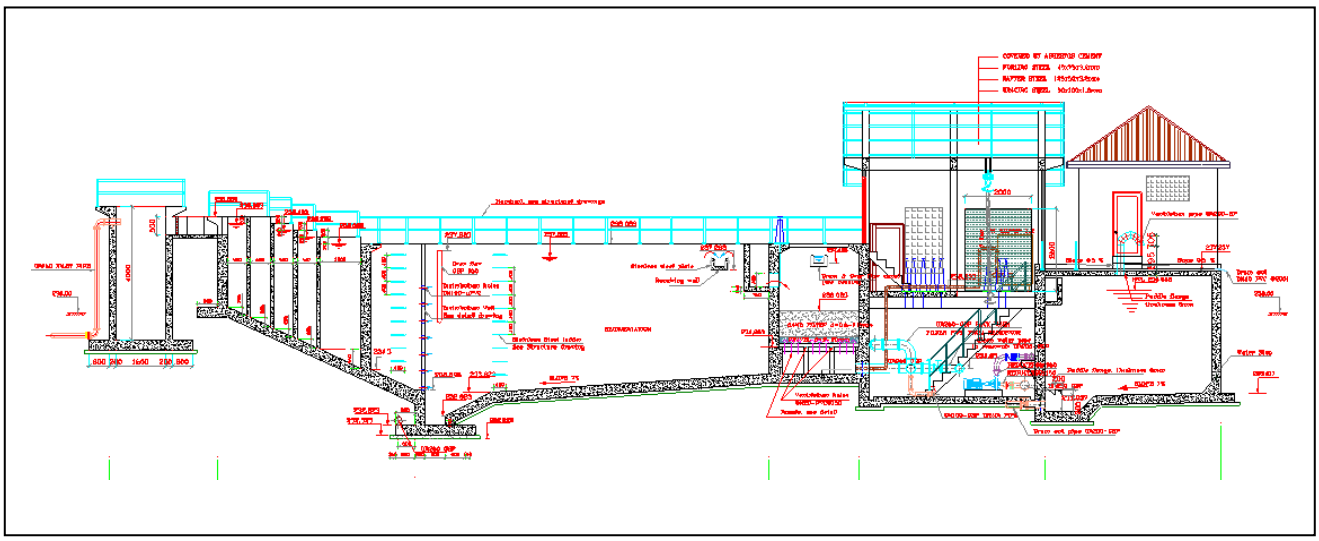


- The WTP will include pre-sedimentation, flocculation, sedimentation, rapid gravity filtration, a backwash tank and chlorination facilities, 100 m^3 clear water reservoir, detention ponds, plant office and a small water testing laboratory. The distribution

and reticulation network will include about 15 km of pipelines. A branch Nam Papa (BNP) office will be constructed in the district center;

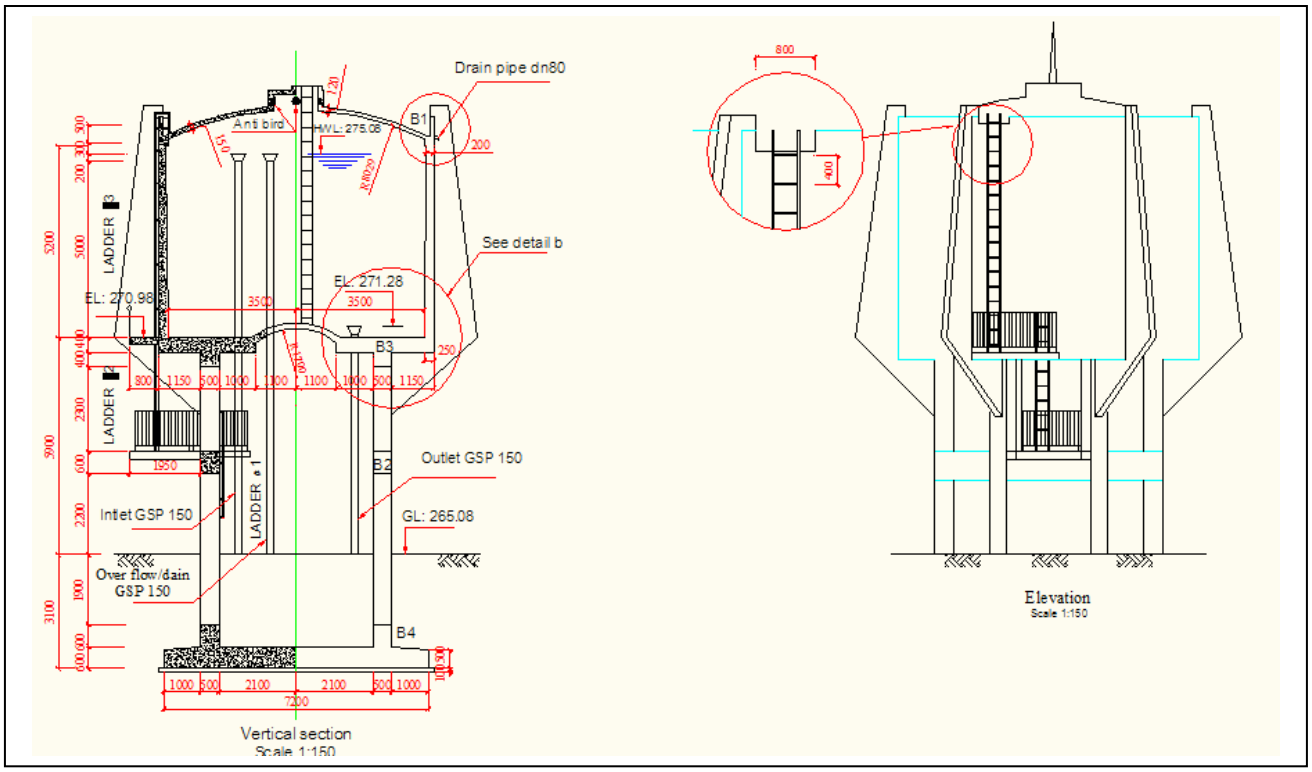


Details of Water Treatment Plan with capacity of 1,200 m3/day



Longitudinal-Section of Water Treatment Plan with capacity of 1,200 m3/day

- A raw water transmission main line supply to 200 m3/day elevated reservoir at Palek village;



Output 4 – Improved Capacity for Project Implementation and O&M

This output includes project implementation assistance, capacity development for O&M and incremental administration support.

Project Implementation Assistance (PIA): will provide consulting services and training to assist the provincial project coordination unit (PCU) each District project implementation unit (PIU) to implement the project. It will also enhance the capacities of PIUs, and village water and sanitation units (WATSANs) to implement and monitor the project.

Capacity Development for O&M: will help to develop more efficient systems in the town to manage urban services in a sustainable manner, by building the capacities of the provincial and branch Nam Papa (BNP) and district PWT. It will also provide support to village water and sanitation units (WATSANs) and communities to enhance their capacities to operate and maintain village infrastructure and their on-site water and sanitation facilities.

Cost Estimate

- The Sethamouak subproject cost is estimated at $890,000 equivalent, including taxes and duties. Table 1-1 provides a summary of the Sethamouak project cost estimate.

- Table 1-11: Sethamouak subproject Cost Estimate (USD)

No.	Output	Total Cost (USD)
1	**Urban Planning**	**50,000**
2	**Water Supply Development**	**750,000**
3	**Sanitation Improvements**	**30,000**
4	**Capacity Building**	**20,000**
	TOTAL BASE COST	**850,000**
5	**Physical and Price Contingencies**	**40,000**
	TOTAL ESTIMATED PROJECT COST	**890,000**

(dxxxii)***Notes:*** *Cost estimates based on December 2018 prices, including taxes and duties*

(dxxxiii)

Executing Agency and Implementation Arrangements

Project implementation arrangements are expected to be similar to the ongoing Adaptation Project phase I of UN-Habitat in 3 southern provinces of Lao PDR. MPWT will be the Executing Agency (EA) for the project. A national project steering committee (PSC), which was established for the project, will also oversee this project, give overall direction and provide policy guidance. The same PCU/PIU that were established for the project in the Department of Water Supply (DWS) of MPWT will also be responsible for overall planning, coordination and management of this project.

PIUs will be established under the DPWT in Savannakhet's province. With assistance from the consultants and PCU/PIU will be responsible for day-to-day coordination and supervision of project implementation in the Project district. A provincial project steering committee (PPSC) will be established to coordinate district agencies and make key decisions on behalf of the provincial government. At the district level, the district governor or vice governor will oversee the project, monitor progress, review quality of the work, coordinate the project with the PIU and local communities, and report on progress to the PPSC.

Implementation Period

The Project will be implemented over a four-year period from fourth quarter 2019 until fourth quarter 2023. The detailed implementation will be governed by an agreement of cooperation between UN-Habitat and NPSE Savannakhet. For further information on the implementation arrangements, please see Part III, Section A.

Procurement

Goods, works and services financed under the loan will be procured in accordance with *AF's Procurement Guidelines.* International Competitive Bidding (ICB) procedures will be used for major civil works contracts estimated to cost over $1.0 million, and for supply contracts valued over $500,000. Procurement of civil works valued at less than $1.0 million equivalent will be undertaken through national competitive bidding (NCB). Shopping procedures will be followed for materials and equipment packages or works

estimated to cost less than $100,000 equivalent. Local procurement procedures will be used for the small village level civil works and supply contracts. To the extent possible, for local procurement, quotations will be invited from at least three suppliers or contractors.

The PIU in province will be responsible for procurement. Installation of water meters and service connections will be carried out by the construction contractor under the main water supply construction contract for each town.

Consulting Services

Consultants whose services are provided under Bank financing have been selected and engaged in accordance with the Bank's Guidelines on the Use of Consultants. The main consulting services are provided through a consortium of two national companies and one international, using quality-and cost-based selection (QCBS).

Tariff and Affordability

The financial objectives of the sector are: (i) fully recover utility wide operation and maintenance (O&M) costs; (ii) recover utility wide debt service; (iii) maintain a utility wide debt service ratio of at least 1.2; (iv) gradually recover an increasing proportion of annual depreciation expense of the utility wide fixed assets; and (v) maintain its accounts receivable at less than 90 days of annual sales. To meet the agreed upon financial objectives of the sector, the projected utility wide tariffs shall be increased at a minimum of 20% every three years to keep pace with inflation. The domestic tariff is a rising 3-block structure to ensure affordability by the low-income group (LIG).

The percentages of monthly household income spent on water, inclusive of the monthly meter rental and turnover tax, by the average household and LIG are below 5% in 2014 and 2018. Based on generally accepted principle that the expenditure on water should not exceed 5% of household income, the projected water tariffs are considered affordable.

The results of the socio-economic survey revealed that households are willing to pay an average of about Kip 12,300 per month for piped water supply with 81% of respondents willing to pay at least Kip 10,000 per month. These figures are highly suspect, and are not consistent with findings on other similar projects. Further, it was noted that asset ownership, such as motorcycles, is also very evident in the town. However, the analysis above shows that the average monthly water bill in 2014 and 2018, inclusive of the monthly meter rental and turnover tax, are higher than the households' willingness to pay. However, affordability seems to be a far more reliable indicator. In addition, it has been found that the few poor families who either cannot afford or are unwilling to pay for water, regulate their consumption to meet their particular circumstances. During this transition period, the PNPs forgive unpaid bills. In addition, it is recommended that the minimum 5m^3/month be eliminated, so that the poor only pay for what they actually use.

Project Benefits and Beneficiaries

The project will benefit an estimated **11,358 residents (Y2030)** in the 7 core villages of Sethamouak Town by providing safe, reliable piped water supplies and improved urban environments that will have a direct impact on the health and living conditions of the town communities. Health and hygiene promotion activities will improve the health status of the target communities.

The Sethamouak town's economy will benefit from enhanced productivity as a result of health improvements, time savings in collecting water, as well as from increased urban efficiency arising from improved sanitation. Many residents will benefit from lower water costs and from savings in health care costs.

Sethamouak town there are in total households 1,533, of which 541 households (35%) households classified as poor. Nevertheless, all project interventions will either directly or indirectly benefit the poor. The target population will benefit from: (i) greater access to safe water supplies and sanitation which will improve health profiles, and; (ii) from improved sanitation that will enhance the poor's mobility and access to income-earning activities and government facilities such as schools and hospitals.

Both men and women will benefit from project activities, but women will be the major beneficiaries of the piped water supply system through timesaving, drudgery avoidance, and improved family health. Women will also benefit from the sanitation improvements.

Land Acquisition and Resettlement (LAR)

The LAR impacts in Sethamouak Town are insignificant, or **AF category B2-Midium Risk**. There are no severely affected households. The main water supply facilities such as the major part of a dam, intake, water treatment plant, and reservoir will be located on public land; the transmission and distribution mains and reticulation pipes will be laid within road rights-of-way, with minor impacts on land, property or crops.

Environmental Impacts

This subproject will improve the current water supply and sanitation facilities of Sethamouak town. This improved supply of piped drinking water will lead to better public health and general living conditions.

The Sethamouak project will not cause any adverse permanent impacts on water and land resources. Temporary negative impacts during the construction phase will be managed through mitigation measures, while already existing constraints during operation will be avoided or limited through complementary or new preventive operation and maintenance related procedures of the new water supply system and existing sanitation scheme. The Environmental Safeguards Management Plan (ESMP) has included relevant counter measures, and recommends, in addition, the preparation of a Health, Safety & Environmental Plan (HSEP) as complementary step for minimizing disturbances to nature and people as they occur typically for construction sites of a water supply and sanitation scheme of small towns.

There is no specific environmental issue that would require high attention by the project so that standard implementation of an ESMP and HSEP should meet environmental conditions of national and international laws, guidelines and regulations. The identified mitigation is expected to bring negative temporary impacts during construction phase to acceptable levels with focus on the new dam and intake construction site. Positive impacts on public health, quality of life and economic development during operation phase will be highly significant through the expansion of safe water supply to the Sethamouak town's population.

Environmental monitoring of river flows and of quality of raw and treated water should continue during operation by Provincial Nam Papa.

As the project's environmental impacts in Sethamouak town (see Annex 1: IEE Sethamouak Town) are insignificant, and meet the **AF category B2-Midium Risk**, no further environmental assessment is required beyond the detailed review of the ESMP during implementation the infrastructures works, and the preparation of a HSEP.

- PROFILE OF SAYPHOUTHONG AREA

Town Location and Profile

Sethamouak town is the District Town of Phine in Savannakhet Province. Savannakhet Province is the most populated province in Lao PDR with the total population of 970,478 persons. The Province comprises of 15 districts of which four including Phine are officially classified as poor districts. Phine District is the third largest urban settlement located in the East-West Economic Corridor, on the junction between the highway No 9 linking the North East of Thailand to the central Part of Viet Nam and the highway No. 23 providing access to the South-East hinder land provinces (Saravane, Attapeu and Sekong).

In view of the above, the Government of Lao PDR considers as of high priority the improvement of social and physical basic infrastructures of small towns along the Corridor in order to realize the expected benefits. Subsequently, Sethamouak Town with comparable advantage in terms of **"*Climate action into urban planning to build resilient communities along an economic corridor in Lao PDR".***

Sethamouak Town is composed of 7 villages with a total 2018 population of 8,956 persons. About sixty two (62) percent of the population are "Phouthai, Katang and Mangkone", three of the minority ethnic groups in Lao PDR. There are in total 1,533 households, of which 541 households (35%) are considered as poor households.

Natural Features

Topography

The town's 7 core villages are situated on the lowlands, about 61 km northeast of the Mekong River. Phine district is bisected by the Sethamouak River, a major tributary of the Mekong. The elevation of the core villages vary from about 148 m at the Sethamouak riverbank, to 182 m at Paksong near the district center. The town is surrounded by low-lying land and swamps which are transected by numerous intermittent streams.

Geology and Soils

Soils in Sethamouak district consist of alluvial deposits of sand and sandy clay, underlain by sandstones. Nam Sa'at bore logs indicate 10 m of soils and weathered rock overlying fissured sandstone. Sandstone outcrops are exposed at the lower end of the proposed water treatment plant site at Xaysomboun Village and sandstone is likely to be encountered at river bed level near the proposed intake site where the Sethamouak River has formed a "hairpin" bend.

Lao PDR has a tropical monsoon climate which features a pronounced dry season (November to February) and wet season (May to October). The dry season is generally

cooler, though temperatures rise significantly in March and April prior to the onset of the rains. Rainfall data for Savannakhet province indicate that maximum monthly rainfall occurs in July and August, averaging 322mm in July over the past decade.

Average annual temperature is about 28ºC, varying from a low of 18ºC in December-February to a maximum of 35 ºC in April. Monthly maximum temperatures are above 30 ºC for most of the year.

Evaporation averages 94 mm/month, ranging from 60mm in August and September to more than 100 mm from November until April.

Surface water

The Sethamouak River is the main water resource in Phine district. Its catchment accounts for about 65% of the District's land area. While the river is reportedly very high turbidity in the raining season, it carries large quantities of sediment in the wet season. The Sethamouak River is extensively used for irrigation.

Groundwater

Groundwater is used extensively for domestic water supply throughout Sethamouak's core villages. Savannakhet Nam Saat advised that, prior to 1995, the water table in Sethamouak was at about 18 m depth, but is now much lower because of increasing groundwater use which has affected the reliability of the wells. Household bores in Sethamouak consist of two main types: typically about 20 m deep bores with hand pumps that yield about 0.3L/s, and about 40-50m deep bores with electric pumps that yield about 0.5L/s. Nam Sa'at bore logs indicate that the deep bores take water from fissures within the underlying sandstone, which are rapidly depleted in the dry season.

Population and Household Characteristics

In 2018, the total population of the 7 core villages was 8,956 people. Women account for 56% of household members (male/female ratio of 0.84); overall, they head approximately 7.8% of households in the town. About 60% of the population is working age (15-60 years).

Table 1-2: Sethamouak Population Characteristics

No	Core Villages	2018 Pop'n.	No. HH	Persons/ HH	M/F Ratio
1	Oudomxay	1,201	260	4.6	0.83
2	Xesavang	1,447	236	6.1	0.89
3	Xanamixay	882	118	7.5	0.79
4	Xaisomboun	1,444	227	6.4	0.85
5	Sibounheuang	2,028	338	6.0	0.84
6	Palek	490	94	5.2	0.85
7	Nonxay	1,464	260	5.6	0.83
	TOTAL	**8,956**	**1,533**	**5.9**	**0.84**

Ethnicity

In 2018, about sixty two (62) percent of the population are “Phouthai, Katang and Mangkone”, three of the minority ethnic groups in Lao PDR. There are in total 1,533 households, of which 541 households (35%) are considered as poor households.

Education

During 2018’s survey, in Sethamouak town have approximately 1 Children school, 5 primary schools and 1 secondary school (table 1-3 summarize the number of schools in the Sethamouak town)

Table 1-3: Schools in Sethamouak’s Core Villages

No.	Name of school	Student			Teacher		
		Total	male	female	Total	Male	Female
1	Xethamuak Secondary school	806	418	388	35	10	25
2	Xethamuak Children school	140	70	70	8	-	8
3	Oudomxay Primary school	197	87	110	7	1	6
4	Thaoudom Primary school	121	59	62	7	2	5
5	Xesavath Primary school	289	128	161	13	2	11
6	Nonxay Primary school	183	83	100	6	2	4
7	Sibounheuang Primary school	292	139	153	9	3	6
Sumary		**2,028**	**984**	**1,044**	**85**	**20**	**65**

Health and Hygiene Conditions

The Sethamouak’s 2018 survey results for ‘*incidence of water-related disease by HH’* did not highlight any disease for the last 6 months.

Land and House Tenure

The majority of the interviewed households own their house and land (97%). Approximately 85% of those who owned the land and house obtained the ownership documents and most households said that they are allowed to sell their property.

Occupations and Livelihoods

The main occupation of the population in Sethamouak is farming (55%). Around 40% are the dependents including the children, the old age or disable people and the students who cannot contribute to the income of the family. Government officers and the teachers represent about 5% and 2% respectively.

Based on data from surveyed households, the majority (61%) of women living in Sethamouak core villages are economically active.

Income and Poverty Levels

An attempt was made to ascertain the average monthly cash income and expenses of households. On analysis, it was found that figures provided were generally an estimation of the respondents. As with any study/survey one has to be extremely cautious.

The monthly income per person is calculated dividing the yearly HH income by the average HH size in Sethamouak (5.9), giving us an average monthly income of Kip 480,000 per person.

Existing Water Supply and Sanitation

Water Supply

The Sethamouak River is the main water resource in Phine district. Its catchment accounts for about 65% of the District's land area. While the river is reportedly very high turbidity in the raining season, it carries large quantities of sediment in the wet season. The Sethamouak River is extensively used for irrigation.

There are no water treatment facilities in the Sethamouak Town. Wealthier households buy bottled water at US$15/m3 about 100 times higher than the average tariff for formalized system. The majority of the population in the town relies on untreated water from open dug wells of over 40 meters deep, boreholes using hand pump and electric pump. Surface water (Sethamouak River) is also used during the rainy season although the turbidity is high. Water shortage in the dry season is a serious threat to the health of the population, particularly the poor households who could not afford to dig wells of over 35-40 meters deep.

Present water supply coverage: **0%**.

On-Site Sanitation

The issue of wastewater and the sanitation in Sethamouak is not different from other small towns in the country: uncontrolled disposal of domestic wastewater, no drainage ditches in the public place such as markets, bus stations, schools or hospitals etc. Some households still have no sanitary latrine.

The town does not have a sludge collection tanker or septage disposal facilities.

Present sanitation coverage: **43%**

Other Infrastructure

Roads and Drains

The Sethamouak town center has about 45% of urban gravel roads also have side drains, but village access roads lack side drains and are often boggy in the wet season. The terrain is relatively flat. Primary drains for the district center discharge to adjoining swamp areas and have limited outlets and poorly defined connecting channels, so that stormwater backs up in the wet season, causing minor flooding of the town.

Electricity

Over 98% of households in the core villages are connected to the electricity grid, which provides 24-hour supply.

- POPULATION GROWTH AND WATER DEMAND FORECASTS

General

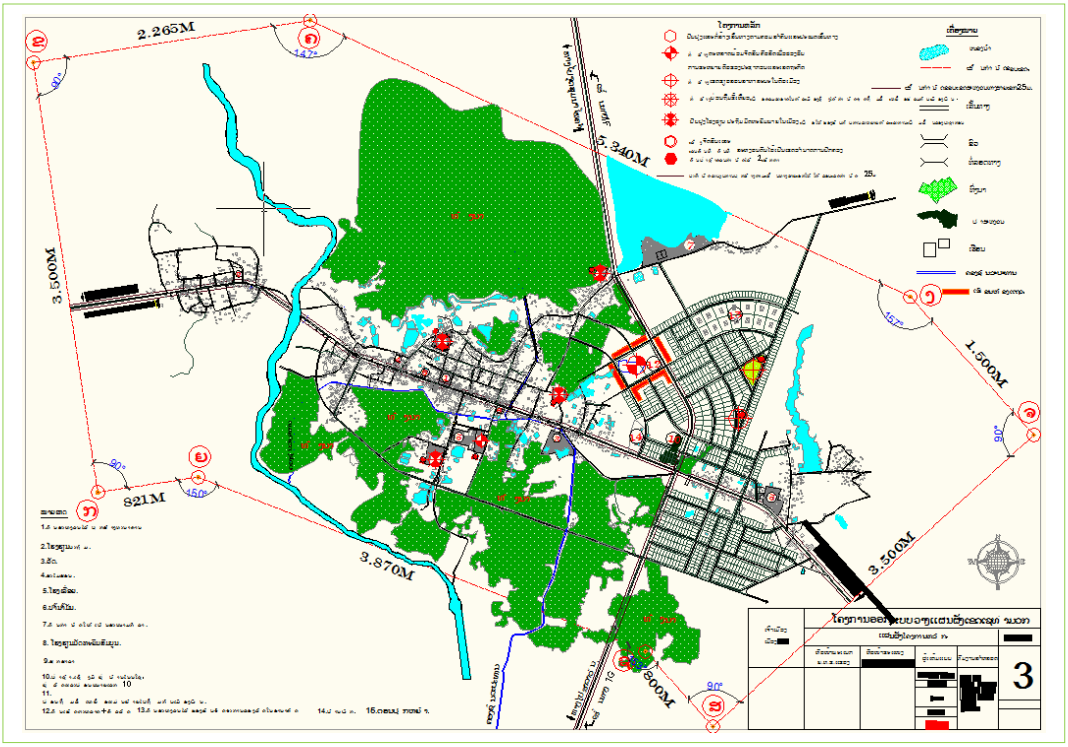
Sethamouak town is the center of services, trade and agriculture in Phine district, which is officially classified as poor district. Phine District is the third largest urban settlement

located in the East-West Economic Corridor, on the junction between the highway No 9 linking the North East of Thailand to the central Part of Viet Nam and the highway No. 23 providing access to the South-East hinder land provinces (Saravane, Attapeu and Sekong).

Rice, water melons and soy beans are Sethamouak's main agricultural products. At present there is no agro-processing or industrial development in Sethamouak.

Urban Master Plan

The Urban Master Plan for Sethamouak was prepared by the Department of Public Work and Transport of Savannakhet in 2016, and was approved by the provincial governor in 2017. The Master Plan is essentially a land use plan, but is based on the following orientation for future development:



Population Projections

The population projections are set out in Table 1-4. Within the core villages, total population is forecast to increase from about 8,956 in 2018 to about 11,358 in 2030.

Table 1-4: Population Projections for Sethamouak's Core Villages

Year 2018 Population	Growth Rate %	Forecast Population 2020	Forecast Population 2025	Forecast Population 2030
8,956	2.00	9,318	10,288	11,358

Water Demand Forecasts

General Approach

Water demand forecasts for the Sethamouak subproject were prepared by making separate projections of each component of demand, including:

Demand for domestic use (based on per capita consumption, coverage targets and population projections);

Demand for industry (based on a % of domestic use, and specific allowances for large industries);

Demand for services (based on a % of domestic use, and specific allowances for large services areas);

Unaccounted-for-water[57] (ufw) as a % of total demand, excluding the demand of large industrial zones.

Production losses in treatment plant (based % of total demands).

Domestic Consumption

Water demand and consumption data for other provincial and district towns in Lao PDR show that domestic consumption accounts for about 90% of total demand. Per capita consumption figures for urban water supply systems in Lao PDR vary widely. For 52 water supply systems throughout the country (excluding Vientiane capital), per capita consumption ranges from 36 to 191 lpcd, with an average of 135 lpcd, while for 31 small town water supply systems, the corresponding figures are 11 to 145 lpcd, with an average of 79 lpcd. (WSD Statistics for PNPs, 2006).

Per capita consumption for Sethamouak's the piped water supply systems (PNP and the private systems) varies from 40 to 80 lpcd, however customers supplement the piped supplies with bottled water and with rainwater in the wet season, so actual consumption is likely to be higher. According to the household surveys, householders estimate that their consumption varies from 30 to 130 lpcd, with an average of 80 lpcd.

Based on Sethamouak household survey results and experience from other projects, per capita consumption for drinking and cooking is about 10 lpcd, while water for bathing and washing is in the order of 50 lpcd. About 4-16 lpcd will be required to operate a pour-flush toilet[58], so per capita consumption for a typical household with pour flush toilet is estimated at 64-76 lpcd. Experience in other towns in Lao PDR indicates that piped connections directly to the house will usually increase water consumption over time. On the other hand, some residents in Sethamoauk will continue to use existing pumped wells and free sources of supply such as rainwater to minimize their overall water supply costs. To account for Sethamoauk having relatively low poverty levels, and a growing number of private businesses, this Feasibility Study has adopted a per capita consumption figure of 80 lpcd, 49 m^3/day for backwashing filters, plus 10% for non-domestic use and 15% for unaccounted for water (ufw).

Water Demand Forecasts

Table 1-4 summarizes the demand forecasts and design criteria for the Sethamouak subproject. By 2030, the average daily water production at the water treatment plant is expected to be 1,200 m^3/day, comprising 78% domestic consumption, with the remaining 22% being for institutions, public use, services, handicraft and small industries, and allowances for NRW and backwashing the filters.

[57] Unaccounted-for-water is the difference between water production and authorized consumption.

[58] In general, pour flush toilets require 1-4 liters of water per flush, including water for washing. Assuming that each member of the household uses the facility 4 times per day, consumption varies from 4-16 lpcd.

Table 1-5: Water Demand Forecasts for Sethamouak Town

No.	Items	Unit	Forecasts			
			2018	2020	2025	2030
A.	Domestic Demand					
1	Growth Rate	%	2.50	2.50	2.50	2.50
2	Population in Core Area		8,956	9,318	10,288	11,358
3	Population in Extension Area	No.				
4	Total Population	No.	8,956	9,318	10,288	11,358
5	Coverage in Core Area	%	-	80	80	80
6	Coverage in Extension Area	%	-	80	80	80
7	Percentage Coverage	%	-	80%	80%	80%
8	Population with Piped Water	No.	-	7,454	8,230	9,087
9	Per Capita Consumption	l/c/d	-	80	80	80
10	Total Domestic Demand	m^3/d	-	596	658	727
B.	Non Domestic Demand					
1	Services, Small Industry, Institutions, Public (% Dom)	%	-	*20*	*20*	*20*
2	Total Non domestic demand	m^3/d	-	119	132	145
C.	Subtotal Water Demand All Categories	m^3/d	-	716	790	872
D.	Non Revenue Water (NRW) in Distribution system					
1	NRW as % Average Daily Water Production	%	-	*15*	*15*	*15*
2	NRW (physical losses only-pipelines and WTP)	m^3/d	-	107	119	131
E.	Average Daily Water Production (C+D) rounded	m^3/d	-	820	910	1,000
F.	Peak Daily Water Demand					
1	Peak Daily Water Demand		-	1.2	1.2	1.2
2	Peak Daily Water Demand (PDD)	m^3/d	-	984	1,092	1,200
3	Peak Daily Water Demand	l/s	-	11.4	12.6	13.9
G.	Required Treatment Plant Output (rounded)	m^3/d	-	980	1,090	1,200
H.	Treatment Plant Backwashing					
1	Backwashing as % of Treatment Plant Output	%	-	*5*	*5*	*5*
2	Treatment Plant Backwashing	m^3/d	-	49	55	60
I.	Raw Water System					
1	Required Capacity of Source & Raw Water System	m^3/d	-	1,029	1,145	1,260
2	Required Source Capacity (rounded)	m^3/d	-	1,030	1,140	1,260
3	Required Source Capacity	l/s	-	11.9	13.2	14.6
J.	Peak Hourly Demand (Distribution System)					
1	Peak Hourly Factor	%	-	1.5	1.5	1.5
2	Peak Hourly Demand (KhxPDD/86.4)	l/s	-	17.9	19.8	21.9

- DESIGN & TECHNOLOGY CHOICE

Introduction

This section outlines design and planning criteria for the Sethamouak water supply system. It also discusses water treatment technology.

Design and Planning Periods

The Project is scheduled for implementation in the period 2019-2021. Sethamouak project the planning has considered development to 2030 (12 year design life), to ensure that: (i) adequate provisions are made in the Project for future expansion; (ii) facilities are optimally sized, and; (iii) adequate land areas are reserved for future facilities. The proposed design horizons for intakes, raw water transmission and water treatment plants were determined by least cost analyses, while design periods for other parts of the system were determined by practical considerations. (e.g. problems and risks associated with future land acquisition and upgrading operating water supply systems in growing urban areas).

Water Treatment Technology

The choice of water treatment technology for Sethamouak is dictated primarily by the raw water quality, operator capacity and financial resources to ensure sustainability. Wet season turbidity of the Sethamouak River is high, and is subject to rapid fluctuations. Slow sand filters and rapid sand filters were considered for possible use in Sethamouak. Although slow sand filters are relatively simple to operate, they require a large land area and require pre-sedimentation and/or sedimentation processes to operate with highly turbid waters. Limited land is available in Sethamouak and the raw water is very turbid. Slow sand filters are not therefore a viable option. Rapid sand filters are the most appropriate system.

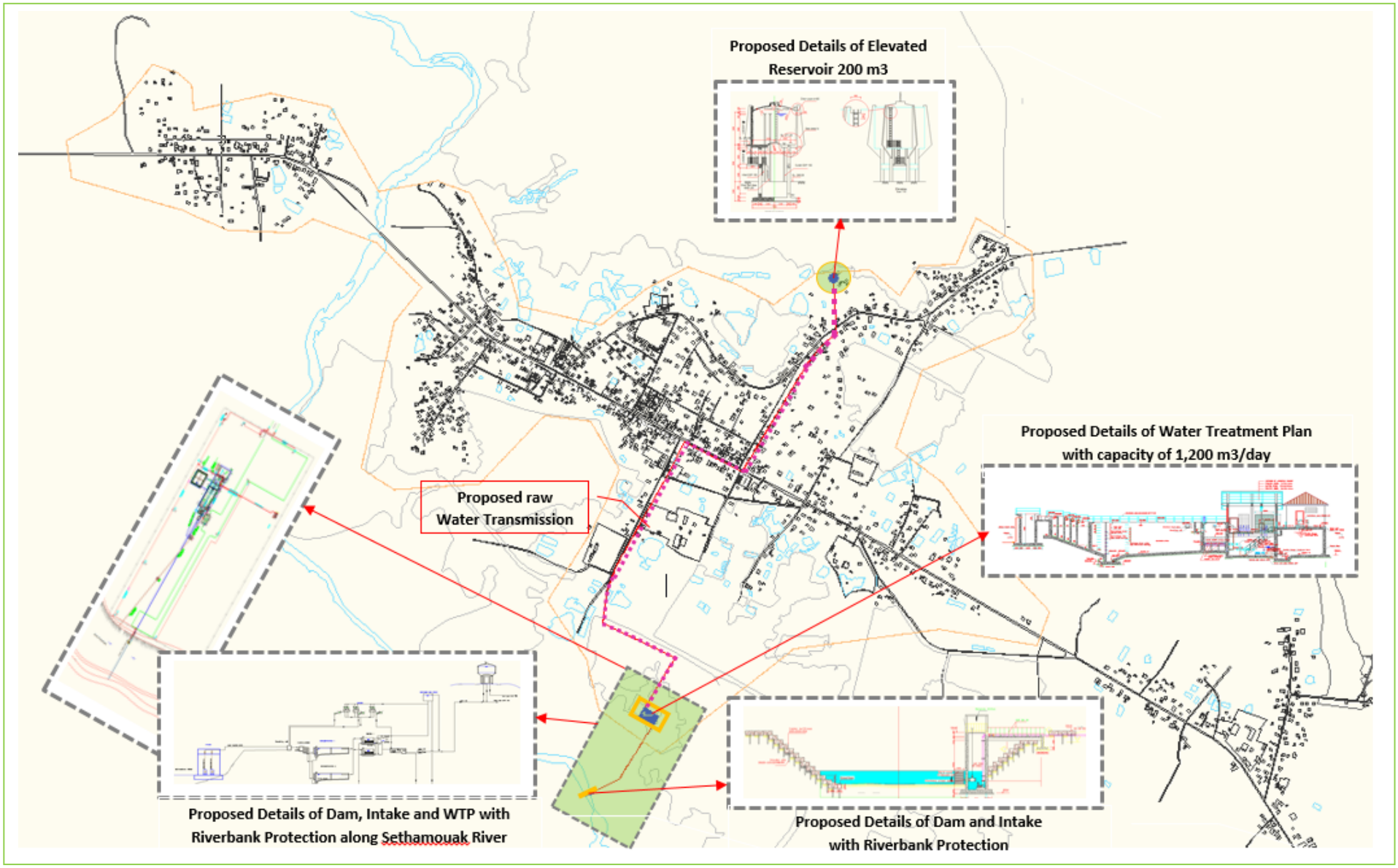

Proposed Details of Elevated
Reservoir 200 m3
Proposed raw
Water Transmission
Proposed Details of Water Treatment Plan
with capacity of 1,200 m3/day
Proposed Details of Dam, Intake and WTP with
Riverbank Protection along Sethamouak River
Proposed Details of Dam and Intake
with Riverbank Protection

Figure 1-3: Proposed Sethamouak WTP Conceptual Design

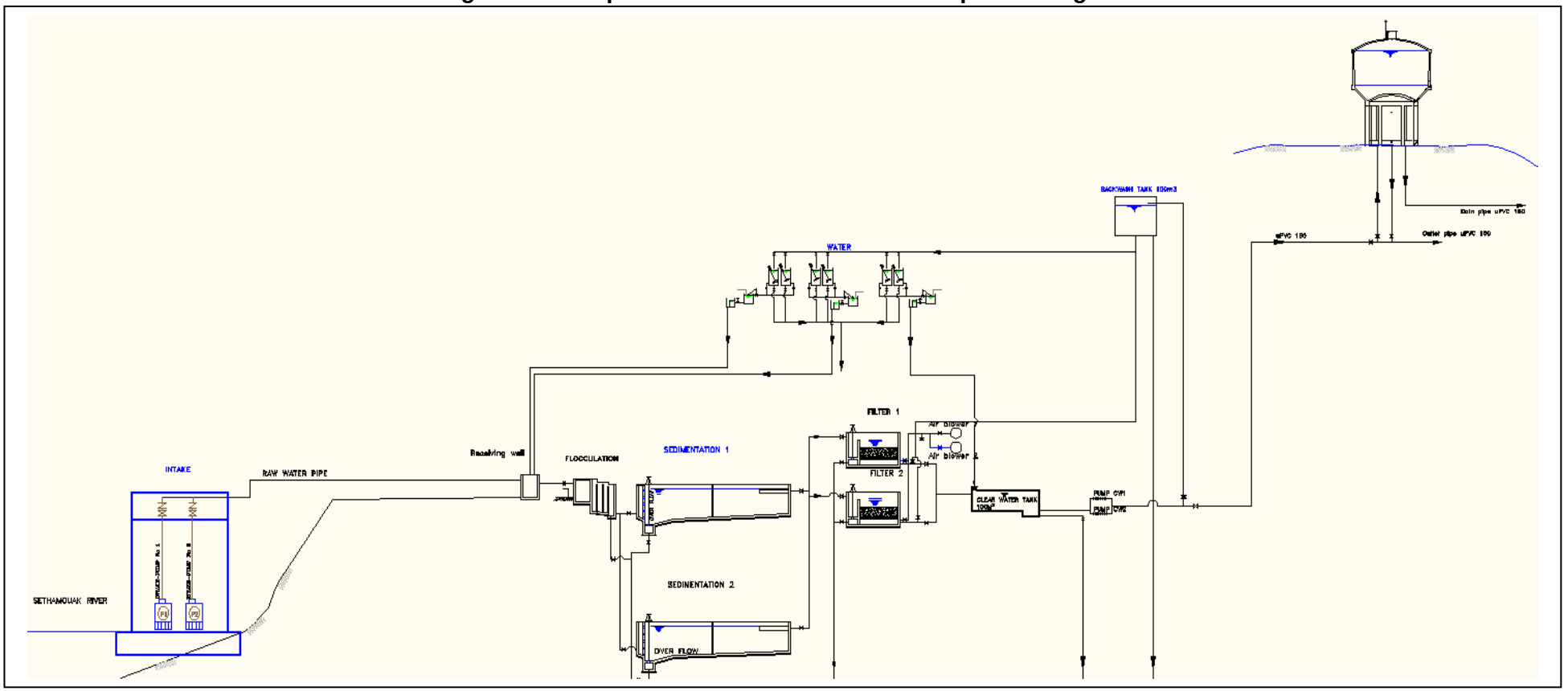


Figure 1-4: Proposed Sethamouak WTP Conceptual Design

Management Arrangements

The new Branch of Nam Papa (BNP) will be establish and responsible for managing, operating and maintaining the new or rehabilitated water supply systems. The Provincial Nam Papa (PNP) in the provincial capital will provide ongoing technical and managerial support to the PNP following commissioning of the new water supply system. It will process/print water bills in the provincial office, and coordinate BNP staff training. The Provincial Public Works and Transport (PWT) will be responsible for managing the new or improved sanitation systems.

- Calculation of Water Tariffs

Project-Specific Tariff

The project-specific tariff was determined using the Average Incremental Financial Cost (AIFC) approach, which is regarded as an approximation of the long-run marginal cost. The average tariff required for full cost recovery of the subproject is Kip 4,551 / m^3. The average tariff required to cover the subproject's full O&M cost and 30% of capital cost is Kip 2,438 / m^3. The long run utility wide average tariff, which will also be applied to the subproject, is Kip 4,997 / m^3 at 2010 price level. The use of utility wide tariff for the subproject does not result to a subsidy for subproject consumers.

Affordability and Willingness to Pay

An affordability analysis was undertaken to ensure that domestic consumers, particularly those in LIG, can afford the projected water tariff levels that meet the financial objectives of the sector. The affordability analysis was done for year 2017, two years after the project is assumed to be operational, and year 2024.

The results of the socio-economic survey revealed that households are willing to pay an average of about Kip 20,000 per month for piped water supply with 43% of respondents willing to pay between Kip 11,000 to Kip 70,000 per month. The analysis above shows that the average monthly water bill in 2017 and 2024, inclusive of the monthly meter rental and turnover tax, are higher than the households' willingness to pay. During this transition period, the PNPs forgive unpaid bills. In addition, it is recommended that the minimum 5m^3/month be eliminated, so that the poor only pay for what they actually use.

- PROJECT ECONOMIC ANALYSIS

General

The economic analysis was carried out for the water supply and sanitation component of the subproject in accordance with the Bank's Guidelines for the Economic Analysis of Projects (1997) and the Bank's Guidelines for the Economic Analysis of Water Supply Projects (1998). The analysis was conducted over a period of 25 years with no salvage value assumed.

Capital costs and incremental operation and maintenance (O&M) costs of the water supply and sanitation system have been considered. Economic costs have been derived from the financial project costs. All costs were expressed in constant (2010) prices. Taxes and duties have been excluded from base costs. Economic costs were valued using the domestic price numeraire and expressed in local currency. Tradable components have been adjusted to economic prices using shadow exchange rate factors (SERF) and non-traded components are valued at domestic market prices. A shadow wage rate factor (SWRF) for unskilled labor has been used to reflect its opportunity costs in the context of wide availability of labor in Lao PDR.

Demand Forecast

Water demand in the subproject town was derived from the current population within the planned service area, population growth, current and future domestic water consumption levels, and a provision for non-domestic water consumption. Reliable data on the amount of water presently consumed by households without piped-water connection in the subproject town is not available. Households typically utilize a variety of water sources and do not measure or assess their consumption. However, based on the socio-economic household survey result as well as observations of water use behavior in the subproject town during the field visits, it is estimated that average daily demand from existing sources of non-piped water ranges between 40 and 70 liters per capita per day (lpcd) depending on the effort and resources needed to acquire the water, and on income levels. Internationally accepted lifeline consumption requirement was estimated to be 40 lpcd.

Per capita water consumption is expected to increase after construction of the piped water supply system, due primarily to (i) the reduced cost of acquiring water, (ii) improved water quality, and (iii) greater convenience and reliability of the piped water supply system. Demand is also a function of changes in price and household income and estimated price and income elasticity were incorporated in the demand forecasts.

- PROJECT BENEFITS AND IMPACTS

Expected Beneficiaries and Benefits

In Sethamouak, the subproject will provide direct and indirect benefits for all people living and working in the 7 core villages of the town. Specifically, this will include up to 10,288 people in 2025 and 11,358 people in 2030.

For people living in Sethamouak, the principal benefits derive from the development of a system of piped, treated water. They include improved convenience and reliability of water supplies for domestic uses in all core villages, as well as increased quantities of water and improved water quality.

Health benefits will result from the provision of safe water and improved household sanitation conditions that reduce the incidence of diarrhea, dysentery, kidney stones and other water-related illness. Other health benefits will include reduced costs for health care and a reduction in work time lost.

The availability of treated water and reliable water supplies may also support the development of economic activities in Sethamouak. About 68% of surveyed households in Sethamouak purchase bottled water for drinking. All households rely partially or entirely on other sources of water for household drinking water, for example, by boiling well water. The availability of treated piped water may result in modest reductions in household expenditures for households that buy water, although this may be offset by increased consumption of water as well as continued purchase of bottled water due to, for example, taste preferences.

Poverty Reduction

The incidence of poverty is very low in the core villages in Sethamouak. Therefore, the poverty reduction benefits are minimal due to the development of the water supply system.

In the case of the small number of poor households in the subproject area, the Project policies help to ensure equitable benefits. Specifically, poor households are entitled to (i) no upfront charges for connection to the water supply system regardless of when they connect, on condition that they pay for a minimum amount of water use; (iii) progressive tariffs based on consumption

levels (to be confirmed); and, (iii) financial assistance to construct or upgrade their sanitation facilities.

The direct benefits of piped water to the house and hygienic latrines that may contribute to reducing poverty levels of poor households include (i) reduced costs for health care due to the availability of clean water and proper sanitation; and, (ii) reduced costs for drinking water, if households substitute boiled piped water for purchased bottled water; and, (iii) increased opportunities for income-generating activities that require a water source (e.g., food processing or a small restaurant) and/or increased profitability of existing activities.

Gender

Everyone surveyed in core villages agreed that the water supply system offers significant benefits for adult women, as well as for men. In addition to improved health, people believe that women and men will both enjoy time savings and reduced workload. That is, the time and effort to get water will be less compared with current practices of getting water from wells or, in villages close to the Sethamouak River, going to the river to wash clothes or bathe. The majority felt that access to piped, treated water would result in greater income-generating opportunities, although the benefit for men was seen to be slightly higher than for women. More than half of respondents indicated that as a result of the water supply system, both girls and boys would have reduced workloads and more time for education.

Women and men in Sethamouak are almost equally involved in community affairs, measured as the percentages of households with active members. Men tend to be involved in activities of the Youth Union, while women participate through the Lao Women's Union. The objective of the Project gender strategy is to build on the interests and strengths of both women and men to be involved in the proposed village-level activities, and to ensure that the views of both groups are taken into consideration in making decisions. Therefore, the following specific gender actions will be undertaken for the Sethamouak subproject.

Environment

Annex 1 contains an initial environmental examination (IEE) for the Sethamouak Town, whose main results are as follows:

- Environmental Impacts and Mitigation Measures
  All the Sethamouak subproject activities during construction and operation phase will take place in both residential and non-residential areas.

  Concerning key areas of environmental relevance, the IEE (i) does not indicate site/design related negative effects, (ii) does not expect permanent adverse impacts on surface and groundwater resources (new dam and intake at the bank of Sethamouak River), and/or land resources (new water treatment component connecting new intake to existing main system mainly on governmental land in and partly along road (Right-of-Way).

  Monitoring of the raw water source should be continued during the operation phase by PNP.

- Environmental Management
  The IEE shows that the implementation of the Sethamouak subproject will not cause any adverse permanent impacts on the environment during construction and operation in the short-, medium- and long term. The minor impacts that are associated with construction and operation of the subproject's water supply system and sanitation facilities can be mitigated without difficulty through proper engineering design and incorporation or application of

recommended mitigation measures and procedures at all stages in accordance with the Environmental Safeguards Management Plan (ESMP) and Health, Safety & Environment Plan (HSEP) both to be included in contract documents as pay-items. There are no risks for human health expected during the construction and operational phases.

Implementation related costs for the ESMP and HSEP during the construction phase are covered by the available project budget. Operation related monitoring costs will have to be allocated in future PNP financial planning.

- **Conclusion and Recommendations**

The Sethamouak subproject's environmental impacts are insignificant, and meet the AF category B2 – Medium risk classification. Therefore, the subproject is judged to be eligible for inclusion in the Project. No further environmental assessment is required beyond the detailed review of the ESMP during implementation the infrastructure works, and the preparation of a HSEP.

Annex 5 – Initial Environmental Examin ation of Infrastructure to be constructed in Sethamouak Town

ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ
ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນາຖາວອນ
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ພະແນກ ໂຍທາທິການ ແລະ ຂົນສົ່ງ
ລັດວິສະຫະກິດ ນ້ຳປະປາແຂວງ
ໂທ: (+856-41) 212047

ເລກທີ: 2930 /ນປປ.ສຂ
ລົງວັນທີ: 07 DEC 2018

IEE SETHAMOUAK TOWN

ການປະເມີນ ຜົນກະທົບສິ່ງແວດລ້ອມ ເບື້ອງຕົ້ນ
ໂຄງການກໍ່ສ້າງ ລະບົບນ້ຳປະປາ ເມືອງ ເຊທ່າມວກ
ແຂວງ ສະຫວັນນະເຂດ ດ້ວຍກຳລັງການຜະລິດ 1,200 ມ^3/ມື້

ຖະໜົນ ລາດສະວົງເສົາ, ບ້ານ ນາເຫລົ່າ
ເມືອງ ນະຄອນໄກ່ສອນພົມວິຫານ, ສປປ ລາວ

ທັນວາ 2018

ສາລະບານ

ສາລະບານຕາຕະລາງ

ສາລະບານຮູບ

1 ພາກສະເໜີ.

1.1 ປະຫວັດຄວາມເປັນມາຂອງໂຄງການ.

ໂຄງການນ້ຳປະປາ ເຊທ່າມວກ ເມືອງ ພີນ ແຂວງ ສະຫວັນນະເຂດ, ແຜນການລົງທຶນຂອງລັດ ປີ2017 ທີ່ໄດ້ຮັບການຊີ້ນຳຈາກກົມນ້ຳປະປາ, ກະຊວງໂຍທາທິການ ແລະ ຂົນສົ່ງ. ໂດຍມອບໃຫ້ພະແນກໂຍທາທິການ ແຂວງສະຫວັນນະເຂດ ເປັນຜູ້ຈັດຕັ້ງປະຕິບັດຈັດການປະມູນຫາບໍລິສັດທີ່ປຶກສາເພື່ອມາປະຕິບັດ ວຽກສຶກສາ ຄວາມເປັນໄປໄດ້ ແລະ ສຳຫຼວດ-ອອກແບບລະບົບນ້ຳປະປາ ເຊທ່າມວກ ເມືອງ ພີນ ເພື່ອສະໜອງນ້ຳສະອາດ ຖືກຫຼັກອານາໄມໃຫ້ແກ່ປະຊາຊົນເຂດດັ່ງກ່າວ ໃນປັດຈຸບັນເທດສະບານເມືອງນັ້ນແມ່ນມີລະບົບນ້ຳທີ່ເຮັດຂຶ້ນເອງ ເຊັ່ນ: ນ້ຳສ້າງຕື້ນ, ນ້ຳສ້າງເລິກ,ນ້ຳບາດານ, ນ້ຳຫ້ວຍ,ໜອງ,ນ້ຳຜາຍຊຶນລະປະທານ,ໃນລະດູແລ້ງແມ່ນຂາດເຂີນ.

ເພື່ອຜັນຂະຫຍາຍແຜນພັດທະນາເສດຖະກິດສັງຄົມຂອງລັດຖະບານ, ແຜນພັດທະນາເສດຖະກິດສັງຄົມ ຂອງແຂວງ ແລະ ວຽກສາມສ້າງໄດ້ຖືກປະຕິບັດເທື່ອລະກ້າວ ໂດຍສະເພາະວຽກງານກໍ່ສ້າງພື້ນຖານໂຄງລ່າງ ດ້ານນ້ຳປະປາກໍ່ເປັນໜຶ່ງໃນແຜນບຸລິມະສິດຂອງຂັ້ນເທິງວາງອອກ.

ໂຄງການດັ່ງກ່າວນີ້ຈະຕອບສະໜອງນ້ຳໃຫ້ແກ່ຜູ້ຢູ່ອາໄສໃນເຂດເທດສະບານເມືອງ ແລະ ໝູ່ບ້ານໃກ້ຄຽງລວມມີ 7 ບ້ານ.

- ອີງຕາມ ແນວທາງຂອງພັກ ແລະ ລັດຖະບານທີ່ເລັ່ງໃສ່ການພັດທະນາທຸກເຂດແຂວງ, ຕົວເມືອງ ແລະ ທ້ອງຖິ່ນໃນທົ່ວປະເທດໃຫ້ຫລຸດພົ້ນອອກຈາກຄວາມທຸກຍາກ ແລະ ຫຼຸດພົ້ນອອກຈາກປະເທດດ້ອຍພັດທະນາໃນປີ 2020.
- ອີງຕາມ ທິດທາງຕາດໝາຍສູ້ຊົນແຕ່ນີ້ຮອດປີ 2020 ຂອງພັກ ແລະ ລັດຖະບານໃຫ້ປະຊາຊົນແຕ່ລະຕົວເມືອງໃນຂອບເຂດທົ່ວປະເທດ80% ໃຫ້ໄດ້ຊົມໃຊ້ນ້ຳປະປາ.

2 ວິທີການສຶກສາ

ວິທີການສຶກສາ ເພື່ອສ້າງບົດລາຍງານການສຶກສາເບື້ອງຕົ້ນ ກ່ຽວກັບ ຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ຂອງ ໂຄງການ ກໍ່ສ້າງລະບົບນ້ຳປະປາ ເຊທ່າມວກ ປະກອບດ້ວຍ: ກະກຽມແບບຟອມເກັບກຳຂໍ້ມູນ, ສ້າງແຜນການ , ວັດຖຸອຸປະກອນທີ່ຈຳເປັນ.

ການລົງສຳຫຼວດ ແລະ ເກັບກຳຂໍ້ມູນສຳພາດ ດ້ານເສດຖະກິດ-ສັງຄົມ ແລະ ສະພາບແວດລ້ອມທຳມະຊາດ ຂອງພື້ນທີ່ໂຄງການ, ກຳນົດຈຸດຄວບຄຸມ ຄ່າພິກັດ (Coordinate) ແລະ ຄ່າລະດັບ (Elevation) ເພື່ອນຳໃຊ້ເຂົ້າໃນການຄົດໄລ່, ອອກແບບ ແລະ ປັກຫຼັກໝາຍກໍ່ສ້າງ.

ເກັບກຳຂໍ້ມູນ ສະພາບພູມມີປະເທດ (Topographic) ຕາມທາງຮາບ, ຂໍ້ມູນຕັດຍາວ, ຂໍ້ມູນຕັດຂວາງ ແລະ ຂໍ້ມູນ ທໍລະນີສາດ ຂອງພື້ນທີ່ ທີ່ຕັ້ງໂຄງການເຊັ່ນ :ໂຄງສ້າງ ,ອາຄານ ແລະ ອົງປະກອບອື່ນໆ ທີ່ມີຢູ່ແລ້ວ ພ້ອມດ້ວຍສະ ພາບພື້ນທີ່ ທີ່ຈະຂະຫຍາຍຕື່ມ ຫຼືຈຸດທີ່ຕ້ອງການສ້ອມແປງ ຢ່າງລະອຽດ. ເພື່ອນຳໃຊ້ເຂົ້າໃນການຄົດໄລ່ ຈັດວາງແຜນຜັງ, ວິເຄາະໂຄງສ້າງ ແລະ ອອກແບບ.

ອຸປະກອນສຳຫຼວດປະກອບມີ:

- ເຄື່ອງວັດແທກ ຄ່າພິກັດ ແລະ ຄ່າລະດັບ (GPS Garmin 60CSx)
- ກ້ອງ Total station Leica TS02
- ກ້ອງ Leveling instrument SOKKIA
- ແມັດ Measuring tape
- ແບບຟອມການເກັບກຳຂໍ້ມູນຕ່າງໆ

- ວິສາວະກອນສຳຫຼວດ

ການຈັດວາງຂໍ້ມູນ, ວິເຄາະຄົດໄລ່ ແລະ ແຕ້ມແບບ ແມ່ນນຳໃຊ້ Excel, Auto Land development ແລະ AutoCAD program.

ສະນັ້ນ ,ຈຶ່ງສາມາດປະເມີນຜົນກະທົບ ລະບຸ ,ປະເມີນ ແລະ ກຳນົດມາດຕະການຫຼຸດຜ່ອນຜົນກະທົບຂອງໂຄງການ

3 ສະພາບສິ່ງແວດລ້ອມທຳມະຊາດ ແລະ ສັງຄົມໃນປັດຈຸບັນ

3.1 ທາງກາຍຍະພາບ

3.1.1 ສະພາບອາກາດ

ສປປ ລາວ ຢູ່ໃນພູມອາກາດຂອງເຂດຮ້ອນ, ມີລົມມໍລະສຸມ ແຕ່ບໍ່ມີພາຍຸ, ສຳລັບເຂດພູດອຍພາກເໜືອ ແລະ ເຂດສາຍພູຫຼວງອາກາດ ມີລັກສະນະເຄິ່ງຮ້ອນເຄິ່ງໜາວ ອຸນຫະພູມສະລີ່ຍ ສະເລ່ຍປະຈຳປີສູງເຖິງ 15-30 ອົງສາເຊ, ການຜົກຕ່ຽງອຸນຫະພູມລະຫວ່າງກາງເວັນ ແລະ ກາງຄືນມີປະມານ 10 ອົງສາເຊ. ຈຳນວນຊົ່ວໂມງ ທີ່ມີແສງແດດຕໍ່ປີປະມານ 2,300-2,400 ຊົ່ວໂມງ (ປະມານ 6.3-6.5 ຊົ່ວໂມງຕໍ່ມື້), ຄວາມຊຸ່ມຊື່ນ ສຳພັດຂອງອາກາດ ມີປະມານ 70 - 85%, ປະລິມານ ນ້ຳຝົນໃນປີນີ້ແທກໄດ້ 1,076.8 ມມ.

ຕາຕະລາງ1: ຄວາມຊຸ່ມຊື່ນສະເລ່ຍ ສູງສຸດ-ຕ່ຳສຸດໃນແຕ່ລະປີ.

	ສະຖານີອຸຕຸນິຍົມ							
	Meteorology Station							
ປີ	ຫຼວງພະບາງ		ນຄ. ວຽງຈັນ		ສະຫວັນນະເຂດ		ປາກເຊ	
Year	Luangprabang		Vientiane Capital		Savannakhet		Pakse	
	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ
	Max	Min	Max	Min	Max	Min	Max	Min
2010	33.40	20.70	32.20	22.90	32.30	21.30	33.10	23.90
2011	31.38	20.07	30.83	22.37	30.72	20.56	31.89	22.64
2012	32.78	21.05	32.04	23.68	31.99	21.95	32.98	23.64
2013	32.10	20.40	31.80	23.10	31.50	21.70	32.60	23.00
2014	32.60	20.40	32.10	23.10	32.00	21.90	32.60	22.90

ແຫລ່ງຂໍ້ມູນ : ກົມອຸຕຸນິຍົມ ແລະ ອຸທົກກະສາດ, ກະຊວງ ຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ(http://www.lsb.gov.la/Meteorology14.php)

ຕາຕະລາງທີ 2: ຈຳນວນຊົ່ວໂມງແສງແດດ ໃນແຕ່ລະປີ.

	ສະຖານີອຸຕຸນິຍົມ							
	Meteorology Station							
ປີ	ຫຼວງພະບາງ		ນຄ. ວຽງຈັນ		ສະຫວັນນະເຂດ		ປາກເຊ	
Year	Luangprabang		Vientiane Capital		Savannakhet		Pakse	
	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ	ສູງສຸດ	ຕ່ຳສຸດ
	Max	Min	Max	Min	Max	Min	Max	Min
2010	95.00	49.00	90.00	55.33	94.00	56.00	85.00	53.00
2011	95.67	54.45	90.00	57.55	94.00	58.62	85.57	54.67
2012	95.74	52.65	89.94	58.02	93.66	57.01	87.25	54.84
2013	96.00	63.00	89.00	58.00	94.00	56.00	88.00	52.00
2014	95.00	48.00	89.00	56.00	94.00	57.00	88.00	55.00

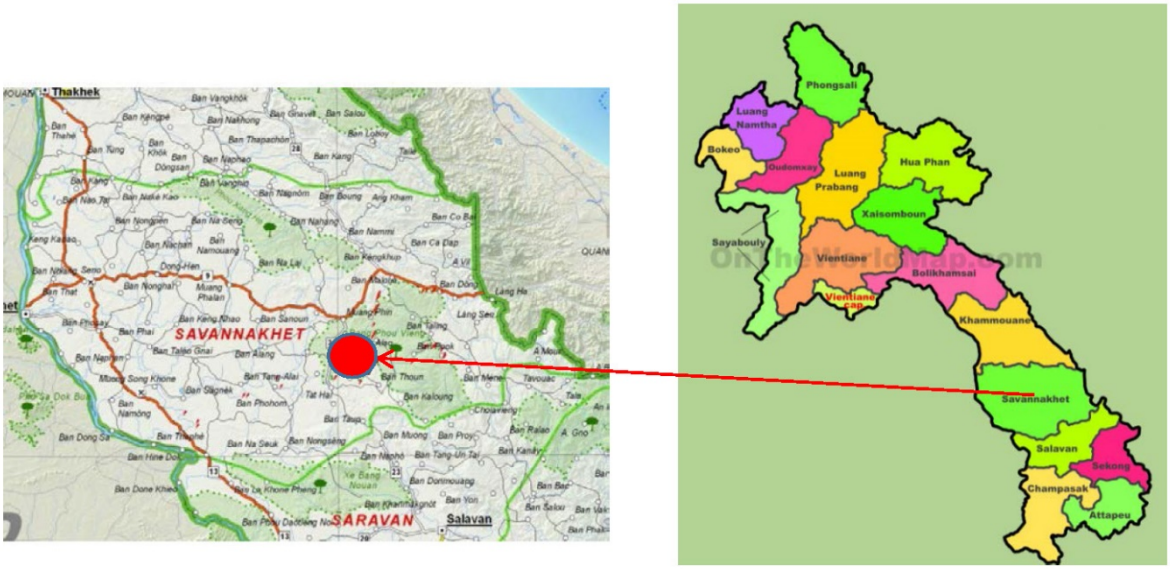
ແຫລ່ງຂໍ້ມູນ : ກົມອຸຕຸນິຍົມ ແລະ ອຸທົກກະສາດ, ກະຊວງ ຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ (http://www.lsb.gov.la/Meteorology14.php)

3.1.2 ພູມສັນຖານ

ເມືອງ ຜິນ, ເຂດເຊ່ທ່ານວກ ຕັ້ງຢູ່ທາງທິດຕາເວັນອອກສ່ຽງເໜືອຂອງແຂວງ ສະຫວັນນະເຂດ ມີໄລຍະຫ່າງຈາກແຂວງ ປະມານ 150 ກິໂລແມັດ, ມີເນື້ອທີ່ທັງໝົດ 2,699.40 ກິໂລຕາແມັດ, ໃນປີ2017 ມີ ພົນລະເມືອງທັງໝົດ ຈຳນວນ **67,184** ຄົນ, ຍິງ **33,861** ຄົນ ມີຄົວເຮືອນທັງໝົດ 10,264 ຄົວເຮືອນ, ປະກອບມີ 1 ຈຸດສຸມຂອງແຂວງ, ຈຸດສຸມຂອງເມືອງ, ມີ 15ກຸ່ມບ້ານ ແລະ 100 ບ້ານ, ມີ 04 ຊົນເຜົ່າຕົ: ຊົນເຜົ່າລາວ 15,46%, ເຜົ່າມະກອງ 18,64%, ເຜົ່າກະຕາງ 45,14%, ເຜົ່າ ຜູ້ໄທ 20,72%, ເຜົ່າບຣູ 0.03%, ລວມກວມ 100 % .

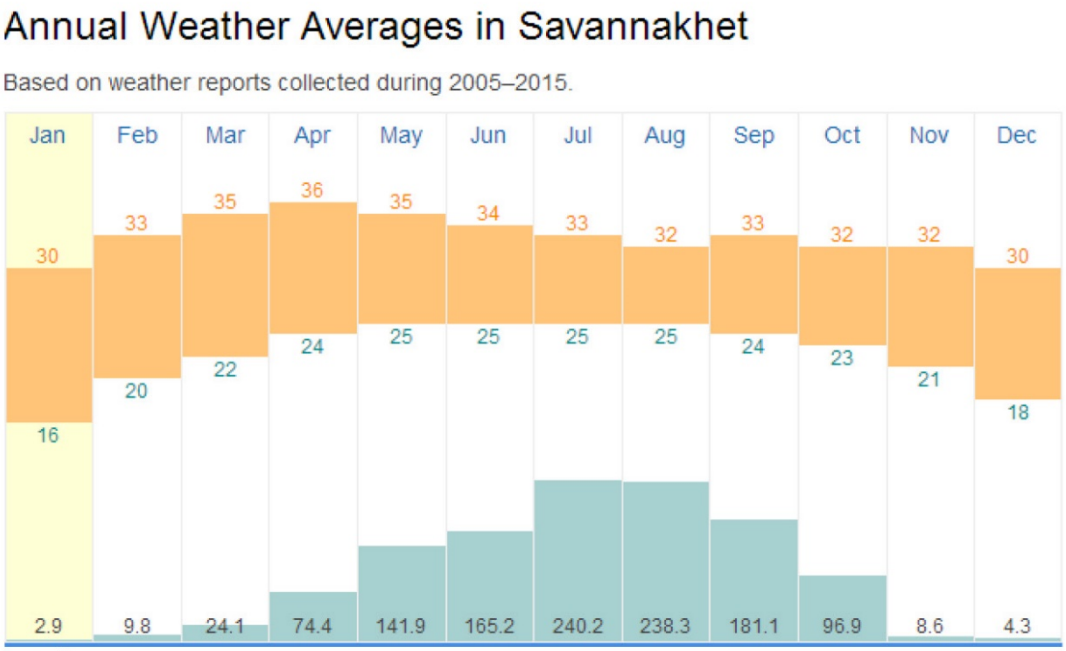
- ທິດເໜືອຕິດກັບ : ເມືອງວິລະບຸລີ
- ທິດຕາເວັນຕົກຕິດກັບ : ເມືອງຕຸ້ມລານໄຊ, ເມືອງຊົນນະບຸລີ, ເມືອງທ່າປາງທອງ
- ທິດໃຕ້ຕິດກັບ : ເມືອງຕຸ້ມລານ ແຂວງສາລະວັນ
- ທິດຕາເວັນອອກຕິດກັບ : ເມືອງ ເຊໂປນ

ຮູບທີ 1: ລັກສະນະພູມສັນຖານບໍລິເວນໂຄງການ



3.1.3 ປະລິມານນ້ຳຝົນ

ແຂວງ ສະຫວັນນະເຂດ ແມ່ນນອນຢູ່ໃນເຂດພູມອາກາດລົມມໍລິຊຸມ ເຊິ່ງປະກອບມີ 2ລະດູແຕກຕ່າງກັນ ເຊັ່ນ :ລະດູແລ້ງ ແລະ ລະດູຝົນ ,ລະດູແລ້ງເລີ່ມແຕ່ເດືອນທັນວາ ແລະ ສຸດລົງໃນເດືອນເມສາ ,ລະດູຝົນ ເລີ່ມແຕ່ເດືອນມິຖຸນາ ຫາ ເດືອນຕຸລາ ສ່ວນເດືອນພຶດສະພາ ຫາ ເດືອນພະຈິກ ເປັນເດືອນຂ້າມຜ່ານຈາກລະດູໜຶ່ງ ຫາ ອີກລະດູໜຶ່ງ. ໃນຊ່ວງລະດູແລ້ງອາກາດມີການປ່ຽນແປງ ແລະ ແຕກຕ່າງກັນຫຼາຍ ລະຫວ່າງເດືອນທັນວາ ຫາ ເດືອນກຸມພາ ພູມອາກາດຈະໜາວເຢັນ ຫຼັງຈາກນັ້ນອາກາດຈະຮ້ອນເອົ້າຈົນຮອດຕົ້ນເດືອນພຶດສະພາ. ສະເລ່ຍປະລິມານນ້ຳຝົນ ໄດ້ສະແດງໄວ້ໃນເສັ້ນສະແດງລຸ່ມນີ້:



ແຫຼ່ງຂໍ້ມູນ: https://www.timeanddate.com/weather/laos/savannakhet/climate

3.1.4 ແຫຼ່ງນ້ຳ

ແຫຼ່ງນ້ຳທຳມະຊາດໃນບໍລິເວນໂຄງການທີ່ປະຊາຊົນໃຊ້ໃນການບໍລິໂພກປະກອບມີ ນ້ຳໜ້າດິນ, ນ້ຳໃຕ້ດິນ (ນ້ຳບາດານ, ນ້ຳສ້າງ) ນ້ຳເຊ ແລະ ນ້ຳຫ້ວຍ.

3.1.4.1 ນ້ຳໜ້າດິນ

ຈາກການລົງສຳຫຼວດເກັບກຳຂໍ້ມູນຕົວຈິງ ໃນເຂດໂຄງການສຳລັບແຫຼ່ງນ້ຳດິບທີ່ຈະປ້ອນເຂົ້າໂຮງງານຜະລິດນ້ຳປະປາແມ່ນເຮົາໄດ້ສຶກສາຢູ່ 03 ທາງເລືອກຄື: ນ້ຳຝາຍຊົນລະປະທານ, ຫ້ວຍເຊທ່າມວກ ແລະ ນ້ຳບາດານ, ແຕ່ມີພຽງໜຶ່ງທາງເລືອກເທົ່ານັ້ນ ທີ່ສາມາດສະໜອງນ້ຳໃຫ້ແກ່ການຜະລິດໄດ້ຕະຫຼອດປີຄື: ນ້ຳຈາກເຊທ່າມວກ ທີ່ດີບໍ່ມີຄວາມຂຸ່ນສູງ, ປະລິມານນ້ຳແມ່ນມີພຽງພໍຕະຫຼອດປີຖ້ຳເຮັດເຄື່ອນ. ເປັນແຫຼ່ງນ້ຳດິບເພື່ອປ້ອນເຂົ້າໂຮງງານຜະລິດນ້ຳປະປາ, ເພື່ອໃຫ້ປະຊາຊົນໄດ້ໃຊ້ນ້ຳທີ່ສະອາດ ແລະ ປອດໄພ.

ຮູບທີ 2: ນ້ຳເຊທ່າມວກ

3.1.5 ອັດຕາການໄຫຼຂອງນ້ຳ

ຝາຍເຊຫົ່າມວກ ຈະສ້າງເປັນເຂື່ອນຫີນແບບກັນຊຶມເພື່ອກັກເກັບນ້ຳໂດເຂື່ອນຍາວ 1,00 ແມັດ, ສູງ 2 ແມັດ ໃນເນື້ອທີ່ 2 ພັນກວ່າເຮັກຕາ, ອ່າງໂຕ່ງມີບໍລິມາດເກັບນ້ຳໄດ້ 75 ລ້ານກວ່າແມັດກ້ອນ, ສາມາດສະໜອງນ້ຳໄດ້ຕະຫຼອດປີ ເຊິ່ງມີອັດຕາການໄຫຼ 3.07 ມ^3/ວິນາທີ.

3.1.6 ຄຸນນະພາບນ້ຳ

ຈາກຜົນວິໄຈຕົວຢ່າງ ນ້ຳເຊຫົ່າມວກ ເຫັນໄດ້ເຖິງຄຸນນະພາບຂອງນ້ຳເຊິ່ງມີຄວາມຂຸ່ນ 140 NTU ຄ່າ pH=7.95 ເຊິ່ງຕາມມາດຕະຖານແລ້ວຄ່າ pH ທີ່ຍອມຮັບໄດ້ແມ່ນ pH= 5-9 ນັ້ນສະແດງໃຫ້ເຫັນວ່າ ຄຸນນະພາບຂອງນ້ຳເຊຫົ່າມວກ ມີສັກກະຍະພາບພຽງພໍໃນການຜະລິດນ້ຳປະປາ.

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Water Analysis report

Vientiane Capital City
NamPaPa Nakhonluang
Chinaimo Water Treatment Plant Laboratory
Tel.:312564 or Mobile 2204693

Sampling Place: ລັດວິສະກະກິດນ້ຳແລະສິ່ງແວດລ້ອມ
Location: ແຂວງ ສະຫັວນນາເຂດ.

Testing Date: 04/12/2018

N.	Description of analysis	units	Results			Surface water Quality Standards
	Sampling of Number		N.1	N.2	N.3	
	Sampling Name		[illegible]	[illegible]	[illegible]	
1.	Turbidity	NTU	375.0	140.0	61.3	N'
2.	Color	CU	266.0	90.0	X	N'
3.	Odor	-	soil	soil	X	N'
4.	pH(value)	-	8.07	7.95	7.90	5~9
5.	M. Alkalinity ($CaCO_3$)	mg/l	x	x	90.0	-
6.	Ammonia ion (NH_4^+)	mg/l	x	x	1.30	-
7.	Total Hardness ($CaCO_3$)	mg/l	86.0	98.0	X	-
8.	E.Coli	MPN /100ml	5/5	5/5	5/5	-
9.	Total Suspended Solids(TSS)	mg/l	294.0	274.0	X	-
10.	Calcium (Ca)	mg/l	19.2	36.0	x	-

Remarks:. N.D= Non Detection.

Laboratory: Ms Khonesavanh.K

Chief Chinaimo WTP: ຄຳເພື່ອງ ມະນີວັນ

General Manager NPNL: ວຽງທວາຍ ວັນນະລາດ

3.1.7 ລະບົບນິເວດ

ຂອບເຂດຂອງໂຄງການຢູ່ພາຍໃຕ້ການສະໜັບສະໜຸນ ແລະ ສິ່ງເສີມ ການພັດທະນາການທ່ອງທ່ຽວ, ດ້ານນອກຈາກນັ້ນ ບັນດາໜອງນ້ຳ, ຫ້ວຍ ຕ່າງໆທີ່ຢູ່ໃນເຂດດັ່ງກ່າວຍັງສາມາດນຳໄປໃຊ້ໃນການເພີ່ມການຜະລິດນ້ຳ ແລະ ປ່າທີ່ມີຢູ່ຕາມລະບົບນິເວດໃຫ້ມີການເຕີບໃຫ່ຍ, ການປົກປັກຮັກສາຢ່າງລະມັດລະວັງເຊິ່ງເປັນຜົນດີ ຕໍ່ກັບການປະມົງ ແລະ ການພັດທະນາການທ່ອງທ່ຽວ.

ສຳລັບການປົກປັກຮັກສາສິ່ງແວດລ້ອມ, ນ້ຳເປື້ອນ ແລະ ຂີ້ເຫຍື້ອຈະຕ້ອງມີການຄວບຄຸມຢ່າງເຄັ່ງຄັດໃນຂະບວນການບຳບັດກ່ອນທີ່ຈະມີການປ່ອຍອອກສູ່ສິ່ງແວດລ້ອມ.

3.2 ຊັບພະຍາກອນທຳມະຊາດ

3.2.1 ຊັບພະຍາກອນປ່າໄມ້

ສະຫວັນນະເຂດເປັນແຂວງໜຶ່ງທີ່ອຸດົມສົມບູນໄປດ້ວຍຊັບພະຍາກອນທຳມະຊາດ ພູຜາປ່າໄມ້. ນອກນີ້ຍັງມີປ່າສະຫງວນເຊັ່ນ: ປ່າສະຫງວນແຫ່ງຊາດດົງພູວຽງ, ປ່າສະຫງວນແຫ່ງຊາດເຊບັ້ງນວນ, ປ່າສະຫງວນແຫ່ງຊາດພູຊ້າງແຫ່. ພູຊ້າງແຮ່ເປັນສາຍພູຫີນ ແລະ ເປັນຖິ່ນຖານອາໄສຂອງຊາວຜູ້ໄທ, ດົງພູວຽງເປັນທີ່ຮູ້ຈັກກັນວ່າເປັນປ່າເກົ່າແກ່ທີ່ມຕົ້ນໄມ້ສູງໃຫ່ຍ, ບຶງສັກສິດ ແລະ ພະທາດອີ່ຮັງ. ນອກຈາກນັ້ນຍັງມີສັດທີ່ໃກ້ສູນພັນເຊັ່ນ: ໂອ່ງ, ຄ່າງເງິນ ແລະ ນົກແກ໋ງເຊິ່ງພົບເຫັນໄດ້ຍາກໃນເຂດປ່າສະຫງວນແຫ່ງອື່ນໆ.

3.2.2 ຊີວະນາໆພັນ-ສັດປ່າ ແລະ ພືດພັນຫາຍາກ

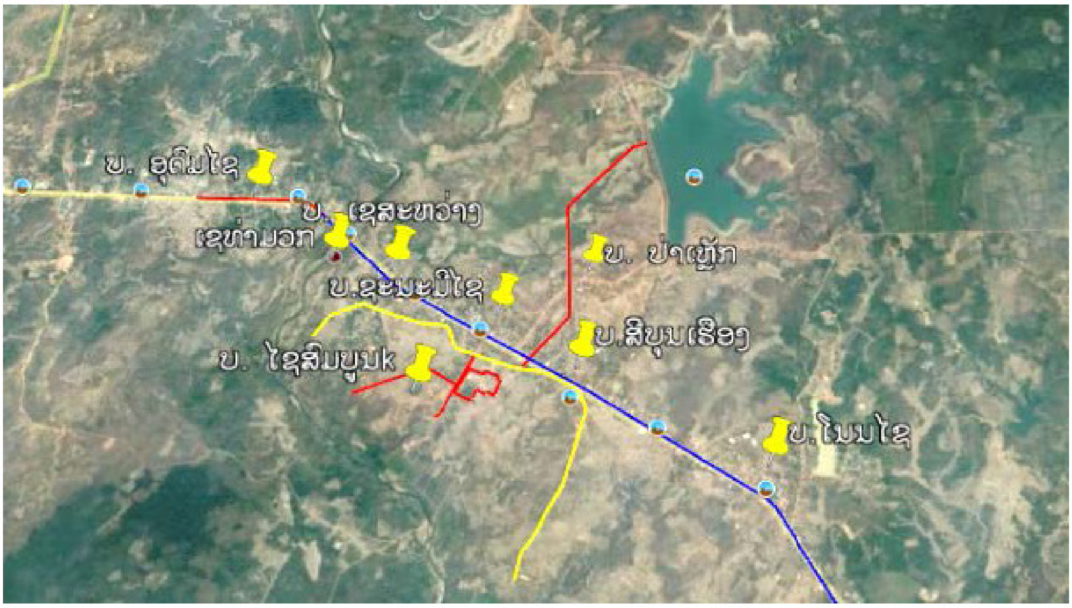
ແຂວງ ສະຫວັນນະເຂດ ເປັນແຂວງ ທີ່ມີອາກາດຮ້ອນ ,ແຫ້ງແລ້ງ ເຊິ່ງເປັນສາເຫດອັນສຳຄັນທີ່ເຮັດໃຫ້ມີຜົນກະທົບຕໍ່ສິ່ງທີ່ມີຊີວິດ .ເຂດປ່າຜະລິດແມ່ນເປັນແຫຼ່ງຜະລິດອາຫານໃຫ້ແກ່ຊຸມຊົນເປັນການສ້າງຜົນກຳໄລໃຫ້ແກ່ຄອບຄົວ ແລະ ທັ້ງເປັນບ່ອນຫາຢູ່ຫາກິນຂອງປະຊາຊົນເປັນຕົ້ນແມ່ນ :ຫໍ່ໄມ້ ,ຜັກ ,ເຫັດ.....ໆລໆ ຕາມແຕ່ລະຖຸການ.

4 ລາຍລະອຽດຂອງໂຄງການ

4.1.1 ທີ່ຕັ້ງ ແລະ ເຂດບໍລິການຂອງໂຄງການ

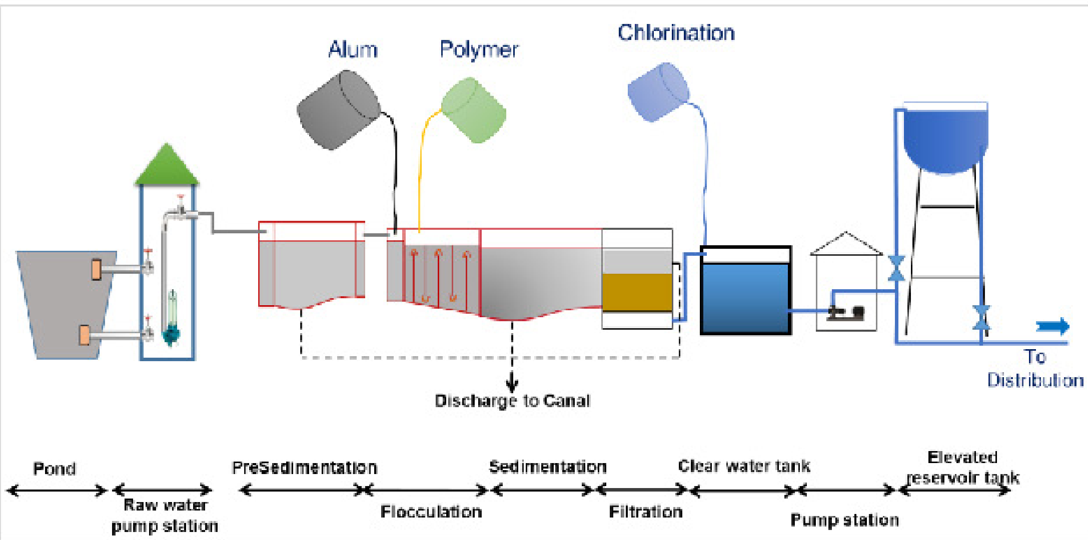
ໂຄງການນີ້ຕັ້ງຢູ່ເມືອງ ຜິນ, ເຂດເຊທ່າມວກ, ແຂວງ ສະຫວັນນະເຂດ, ມີຈຸດທີ່ຕັ້ງຂອງໂຮງງານຂຶ້ນກັບການປົກຄອງຂອງບ້ານ ເທດສະບານເຊທ່າມວກ ໂຄງການດັ່ງກ່າວ ພວກເຮົາໄດ້ສຶກສາຄວາມເປັນໄປໄດ້ທາງດ້ານເສດຖະກິດ-ສັງຄົມ, ທາງດ້ານເຕັກນິກຕ່າງໆ. ການຄັດເລືອກແຫຼ່ງນ້ຳແມ່ນໄດ້ສຶກສາເອົານ້ຳຈາກເຊທ່າມວກ, ເພາະມີປະລິມານນ້ຳທີ່ສາມາດຕອບສະໜອງໄດ້ຕະຫຼອດປີ ສ່ວນລະບົບໂຮງງານແມ່ນຕັ້ງຢູ່ບໍລິເວນດິນລວມຂອງບ້ານ ນ້ຳທີ່ຜະລິດອອກຈາກລະບົບໂຮງງານແມ່ນປ່ອຍໃຫ້ນ້ຳໄຫຼເຂົ້າຫາອ່າງເກັບນ້ຳສະອາດ (ອ່າງເກັບນ້ຳໃຕ້ດິນ). ແລ້ວໃຊ້ປ້ຳສົ່ງຫາເຂດບໍລິການຖ້າເຫຼືອໃຊ້ແມ່ນຂື້ອນອ່າງນ້ຳສູງ ເຊິ່ງເຂດບໍລິການຂອງໂຄງການແມ່ນກວມເອົາ 7 ບ້ານຄື: ບ. ໄຊອຸດົມ, ບ. ເຊສະຫວ່າງ, ບ. ໄຊສົມບູນ, ບ. ສີບຸນເຮືອງ, ບ. ຊະນະມີໄຊ, ບ. ປ່າຫຼັກ ແລະ ບ. ໂນນໄຊ.

ຮູບທີ3: : ແຜນຈຸດທີ່ຕັ້ງ ແລະ ຂອບເຂດຂອງໂຄງການ



4.2 ອົງປະກອບ ແລະ ຂະບວນການຜະລິດ.

ໂຄງການກໍ່ສ້າງລະບົບນໍ້າປະປາເມືອງ ພີນ ເຂດເຊທ່າມອກ, ມີກຳລັງການຜະລິດ 1,000 ມ^3/ມື້ ມີອາຍຸການນຳໃຊ້ສູງສຸດ 15 ປີ ເຊິ່ງມີອົງປະກອບ ແລະ ຂະບວນການຜະລິດ ດັ່ງນີ້; ສາຍທໍ່ແຈກ. ໃຊ້ປໍ້າສູບສົ່ງນໍ້າດິບຈາກສະຖານີສູບນໍ້າດິບ - ລະບົບສາຍທໍ່ສົ່ງ - ລະບົບໂຮງງານຜະລິດນໍ້າ, ຫຼັງຈາກນໍ້າໄດ້ຜ່ານການກອງ ແລະ ຂ້າເຊື້ອແລ້ວ - ປໍ້າສູບສົ່ງເຂົ້າຫາເຂດບໍລິການເຫຼືອໃຊ້ແມ່ນເກັບມ້ຽນອ່າງນໍ້າສູງ ມີລາຍລະອຽດດັ່ງນີ້:



ຮຸບທີ 4: ອົງປະກອບ ແລະ ຂະບວນການຜະລິດນ້ຳປະປາ

4.2.1 ລະບົບຫົວງານ

ສຳລັບການສ້າງສະຖານີສູບນ້ຳດິບ (ຫົວງານ) ແມ່ນຈະໄດ້ສຶກສາຢຸ່ 02 ທາງເລືອກ ເພື່ອຊອກຫາທາງເລືອກທີ່ ເໝາະສົມສຳລັບການເລືອກສະຖານທີ່ຕັ້ງລະບົບຫົວງານ. ດັ່ງທີ່ໄດ້ສະເໜີໃນບົດສຶກສາຄວາມເປັນໄປໄດ້ຂອງໂຄງການ ເຊິ່ງໃນບົດສຶກສາແມ່ນໄດ້ເລືອກເອົາທາງເລືອກທີ 01 ເປັນສະຖານທີ່ຈະສ້າງເປັນສະຖານີສູບນ້ຳຄື: ເຮັດເປັນລະບົບແບບນ້ຳສ້າງບໍລິເວນແໜ່ງນ້ຳ ແລ້ວໃຊ້ທໍ່ສົ່ງນ້ຳດິບເຂົ້າຫາສ້າງ ຈາກນັ້ນແມ່ນດຶດນ້ຳດິບຂຶ້ນຫາໂຮງງານຜະລິດນ້ຳ.

ສະຖານີດຶດນ້ຳ (ຫົວງານ) ແມ່ນໃຊ້ລະບົບຫໍຄອຍ (Intake) ຢຸ່ນ້ຳຂອງ ໂດຍໃຊ້ປ້ຳ 02 ໜ່ວຍ (ໜຶ່ງໜ່ວຍເຮັດວຽກສະລັບກັນ), ຊຶ່ງຈະສຸບສົ່ງຂຶ້ນຫາໂຮງງານຜະລິດນ້ຳໂດຍກົງ.

4.2.2 ຂະບວນການສ້າງຕະກອນ

ສຳລັບການອອກແບບ ລະບົບປະສົມໄວ ແມ່ນໃດ້ອອກແບບຕິດຕັ້ງ Parshall flume ຂະໜາດ ຄວາມ ກ້ວາງ ຂອງ ຊ່ວງຄອງ ເທົ່າກັບ 25 mm.

ນ້ຳດິບທີ່ໄຫຼຜ່ານຊ່ວງຄອງດັ່ງກ່າວນີ້ຈະເກີດມີການໄຫຼແບບມຸນວຽນ (Turbulent flow) ດ້ວຍ ຄ່າຂອງ G ປະມານ 700-1000/s.

ຂະບວນການສ້າງຕະກອນປະກອບດ້ວຍ 3 ອ່າງ ຄື ອ່າງຮັບນ້ຳດິບ (Receiving well), ອ່າງປະສົມໄວ (Rapid mixing tank) ແລະ ອ່າງກວນຊ້ຳ (Slow mixing tank).

ອ່າງຮັບນ້ຳດິບ (Receiving Well): ເປັນອ່າງທີ່ຖືກອອກແບບໃຫ້ຮັບນ້ຳທີ່ຖືກປ້ຳສົ່ງມາ ນ້ຳຂອງ ກ່ອນປ່ອຍເຂົ້າສູ່ໂຮງງານ ກ່ອນເຂົ້າສູ່ອ່າງປະສົມໄວ.

ອ່າງປະສົມ (Mixing tank): ອ່າງປະສົມນ້ຳດິບກັບສານສົ້ມທີ່ໄຫຼຜ່ານມາຈາກອ່າງຮັບນ້ຳດິບ ຊຶ່ງຈະໃຊ້ລະບົບຕີດ້ວຍແຮງນ້ຳ.

ອ່າງກວນໄວ (Rapid Mixing Tank - Coagulation): ສານເຄມີ ທີ່ຊ່ວຍໃນການຕົກຕະກອນໄດ້ຖືກຕື່ມເຂົ້າໃນອ່າງກວນໄວ ເພື່ອໃຫ້ຕະກອນທີ່ໄຫຼມານຳນ້ຳຈັບຕົວກັນເປັນຕະກອນທີ່ມີຂະໜາດໃຫຍ່ຂຶ້ນ. ອ່າງກວນໄວໄດ້ຖືກອອກແບບໃຫ້ເກີດການປະສົມແບບການໄຫຼທີ່ສົມລະວິນຂອງນ້ຳ (Hydraulic Mixer) ເພື່ອເຮັດໃຫ້ສານເຄມີປະສົມກັບນ້ຳຢ່າງສົມບຸນ. ການອອກແບບແມ່ນກຳນົດ ຄ່າ G = 700 – 1000 s^{-1} , t= 20 – 60 s ແລະ $\Delta H < 0.5$ ແມັດ ເພື່ອໃຫ້ລະບົບມີປະສິດທິພາບ.

ອ່າງກວນຊ້ຳ (Flocculation tank): ການອອກແບບ ອ່າງກວນຊ້ຳນີ້ ໄດ້ອອກແບບເປັນ ແບບນ້ຳໄຫຼລອດຮຸບແຜນກັ້ນເພື່ອຮັກສາຄວາມໄວຂອງການໄຫຼຈາກ 0.3 m/s to 0.45 m/s.

ສຳລັບໂຄງການນີ້ ເຮົາໄດ້ອອກແບບ ອ່າງກວນ ແບ່ງອອກເປັນ ທັງໝົດ 5 ຫ້ອງ ແລະ ຫ້ອງທີ່ 1 ມີ ລະບົບ ຝາໄມ້ກັ້ນ ຈຳນວນ 5 ຝາ, ຫ້ອງທີ່ 2 ມີ ຈຳນວນ 4 ຝາ, ຫ້ອງທີ່ 3 ມີຈຳນວນ 4 ຝາ, ຫ້ອງ ທີ່ 4 ມີ ຈຳນວນ 2 ຝາ ແລະຫ້ອງທີ່ 5 ບໍ່ມີ ໂດຍ ທີ່ ກຳນົດ ໃກ້ ຄ່າ ຂອງ G ຂອງແຕ່ລະຫ້ອງ ເລີ່ມແຕ່ 80 ຫາ 10 S^-1.

ຂະບວນການຕົກຕະກອນ: ເປັນຂະບວນການທີ່ໃຊ້ເພື່ອແຍກນ້ຳ ແລະ ຕະກອນອອກຈາກກັນໂດຍການຕົກຕາມແຮງດຶງດຸດຂອງໜ່ວຍໂລກ ໃນການຜະລິດນ້ຳປະປາສ່ວນຫຼາຍຂະບວນການນີ້ຈະຖືກໃຊ້ເພື່ອແຍກຕະ

ກອນທີ່ສາມາດຕົກລົງພື້ນອ່າງດ້ວຍນ້ຳໜັກຂອງຕົນເອງ (Settleable solids) ປະສິດທິພາບຂອງລະບົບຈະຂຶ້ນກັບຫຼາຍປັດໄຈເຊັ່ນ: ຄຸນນະພາບຂອງນ້ຳດິບ, ປະລິມານຂອງຕະກອນໃນນ້ຳ, ນ້ຳໜັກຂອງຕະກອນ, ຄຸນລັກສະນະສະເພາະຂອງອ່າງຕົກຕະກອນ.

ໃນກໍລະນີນີ້ ອ່າງຕົກຕະກອນໄດ້ອອກແບບໃຫ້ເປັນອ່າງສີ່ຫຼ່ຽມທີ່ມີການໄຫຼຕາມທາງນອນ, ໃນການອອກແບບຕົວບົ່ງຊີ້ຫຼັກ Q/A (ປະລິມານການໄຫຼຕໍ່ເນື້ອທີ່ຕັດຂອງອ່າງ), ຄວາມສູງຂອງອ່າງ ແລະ ເວລາທີ່ໃຊ້ໃນການຕົກຕະກອນ, ຄວາມໄວການໄຫຼຂອງນ້ຳຕາມທາງນອນ ຄ່າທີ່ໃຊ້ໃນການອອກແບບໄດ້ສະແດງໃນຕາຕະລາງລຸ່ມນີ້:

ຕາຕະລາງ : ການອອກແບບອ່າງຕົກຕະກອນ

ຕົວບົ່ງຊີ້	ຄ່າອອກແບບ
- Q/A ($m^3/m^2.d$)	- 20-60
- $H_{Horizontal}$ (m/min)	- 0.16-0.90
- H_{water} (m)	- 3-5
- T (Detention time, min)	- 120-240
- Q/A weir	- 100-200
- W:L	- 1:4

ຂະບວນການຕອງນ້ຳ: ຂະບວນການຕອງ ເປັນຂະບວນການຕອງຕະກອນທີ່ມີຂະໜາດນ້ອຍທີ່ຫຼົງເຫຼືອຈາກການຕົກຕະກອນໃນອ່າງນ້ຳນອນ, ຂະບວນການຕອງນ້ຳປະກອບມີ 02 ແບບຄື: ຕອງໄວ (Rapid sand filtration), ຕອງຊ້ຳ (slow sand filtration). ໃນກໍລະນີນີ້ ໄດ້ອອກແບບເປັນການຕອງໄວ ຍ້ອນວ່າຄວາມຂຸ່ນຂອງນ້ຳສູງ ແລະ ຕ້ອງການນ້ຳໄວ້ພື້ນທີ່ສຳລັບການກໍ່ສ້າງອ່າງຕອງ ອຍ.ຂໍ້ມູນລະອຽດໃນການອອກແບບໄດ້ສະແດງໄວ້ໃນຕາຕະລາງ:

ຕາຕະລາງ: ການອອກແບບອ່າງຕອງນ້ຳ

ຕົວຊີ້ບົ່ງ	ຄ່າອອກແບບ
- ອັດຕາການຕອງ ($m^3/m^2.h$)	- 5-15
- ຂະໜາດອ່າງຕອງ (m^2)	- < 100 ຊັ້ນຫີນ
- ຄວາມສູງຂອງອ່າງຕອງ (m)	- 0.7-1 ຊັ້ນຊາຍ
- ຂະໜາດເມັດທີ່ມີປະສິດທິພາບຂອງຊາຍ (mm)	- 0.6-1.2
- ຄ່າປະສິດການຈັດລຽງຕົວຂອງຊາຍ	- 1.5-1.7
- Head loss (m)	- $\Delta H \leq 0.3$
- ໄລຍະເວລາການດຳເນີນການ (ມື້)	- 1-2
- ວິທີການລ້າງອ່າງຕອງ	- ໃຊ້ການໄຫຼຂອງນ້ຳ
- ນ້ຳທີ່ໃຊ້ໃນການລ້າງ	- ໃຊ້ນ້ຳ ແລະ ອາກາດ (ບາງກໍລະນີອາດຈະມີການລ້າງຜິວໜ້ານ້ຳ)
- ເວລາທີ່ໃຊ້ໃນການລ້າງ (min)	- 3-6% ຂອງນ້ຳທີ່ຖືກຕອງ
	- 10

ອ່າງຕົກຕະກອນ (Sedimentation tank): ອອກແບບ ເປັນອ່າງນ້ຳນອນ ແບບ ສີ່ຫຼ່ຽມຍາວ ໃນ ອັດຕາ ຊັດສ່ວນ ລວງກວ້າງ ເທົ່າກັບ 3.5 ແມັດ ແລະ ລວງຍາວເທົ່າກັບ 14 ແມັດ ແລະ ລວງເລິກສະເລ່ຍຂອງ ອ່າງ ເທົ່າກັບ 3.3 ແມັດ ຈຳນວນ ສອງອ່າງ.

ເງື່ອນໄຂການອອກແບບ ໄດ້ກຳນົດ ເອົາ suface loading rate = 20m^3/m^2/day. ພື້ນໃດ້ອອກ ແບບ ເປັນ ພື້ນທີ່ມີຄວາມລາດຊັນ ປະມານ 9% ຂອງລວງເລິກ. ລະອຽດມີບົດຄິດໄລ່ທາງດ້ານຊົນລະສາດໃນ

ຝ່າຍທີ່ຮອງຮັບນ້ຳໃສເຂົ້າຫາອ່າງຕອງ (Weir): ເລືອກໃຊ້ຮາງທີ່ຕັ້ງຢູ່ທ້າຍອ່າງນ້ຳນອນເພື່ອເກັບກັກເອົານ້ຳ ດ້ານເທິງທີ່ໄດ້ແລ້ວໄຫລລົງໄປຕອງທີ່ອ່າງຕອງ.

4.2.3 ການຕອງນ້ຳ

ລະບົບຕອງຊາຍໄວ ໃນອັດຕາການຕອງ 5m3/m2/hr ໂຮງງານຜະລິດນ້ຳປະປາ 1,000 ມ^3 ຕໍ່ວັນ ເນື້ອທີ່ ຕອງຊາຍທັງໝົດ 12 m^2 ແບ່ງເປັນສອງອ່າງ ທີ່ມີຂະໜາດ 2m x 3m. ແຜນຕອງໃດ້ອອກແບບກຳນົດ ໃຫ້ນຳໃຊ້ ຂະນິດຫົວຕອງ ແບບ Nozzles.

ຮ່ອງລະບາຍນ້ຳລ້າງ: ເປັນຮ່ອງທີ່ຢູ່ເຄິ່ງກາງອ່າງຕອງເພື່ອຮອງຮັບການລະບາຍນ້ຳທີ່ເປື້ເປື້ອນອອກໃນເວລາ ທີ່ລ້າງອ່າງຕອງແຕ່ລະຄັ້ງ.

4.2.4 ອ່າງເກັບນ້ຳສະອາດ

ອ່າງເກັບນ້ຳສະອາດ (ClearWaterTank and ForWardingPump): ອ່າງເກັບນ້ຳສະອາດແມ່ນອ່າງ ທີ່ເກັບນ້ຳໄວ້ບໍລິການ ແລະ ໃສ່ຢາຂ້າເຊື້ອ ການຂ້າເຊື້ອແມ່ນໃຊ້ແຄນຊຽມໄຮໂປຄຼໍໄຮ (Calcium Hypochlorite, $Ca(ClO)_2$). ອອກແບບເວລາເກັບກັກ 6-8 ຊົ່ວໂມງ ແລະ ແບ່ງອອກເປັນ 01 ອ່າງຄື: ອ່າງ ເກັບນ້ຳສະອາດຢູ່ໂຮງງານ 300 ມ^3 ເປັນແບບອ່າງສີ່ຫຼ່ຽມມົນທຶນ ໂຄ້ງສ້າງຄອນກຣີດເມີມເຫຼັກ.

4.2.5 ອ່າງເກັບນ້ຳສູງ (Elevated Tank):

ອ່າງເກັບນ້ຳສູງ (Elevated Tank): ອ່າງເກັບນ້ຳສູງ ຂະໜາດ 250 ມ^3 ຊຶ່ງຕັ້ງຢູ່ຈຸດທີ່ສູງ ແລະ ໃກ້ກັບ ໂຮງງານຜະລິດນ້ຳປະປາ, ເປັນອ່າງບໍລິການນ້ຳໃຫ້ຜູ້ຊົມໃຊ້ນ້ຳ ຢູ່ເຂດບໍລິການຂອງໂຄງການ, ອ່າງດັ່ງກ່າວປະກອບ ດ້ວຍອຸປະກອນຕ່າງໆເຊັ່ນ: ລະບົບທໍ່ນ້ຳເຂົ້າ-ອອກ, ທໍ່ນ້ຳລົ້ນ, ທໍ່ລະບາຍ, ປະຕູນ້ຳ, ລູກລອຍ ແລະ ອຸປະກອນອື່ນໆທີ່ຈຳເປັນ. ອ່າງເກັບນ້ຳສູງ ຈະສູງ 25 ແມັດ, ເປັນສະຖານີບໍລິການນ້ຳຕະຫຼອດ 24 ຊົ່ວໂມງ ໃຫ້ຜູ້ ຊົມໃຊ້ນ້ຳຢູ່ໃນເຂດບໍລິການຂອງໂຄງການດັ່ງກ່າວ ດ້ວຍການປ່ອຍໃຫ້ນ້ຳໄຫຼແບບທຳມະຊາດ.

4.2.6 ລະບົບສາຍທໍ່ແຈກ

ທໍ່ ແລະ ອຸປະກອນຕ່າງໆ ທີ່ອອກແບບເພື່ອຕິດຕັ້ງຢູ່ໂຮງງານຜະລິດນ້ຳແມ່ນ ໄດ້ອອກແບບໃຫ້ນຳໃຊ້ ວັດສະດຸປະເພດ HDPE ເພື່ອຮັບປະກັນອາຍຸການໃຊ້ງານໃຫ້ຍາວນານ. ອຸປະກອນທີ່ໃຊ້ປະກອບມີ ປະຕູນ້ຳ, ຂໍ້ຕໍ່ລິດ ແລະ ຂໍ້ງໍ 90, 45 ແລະ ອື່ນໆ. ລາຍລະອຽດ ໄດ້ກຳນົດ ມາດຕະຖານເຕັກນິກ ໄວ້ດັ່ງລຸ່ມນີ້:

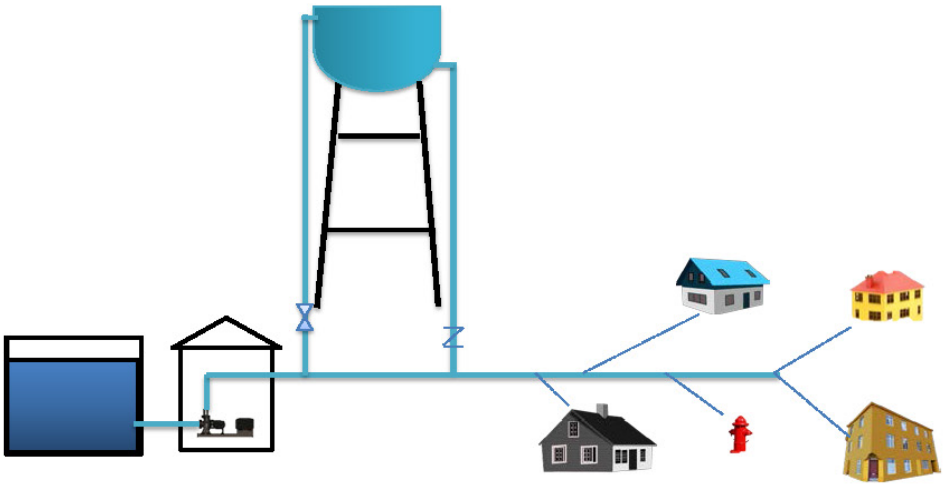
- ທໍ່ HDPE PN10
- DCI K9

ອຸປະກອນ ຂໍ້ຕໍ່ທຸກປະເພດ

- HDPE PN10
- DCI, K12
- DCI PN10, K12

ປະຕູນ້ຳທຸກໆ ຊະນິດ

- DCI PN10



5 ການປະເມີນຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ

5.1 ການປະເມີນຜົນກະທົບໂດຍລວມ

ຕາຕະລາງ 3: ການປະເມີນຜົນກະທົບໂດຍລວມ

ກິດຈະກຳ	ປະເພດຂອງຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ		ລະດັບຄວາມສຳຄັນ	ຄວາມຖີ່/ໄລຍະເວລາ	ລະດັບຜົນກະທົບຕໍ່ການດຳລົງຊີວິດ	ປະເພດຂອງຜົນກະທົບ (ບວກ/ລົບ)
ໄລຍະກໍ່ສ້າງ						
ການກະກຽມສະຖານທີ່	ທຳມະຊາດ	ການບຸກເບີກເນື້ອທີ່ດິນທຳມະຊາດ ແລະ ປ່າໄມ້ ທີ່ເປັນທຳມະສິດຂອງໂຄງການເຊັ່ນ: ການປຸກສ້າງທີ່ພັກເຊົ່າຊົ່ວຄາວໃຫ້ທຳມະກອນ ແລະ ຜູ້ທີ່ເຮັດວຽກໃນໂຄງການ, ລະບົບຫ້ອງການ, ລະບົບໂຮງງານ ແລະ ລະບົບແຈກຈ່າຍນ້ຳ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ການປ່ຽນແປງລະບົບນິເວດດິນ ຈາກການບຸກເບີກພື້ນທີ່ຂຸດຂຸມເກັບກັກນ້ຳ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ການປ່ຽນແປງລະບົບນິເວດນ້ຳໃຕ້ດິນເນື່ອງຈາກການບຸກເບີກພື້ນທີ່ຂຸດເຈາะບໍ່ລິເວນກໍ່ສ້າງ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ເກີດມົນລະພິດທາງອາກາດເຊັ່ນ ຄວັນລົດ (ຈາກລົດ ແລະ ເຄື່ອງຈັກ ທີ່ໃຊ້ໃນການບຸກເບີກພື້ນທີ່) ແລະ ຂີ້ຝຸ່ນຈາກການບຸກເບີກ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
	ສັງຄົມ	ການສັນຈອນເພີ່ມຂຶ້ນເນື່ອງຈາກການນຳລົດ ແລະ ເຄື່ອງຈັກມາຮັບໃຊ້ໃນການບຸກເບີກພື້ນທີ່.	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ການເພີ່ມຂຶ້ນຂອງປະຊາກອນໃນບໍລິເວນໂຄງການເນື່ອງຈາກການຍົກຍ້າຍເຂົ້າມາຂອງທຳມະກອນ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
		ການຄ້າຂາຍ ແລະ ທຸລະກິດຂະໜາດນ້ອຍຂຶ້ນໃນບໍລິເວນໂຄງການ.	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ບວກ
ການນຳໃຊ້ຜາຫະນະ ແລະ ເຄື່ອງຈັກຕ່າງໆ	ທຳມະຊາດ	ນ້ຳເປື້ອນຈາກການລ້າງລົດ ແລະ ເຄື່ອງຈັກຢູ່ພື້ນທີ່ໂຄງການອາດຈະຊຶມລົງໄປປົນເປື້ອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ຕ່ຳ	ລົບ

		ນ້ຳເປື້ອນຈາກການຮົ່ວໄຫຼຂອງ ນ້ຳມັນລຶດ ແລະ ເຄື່ອງຈັກອາດຈະຊຶມລົງໄປປົນເປື້ອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ຕ່ຳ	ລົບ
	ທາງອ້ອມ	ເກີດສຽງດັງລົບກວນໃນເວລານຳໃຊ້ຜາຫະນະ ແລະ ເຄື່ອງຈັກໃນເວລາກໍ່ສ້າງ	ກາງ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
ການຍົກຍ້າຍເຂົ້າມາ ບໍລິເວນໂຄງການຂອງກຳມະກອນ ແລະ ຜູ້ທີ່ເຮັດວຽກໃນໂຄງການ	ທຳມະຊາດ	ຂາດແຄນບ່ອນເກັບ ແລະ ການຈັດການ ຂີ້ເຫຍື້ອຈາກການຊົມໃຊ້ຂອງຜູ້ທີ່ຍ້າຍເຂົ້າມາ ແລະ ສິ່ງເສດເຫຼືອຈາກການກໍ່ສ້າງ (ຂີ້ເຫຍື້ອ ແລະ ນ້ຳເປື້ອນ).	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ນ້ຳເປື້ອນຈາກການຊົມໃຊ້ໃນຊີວິດປະຈຳວັນ (Grey water) ຂອງຜູ້ທີ່ຍົກຍ້າຍເຂົ້າມາ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ນ້ຳເປື້ອນທີ່ປະກອບດ້ວຍ ສານອາຫານ (Nutrients) ແລະ ຈຸລິນຊີເຊັ່ນ Faecal coliform ແລະ Escherichia coli(Micro-organism) ຈາກວິດຖ່າຍຜູ້ທີ່ຍົກຍ້າຍເຂົ້າມາ (Black water) ອາດຈະຊຶມລົງດິນແລ້ວປົນເປື້ອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ກາງ	ລົບ
		ນ້ຳເປື້ອນທີ່ເກີດຈາກຂີ້ເຫຍື້ອ, ສິ່ງເສດເຫຼືອຈາກການກໍ່ສ້າງ ແລະ ນ້ຳເປື້ອນຈາກວິດຖ່າຍ ເກີດການປົນເປື້ອນກັບນ້ຳຝົນ ແລ້ວໄຫຼໄປຫາໜ່ວຍນ້ຳໜ້າດິນ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
	ທາງອ້ອມ	ນ້ຳເປື້ອນສິ່ງກິ່ນເໝັນລົບກວນຜູ້ທີ່ອາໄສຢູ່ບໍລິເວນໂຄງການ	ສຳຄັນ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
		ການຈະລາຈອນເຝື້ມຂຶ້ນເນື່ອງຈາກຜາຫະນະເຝື້ມຂຶ້ນຕາມຈຳນວນຄົນທີ່ຍົກຍ້າຍເຂົ້າມາ	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
ວຽກຂຸດເຈາະ (Excavation works)		ເກີດສຽງດັງລົບກວນໃນເວລານຳໃຊ້ຜາຫະນະ ແລະ ເຄື່ອງຈັກຂຸດເຈາະໃນເວລາກໍ່ສ້າງ	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ມົນລະພິດທາງອາກາດເຊັ່ນ ຂີ້ຝຸ່ນ ຈຳນວນຫຼວງຫຼາຍທີ່ເກີດຈາກການຕັດດິນ, ຂົນດິນ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
ການສ້າງສະຖານີສູບນ້ຳ	ທຳມະຊາດ	ເກີດການປົນເປື້ອນກັບນ້ຳຝົນເນື່ອງຈາກການລົບກວນຊັ້ນດິນ	ກາງ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ເກີດມີການເຊາະເຈື່ອນຂອງດິນໃນບໍລິເວນທີ່ມີການກໍ່ສ້າງ	ສຳຄັນ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
	ທາງອ້ອມ	-	-	-	-	-

ກິດຈະກຳ	ປະເພດຂອງຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ		ລະດັບຄວາມສຳຄັນ	ຄວາມຖີ່/ໄລຍະເວລາ	ລະດັບຜົນກະທົບຕໍ່ການດຳລົງຊີວິດ	ປະເພດຂອງຜົນກະທົບ (ບວກ/ລົບ)
ໄລຍະດຳເນີນການ						
ຂະບວນການຜະລິດ	ທຳມະຊາດ	ເຮັດໃຫ້ລັກສະນະຂອງດິນມີການປ່ຽນແປງ ເນື່ອງມາຈາກການປ່ອຍນ້ຳເສຍຈາກການທຳຄວາມສະອາດຕ່າງ ເຊິ່ງມີການເຈື່ອປົນຂອງສານສີ້ມມານຳ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
		ການປ່ອຍນ້ຳເສຍທີ່ມີສານສີ້ມເຈື່ອປົນເຮັດໃຫ້ດິນມີລັກສະນະແຂງ ແລະ ເຮັດໃຫ້ເກີດມີຄ່າ PH ສູງ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
	ສັງຄົມ	ເຮັດໃຫ້ປະຊາຊົນເກີດຄວາມກັງວົນໃນການປ່ອຍນ້ຳເສຍຂອງໂຮງງານໃນ ເວລາທີ່ມີການທຳຄວາມສະອາດຕ່າງ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
ການທຳງານຂອງປ້ຳ	ທຳມະຊາດ	ການຮົ່ວຊຶມຂອງນ້ຳມັນຈາກເຮືອນປ້ຳອາດຈະກະທົບຕໍ່ນ້ຳໃຕ້ດິນໃນເວລາທີ່ມີຝົນຕົກໜັກ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
	ສັງຄົມ	ການທຳງານຂອງປ້ຳສູບນ້ຳເຮັດໃຫ້ເກີດສຽງດັງ.	ກາງ	ຖາວອນ	ຕ່ຳ	ລົບ
ດ້ານເສດຖະກິດ	ສັງຄົມ	ຈະກໍ່ໃຫ້ເກີດຜົນກະທົບທາງດ້ານບວກຕໍ່ກັບສະພາບເສດຖະກິດ ແລະ ສັງຄົມ ຂອງຊຸມຊົນເຮັດໃຫ້ເກີດຄວາມຈະເລີນໃນທ້ອງຖິ່ນ ສາມາດຍົກລະດັບຄຸນນະພາບຊີວິດຂອງປະຊາຊົນ ໃຫ້ດີຂຶ້ນເຮັດໃຫ້ເສດຖະກິດໃນຄອບຄົວດີຂຶ້ນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
		ພ້ອມທັງມີລາຍໄດ້ເພີ່ມຂຶ້ນຈາກນັກທ່ອງທ່ຽວ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ

		ຜົນກະທົບໃນດ້ານເສດຖະກິດ ແລະ ສັງຄົມ ຂອງຊຸມຊົນໃນຊ່ວງດຳເນີນການຂອງໂຄງການ ຈຶ່ງເປັນຜົນກະທົບທາງບວກຫຼາຍກວ່າເຊັ່ນ: ຊ່ວຍໃຫ້ເກີດການພັດທະນາດ້ານການຊົມໃຊ້ນ້ຳສະອາດ, ຫຼຸດຜ່ອນການເຈັບເປັນອັນເນື່ອງຈາກການນຳໃຊ້ນ້ຳເຂົ້າໃນກິດຈະກຳຕ່າງໆ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
ດ້ານການທ່ອງທ່ຽວ	ສັງຄົມ	ພາຍຫຼັງການສຳເລັດ ຈະນຳໃຫ້ເກີດຜົນກະທົບທາງດ້ານບວກຕໍ່ກັບສະພາບເສດຖະກິດ ດ້ານການທ່ອງທ່ຽວ ສາມາດສ້າງລາຍຮັບດ້ານການບໍລິການ ທີ່ພັກ-ຮ້ານອາຫານ ເພີ່ມຂຶ້ນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
		ສ້າງຄວາມເຊື່ອໝັ້ນໃຫ້ນັກທ່ອງທ່ຽວ ດ້ານສຸຂະອານາໄມ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
ດ້ານສາທາລະນະສຸກ	ສັງຄົມ	ພາຍຫຼັງສຳເລັດ ຈະມີການເປີດບໍລິການນ້ຳສະອາດໃຫ້ປະຊາຊົນໄດ້ໃຊ້ ເປັນການຫຼຸດຜ່ອນການເກີດພະຍາດທີ່ມາກັບນ້ຳ ເຊັ່ນ: ພະຍາດຖອກທ້ອງ ເປັນຕົ້ນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
		ໂຮງໝໍ ແລະ ສຸກສາລາ ຈະມີນ້ຳສະອາດໄວ້ໃຊ້ , ບໍລິການໃຫ້ປະຊາຊົນທີ່ມາປິ່ນປົວ ແລະ ຍັງເປັນການສ້າງຄວາມເຊື່ອໝັ້ນ ດ້ານສຸຂະອານາໄມໃຫ້ກັບຄົນເຈັບ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ

5.2 ການປະເມີນຜົນກະທົບດ້ານລົບ ແລະ ມາດຕະການຫຼຸດຜ່ອນ

ລະບົບການຜະລິດຂອງໂຄງການນີ້ ແມ່ນມີສານເຄມີໜ້ອຍທີ່ສຸດທີ່ຈະປ່ອຍສູ່ທຳມະຊາດ, ເນື່ອງຈາກວ່າ ຄຸນະພາບນ້ຳດິບ ແລະ ວິທີການອອກແບບລະບົບໂຮງງານຜະລິດນ້ຳປະປາ ແມ່ນນຳໃຊ້ວິທີແບບພື້ນຖານ ຈຶ່ງບ່ອາດ ຈະເກີດເຫດບັງເອີນທີ່ຈະກະທົບຕໍ່ສິ່ງແວດລ້ອມໄດ້. ເຖິງຢ່າງໃດກໍ່ຕາມ, ໃນຊ່ວງໄລຍະເວລາໃນການກໍ່ສ້າງ, ຈະມີ ຜົນກະທົບທາງດ້ານລົບບາງຢ່າງຕໍ່ກັບສະພາບແວດລ້ອມດັ່ງນີ້:

- ການຂົນສົ່ງອຸປະກອນຕ່າງໆໃນການກໍ່ສ້າງ ຫຼື ຂຸດຮ່ອງເພື່ອວາງທໍ່ຈະເປັນສາເຫດເຮັດໃຫ້ມີຝຸ່ນ, ສຽງດັງ, ລົດ ຕິດ. ເຖິງຢ່າງໃດກໍ່ຕາມຜົນກະທົບດັ່ງກ່າວນີ້ກໍ່ຈະບໍ່ເປັນອັນຕະລາຍ, ມັນກໍ່ຍັງມີຄວາມຈຳເປັນທີ່ຈະຕ້ອງໄດ້ ຈຳກັດຜົນກະທົບຂອງພວກມັນທີ່ມີຕໍ່ສະພາບແວດລ້ອມ.
- ຂີ້ເຫຍື້ອທີ່ເກີດຈາກວຽກງານການກໍ່ສ້າງຕ່າງໆ ທີ່ປ່ອຍອອກສູ່ສິ່ງແວດລ້ອມຈະເປັນຜົນກະທົບທາງດ້ານລົບ ນອກຈາກວ່າຈະມີການຄວບຄຸມສິ່ງເສດເຫຼືອເຫຼົ່ານັ້ນຢ່າງຈິງຈັງ.
- ໃນລະຫວ່າງການດຳເນີນງານຂອງສະຖານີສູບນ້ຳ ແລະ ລະບົບການຂ້າເຊື້ອພະຍາດ, ມັນມີຄວາມຈຳເປັນທີ່ຈະ ຕ້ອງປະຕິບັດຕາມກົດລະບຽບການປ້ອງກັນການລະເບີດ ແລະ ໄຟໄໝ້ ເຊັ່ນ ໄຟຮົ່ວ ຫຼື ທໍ່ສົ່ງນ້ຳແຕກຊຶ່ງເປັນ ສາເຫດເຮັດໃຫ້ເກີດມີລົດຕິດ ແລະ ສິ່ງຜົນກະທົບ ຕໍ່ກັບສະພາບການດຳລົງຊີວິດ ແລະ ການຜະລິດຂອງ ປະຊາຊົນໃນເຂດດັ່ງກ່າວ.

5.3 ການປະເມີນຜົນກະທົບດ້ານບວກ ແລະ ມາດຕະການເພີ້ມ

ການກໍ່ສ້າງລະບົບສະໜອງນ້ຳປະປາ ໃນເຂດໂຄງການນີ້ ຈະມີຜົນກະທົບດ້ານບວກ ຕໍ່ການພັດທະນາ ເສດຖະກິດ-ສັງຄົມຂອງໜົດທຸກຂົງເຂດຢູ່ໂດຍສະເພາະແມ່ນຢູ່ເຂດບ້ານທີ່ຢູ່ພື້ນທີ່ບໍລິການ ລະບົບດັ່ງກ່າວ ຍັງມີ ສ່ວນໃນການປັບປຸງ ມາດຕະຖານການດຳລົງຊີວິດຂອງປະຊາຊົນ, ຮັບປະກັນການປັບປຸງດ້ານສາທາລະນະສຸກຂອງ ປະຊາຊົນ ຊຶ່ງມີຜົນຢ່າງຍິ່ງຕໍ່ການພັດທະນາດ້ານການທ່ອງທ່ຽວ ແລະ ຍັງເປັນການສົ່ງເສີມການລົງທຶນເຂົ້າໃນ ຂົງເຂດດັ່ງກ່າວ.

ຫຼັງຈາກໂຄງການນີ້ສຳເລັດລົງ, ວຽກງານການປົກປັກຮັກສາສິ່ງແວດລ້ອມຈະບໍ່ພຽງແຕ່ສຸມໃສ່ສະພາບແວດ ລ້ອມທາງນ້ຳເທົ່ານັ້ນ, ແຕ່ຍັງຈະສຸມໃສ່ສິ່ງແວດລ້ອມທາງດ້ານດິນ ແລະ ສິ່ງແວດລ້ອມທາງອາກາດນຳອີກ. ສິ່ງ ເຫລົ່ານີ້ແມ່ນປັດໃຈພື້ນຖານ ໃນການດຳເນີນວຽກງານຕ່າງໆຂອງການປົກປັກຮັກສາສະພາບແວດລ້ອມໂດຍລວມ ເຊິ່ງມັນຈະເຮັດໃຫ້ເປັນເຂດທີ່ບໍລິສຸດ ແລະ ເປັນເຂດທີ່ດຶງດູດຜູ້ຄົນ, ເພາະຈະມີສະຖານທີ່ທ່ອງທ່ຽວທາງທຳມະຊາດ , ເປັນບ່ອນພັກຜ່ອນຢ່ອນໃຈ. ນອກຈາກນັ້ນ, ໂຄງການສະໜອງນ້ຳສະອາດແມ່ນປັດໃຈສຳຄັນອັນດັບໜຶ່ງ ແລະ ເປັນພື້ນຖານສຳລັບການພັດທະນາໂຄງການອື່ນໆກ່ຽວກັບ ໂຄງລ່າງພື້ນຖານດ້ານເຕັກນິກ ແລະ ສະພາບແວດລ້ອມ ຂອງບ້ານກໍ່ຄືສະພາບແວດລ້ອມຂອງຕົວເມືອງ.

ມາດຕະຖານການດຳລົງຊີວິດຂອງປະຊາຊົນຈະໄດ້ຮັບການປັບປຸງໃນທາງທີ່ດີຂຶ້ນ, ມີນ້ຳປະປາຊົມໃຊ້ , ພະຍາດຕ່າງໆຈະມີການຫຼຸດຜ່ອນ ຊຶ່ງສິ່ງເລົ່ານີ້ ແມ່ນມີຄວາມໝາຍຢ່າງຍິ່ງເພາະຂໍ້ມູນທາງສຸນສະຖິຕິ ໃນປະຈຸບັນ

ໄດ້ສະແດງໃຫ້ເຫັນວ່າພະຍາດທັ້ງຫຼາຍທີ່ມາກັບນ້ຳຄິດໄລ່ເປັນອັດຕາທີ່ມີຄວາມສ່ຽງສູງຢູ່ພາຍໃນກຸ່ມເຊື້ອພະຍາດທີ່ຮູ້ຈັກກັນດີເຊັ່ນ: ພະຍາດຖອກທ້ອງ ແລະ ອື່ນໆ.

6 ຜົນກະທົບໄລຍະຍາວ

6.1 ດ້ານບວກ

- ຊ່ວຍໃຫ້ແຜນພັດທະນາພື້ນຖານໂຄງລ່າງຂອງລັດຖະບານ ,ເມືອງ, ແຂວງ ,ພື້ນທີ່ໂຄງການໄດ້ຮັບການຈັດຕັ້ງປະຕິບັດ ເທື່ອລະກ້າວໂດຍສະເພາະແມ່ນລະບົບສາທາລະນຸປະໂພກ ,ສ້າງເງື່ອນໄຂອຳນວຍຄວາມສະດວກໃນການຮັກສາສຸຂະອານາໄມ ,ເປັນພື້ນຖານໃຫ້ແກ່ການພັດທະນາ ດ້ານການຄ້າ ,ດ້ານອຸດສາຫະກຳ ,ດ້ານການບໍລິການ ແລະ ການທ່ອງທ່ຽວ ໃນອານາຄົດ .
- ຊ່ວຍໃຫ້ ຊີວິດການເປັນຢູ່ຂອງປະຊາຊົນໄດ້ຮັບການປັບປຸງດີຂຶ້ນ ,ເພາະວ່າ ນ້ຳປະປາເປັນສິ່ງທີ່ຈຳເປັນ ແລະ ເປັນປັດໃຈໜຶ່ງທີ່ຂາດບໍ່ໄດ້ໃນການດຳລົງຊີວິດຂອງປະຊາຊົນເພື່ອມາອຸປະໂພກ ແລະ ບໍລິໂພກ .ນອກນີ້ຍັງໄດ້ນຳໃຊ້ເປັນວັດຖຸດິບຜະລິດເປັນສິນຄ້າ ແລະ ໃຊ້ໃນຂະບວນການການຜະລິດ ສິນຄ້າອຸດສາຫະກຳ ແລະ ອື່ນໆ.
- ຊ່ວຍໃຫ້ພື້ນທີ່ໂຄງການ ເປັນພື້ນທີ່ສີຂຽວເຊັ່ນ :ສະຖານທີ່ສາທາລະນະ ,ສະຖານທີ່ທ່ອງທ່ຽວ ແລະ ສະຖານທີ່ສຳຄັນຕ່າງໆ .

6.2 ດ້ານລົບ

ການຊົມໃຊ້ນ້ຳປະປາ ໃນຂະແໜງການອຸດສາຫະກຳ ນ້ຳສ່ວນຫຼາຍ ຈະກາຍເປັນນ້ຳເສຍ, ເປື້ເປື້ອນ ຖ້າຫາກບໍ່ມີວິທີກຳຈັດທີ່ຖືກຕ້ອງຈະສົ່ງຜົນກະທົບຕໍ່ສະພາບແວດລ້ອມ ແລະ ແຫຼ່ງນ້ຳທຳມະຊາດໄດ້. ສຳລັບໂຄງການນີ້ແລ້ວເຫັນວ່າ ເຂດພື້ນທີ່ໂຄງການ ຍັງບໍ່ທັນມີ ໂຮງຈັກ, ໂຮງງານເທື່ອ, ມີແຕ່ນ້ຳເສຍຈາກຄົວເຮືອນ ແຕ່ກໍ່ມີຈຳນວນໜ້ອຍ.

ການດຳເນີນການຜະລິດ ສຽງຂອງເຄື່ອງຈັກ, ການສັ່ນສະເທືອນຢູ່ ສະຖານີສູບນ້ຳຂອງ ຈະມີຜົນກະທົບຕໍ່ສັດນ້ຳໃນບໍລິເວນດັ່ງກ່າວເລັກນ້ອຍ. ນ້ຳເສຍຈາກການລ້າງອ່າງໂຮງງານ, ລ້າງອ່າງເຄມີ (ອ່າງນ້ຳຫີນສົ້ມ ແລະ ອ່າງຢາຂ້າເຊື້ອພະຍາດ) ມີຈຳນວນນ້ອຍ ແມ່ນມີວິທີການ, ມາດຕະການປ້ອງກັນໃຫ້ຢູ່ໃນຂອບເຂດ.

7 ການພິຈາລະນາທາງສະພາບແວດລ້ອມໃນລະຫວ່າງການກໍ່ສ້າງ

7.1. ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ມາດຕະການຫຼຸດຜ່ອນ ໃນໄລຍະກໍ່ສ້າງ

ຕາຕະລາງ *4* :ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ມາດຕະການຫຼຸດຜ່ອນ ໃນໄລຍະກໍ່ສ້າງ

ຜົນກະທົບສິ່ງແວດລ້ອມ	ມາດຕະການປ້ອງກັນ ແລະ ແກ້ໄຂຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ.
ລຸນນະພາບນ້ຳໜ້າດິນ ແລະ ນ້ຳໃຕ້ດິນ	-ດຳເນີນການກໍ່ສ້າງຊ່ວງໃນລະດູແລ້ງ ແລະ ລະດູຝົນທີ່ບໍ່ມີຝົນຕົກເພື່ອຫຼີກການເຊາະເຈື່ອນຂອງດິນລົງສູ່ແຫຼ່ງນ້ຳ.
ການຄົມມະນາຄົມຂົນສົ່ງ	- ແຈ້ງແຜນການກໍ່ສ້າງໃຫ້ກັບໜ່ວຍງານ ແລະ ຊຸມຊົນທີ່ກ່ຽວຂ້ອງໃຫ້ຮັບຮູ້ລ່ວງໜ້າຢ່າງໜ້ອຍຕ້ອງ 1 ອາທິດກ່ອນດຳເນີນງານ. -ຕ້ອງບໍ່ວາງກອງວັດສະດຸທີ່ມີຄວາມຈຳເປັນໃນການໃຊ້ວຽກງານກີດຂວາງການຈະລາຈອນ ແລະ ຕ້ອງຂົນຍ້າຍວັດສະດຸອຸປະກອນທີ່ບໍ່ໄດ້ໃຊ້ວຽກງານອອກຈາກຂອບເຂດພື້ນທີ່ກໍ່ສ້າງ ຫຼື ເສັ້ນທາງເຂົ້າອອກຂອງຊຸມຊົນໃນພື້ນທີ່. - ຕ້ອງເລັ່ງການປັບປຸງ ແລະ ຄືນສະພາບພື້ນທີ່ກໍ່ສ້າງ ແລະ ສັນທາງການ

	ສັນຈອນຖ້າເກີດກໍລະນີທີ່ໄດ້ຮັບຜົນກະທົບຈາກກິດຈະກຳການກໍ່ສ້າງໃຫ້ຢູ່ສະພາບເດີມຫຼືດີກວ່າເກົ່າ.
ການປ້ອງກັນຊັບພະຍາ ກອນປ່າໄມ້ ແລະ ສັດປ່າ	ຝ່າຍເຈົ້າຂອງໂຄງການຕ້ອງໃຫ້ຄຳແນະນຳຜູ້ຮັບເໝົາໃນການຮັກສາຕົ້ນໄມ້ໃຫ່ຍໄວ້ ກໍລະນີທີ່ບໍ່ມີຜົນກະທົບຕໍ່ສິ່ງກໍ່ສ້າງ ແລະ ລະບົບທໍ່ລະລິດນ້ຳເພື່ອຮັກສາຄວາມຊຸ່ມຊື່ນ.
ເສດຖະກິດ-ສັງຄົມ.	- ກຳນົດໃຫ້ຜູ້ຮັບເໝົາກໍ່ສ້າງແຈ້ງແຜນການກໍ່ສ້າງໃຫ້ອຳນາດການປົກຄອງທ້ອງຖິ່ນ ແລະ ປະຊາຊົນຮັບຮູ້ຢ່າງທົ່ວເຖິງ. - ຜູ້ຮັບເໝົາກໍ່ສ້າງຕ້ອງກຳນົດນະໂຍບາຍຈ້າງແຮງງານທ້ອງຖິ່ນຕາມຄວາມເໝາະສົມ. - ຜູ້ຮັບເໝົາກໍ່ສ້າງຕ້ອງຄວບຄຸມດູແລກຳມະກອນກໍ່ສ້າງໃຫ້ຢູ່ໃນກິດລະບຽບບໍ່ສ້າງຄວາມວຸ້ນວາຍໃຫ້ກັບປະຊາຊົນໃນຂອບເຂດພື້ນທີ່ໂຄງການ. - ອົບຮົມໃຫ້ກຳມະກອນມີຄວາມຮູ້, ຄວາມເຂົ້າໃຈໃນລະບົບ ແລະ ເທັກນິກການກໍ່ສ້າງ, ການປ້ອງກັນ ແລະ ອະນຸລັກຊັບພະຍາກອນທຳມະຊາດລວມທັງສ້າງຄວາມເຂົ້າໃຈໃນວັດທະນາທຳຮີດຄອງປະເພນີຂອງທ້ອງຖິ່ນເພື່ອປ້ອງກັນການປະຕິບັດຕົນທີ່ອາດຂັດແຍ້ງກັບວັດທະນາທຳຂອງທ້ອງຖິ່ນ. - ດຳເນີນການປະຊາສຳພັນການກໍ່ສ້າງໂຄງການກໍ່ສ້າງລະບົບນ້ຳປະປາ ໃຫ້ແກ່ປະຊາຊົນໃນພື້ນທີ່ໂຄງການໄດ້ຮັບຮູ້ເພື່ອຮ່ວມປະສານງານ ແລະ ຮ່ວມຕິດຕາມການກວດການປະຕິບັດວຽກງານຂອງເຈົ້າໜ້າທີ່ໃນພື້ນທີ່.
ສາທາລະນະສຸກ ແລະ ຄວາມປອດໄພ.	- ປ້ອງກັນ ແລະ ກວດການການເສບຢາເສບຕິດຂອງກຳມະກອນ. - ຝຶກອົບຮົມ ແລະ ທົບທວນມາດຕະການດ້ານຄວາມປອດໄພເປັນແຕ່ລະໄລຍະເພື່ອເປັນການປ້ອງກັນການເກີດອຸປະຕິເຫດຈາກການເຮັດວຽກລວມທັງຜູ້ທີ່ສັນຈອນໄປມາໃນພື້ນທີ່ກໍ່ສ້າງ.

7.2. ການຕິດຕາມກວດກາ ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ການຫຼຸດຜ່ອນ.

ບາດກ້າວໃນການປະຕິບັດ ໂຄງການກໍ່ສ້າງລະບົບນ້ຳປະປາ ຕ້ອງເປັນໄປຕາມຂັ້ນຕອນຕາມສັນຍາທີ່ໄດ້ຕົກລົງກັນໄວ້ ແລະ ປະຕິບັດຕາມກົດໝາຍທີ່ກ່ຽວຂ້ອງຂອງ ສປປ ລາວ ຢ່າງເຂັ້ມງວດ ແລະ ເຈົ້າຂອງໂຄງການພາກສ່ວນທີ່ກ່ຽວຂ້ອງຕ້ອງໄດ້ມີສ່ວນຮ່ວມໃນການປະຕິບັດ ເຊິ່ງນັບແຕ່ການເລີ່ມໂຄງການ ໄລຍະປະຕິບັດໂຄງການ ແລະ ພາຍຫຼັງທີ່ໂຄງການສຳເລັດກໍ່ຕ້ອງມີແຜນການປະເມີນຜົນເປັນໄລຍະຕາມແຜນການທີ່ວາງໄວ້. ສຳລັບການຕິດຕາມກວດກາສາມາດແບ່ງອອກເປັນ ການຕິດຕາມ:

- ພື້ນທີ່ການກໍ່ສ້າງ
- ກິດຈະກຳການກໍ່ສ້າງ
- ການກຳຈັດສິ່ງເສດເຫຼືອຈາກການກໍ່ສ້າງ
- ການເຮັດວຽກຂອງກຳມະກອນ

- ການຂົນສົ່ງ

ເຂດກໍ່ສ້າງພື້ນທີ່ໂຮງງານ ,ສະຖານີສູບນ້ຳ ແລະ ເຂດກໍ່ສ້າງວາງແລວສາຍທໍ່, ຂຸມຊ໊ອນ, ກຳມະກອນຕ້ອງໄດ້ມີຄວາມຮັບຮູ້ທາງດ້ານ ການປ້ອງກັນເຫດການທີ່ຈະເກີດຂຶ້ນທາງດ້ານອຸປະຕິເຫດເປັນຕົ້ນແມ່ນ ການເກີດອຸປະຕິເຫດຕາມທ້ອງຖະໜົນ, ການກໍ່ສ້າງ, ການໄປມາ ແລະ ອື່ນໆ ທີ່ຈະເກີດຂຶ້ນພ້ອມດຽວກັນນັ້ນຂຸມຊ໊ອນກໍ່ຕ້ອງໄດ້ຮັບຂໍ້ມູນຂ່າວສານ, ການສັນຈອນໄປມາ, ມີເຄື່ອງໝາຍເຕືອນບອກການປ້ອງກັນອຸປະຕິເຫດ, ສ່ວນກຳມະກອນກໍ່ຕ້ອງໄດ້ມີການປ້ອງກັນໃນການອອກແຮງງານຢ່າງເໝາະສົມ ແລະ ໄດ້ຮັບການຝຶກອົບຮົມກ່ອນຈະໄດ້ເຂົ້າມາເຮັດວຽກງານ ແລະ ນອກຈາກນັ້ນກໍ່ຍັງຈະຕ້ອງໄດ້ມີການຮັກສາສຸຂະພາບຂອງເຂົາເຈົ້າໃນທຸກດ້ານນຳອີກດ້ວຍ.

8 ລະບຽບການຈັດຕັ້ງປະຕິບັດ ແລະ ຕິດຕາມ

ລະບຽບການຈັດຕັ້ງປະຕິບັດ ລະບຸກຳນົດ ແລະ ບົດບັນຍັດ ແມ່ນຢູ່ພາຍໃຕ້ກົດໝາຍທີ່ເປັນຂໍ້ຈຳກັດ ແລະ ພັນທະຂອງເຈົ້າຂອງໂຄງການ ເພື່ອຄຸ້ມຄອງ ແລະ ຕິດຕາມ ສິ່ງແວດລ້ອມ ສັງຄົມ ແລະ ທຳມະຊາດ. ການຈັດຕັ້ງປະຕິບັດ ແມ່ນ ໃຫ້ເປັນໄປຕາມ:

1. ຄຳແນະນຳ ຂະບວນການສຶກສາເບື້ອງຕົ້ນ ກ່ຽວກັບຜົນກະທົບສິ່ງແວດລ້ອມ ຈາກໂຄງການການລົງທຶນ ແລະ ກິດຈະການຕ່າງໆ 7ກະຊວງຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ເລກທີ 8029/ກຊສ, ນະຄອນຫຼວງວຽງຈັນ (ລົງວັນທີ 17 ທັນວາ 2013).
2. ກົດໝາຍວ່າດ້ວຍທີ່ດິນ (ສະບັບເລກທີ 04/ສພຊ ລົງວັນທີ 21 ຕຸລາ 2003)
3. ກົດໝາຍວ່າດ້ວຍສັດນ້ຳ ແລະ ສັດປ່າ (ສະບັບເລກທີ 07/ສພຊ ລົງວັນທີ 24 ທັນວາ 2008)
4. ກົດໝາຍວ່າດ້ວຍນ້ຳ ແລະ ຊັບພະຍາກອນແຫຼ່ງນ້ຳ (ສະບັບເລກທີ 02-96/ສພຊ ລົງວັນທີ 11 ຕຸລາ 1996)
5. ຂໍ້ຕົກລົງວ່າດ້ວຍມາດຕະຖານສິ່ງແວດລ້ອມແຫ່ງຊາດ ສະບັບເລກທີ 2734/ນຍ, ກຊຜສ (ລົງວັນທີ 7 ທັນວາ 2009). ແລ້ວສິ່ງໃຫ້ພະແນກຊັບພະຍາກອນຂອງ ແຂວງ ເປັນຜູ້ກວດກາ, ອອກໃບຢັ້ງຢືນໃຫ້ ແລະ ຕິດຕາມກວດກາ.

9 ແຜນການຈັດການ ແລະ ກວດກາ ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ການຫຼຸດຜ່ອນ

ຕາຕະລາງທີ ໄດ້ສະແດງໃຫ້ເຫັນຕົວຊີ້ວັດທີ່ສິ່ງຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ, ຄວາມຖີ່ໃນການຕິດຕາມ, ຜູ້ທີ່ມີຄວາມຮັບຜິດຊອບໃນການຕິດຕາມ ແລະ ກວດກາເພື່ອຫຼຸດຜ່ອນຜົນກະທົບທີ່ເກີດຂຶ້ນໃນໂຄງການຕະຫຼອດການກຳນົດມູນຄ່າໃນແຕ່ລະຜົນກະທົບ.

ຕາຕະລາງ 5: ແຜນການຈັດການ, ກວດກາ ແລະ ມາດຕະການຫຼຸດຜ່ອນຜົນກະທົບ

ຜົນກະທົບທີ່ຕ້ອງໄດ້ຕິດຕາມ	ລາຍລະອຽດຂອງການຕິດຕາມ	ເວລາການກໍ່ສ້າງ			ເວລາດຳເນີນການຜະລິດ		
		ຄວາມຖີ່	ຕົວແທນຮັບຜິດຊອບ	ມູນຄ່າກຳນົດປະຈຳປີ	ຄວາມຖີ່	ຕົວແທນຮັບຜິດຊອບ	ມູນຄ່າກຳນົດປະຈຳປີ
ຄຸນນະພາບນ້ຳ	ການປ່ຽນແປງຄຸນນະພາບນ້ຳທີ່ຂອງທີ່ສິ່ງຜົນກະທົບຕໍ່ການຂຸມຊຶນ				ໜຶ່ງຄັ້ງຕໍ່ປີ	ນ້ຳປະປາ ເມືອງ ຜົນ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
	ການກວດສອບຄຸນນະພາບນ້ຳດິບກ່ອນເຂົ້າໂຮງງານ (ໃນປີທຳອິດ ຫຼື ໄລຍະການຜະລິດ)	ຕາມການກຳນົດຂອງ ມາດຕະຖານຄຸນນະພາບນ້ຳດິບ ຂອງ ຄຸນນະພາບນ້ຳໜ້າດິນ ຕາມມາດຕະຖານສິ່ງແວດລ້ອມ ແຫ່ງ ສປປ ລາວ (2009)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການກວດສອບຄຸນນະພາບນ້ຳສະອາດກ່ອນອອກຈາກໂຮງງານ (ໃນປີທຳອິດ ຫຼື ໄລຍະການຜະລິດ)	ຕາມການກຳນົດຂອງ ມາດຕະຖານຄຸນນະພາບນ້ຳ ຂອງ WHO (2014)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການກວດສອບຄຸນນະພາບນ້ຳດິບກ່ອນເຂົ້າໂຮງງານ				ຕາມການກຳນົດຂອງ ມາດຕະຖານຄຸນນະພາບນ້ຳດິບ ຂອງຄຸນນະພາບນ້ຳໜ້າດິນ ຕາມມາດຕະຖານສິ່ງແວດລ້ອມ ແຫ່ງສປປລາວ(2009)	ນ້ຳປະປາ ເມືອງ ຜົນ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ

	ການກວດສອບຄຸນະພາບນ້ຳສະອາດກ່ອນແຈກຈ່າຍໃຫ້ຊຸມຊົນ				ຕາມການກຳນົດຂອງ ມາດຕະຖານຄຸນະພາບນ້ຳຂອງ WHO (2014)	ນ້ຳປະປາ ເມືອງ ຜິນ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
	ການກວດສອບນ້ຳເປື້ອນ ທີ່ອອກຈາກໂຮງງານຜະລິດນ້ຳໃນໄລຍະດຳເນີນການ				ຕາມການກຳນົດຂອງ ມາດຕະຖານການປ່ອຍນ້ຳເປື້ອນ ໃນມາດຕະຖານສິ່ງແວດລ້ອມແຫ່ງ ສປປ ລາວ (2009)	ນ້ຳປະປາ ເມືອງ ຜິນ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
ປະລິມານ ນ້ຳປະປາທີ່ພຽງພໍ	ການກວດສອບປະລິມານນ້ຳກ່ອນເຂົ້າໂຮງງານດ້ວຍເຄື່ອງວັດແທກການໄຫຼ ແລະ ເຄື່ອງວັດແທກຄວາມດັນ (ໃນໄລຍະທົດລອງ)	ປະຈຳວັນ	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການຕິດຕາມໃນເວລາດຳເນີນການ				ປະຈຳວັນ	ນ້ຳປະປາ ເມືອງ ຜິນ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
ມົນລະພິດທາງອາກາດ	ການກວດສອບຕົວຊີ້ວັດທີ່ເປັນອັນຕະລາຍຕໍ່ຊຸມຊົນ	ຕາມການກຳນົດ ຂອງ ມາດຕະຖານ ການປ່ອຍມົນລະພິດທາງອາກາດ ຂອງ ມາດຕະຖານ ສິ່ງແວດລ້ອມ ແຫ່ງ ສປປ ລາວ(2009)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
ມົນລະພິດທາງສຽງ	ການກວດສອບຄວາມແຮງຂອງສຽງທີ່ສິ່ງຜົນກະທົບຕໍ່ຊຸມຊົນ	ຕາມການກຳນົດ ຂອງ ມາດຕະຖານ ການປ່ອຍມົນລະພິດ	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			

		ທາງສຽງຂອງ ມາດຕະຖານສິ່ງ ແວດລ້ອມ ແຫ່ງ ສປປ ລາວ(2009)					
	ການກວດສອບຄວາມແຮງ ຂອງສຽງຈາກເຮືອນປ້ຳ ແລະ ຂະບວນການຜະລິດທີ່ ສິ່ງຜົນກະທົບຕໍ່ຊຸມຊົນ				ຕາມການກຳນົດຂອງ ມາດຕະຖານການປ່ອຍ ມົນລະພິດ ທາງສຽງຂອງ ມາດຕະຖານສິ່ງ ແວດ ລ້ອມ ແຫ່ງ ສປປ ລາວ (2009)	ນ້ຳປະປາ ເມືອງ ຜົນ	ຢູ່ໃນມູນຄ່າຂອງການດຳ ເນີນຜະລິດປະຈຳປີ
ສິ່ງເສດເຫຼືອ	ການຈັດການຂີ້ເຫຍື້ອຈາກ ການກໍ່ສ້າງ	ໜຶ່ງຄັ້ງຕໍ່ອາທິດ ຫຼື ຖີ່ກວ່າ	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງ ການກໍ່ສ້າງ			
	ການຈັດການຂີ້ເຫຍື້ອຈາກ ການຜະລິດ				ໜຶ່ງຄັ້ງຕໍ່ອາທິດຖີ່ກວ່າ	ນ້ຳປະປາ ເມືອງ ຜົນ	ຢູ່ໃນມູນຄ່າຂອງການດຳ ເນີນຜະລິດປະຈຳປີ
	ການຈັດການຕະກອນຈາກ ການຜະລິດ				ໜຶ່ງຄັ້ງຕໍ່ປີ	ນ້ຳປະປາ ເມືອງ ຜົນ	ຢູ່ໃນມູນຄ່າຂອງການດຳ ເນີນຜະລິດປະຈຳປີ

10 ສະຫຼຸບ

ໂຄງການນ້ຳປະປາ ເຂດເຊທ່າມອກ, ເມືອງ ຜິນ, ແມ່ນໄດ້ມີການສຶກສາຜົນກະທົບເບື້ອງຕົ້ນຕາມລະບຽບການຂອງກະຊວງຊັບພະຍາກອນທຳມະຊາດ ແລະ ສິ່ງແວດລ້ອມ ແລະ ພາຍໃຕ້ການຕິດຕາມຂອງ ພະແນກຊັບພະຍາກອນແຂວງ ສະຫວັນນະເຂດ ເປັນຜູ້ຈັດຕັ້ງປະຕິບັດ.

ຈາກການສຶກສາຜົນກະທົບເບື້ອງຕົ້ນຂອງໂຄງການ, ສາມາດສະຫຼຸບໄດ້ວ່າ ຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມທຳມະຊາດ ແລະ ສັງຄົມ ແມ່ນບໍ່ກະທົບຫຼາຍໃນໄລຍະຍາວ. ຜົນກະທົບໃນໄລຍະສັ້ນ ກໍ່ຄືຜົນກະທົບໃນໄລຍະການກໍ່ສ້າງຕໍ່ຄຸນະພາບນ້ຳ, ມົນລະພິດທາງອາກາດ, ສຽງ ແລະ ສິ່ງເສດເຫຼືອ ແມ່ນໄດ້ມີການກຳນົດມາດຕະການຫຼຸດຜ່ອນທີ່ຊັດເຈນເພື່ອປະຕິບັດຕາມ. ສຳລັບຜົນກະທົບໃນໄລຍະຍາວ ແມ່ນຜົນກະທົບດ້ານບວກຕໍ່ສັງຄົມກໍ່ຄືການຂະຫຍາຍການສະໜອງນ້ຳສະອາດໃຫ້ແກ່ປະຊາຊົນ ແລະ ນັກທ່ອງທ່ຽວທີ່ເຂົ້າມາໃນເຂດບໍລິການຂອງໂຄງການນ້ຳປະປາ. ນອກຈາກນີ້, ການນຳໃຊ້ນ້ຳທີ່ໄດ້ມາດຕະຖານຈະຊ່ວຍຫຼຸດຜ່ອນການເກີດພະຍາດທີ່ມາຈາກນ້ຳໃນການນຳໃຊ້ ແລະ ດື່ມນ້ຳທີ່ໄດ້ມາດຕະຖານຂອງກະຊວງສາທາລະນະສຸກ ແລະ ອົງການສາກົນ WHO ໄດ້ວາງອອກ.

ຜູ້ອຳນວຍການລັດວິສາຫະກິດນ້ຳປະປາແຂວງ

ລັດວິສາຫະກິດ ນ້ຳປະປາ

ວຽງແຂກ ຫາມຊະນະ

Annex 6 – Demonstrating Compliance with the Adaptation Fund's Environmental and Social Policy through the Environmental and Social Management Plan

Purpose

The purpose of this overview is to demonstrate compliance of the project with the Environmental and Social Safeguards of the Adaptation Fund. It provides a summary of the measures taken in the project design phase to ensure that the project promotes positive environmental and social benefits, avoids, reduces or mitigates adverse environmental and social risks and impacts considering the 15 Adaptation Fund principles. It further details the measures put in place to uphold the principles throughout the project implementation.

Compliance Process

In line with UN-Habitat's Environmental and Social Management System and the Adaptation Fund's ESP (and Gender Policy). UN-Habitat, in partnership with NPSE Savannakhet completed a rapid climate change vulnerability assessment, feasibility study and initial environmental examination (IEE) in the preparation of this proposal. These documents are presented in Annexes 1-4. This IEE (which covers Component 2 of the proposed project) also ensures that the ESMP and safeguarding process is compliant with Laos' legal requirements.

UN-Habitat's staff in the Laos country office supported the rapid VA, feasibility study and IEE by ensuring that consultations took place with vulnerable groups, and that additional information could be gathered to demonstrate compliance with the requirements of the AF ESP. The consultations focused on climate change related hazards, the perceptions, requirements and priorities of the poorest and most vulnerable, beneficial activities, potential risks and effective risk mitigation.

For a full description of the project that was designed based on these consultations, please see Part II, Section A of the project proposal document.

Screening and Categorization

As part of the rapid VA, feasibility study and IEE, a screening and assessment was carried out to identify and evaluate environmental and social risks and impacts of proposed interventions.

Planning and policy related activities, which make up all actions under Components 1 and 3 have been screened against the 15 AF ESP principles and no potential risks have been observed, or potential risks are sufficiently inconsequential that no further actions are required. Despite this, there will be ongoing monitoring for compliance undertaken as the project is implemented to ensure that risks don't develop.

Activities under Component 3 are 'hard' investments and as such some relatively minor risks have been identified. The design of the project incorporates means to ensure that risks are minimised, by working in only two locations and maximising community engagement, there are no incentives for mismanagement and substantial incentives to ensure compliance with Environmental and Social Principles. The investments are also sufficiently small-scale that any negative impacts that arise

would be raltively minor and localised in their scale. Nevertheless, these activities can be classified as category B for environmental and social safeguard risks and as such an ESMP has been developed, below.

Table 12 - Activity level safeguarding sheet for Sayphouthong Town

District Name	Sayphouthong		
Specific Activity and Brief Description	**"Construct a water infrastructure climate resilient with 3,600m3/day WTP that serves 24/7 of 48,188 residents in Sayphouthong town"**		
Environmental and Social Safeguard Principle	**Yes/No and Specific Risks**	**Linkage in the VA**	**Risk Mitigation Actions incorporated in the design**
Compliance with the law	**Yes** See Tables 6&7, below	The project has assessed that there is no realistic risk under any of the project's proposed activities because the interventions are to be built by government, on public land, and in compliance with the laws outlined in Part II, Section 5 of this proposal	*Relevant national, local authorities and engineers were consulted during the project design phase to ensure compliance with all relevant **laws and technical standards**.* *It will be ensured that each person associated with the subproject is aware of **domestic and international laws and compliance needs to 8th NSEDP, SDG and Lao technical standards requirements**.* UN-Habitat will work with executing entities to monitor developments and changes to the law and train partners, where appropriate.
Access and Equity	**Yes** See Tables 6&7, below	That certain groups are denied access to infrastructure, or that preferential access is given to others. This risk is of medium significance for construction activities under component 2. This is because there is a high number of indigenous people	*Consultations have and will continue to capture all needs of the target communities/households and the activities have been designed according to their **'access and equity**' needs.* *Mapping all the groups and their needs, planning/ management and monitoring process for implementing all components and community management with rules ensuring that equal **'access and equity**' is guaranteed. A pro-poor tariff will be implemented to reduce the possibility that people*

			can't access the services.
Marginalised and Vulnerable Groups	**Yes** See Tables 6&7, below	According to the Feasibilities study conducted in the preparation of this concept note, 62 per cent of the residents of Sethamouak Town and 49 per cent of Sayphouthong District are indigenous people. In each case, they come from the Phoutong, Katang and Mangkone ethnic groups (all of which have languages from the Thai-Kadai ethnolinguistic family. In total, 27,649 (49.8 per cent) of the beneficiaries are indigenous people.	*Community management with rules ensuring that equal access is guaranteed, including for indigenous populations. This means that all consultations and meetings should be made accessible in indigenous languages, where people cannot, or do not wish to communicate in the Lao Language.* *Consultations have and will continue to capture all issues and needs of "**marginalized and vulnerable groups"** and particular impacts on- and needs of marginalized and vulnerable groups will be assessed throughout the project.* *The domestic tariff is a rising 3-block structure to ensure affordability by the low-income group (LIG), this special tariff measures will be created to ensure that poor indigenous households have continued access to water supply, despite their low incomes.*
Human Rights	**No** See Tables 6&7, below	In both towns, women substantially outnumber men. In total, the project has 57,144 beneficiaries, of which 29,669 will be women, meaning that 53.5% of the project's beneficiaries are women.	See measures of other risk categories.
Gender Equity and Women's	**Yes**	Women could be denied access to infrastructure, or prevented	Quotas for female participation in decision making at all levels. Engagement throughout the

Empowerment	See Tables 6&7, below	from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2.	project with the Lao Women's Union and the Women's representative which exists in every village. *The project will actively pursue of **Gender Equity and Women's Empowerment** participation in project activities and stakeholder consultation, e.g. through quota systems and /or organization of separate working groups during the implementation of components 1&2.*
Core Labour Rights	**Yes** See Tables 6&7, below	The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2.	*All community contracts must be scrutinised to ensure they comply with both national law and international standards.* *The project will monitor that international and national labour laws are respected, for any work that may be carried out in relation to the project.*
Indigenous People	**Yes** See Tables 6&7, below	Possible eviction arising from conflicts over land ownership. However, this is very unlikely. All infrastructure investments are being made on land currently owned by the government. No land acquisition is required by the project.	The State pursues the policy of promoting Unity and Equality among all ethnic groups. All ethnic groups have the rights to protect, preserve and promote the fine customs and cultures of their own tribes and the nation. All Acts of creating Division and Discrimination among ethnic groups are forbidden. The State implements every measure to gradually develop and upgrade the economic and social level of all ethnic groups". *Consultations have and will continue to capture all issues and needs of all communities (as the indigenous people, make up the majority of the*

			population nationwide and in the target areas) and particular impacts on- and needs of indigenous people and other communities will be assessed throughout the project.
Involuntary Resettlement	**Yes** See Tables 6&7, below	See 'Marginalised and Vulnerable Groups, above'	*No activity will be implemented where there is the possibility, however small, of forced eviction. AoCs and contracts will include standard clauses stating that target communities will not be '**involuntary resettled**', also after the project.*
Protection of Natural Habitat	**Yes** See Tables 6&7, below	Damage to local ecosystems, including forests, and rivers from infrastructure construction. This risk is low significance, under the proposed activities under component 2, but not impossible, considering that water be supplied will be sourced from the river in both towns.	Incorporating protection of habitats and ecosystems into action planning. The water supply system design includes river bank protection and stabilisation.
Conservation of Biological Diversity	**Yes** See Tables 6&7, below	See Protection of Natural Habitats	See Protection of Natural Habitats
Climate Change	**Yes** See Tables 6&7, below	Construction of infrastructure generates waste, as part of the activities under component 2. However, as waste generation will be highly localised, and systems in place for proper disposal, this is low significance	Incorporating waste management and disposal into design and operating procedures for the construction. *The infrastructure has been designed to avoid 'maladaptation' by ensuring that hazards are not shifted onto other locations not covered by the project*

			Climate Change policies and guidelines to be explained to understood by project personnel prior to implementation and monitored by implementing partners.
Pollution Prevention and Resource Efficiency	**Yes** See Tables 6&7, below	Water infrastructure could be open to contamination, spreading water-borne diseases	Incorporating public health considerations (Especially relating to water contamination) into training under Component 2 *The project will use local materials for construction where possible.*
Public Health	**Yes** See Tables 6&7, below	See Protection of Natural Habitats	See Protection of Natural Habitats
Physical and Cultural Heritage	**Yes** See Tables 6&7, below	Women could be denied access to infrastructure, or prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2.	Quotas for female participation in decision making at all levels. Engagement throughout the project with the Lao Women's Union and the Women's representative which exists in every village.

Land and Soil Conservation	**Yes** For specific risks, see ESS survey questionnaire for the village in question	The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2.	All community contracts must be scrutinised to ensure they comply with both national law and international standards

Table 13 - Activity level safeguarding sheet for Sethamouak Town

District Name	Sethamouak		
Investment and Brief Description	**"Construct a water infrastructure climate resilient with 1,200 m3/day WTP that serves 24/7 of 8,956 residents in Sethamouak Town."**		
Environmental and Social Safeguard Principle	**Yes/No and Specific Risks**	**Linkage in the VA**	**Risk Mitigation Actions incorporated in the design**
Compliance with the law	**Yes** See Tables 6&7, below	The project has assessed that there is no realistic risk under any of the project's proposed activities because the interventions are to be built by government, on public land, and in compliance with the laws outlined in Part II, Section 5 of this proposal	*Relevant national, local authorities and engineers were consulted during the project design phase to ensure compliance with all relevant **laws and technical standards**.* *It will be ensured that each person associated with the subproject is aware of **domestic and international laws and compliance needs to 8th NSEDP, SDG and Lao technical standards requirements**.* UN-Habitat will work with executing entities to monitor developments and changes to the law and train partners, where appropriate.
Access and Equity	**Yes** See Tables 6&7, below	That certain groups are denied access to infrastructure, or that preferential access is given to others. This risk is of medium significance for construction activities under component 2. This is because there is a high number of indigenous	*Consultations have and will continue to capture all needs of the target communities/households and investments have been designed according to their **'access and equity'** needs. A pro-poor tariff will be implemented to reduce the possibility that people can't access the services.* *Mapping all the groups and their needs, planning/ management and monitoring process for implementing all components and community*

		people	*management with rules ensuring that equal **'access and equity'** is guaranteed*
Marginalised and Vulnerable Groups	**Yes** See Tables 6&7, below	According to the Feasibility study conducted in the preparation of this concept note, 62 per cent of the residents of Sethamouak Town and 49 per cent of Sayphouthong District are indigenous people. In each case, they come from the Phoutong, Katang and Mangkone ethnic groups (all of which have languages from the Thai-Kadai ethnolinguistic family. In total, 27,649 (49.8 per cent) of the beneficiaries are indigenous people. In both towns, women substantially outnumber men. In total, the project has 57,144 beneficiaries, of which 29,669 will be women, meaning that 53.5% of the project's beneficiaries are women.	*Community management with rules ensuring that equal access is guaranteed, including for indigenous populations. This means that all consultations and meetings should be made accessible in indigenous languages, where people cannot, or do not wish to communicate in the Lao Language.* *Consultations have and will continue to capture all issues and needs of "**marginalized and vulnerable groups"** and particular impacts on- and needs of marginalized and vulnerable groups will be assessed throughout the project, as part of M&E.* *The domestic tariff is a rising 3-block structure to ensure affordability by the low-income group (LIG), this special tariff measures will be created to ensure that poor indigenous households have continued access to water supply, despite their low incomes (see also – access and equity)*
Human Rights	**No** See Tables 6&7, below	Human rights breaches can arise from denying access to water and other basic services, or from land conflicts, for example. However, the risk of this is	See measures of other risk categories. The specific Human rights risks are negligible.

		very low, under the proposed activities under component 2, as the project (and its supporting structures) are being created to provide continuity of clean water supply to people.	
Gender Equity and Women's Empowerment	**Yes** See Tables 6&7, below	Women could be denied access to infrastructure, or prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2.	Quotas for female participation in decision making at all levels. Engagement throughout the project with the Lao Women's Union and the Women's representative which exists in every village. *The project will actively pursue of **Gender Equity and Women's Empowerment** participation in project activities and stakeholder consultation, e.g. through quota systems and /or organization of separate working groups during Components 1&2.*
Core Labour Rights	**Yes** See Tables 6&7, below	The project will contract communities themselves to provide labour, meaning there is a chance that	*All community contracts must be scrutinised to ensure they comply with both national law and international standards.*

		labour rights may not be respected. Low significance under the proposed activities under component 2.	*The project will monitor that international and national labour laws are respected, for any work that may be carried out in relation to the project.* AoCs stipulate the need to respect core labour rights in line with international norms/ILO standards.
Indigenous People	**Yes** See Tables 6&7, below	Possible eviction arising from conflicts over land ownership. However, this is very unlikely. All infrastructure investments are being made on land currently owned by the government. No land acquisition is required by the project.	The State pursues the policy of promoting Unity and Equality among all ethnic groups. All ethnic groups have the rights to protect, preserve and promote the fine customs and cultures of their own tribes and the nation. All Acts of creating Division and Discrimination among ethnic groups are forbidden. The State implements every measure to gradually develop and upgrade the economic and social level of all ethnic groups". *Consultations have and will continue to capture all issues and needs of all communities (as the indigenous people, make up the majority of the population nationwide and in the target areas) and particular impacts on- and needs of indigenous people and other communities will be monitored throughout the project*
Involuntary Resettlement	**No** See Tables 6&7, below	See 'Marginalised and Vulnerable Groups, above'	*No activity will be implemented where there is the possibility, however small, of forced eviction. AoCs and contracts will include standard clauses stating that target communities will not be '**involuntary resettled**', also after the project.*
Protection of Natural Habitat	**Yes** See Tables 6&7, below	Damage to local ecosystems, including forests, and rivers from infrastructure construction. This risk is low significance,	Incorporating protection of habitats and ecosystems into action planning. Designing infrastructure so that it complements nature.

		under the proposed activities under component 2, but not impossible, considering that water be supplied will be sourced from the river in both towns.	
Conservation of Biological Diversity	**Yes** See Tables 6&7, below	See Protection of Natural Habitats	See Protection of Natural Habitats
Climate Change	**Yes** See Tables 6&7, below	Construction of infrastructure generates waste, as part of the activities under component 2. However, as waste generation will be highly localised, and systems in place for proper disposal, this is low significance	Incorporating waste management and disposal into design and operating procedures for the construction. *The infrastructure has been designed to avoid 'maladaptation' by ensuring that hazards are not shifted onto other locations not covered by the project* . *Climate Change policies and guidelines to be explained to understood by project personnel prior to implementation and monitored by implementing partners.*
Pollution Prevention and Resource Efficiency	**Yes** See Tables 6&7, below	Water infrastructure could be open to contamination, spreading water-borne diseases	Incorporating public health considerations (Especially relating to water contamination) into training under Component 2 *The project will use local materials for construction where possible.*
Public Health	**Yes** See Tables 6&7, below	See Protection of Natural Habitats	See Protection of Natural Habitats
Physical and Cultural	**Yes**	Women could be denied access to infrastructure, or	Quotas for female participation in decision making at all levels. Engagement throughout

Heritage	See Tables 6&7, below	prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2.	the project with the Lao Women's Union and the Women's representative which exists in every village.
Land and Soil Conservation	**Yes** See Tables 6&7, below	The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2.	All community contracts must be scrutinised to ensure they comply with both national law and international standards

Table 14 - Environmental and social assessment of investments under Component 2

Investment		Target District/Town	Estimated number of beneficiaries	Risk Assessment		
				Impact description of potential risk (considering the 15 AF principles)	Significance of impact of potential risk*	Proposed risk mitigation / justification of risk reduction / mitigation incorporated within design
2.1	Construct a water infrastructure climate resilient with 3,600 m3/day WTP that serves 24/7 of 48,188 residents in Sayphouthong Town	Sayphouthong	48,188	• The project has assessed that there is no realistic risk under any of the project's proposed activities because the interventions are to be built by government, on public land, and in compliance with the laws outlined in Part II, Section 5 of this proposal; • That certain groups are denied access to infrastructure, or that preferential access is given to others. This risk is of medium significance for construction activities under component 2. This is because there is a high number of indigenous people; • According to the Feasibilities study conducted in the preparation of this concept note, in total, 27,649 (49.8 per cent) of the beneficiaries are indigenous people. In both towns, women substantially outnumber men. In total, the project has 57,144	Low Medium Low Low Low Low	• Relevant national, local authorities and engineers were consulted during the project design phase to ensure compliance with all relevant laws and technical standards, it will be ensured that each person associated with the subproject is aware of domestic and international laws and compliance needs to 8th NSEDP, SDG and Lao technical standards requirements. • The main water supply facilities such as the major part of a dam, intake, water treatment plant, and reservoir will be located on public land; the transmission and distribution mains and reticulation pipes will be laid within road rights-of-way; • Consultations have and will continue to capture all issues and needs of "marginalized and vulnerable groups" and particular impacts on- and needs of marginalized and vulnerable groups will be assessed throughout the project;

				beneficiaries, of which 29,669 will be women, meaning that 53.5% of the project's beneficiaries are women; • Human rights breaches can arise from denying access to water and other basic services, or from land conflicts, for example; • However, the risk of this is very low, under the proposed activities under component 2, as the project (and its supporting structures) are being created to provide continuity of clean water supply to people. • Women could be denied access to infrastructure, or prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases; • The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2; • Possible eviction arising from conflicts over land ownership.	Low Low Low Medium Medium Low Low	• The domestic tariff is a rising 3-block structure to ensure affordability by the low-income group (LIG), this special tariff measures will be created to ensure that poor indigenous households have continued access to water supply, despite their low incomes; • The project will actively pursue of Gender Equity and Women's Empowerment participation in project activities and stakeholder consultation, e.g. through quota systems and /or organization of separate working groups during the implementation of Components 1&2 • The project will monitor that international and national labour laws are respected, for any work that may be carried out in relation to the project; • Consultations have and will continue to capture all issues and needs of all communities (as the indigenous people, make up the majority of the population nationwide and in the target areas) and particular impacts on- and needs of indigenous people and other communities will be assessed thoughout the project; • No activity will be implemented where there is the possibility, however small, of forced eviction. AoCs and contracts

				However, this is very unlikely. All infrastructure investments are being made on land currently owned by the government. No land acquisition is required by the project; • Damage to local ecosystems, including forests, and rivers from infrastructure construction. This risk is low significance, under the proposed activities under component 2, but not impossible, considering that water be supplied will be sourced from the river in both towns; • Construction of infrastructure generates waste, as part of the activities under component 2. However, as waste generation will be highly localised, and systems in place for proper disposal, this is low significance; • Water infrastructure could be open to contamination, spreading water-borne diseases; • Women could be denied access to infrastructure, or prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care		will include standard clauses stating that target communities will not be 'involuntary resettled', also after the project; • Maladaptation 'triggers' have been included in the design by ensuring, for example, that the project does not divert resources away from other areas not included in the project. Climate Change policies and guidelines to be explained to understood by project personnel prior to implementation and monitored by implementing partners; • The project will use local materials for construction where possible.

				when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2; • The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2.		
2.2	Construct a water infrastructure climate resilient with 1,200 m3/day WTP that serves 24/7 of 8,956 residents in Sethamouak Town	Sethamouak	8,956	• The project has assessed that there is no realistic risk under any of the project's proposed activities because the interventions are to be built by government, on public land, and in compliance with the laws outlined in Part II, Section 5 of this proposal; • That certain groups are denied access to infrastructure, or that preferential access is given to others. This risk is of medium significance for construction activities under component 2. This is because there is a high number of indigenous people; • According to the Feasibilities study conducted in the preparation of this concept note, in total, 27,649 (49.8 per cent) of the beneficiaries are indigenous people. In both towns, women substantially outnumber men. In total, the project has 57,144	Low Medium Low Low Low	• Relevant national, local authorities and engineers were consulted during the project design phase to ensure compliance with all relevant laws and technical standards, it will be ensured that each person associated with the subproject is aware of domestic and international laws and compliance needs to 8th NSEDP, SDG and Lao technical standards requirements. The main water supply facilities such as the major part of a dam, intake, water treatment plant, and reservoir will be located on public land; the transmission and distribution mains and reticulation pipes will be laid within road rights-of-way; • Consultations have and will continue to capture all issues and needs of "marginalized and vulnerable groups" and particular impacts on- and needs of marginalized and vulnerable groups will be assessed throughout the proejct;

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				when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2; The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2.		

Table 15 - Potential risks, mitigation measures and monitoring for investments under Component 3

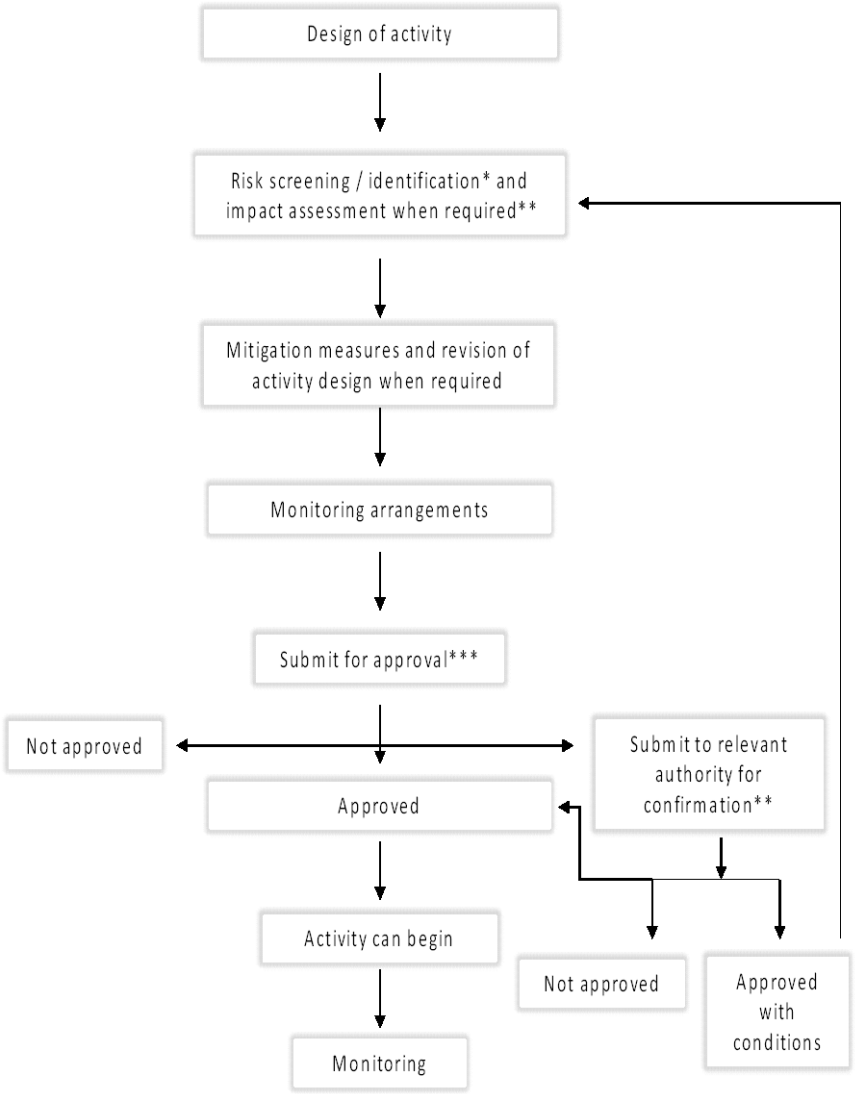
Output	AF triggered, risk of potential impact and significance score	Measure to avoid or mitigate potential risks	Monitoring indicator	Frequency and responsibility monitoring
2.1 Construct a water infrastructure climate resilient with 3,600 m3/day WTP that serves 24/7 of 48,188 residents in Sayphouthong Town	• The project has assessed that there is no realistic risk under any of the project's proposed activities because the interventions are to be built by government, on public land, and in compliance with the laws outlined in Part II, Section 5 of this proposal; • That certain groups are denied access to infrastructure, or that preferential access is given to others. This risk is of medium significance for construction activities under component 2. This is because there is a high number of indigenous people; • According to the Feasibilities study conducted in the preparation of this concept note, in total, 27,649 (49.8 per cent) of the beneficiaries are indigenous people. In both towns, women substantially outnumber men. In total, the project has 57,144 beneficiaries, of which 29,669 will be women, meaning that 53.5% of the project's beneficiaries are women; • Human rights breaches can arise from denying access to water and other basic services, or from land conflicts, for example; • However, the risk of this is very low, under the proposed activities under component 2, as the project (and its supporting structures) are being created to provide continuity of clean water supply to people. • Women could be denied access to infrastructure, or prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases; • The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2;	• The main water supply facilities such as the major part of a dam, intake, water treatment plant, and reservoir will be located on public land; the transmission and distribution mains and reticulation pipes will be laid within road rights-of-way; • Consultations have and will continue to capture all issues and needs of "marginalized and vulnerable groups" and particular impacts on- and needs of marginalized and vulnerable groups will be assessed throughout the project • The domestic tariff is a rising 3-block structure to ensure affordability by the low-income group (LIG), this special tariff measures will be created to ensure that poor indigenous households have continued access to water supply, despite their low incomes; • The project will actively pursue of Gender Equity and Women's Empowerment participation in project activities and stakeholder consultation, e.g. through quota systems and /or organization of separate working groups during the implementation of Components 1&2 of the project. • The project will monitor that international and national labour laws are respected, for any work that may be carried out in relation to the project; • Consultations have and will continue to capture all issues and needs of all communities (as the indigenous people, make up the majority of the population nationwide and in the target areas) and particular impacts on- and needs of indigenous people and other communities will be monitored throughout the project; • No unidentified subproject will be approved where there is the possibility, however small, of forced eviction. AoCs and contracts will include standard clauses stating that target communities will not be 'involuntary resettled', also after the project; • Maladaptation 'triggers' have been mitigated in the infrastructure design by ensuring, for example, that resources will not be diverted away from other areas not in the project. Climate Change policies and guidelines to be explained to understood by project personnel prior to implementation and monitored by implementing partners; • The project will use local materials for construction where possible.	• Number of AoCs that fully incorporate the 15 ESP principles; • Number of project partners trained in VA (principles, assessment methodologies); • Number of VA carried out; • Percentage of women, men, youth, elderly, people with disabilities, varying ethnic groups participating in planning and construction activities; • Number of participatory workshops held in each community; and • Number of target population benefiting from provided services water infrastructure	Baseline, mid-term and end

	• Possible eviction arising from conflicts over land ownership. However, this is very unlikely. All infrastructure investments are being made on land currently owned by the government. No land acquisition is required by the project; • Damage to local ecosystems, including forests, and rivers from infrastructure construction. This risk is low significance, under the proposed activities under component 2, but not impossible, considering that water be supplied will be sourced from the river in both towns; • Construction of infrastructure generates waste, as part of the activities under component 2. However, as waste generation will be highly localised, and systems in place for proper disposal, this is low significance; • Water infrastructure could be open to contamination, spreading water-borne diseases; • Women could be denied access to infrastructure, or prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2; • The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2.			
2.2 Construct a water infrastructure climate resilient with 1,200 m3/day WTP that serves 24/7 of 8,956 residents in Sethamouak Town	• The project has assessed that there is no realistic risk under any of the project's proposed activities because the interventions are to be built by government, on public land, and in compliance with the laws outlined in Part II, Section 5 of this proposal; • That certain groups are denied access to infrastructure, or that preferential access is given to others. This risk is of medium significance for construction activities under component 2. This is because there is a high number of indigenous people; • According to the Feasibilities study conducted in the preparation of this concept note, in total, 27,649 (49.8	• The main water supply facilities such as the major part of a dam, intake, water treatment plant, and reservoir will be located on public land; the transmission and distribution mains and reticulation pipes will be laid within road rights-of-way; • Consultations have and will continue to capture all issues and needs of "marginalized and vulnerable groups" and particular impacts on- and needs of marginalized and vulnerable groups will be monitored throughout the project. • The domestic tariff is a rising 3-block structure to ensure affordability by the low-income group (LIG), this special tariff measures will be created to ensure that poor indigenous households have continued access to water supply, despite their low incomes; • The project will actively pursue of Gender Equity and Women's Empowerment participation in project activities and stakeholder	• ncorporate the 15 ESP principles; • Number of project partners trained in VA (principles, assessment methodologies); • Number of VA carried out; • Percentage of women, men, youth, elderly, people with disabilities, varying ethnic groups participating in planning and construction activities; • Number of participatory	Baseline, mid-term and end

	per cent) of the beneficiaries are indigenous people. In both towns, women substantially outnumber men. In total, the project has 57,144 beneficiaries, of which 29,669 will be women, meaning that 53.5% of the project's beneficiaries are women; • Human rights breaches can arise from denying access to water and other basic services, or from land conflicts, for example; • However, the risk of this is very low, under the proposed activities under component 2, as the project (and its supporting structures) are being created to provide continuity of clean water supply to people. • Women could be denied access to infrastructure, or prevented from making critical decisions. Women outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases; • The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2; • Possible eviction arising from conflicts over land ownership. However, this is very unlikely. All infrastructure investments are being made on land currently owned by the government. No land acquisition is required by the project; • Damage to local ecosystems, including forests, and rivers from infrastructure construction. This risk is low significance, under the proposed activities under component 2, but not impossible, considering that water be supplied will be sourced from the river in both towns; • Construction of infrastructure generates waste, as part of the activities under component 2. However, as waste generation will be highly localised, and systems in place for proper disposal, this is low significance; • Water infrastructure could be open to contamination, spreading water-borne diseases; • Women could be denied access to infrastructure, or prevented from making critical decisions. Women	consultation, e.g. through quota systems and /or organization of separate working groups during the implementation of Components 1&2; • The project will monitor that international and national labour laws are respected, for any work that may be carried out in relation to the project; • Consultations have and will continue to capture all issues and needs of all communities (as the indigenous people, make up the majority of the population nationwide and in the target areas) and particular impacts on- and needs of indigenous people and other communities will be monitored throughout the project. • No activity will be implemented where there is the possibility, however small, of forced eviction. AoCs and contracts will include standard clauses stating that target communities will not be 'involuntary resettled', also after the project; • Maladaptation 'triggers' have been mitigated in the infrastructure design by ensuring, for example, that resources will not be diverted away from other areas not in the project. Climate Change policies and guidelines to be explained to understood by project personnel prior to implementation and monitored by implementing partners; The project will use local materials for construction where possible.	workshops held in each community; and • Number of target population benefiting from provided services water infrastructure	

	outnumber men in the project area and have 'more to gain' from continuity of clean water supply because they are, at present, often responsible for collecting water, are the primary users of water in the home, and the primary givers of care when people become sick with water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2; • The project will contract communities themselves to provide labour, meaning there is a chance that labour rights may not be respected. Low significance under the proposed activities under component 2.			

Screening Process



* For all activities against the 15 ESP principles.
Use of Risk Assessment Sheet where necessary

** In consultation with Technical Advisory Group

*** All after activities to be approved by Project Management Committee

Environmental and social management plan

1. Introduction

The ESMP is designed to list the risks and preventative/mitigation measures outlined above in table 5 and outline how they will be monitorired and managed, and by whom, throughout the project.

2. Risks management arrangements

(i) Responsibilities: direct management responsibility of the ESMP will be under the project Team Leader. The team leader will have oversight/final compliance responsibility. Any changes or additional activities that are required during the project implementation, and that fall within allowable limits set by the Adaptation Fund, will need to be approved by the project team leader and presented to the PSC, depending on the scale of the activity. This plan, as well as any changes in the risk landscape, will also be presented to the PSC.

(ii) Management and implementation of the investments: All project activities have been screened against the 15 environmental and social risks areas during project preparation phase (See above). Outcomes will be presented during the project inception to all stakeholders to confirm the management and monitoring arrangements and to agree on the detailed steps required to develop management plans for each activity covering detailed engineering studies, but also risks mitigation measures to comply to national technical standards in line with Part II, Section E

Budget: there are no specific budget requirements for project compliance to the ESP and GP.

3. General environmental and social risks management reduction measures

In addition to the risk management measures identified above, the following elements will be put in place to ensure the compliance with the ESP:

(i) The project MoU and the three Agreements of Cooperation with the Executing Entities will include a detailed reference to the ESMP and the necessary safeguarding measures, particularly Compliance with the Law, Indigenous People, Gender Issues and Labour and Safety Standards (Principles, 1, 5, 6 and 7).

(ii)

- Principle 1: References to standards and laws to which the activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities for compliance.
- Principle 4: Refetences to relevant Humans rights declarations will be included in all legal agreements with all sub-contractors.
- Principe 6: Employment and working conditions following ILO standards will be included in legal agreements with all sub-contractors.
- Principle 7 Indigenous people's rights must be safeguarded by ensuring equal access to resultant services and ensuring that all dialogue is accessible
- Principle 13: Ensure that ICSC international health and safety standards are clearly accessible and understood. e.g. by putting clearly visible signs detailing health

and safety standards to be located at projects sites and by supplying protective equipment.

(iii) UN-Habitat's Project Review Committee will check the compliance of the project with the ESP on inception and the gender focal point at UN-Habitat headquarters can check compliance throughout the project's implementation

(iv) Continuous coordination will take place with focal points in MoNRE, MPWT and NPSE Savannakhet to ensure compliance with the ESP and national laws, standards and policy priorities.

(v) Capacity building and awareness raising; the project team leader, executing entity partners and target communities, will receive training / capacity development to understand and manage the 15 Principles, the ESMP and in particular their responsibilities. This will be done during inception.

4. Risks monitoring arrangements:

(i) This monitoring program commensurate with actions identified above and will report on the monitoring results to the Fund in the mid-term, annual, and terminal performance reports. Monitoring will be done to ensure that actions are taken in a timely manner and to determine if actions are appropriately mitigating the risk / impact or if they need to be modified in order to achieve the intended outcome.

(ii) Annual reporting will include information about the status of implementation of this ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks. The reports shall also include, if necessary, a description of any corrective actions that are deemed necessary.

(iii) Direct monitoring responsibilities will be under the project team leader. The team leader will have oversight / final compliance responsibility. When changes or additional activities are required, monitoring indicators will be changed or added as well.

5. Grievance mechanism

(i) UN-Habitat will implement a grievance mechanism in the target areas, which will allow an accessible, transparent, fair and effective means of communicating if there are any concerns regarding project design and implementation. Employees, and people benefitting / affected by the project will be made aware of the grievance mechanism for any criticism or complaint of an activity.

(ii) This mechanism considers the special needs of different groups as well as gender considerations and potential environmental and social risks. A combination of mailboxes (at community level), confidential persons in the community and telephoning options offer an immediate way for employees and people affected by the project to safely express their concerns. The options will allow local languages and offer the opportunity for and people affected by the project to complain or provide suggestions on how to improve project design and implementation, which will be reviewed and taken up by the project implementation team.

(iii) Project staff will be trained in procedures for receiving messages and on the reporting of any grievances. Community chiefs will also be briefed how to obtain feedback from

community members on a regular basis. In addition, monitoring activities allow project participants to voice their opinions or complaints as they may see fit.

(iv) The address and e-mail address of the Adaptation Fund will also be made public (i.e. project website, Facebook and mailbox) for anyone to raise concerns regarding the project:

Adaptation Fund Board secretariat
Mail stop: MSN P-4-400
1818 H Street NW
Washington DC