ADAPTATION FUND

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND




To:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN P4-400
Washington, D.C., 20433
U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org

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.

[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

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 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]. In order to achieve this, the 8th National Socioeconomic Development Plan 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

[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

the initial project but caters to the government's ongoing priority to build resilience in these small urban settlements.

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 economically active people in Lao PDR is engaged 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

[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

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 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 contribute significantly to the 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, Savanakhet 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.

[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.

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.

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 Table 1. 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 ethnic 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)

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 overrepresented 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

[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

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 steady over the years as measured by the Human Development Index, for which it scored 0.340 in 1980, rising to 0.586 in 2015. However 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 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 in order to accelerate the achievement of MDG targets. One of the six areas concerned is 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

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

[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

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 spin-offs 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 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 or prioritized development initiatives have damaged previously well-functioning ecosystems. The state of the forests is a concern. Although there are different statistics for forest areas, based on varying conditions of forest cover, it is clear that forest cover has continuously declined in recent years resulting in a significant cumulative effect. A JICA report indicates a drop from 70% to 43% of the country's forst cover 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,

[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/

[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

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, in order 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 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.

[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

[31] 8th NSEDP, p.89.

[32] Vulnerability, Risk Reduction, and Adaptation to Climate Change, Lao PDR. World Bank, 2011.

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 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% in particular 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

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

[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

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.

One critical 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 in close proximity to 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 as a result of ecosystem changes, and also more severe human and economic impacts from the flooding.

---

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

[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)

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

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 7,304 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 55,492 direct beneficiaries from its infrastructure component, 29,669 of whom are women.

Table 3: Population details of target towns

District	Population of District (2016)	Population of target settlement (2016)	No. of Women in the target settlements	Population growth rate (% per annum)	Projected population of settlement in 2025	Ethnic minorities (%)
Phine	64,184	7,304	3,970	2.8	11,052	62%
Sayphouthong	48,188	48,188	25,699	1.65	61,596	48%
TOTAL	109,907	55,492	29,669		72,648	

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.

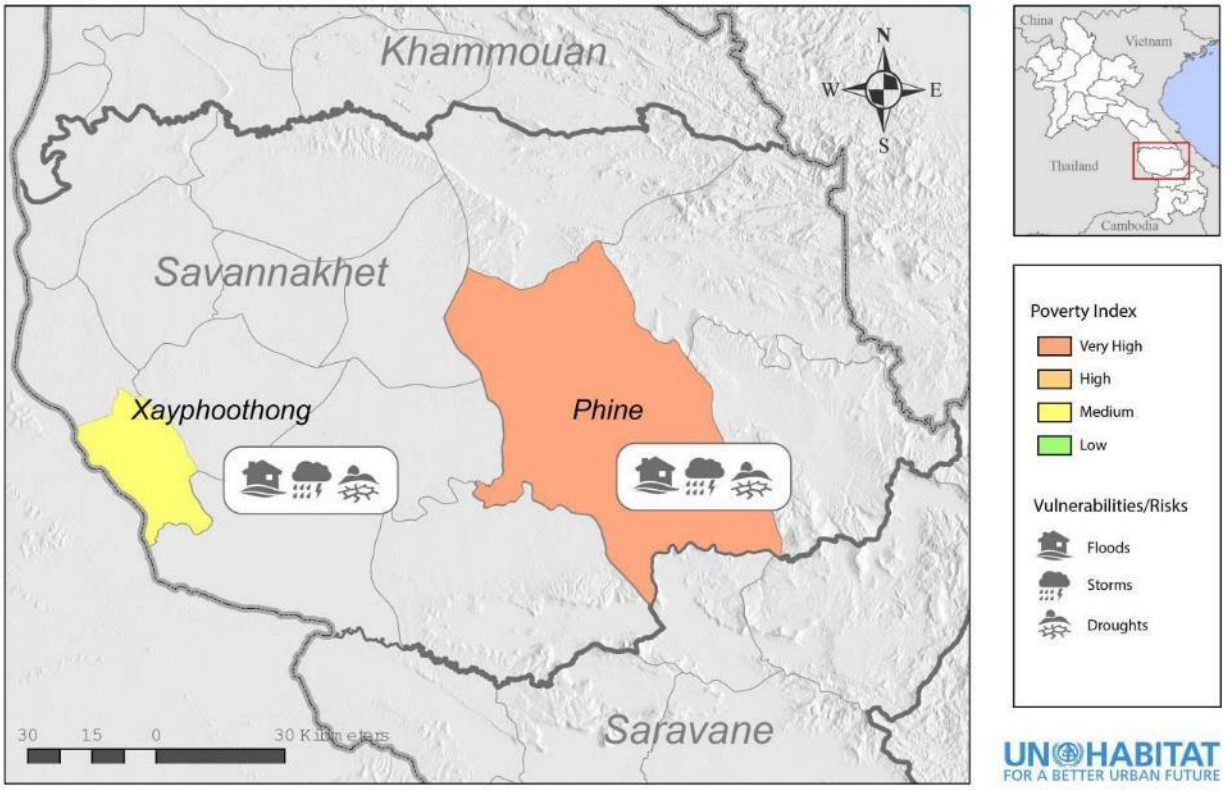


Figure 1 - Location of the Two Target Districts in Lao PDR

Table 4 shows recent extreme weather events in the target districts. It can be seen that 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. Droughts are increasingly occurring in both districts. These lead to crop failure, food insecurity and a lack of useable safe water sources, compelling people to source water from contaminated sources.

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

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%), lvery 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

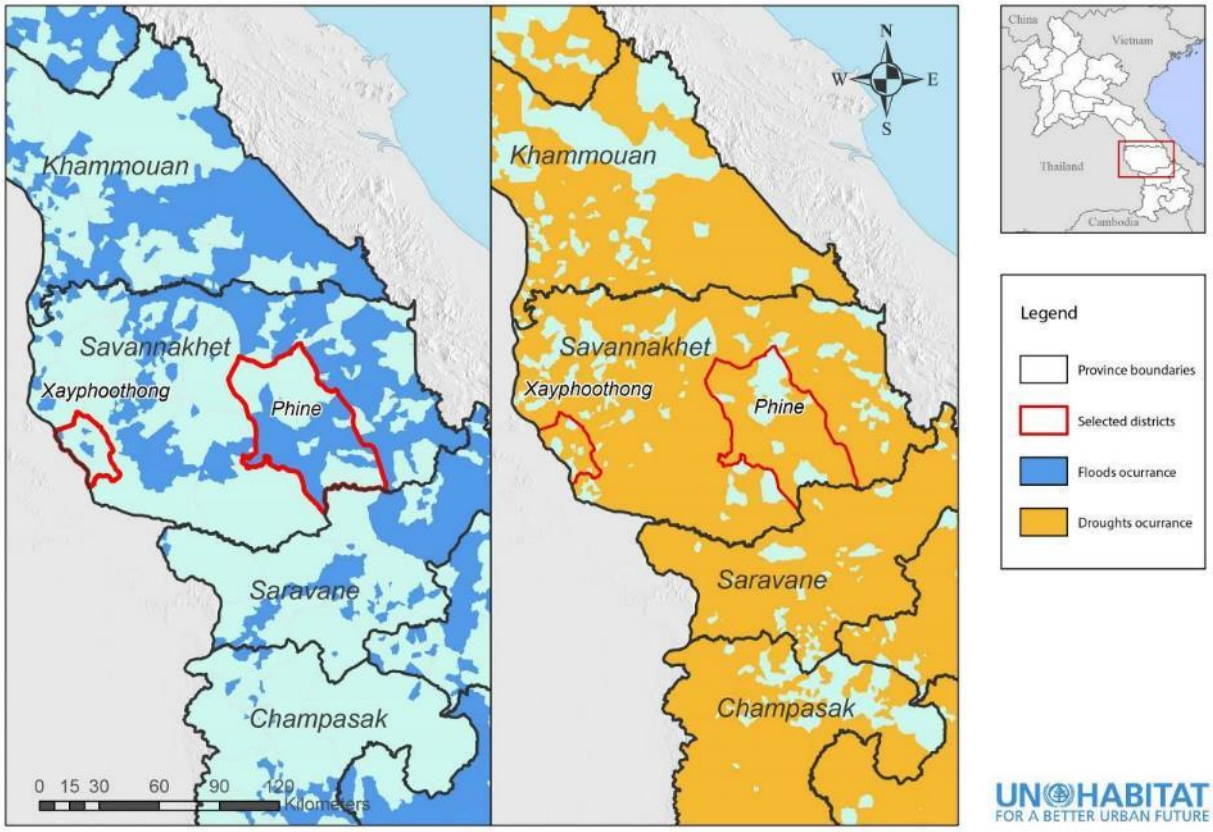


Figure 2 - Flood and Drought Locations

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.	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	Outcome 1.2.	

Capacity built at District, Provincial and National level to plan for climate-resilient infrastructure development and to maintain and manage infrastructure	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 under this project and to enable the government to better plan for adaptation in other infrastructure, beyond that in the project area	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 55,492 people.	
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 55,492 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 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	Output 3.1.1. 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	Outcome 3.1. Project implementation is fully transparent. All stakeholders are informed of products and results and have access to these for replication.	**208,485**

	climate change adaptation in basic service and protective infrastructure		
6. Project Execution cost			**US$478,515**
7. Total Project Cost			**US$5,037,000**
8. Project Cycle Management Fee charged by the Implementing Entity (if applicable)			**US$428,145**
Amount of Financing Requested			**US$ 5,500,000**

4. Projected Calendar:

Milestones	Expected Dates
Start of Project/Programme Implementation	01-2019
Project/Programme Closing	12-2022
Terminal Evaluation	06-2023

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. 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 (different provinces / districts) under its first Adaptation Fund project 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 55,492 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 aged, 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 with a backup of grid electricity. 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 supporting 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 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 practice. 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 conducting and utilising Vulnerability Assessments and action plans, 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 55,492 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:

- Training for project staff and government partners on the environmental, social and gender plan, establishing the grievance mechanism and conducting initial safeguarding measures as outlined in the plan, and in accorance with the Environmental and Social Policy of the Adaptation Fund.
- Construct a water climate resilient water supply system that serves all 48,188 residents of Sayphouthong and 7,304 residents of Sethamouak Towns. This includes the following actions:
    - 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
    - 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.
    - Construct the distribution network with up to 60 kilometres of pipelines
    - Construct a pumping station.

- Develop management systems for the new infrastructure:
    - Set up a district coordination unit to oversee and implement the construction of the project
    - Establish and build the capacity of village water and sanitation units (WATSANs) to implement and monitor the project.
    - 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 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. 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 which gives the overview of the system is included at the end of this section

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:

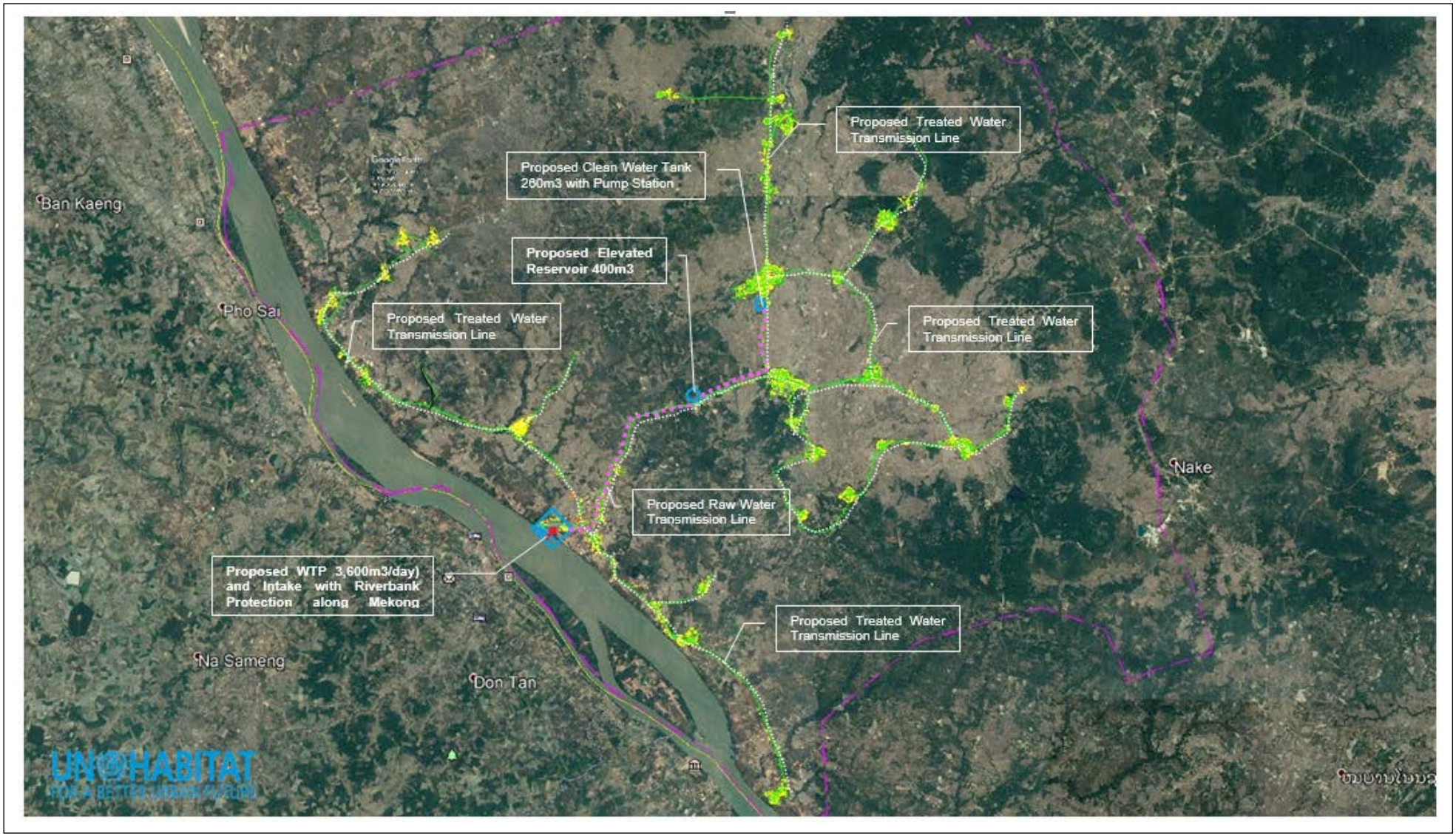
- Capturing and disseminating lessons learned and best practices both within the target area and further afield, to national level.
- Advocacy carried out at the national level in partnership with other stakeholders working on local level climate change adaptation.
- Building capacity in government authorities and other relevant stakeholders such as water utilities for monitoring, evaluation and learning, with oversight and mid-term 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[44]. 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

[44] 8th National Socioeconomic Development Plan

mitigation. The lessons from this project will be uploaded to the platform and will be accessible to all relevant stakeholders.



Proposed water supply system in Sayphouthong 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[45], 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.

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

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
	48,188	25,699	22,489			0.87625

Table 7 - Population Breakdown within the Target Settlements

Sethamuoak Village cluster	2017 Pop'n.	Women	Men	No. HH	Persons/ HH	M/F Ratio
Sesavang	1306	702	604	196	6.7	0.86
Sanamisay	769	418	351	114	6.7	0.84
Sysomboun	1328	730	598	178	7.4	0.82
Oudomsay	888	480	408	124	7.2	0.85
Sybounheuang	2418	1,314	1,104	337	7.2	0.84
Palek	597	323	274	83	7.2	0.85
TOTAL	7306	**3,967**	**3,339**	**1,032**	**7.1**	**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 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.	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. Continued 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 sanitation facilities (beyond small regular contributions to the improved infrastructure).
Social benefits		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. 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 benefits		The development of environmentally sensitive and 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 and 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 55,492 people. That means that the cost per beneficiary of the investments is US$72. Furthermore, the maintenance costs is relatively low at $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[46]. 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 as a result 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 conducting and utilising Vulnerability	Future cost of climate change	✓	Conducting training or planning without considering future climate change and climate vulnerability	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✓
	Community involvement	✓		Community involvement	✗

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

Assessments and action plans, using tailored guidelines	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 7,304 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 safeguarding risks	Less risk		Environmental and social safeguarding risks	Less risk
Establishing	Future cost of	✓	Relying on	Future cost of	✗

committees to operate and maintain the infrastructure and providing training on the basic maintenance, in accordance with the Environmental, Social and Gender Management Plan	climate change		existing government structures to manage the infrastructure in the absence of an Environmental, Social and Gender Plan	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 taken into account 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.

Given the state of discussions, 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 the NAP is developed the project will proactively seek to align with its focus and priorities, if the project begins before the NAP is finalized, the project will inform the NAP and the commitments 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 in a position to provide input on climate change priorities in the updated plans.

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
pping two town level master plans integrating climate resilience building into land-use, water management and infrastructure.	x	x	x	X	x	
g 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
p and construct a water climate resilient water supply system that serves all 48,188 residents of Sayphouthong and 7,304 residents of Sethamouak Towns	x	x	x	X	X	X
shing committees 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 and the Environmental and Social Policy of the Adaptation Fund

Compliance will be ensured with all national technical standards as well as UN-Habitat and Adaptation Fund Environmental and Social 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 under this project and to	Lao PDR Urban Planning Law. No.: 03-99/NA, dated 1999 Participatory Land Use Planning (PLUP) Planning for climate change guidelines Government's '3-build' or 'Samsang' process of decentralisation Provincial and district socio-economic development plans (which are in line with the National 5-year socio-economic development plan; Lao PDR Water and Resource Law. No.: 02-99/NA, dated 1996 Lao PDR Hygiene Law. No.: 08/NA, dated 2004 Lao PDR Water Supply Law. Law No.: 04/NA, dated 2009 National Standard on Quality management for drinking water and household water supply. Decision No. 1371/MoH, dated	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. The project will supply water in compliance	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.

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	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 Procedures 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 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.	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 social Impacts (category: Group 2 as per the ESIA)	Output 2 will trigger safeguarding actions under the following principles: Principle 2, 3, 5, 6, 7, 9, 10, 12, 13, 14 and 15. Further information is provided in the Environmental, Social, Gender and Youth Plan.

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	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		No environmental and 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.

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[47]	2013 - 2022	
	Strengthening resilience to CC in health sector[48]	2015 - 2018	Complete project
World Bank	Mainstreaming disaster and climate risk management in investment decisions[49]	2011 - 2016	Complete project
	Building Resilience to Natural Hazards[50]	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
UN-Habitat and ICLEI	Urban LEDS II €6m (across 8 countries, of which Laos is 1)	2017-2021	Works in Savanakhet and Pakse cities, focussing on mitigation and not working in 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 Oduomxay 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

[47] Link to project document: http://www.adb.org/projects/45301-002/main

[48] Link to project document: http://www.adb.org/projects/47143-001/main

[49] Link to project document: http://www.worldbank.org/projects/P129182/lao-pdr-mainstreaming-disaster-climate-risk-management-investment-decisions?lang=en

[50] 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[51] 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 in order 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

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

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. 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.

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 in order 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 with regard to 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 two. • Understand climate	• Target sites agreed • A clear picture of vulnerability and proposed actions	Rapid vulnerability assessment (RVA) conducted with the proposal of the intervention

	change vulnerability and highlight possible adaptation investments	established	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 building resilience • Understand specific resilience building needs and interest as well as concerns	• Insufficient data and relevant documents were collected	Rapid vulnerability assessment (RVA) conducted with the proposal of the intervention of the project (see 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 Setamouak 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.

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 55,492 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,	People do not have	55,492 people have	Water supply

construction and maintenance of resilient water treatment plants and piped water supply systems	access to year-round, 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.	year-round clean water supply with continued functionality irrespective of extreme events, future climate change and continued population growth.	facilities are 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 committees to operate and maintain the infrastructure and providing training on the basic maintenance, in accordance with the	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	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

Environmental, Social and Gender Management Plan	to water		marginalised groups, 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 key partners are Ministry of Public Works and Transport and the Nam Papa State-owned Enterprise (NPSEs). These institutions will ensure operations and maintenance. 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.

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[52]". In addition, the water supply systems will be managed by local people who have an 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.

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

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 in Table 15 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 Equity 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

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	Only siting infrastructure on public land. 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 analysis 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 55,492 beneficiaries, of which 29,669 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. Special tariff measures will be created to ensure that poor households have continued access to water supply, despite their low incomes.
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) are being created to provide continuity of clean water supply to people.	See measures of other risk categories
Gender Equity 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	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.

	water-borne diseases. There is low risk but medium significance of this under the proposed activities under component 2.	
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
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

PART IV: ENDORSMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. **Record of endorsement on behalf of the government**[53] 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: Jan 10, 2018

[to be updated if required]

1. 536. 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. 0025 - - - /DCC

Vientiane Capital, ...10/01/2018

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 designated authority for the Adaptation Fund in 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. We are pleased to note the progress of the project implemented by UN-Habitat and, thus encourage the development of this new project.

Accordingly, I am pleased to endorse the above project/programme proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented by the United Nations Human Settlements Programme (UN-Habitat) and executed by the Ministry of Public Works and Transport (MPWT) with oversight and support of the Ministry of Natural Resources and Environment (MoNRE).

Sincerely,

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

B. Implementing Entity certification

I certify that this proposal has been prepared in accordance with the guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans including the 8th Five-year National Socioeconomic Development Plan (2016–2020) with a vision to 2030, National Adaptation Program of Action to Climate Change (2009), Strategy on Climate Change of the Lao PDR (2010), Climate Change Adaptation Action Plan (2013-2020) and Nationally Determined Contribution (2016), 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 this project/programme.
Rafael Tuts Director, Programme Division UN-Habitat
Date: *1 August 2018* | Tel. and email: +254-20-762-3726 Raf.Tuts@un.org
Project Contact Person: Bernhard Barth, Human Settlements Officer
Tel: +81-92-724-7121 Email: Bernhard.Barth@un.org

Annex 1 – Feasibility Study for Sayphouthong 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

ADB	Asian Development Bank
AFD	Agence Francaise de Developpement
AIEC	Average Incremental Economic Cost
AIFC	Average Incremental Financial Cost
AP	Affected Persons
BNP	Branch Nam Papa
BPO	Business Promotions Office
BTC	Belgian Technical Cooperation
CAP	Community Actions and Participation
CEDAW	Convention of the Elimination of all forms of Discrimination against Women
CIPP	Community Information and Participation Program
CDP	Capacity Development Program
CPI	Committee for Planning and Investment
DHUP	Department of Housing and Urban Planning
DI	Ductile Iron
DMS	Detailed Measurement survey
DN	Pipe Nominal Diameter (in mm)
DPACS	Department of Public Administration and Civil Service (of the Prime
DPWT	Department of Public Works and Transport
DRC	District Resettlement Committee
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EL	Enterprise Law
EMP	Environmental Management Plan
EOCC	Economic Opportunity Cost of Capital
FIRR	Financial Internal Rate of Return
GAP	Gender Action Plan
GOL	Government of Lao PDR
GPOBA	Global Program of Outputs Based Aid
GRID	Gender Resource Information and Development Centre
GS	Galvanized Steel
HH	Households
HRD	Human Resources Development
ICB	International competitive bidding
IEC	Information, Education and Communication
IEE	Initial Environmental Examination
IEM	Independent External Monitoring
IOL	Inventory of losses
IPS	Improved PNP Sustainability
KOICA	Korean Aid Agency
Lao PDR	Lao People's Democratic Republic
LAR	Land Acquisition and Resettlement
LACF (P)	Land acquisition and compensation framework (plan)
LECS	Lao Expenditure and Consumption Surveys
LFNC	Lao Front for National Reconstruction

ABBREVIATIONS AND EQUIVALENTS (continued)

LWU	Lao Women's Union
M.	Muang
M&E	Monitoring and evaluation
MDGs	Millennium Development Goals
MIS	Management Information System
MOH	Ministry of Health
MPWT	Ministry of Public Works and Transport
Nam Saat	The National Center of Environmental Health and Water Supply
NCB	National competitive bidding
NCRWSSP	Northern and Central Regions Water Supply and Sanitation Sector Project
NDF	Nordic Development Fund
NGO	Non-Government Organization
NGPES	National Growth and Poverty Elimination Strategy
NORAD	Norwegian Agency for Development Cooperation
NPL	Nam Papa Lao
NPNL	Nam Papa Nakhonluang
NPV	Nam Papa Vientiane
NTU	Nephelometric Turbidity Units
NWTTI	National Waterworks Technical Training Center (Thailand)
OHUP	Office of Housing and Urban Planning (of DPWT at provincial level)
OOE	Office of Education
OOH	Office of Health
OPWT	Office of Public Works and Transport
O&M	Operation and Maintenance
PCU	Project Coordination Unit
PDR	People's Democratic Republic
PE	Polyethylene
PIA	Project Implementation Assistance
PIB	Public Information Booklet
PIR	Poverty Impact Ratio
PIU	Project Implementation Unit
PN	Pipe Pressure Class
PNP	Provincial Nam Papa
PPIAF	Public-Private Infrastructure Advisory Facility
PPP	Public Private Partnership
PPME	Project Performance Monitoring and Evaluation
PPSC	Provincial Project Steering Committee
PSA	Poverty and Social Analysis
PSC	Project Steering Committee
PSP	Private Sector Participation
PVC	Polyvinyl Chloride
RCS	Replacement Cost Survey
ROW	Right of Way
SES	Socio-Economic Survey
SGIA	Second Generation Imprest Account
SIP	Sector Investment Plan

SOE	State Owned Enterprise

ABBREVIATIONS AND EQUIVALENTS (continued)

SSIP	Small Scale Independent Provider
STEA	[Former] Science Technology and Environmental Agency
STDP	Small Towns Development Sector Project
STWSP	Small Towns Water Supply and Sanitation Sector Project
TA	Technical Assistance
TOR	Terms of Reference
TDG	Tariff Determination Guidelines
UDAA	Urban Development Administration Authority
UFW	Unaccounted-for-water
VEI	Village Environmental Improvements
VIP	Ventilated improved latrine
VRC	Village Resettlement Committee
WACC	Weighted Average Cost of Capital
WASA	Water Supply Authority
WATSAN	Water and Sanitation Unit
WB	World Bank
WFP	World Food Program
WREA	Water Resources and Environmental Agency (created 23 July 2007)
WSARC	Water Supply Authority Regulatory Committee
WSD	Water Supply Division
WSIP	Water Supply Investment Plan
WSP-EAP	Water and Sanitation Program for East Asia and the Pacific
WSSSP	Water Supply and Sanitation Sector Project
WSTP	Water Supply Tariff Policy
WTTC	Waterworks Technical Training Center (Lao PDR)

UNITS

ha	Hectare
Lpcd	Liters per capita per day
L/s	Liters per second
m	Meter
mg/L	Milligrams per Liter
mm	Millimeter
m^3/day	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

1.1.1 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.

1.1.2 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.

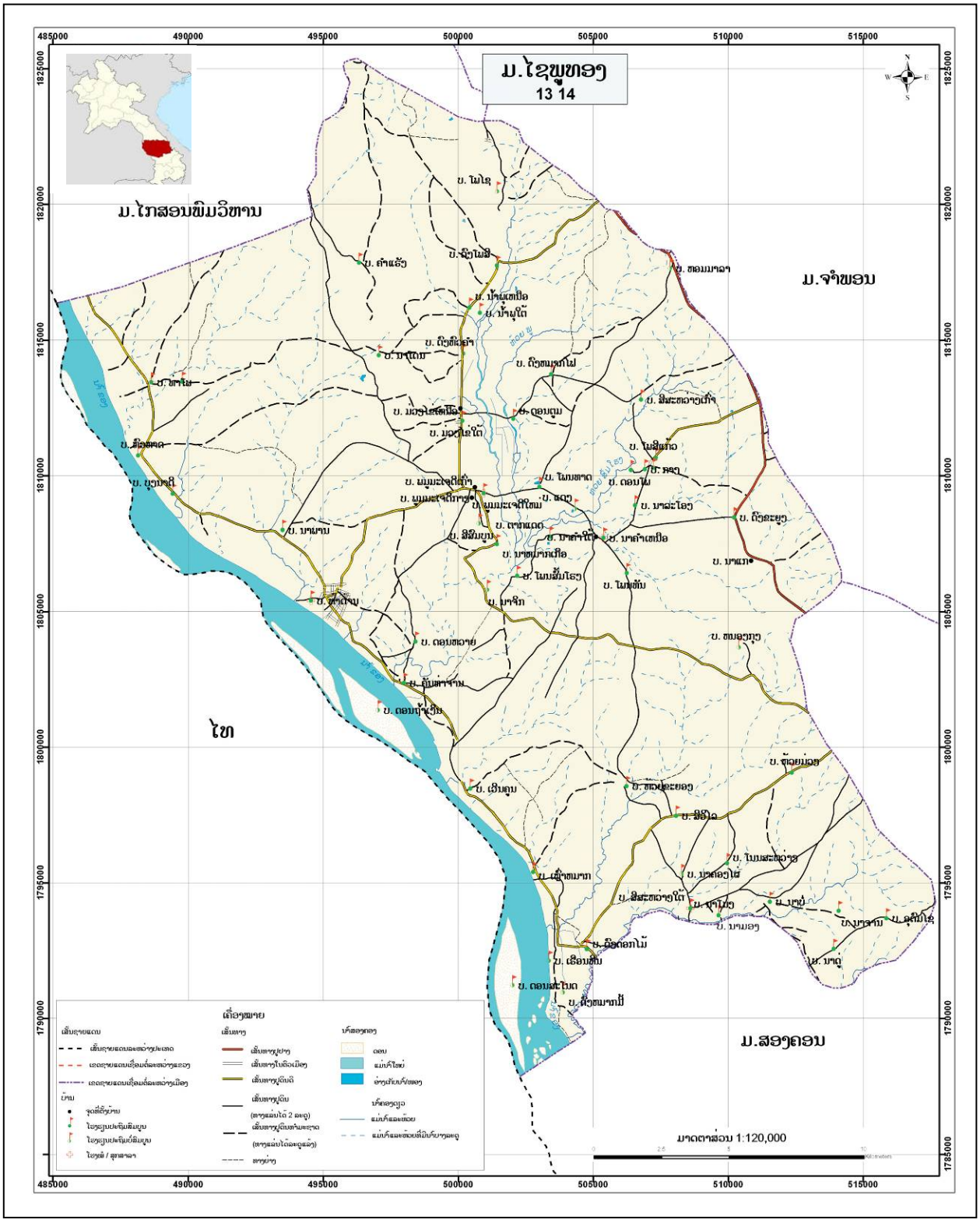
Project Impact and Outcome

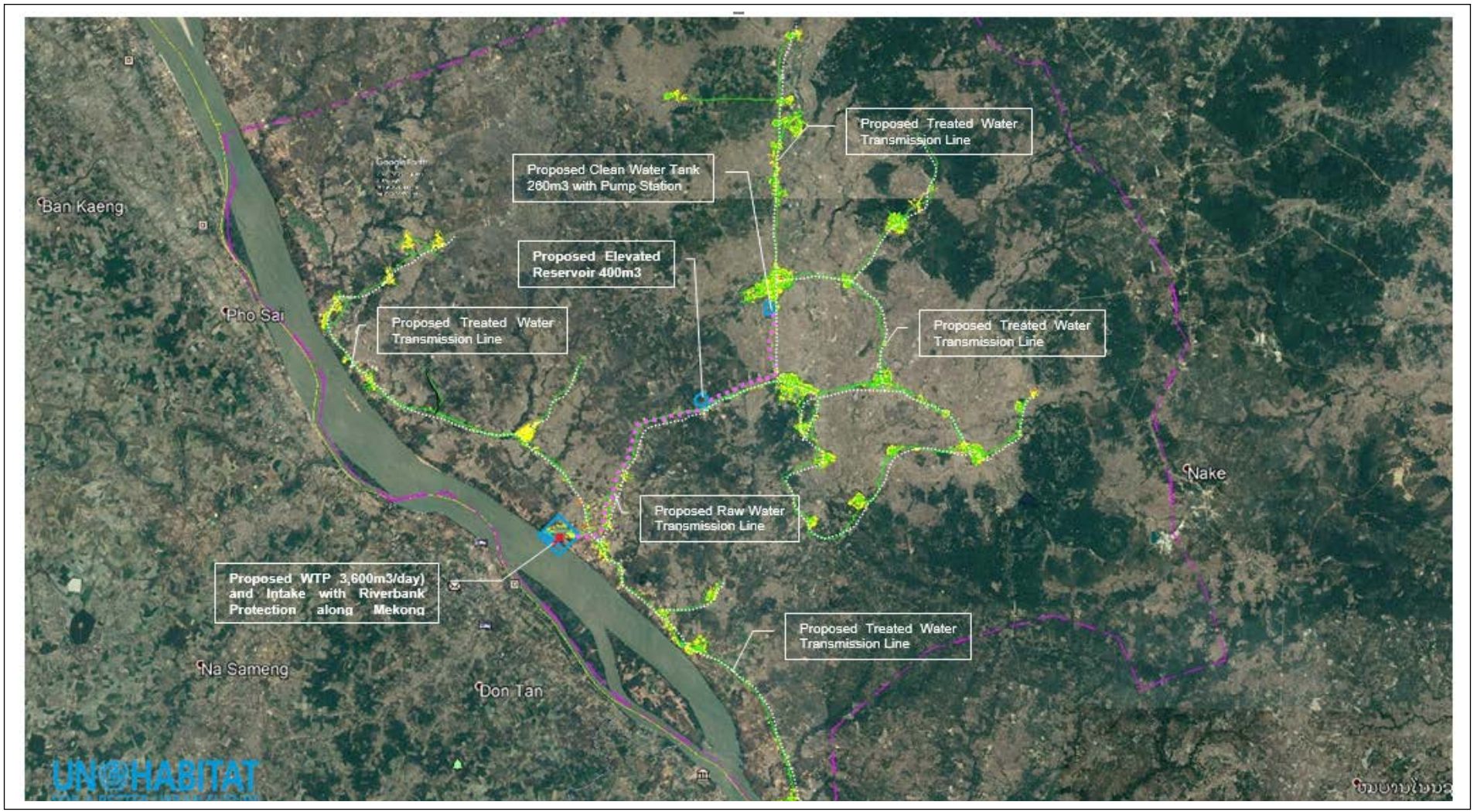
The expected impact of the Project is to build resilience to climate change in communities along an economic corridor in the central region of Lao PDR. This will be achieved by the provision of climate resilient infrastructure and the mainstreaming of climate action into urban planning. To achieve this 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 1-1 - Location of Project: Sayphouthong District Town in Savannakhet Province





Proposed water supply system in Sayphouthong Town

PROJECT DESCRIPTION

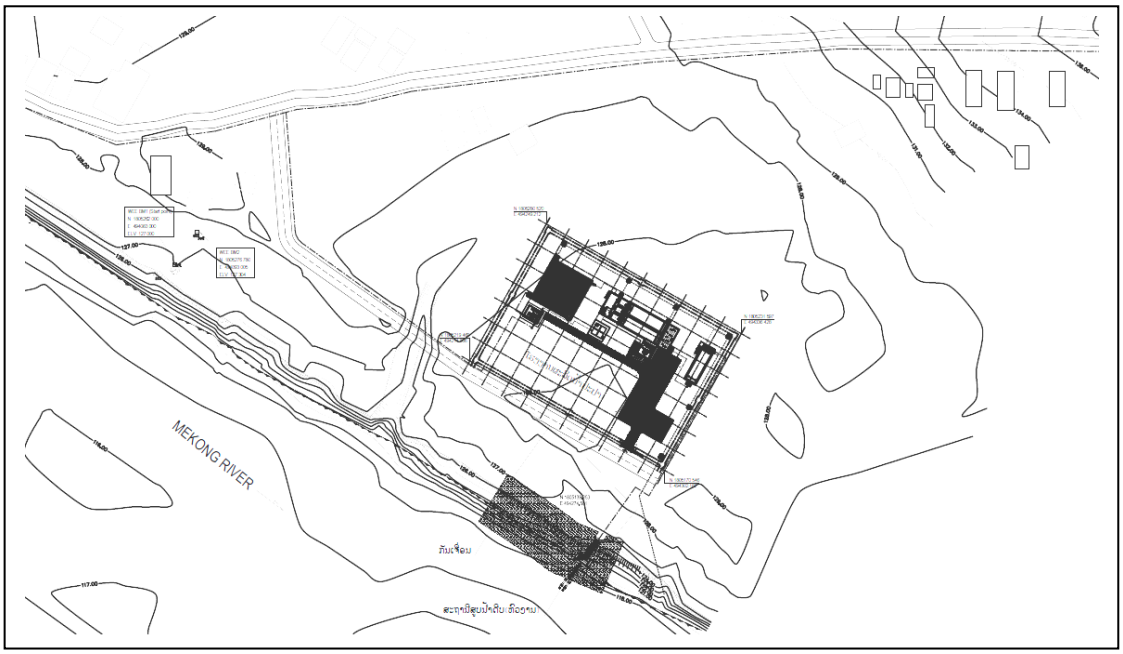
Project Description

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:

1.1.3 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:

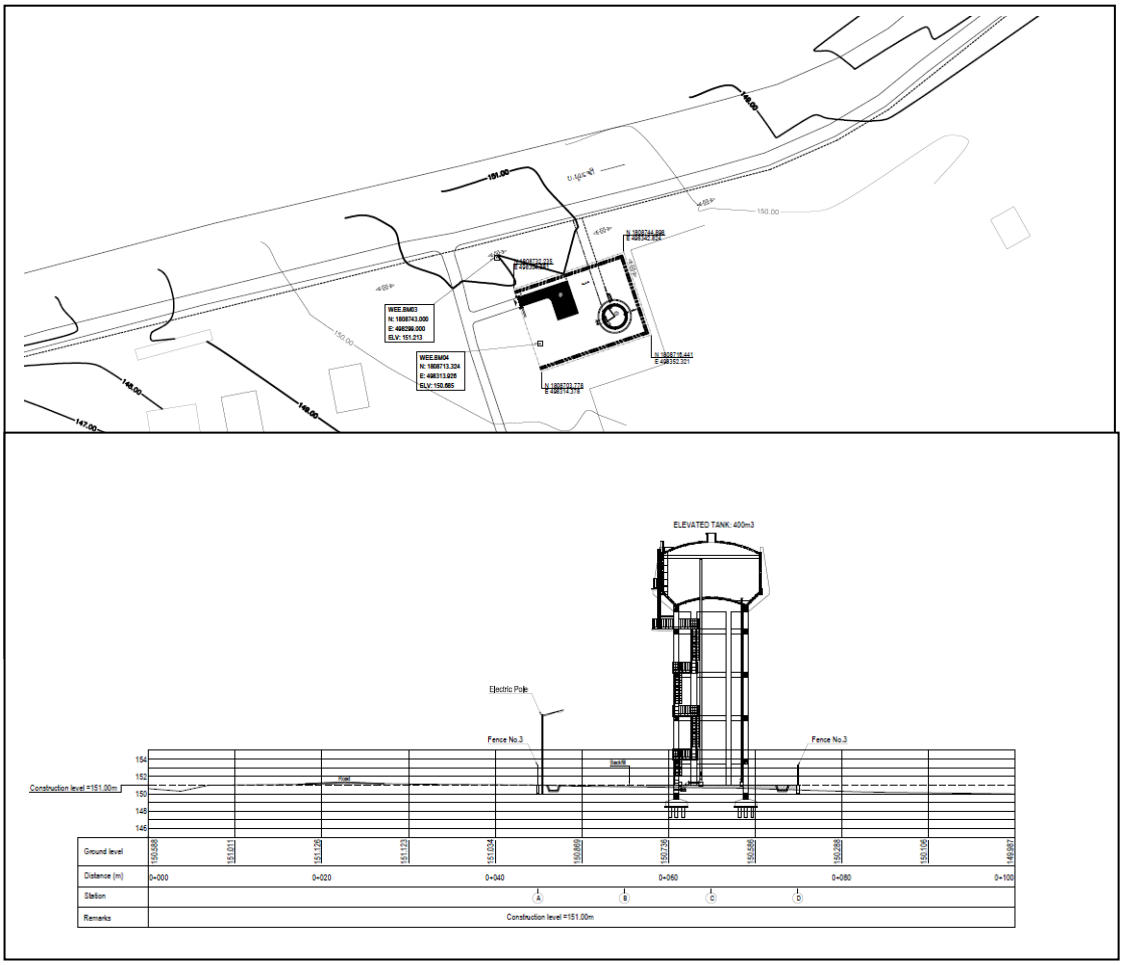
- on the Mekong river a 3,600 m3/day water treatment plant (WTP) with a water intake and riverbank protection located at Thadan village;



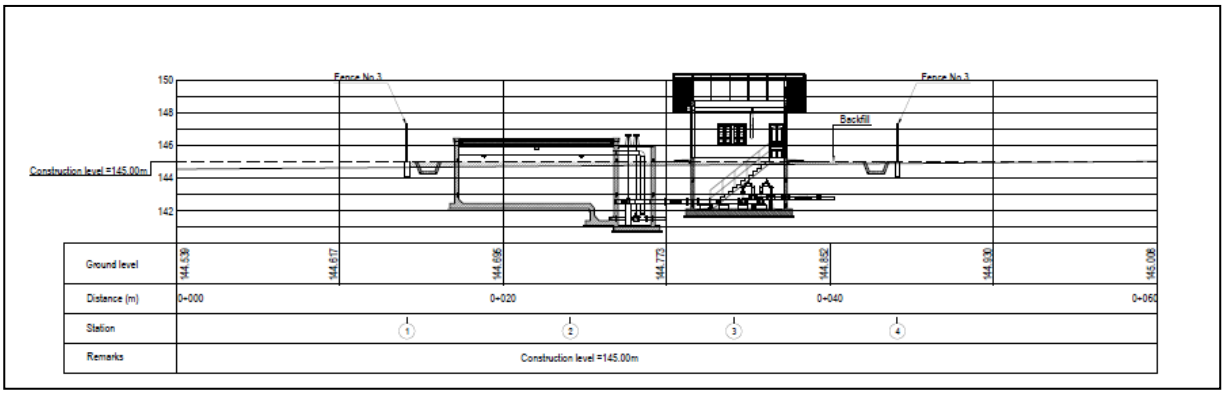
- The WTP located near the district center will include pre-sedimentation, flocculation, sedimentation, rapid gravity filtration, a backwash tank and

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.

1.1.4 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 4-1: 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

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

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 2019 to 2022. The order in which projects are implemented will be determined by Agreement of Cooperation AoC between UN-Habitat with NPSE/DPWT, depending on: (i) readiness of the concerned provincial and district governments to implement the projects, and; (ii) geographical grouping of the projects to minimize costs and maximize implementation efficiency.

Procurement

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 District 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 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

1.1.5 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.

1.1.6 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.

1.1.7 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.

.

1.1.8 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.

1.1.9 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 6-1: 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

No	Core Villages	2017 Pop'n.	No. HH	Persons/ HH	M/F Ratio
3	Khanthacham	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**

1.1.10 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.

1.1.11 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)

1.1.12 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.

1.1.13 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.

1.1.14 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.

1.1.15 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.

1.1.16 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

1.1.17 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

1.1.18 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.

1.1.19 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

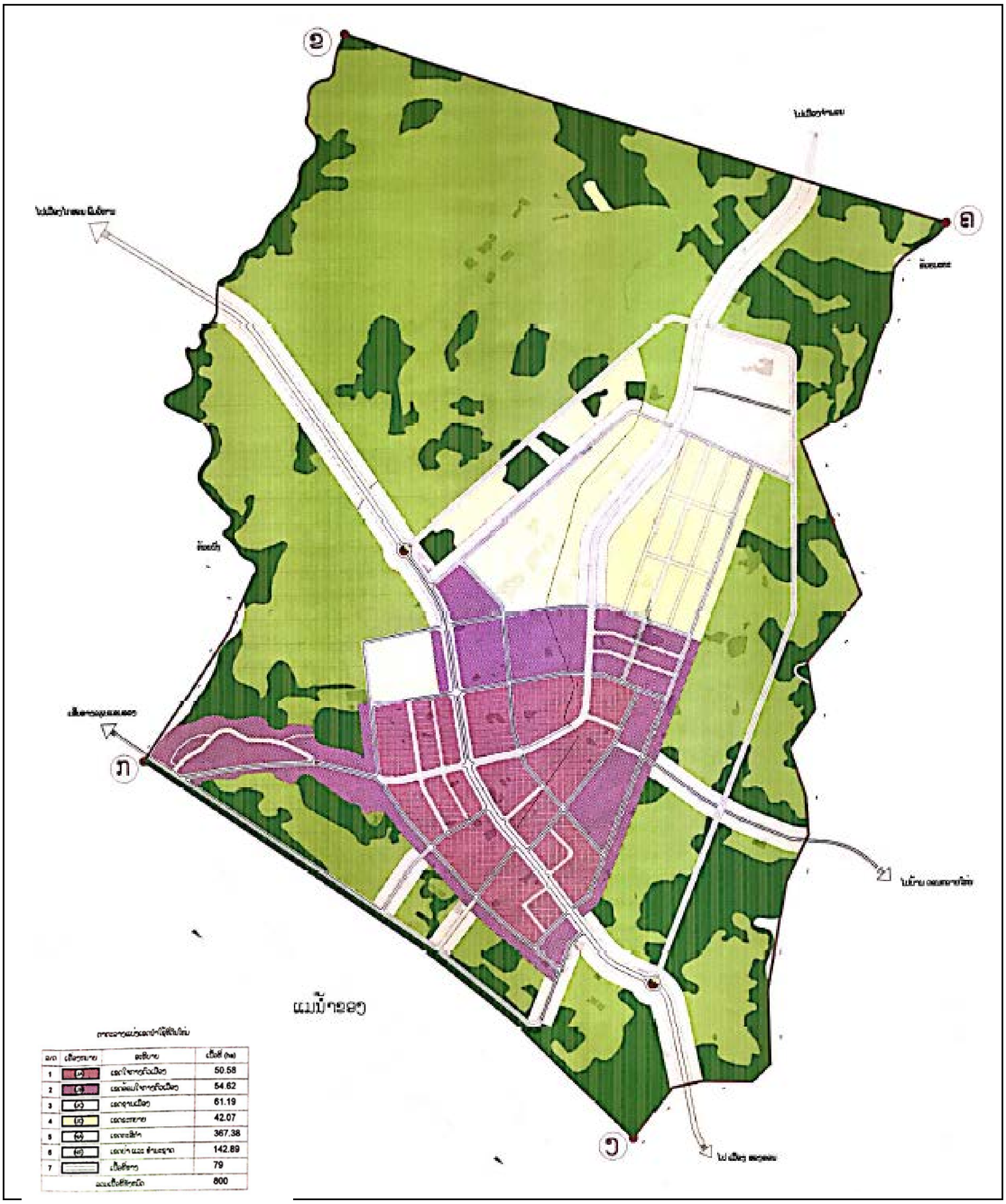
Sayphouthong town is the center of services, trade and agriculture in Sayphouthong district, which is one of the largest districts along Mekong River in Savannakhet province. It is located on National Road 13, which links two main population centers – the provincial capital, Kaysone about 35km to the 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:


50.58
54.62
61.19
42.07
367.38
142.89
79
800

- 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 7-1: 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

1.1.20 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[54] (ufw) as a % of total demand, excluding the demand of large industrial zones.
- Production losses in treatment plant (based % of total demands).

1.1.21 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

[54] Unaccounted-for-water is the difference between water production and authorized 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.
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[55], 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).

1.1.22 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.

[55] 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 7-2: 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.

1.1.23 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).

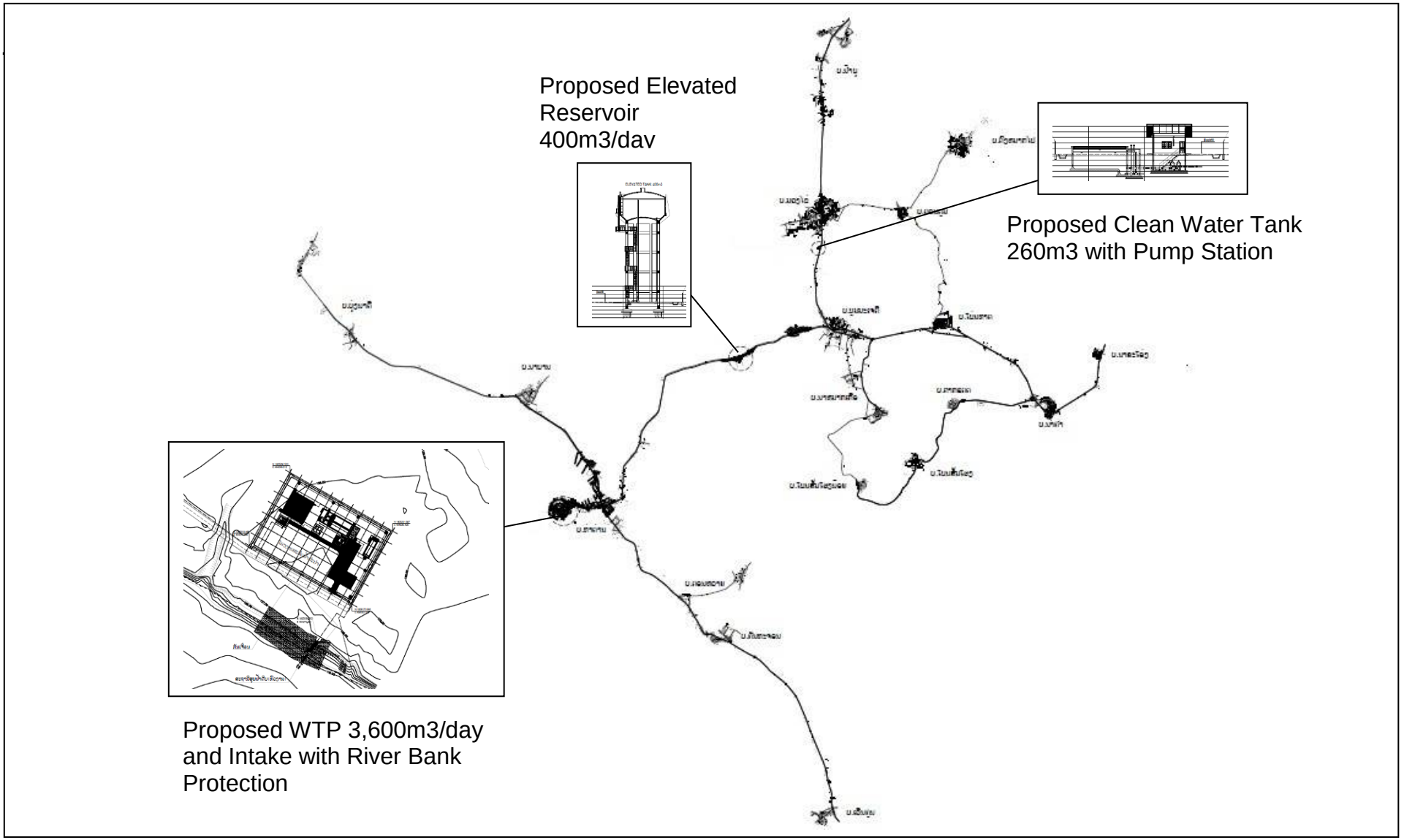
The adopted design periods for various parts of the water supply system are as follows:

Table 8-1: Recommended Design Periods

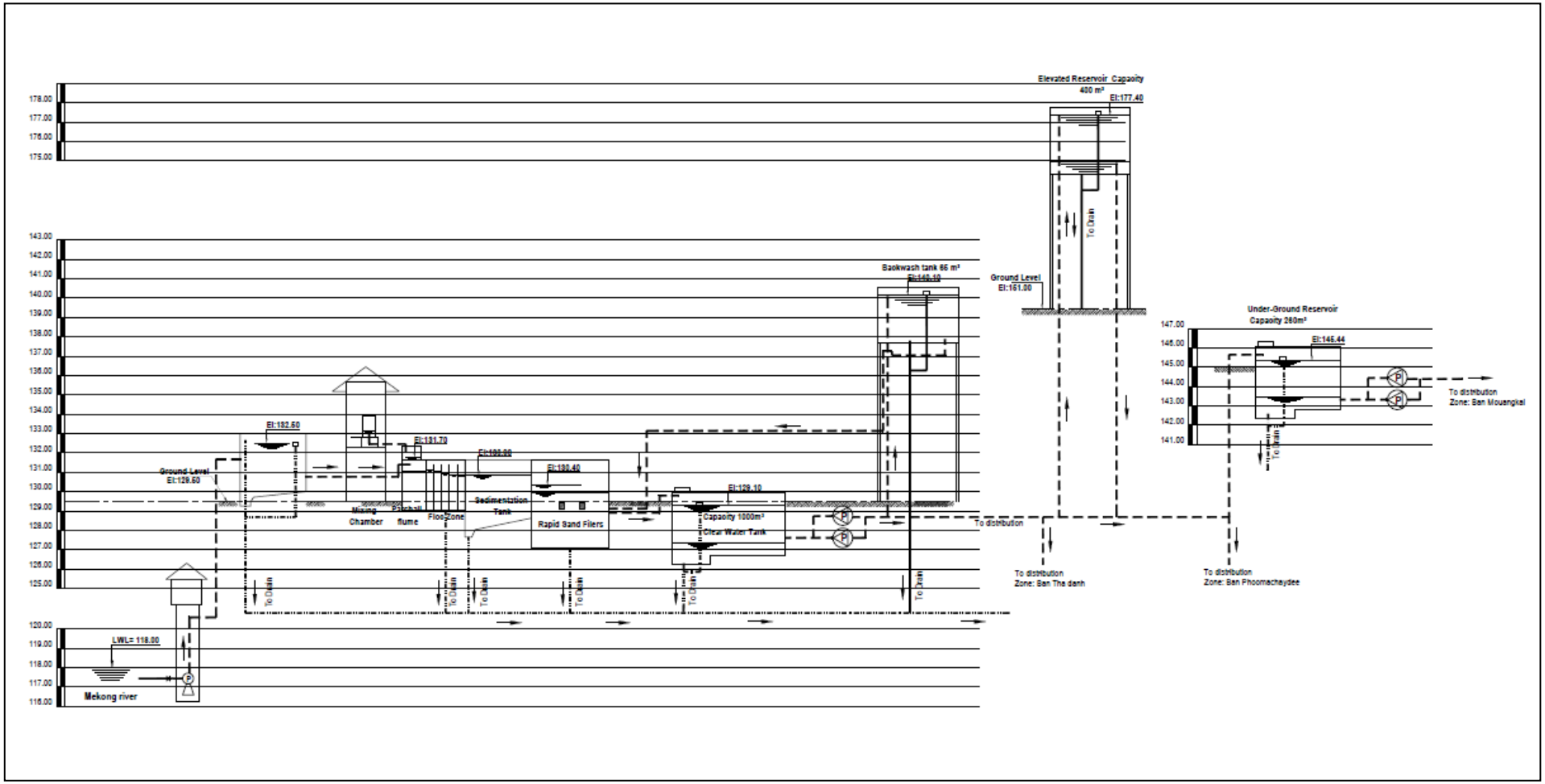
Component	Design Approach
Intake and raw water transmission mains	Design for Y2032 demands
Water treatment plant	Design for Y2032 demands, with provision (e.g. adequate hydraulic capacity) for plant uprating. Acquire adequate land to enable plant duplication in future.
Treated water transmission and	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.



Proposed water supply system in Sayphouthong Town



Proposed water supply system in Sayphouthong Town

1.1.24 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 9-2: O&M Equipment for PNP and Sayphouthong BNP

Item No	Description of Item	No
1	1 tonne Flatbed truck	1
2	Set of furniture for water treatment plant, including desks, chairs, and work benches.	1
3	Basic laboratory equipment for water quality testing	1
4	Standard software programs such as standard accounting (assumes billing will be centralized at the PNP provincial office)	1
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
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 9-3: 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 2 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 2 – Rapid Vulnerability Assessment Sayphouthong Town

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

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

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 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

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

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

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

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

Data collection

Consultation with communities

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

RAPID VULNERABILITY ASSESSMENT (RVA)		
1314	SAYPHOUTHONG	SAVANNAKHET PROVINCE, LAO PDR
Field visit: Location for Elevated reservoir	 	

Annex 3 – Rapid Vulnerability Assessment Phine Town

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
Population of District (2017)	64,634	
Population of District Town (2017)	7,304	
Population Growth Rate	2.8% annum	
Population of District Town (2025)	9,110	
Population of District Town (2032)	11,052	

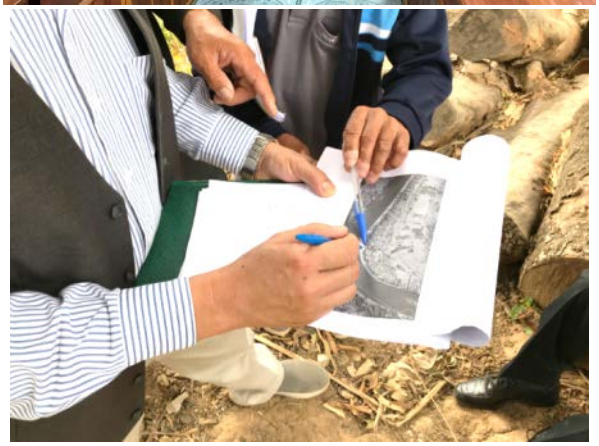
One of the small towns in Lao PDR proposed for inclusion in the Adaptation Fund programme is **Sethamouak** the District Town of Phine in Savannakhet Province. Savannakhet Province is the most populated province in Lao PDR with the total population of 970,478 persons. The Province comprises of 15 districts 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".***

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
Sethamouak District Town is composed of 6 villages with a total 2017 population of 7,304 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 1,032 households, of which 309 households (30%) 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		
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: 120 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	

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
		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%**
- 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. 15m 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

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
	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 9,110 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; • 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 supply24/7 for 7,304 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 4,163 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	

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
	settlements and infrastructure systems	
RAPID VULNERABILITY ASSESSMENT PICTURES		
Meeting with District governor/DoNRE/DPWT/ NPSE-Savannakhet Dated 13/12 /2017		
Data collection		
Consultation with communities		

RAPID VULNERABILITY ASSESSMENT (RVA)		
1304	PHINE DISTRICT	SAVANNAKHET PROVINCE, LAO PDR
Field visit: Sethamouak river (at downstream)		
Field visit: Sethamouak river (at uptream)		

Annex 4 – IEE Sayphouthong Town

ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ
ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນະຖາວອນ

----------000----------

ພະແນກ ໂຍທາທິການ ແລະ ຂົນສົ່ງ
ລັດວິສະຫະກິດ ວິສະວະກຳນ້ຳ ແລະ ສິ່ງແວດລ້ອມ
ໂທ: (856-21) 255 430. P.O Box 2571
ແຟັກ: (856-21) 264815

1499-...
ເລກທີ:............../ວບສ
ລົງວັນທີ: 02 OCT 2017

INITIAL ENVIRONMENTAL EXAMINATION

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

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

1 ພາກສະເໜີ.

1.1 ປະຫວັດຄວາມເປັນມາຂອງໂຄງການ.

ໂຄງການນ້ຳປະປາ ເມືອງ ໄຊພູທອງ ແຂວງສະຫວັນນະເຂດ, ແຜນການລົງທຶນຂອງລັດ ປີ2017 ທີ່ໄດ້ຮັບການອະນຸມັດຂອງກົມນ້ຳປະປາ, ກະຊວງໂຍທາທິການ ແລະ ຂົນສົ່ງ. ໂດຍມອບໃຫ້ພະແນກໂຍທາທິການ ແຂວງສະຫວັນນະເຂດ ເປັນຜູ້ດຳເນີນການຈັດຊື້ ຈັດຈ້າງ ວຽກສຶກສາຄວາມເປັນໄປໄດ້ ແລະ ສຳຫຼວດ-ອອກແບບລະບົບນ້ຳປະປາ ໃນການສະໜອງນ້ຳສະອາດໃຫ້ແກ່ປະຊາຊົນເຂດ ເມືອງທ່າປາງທອງ ປະຈຸບັນນີ້ຍັງບໍ່ທັນມີລະບົບນ້ຳປະປາ, ດ້ວຍເຫດນີ້ ຜູ້ທີ່ພັກອາໄສຢູ່ທີ່ພົບກັບຄວາມຫຍຸ້ງຍາກ ໃນການນຳ ເອົານ້ຳມາບໍລິໂພກໃນຄອບຄົວສ່ວນໃຫຍ່ແມ່ນໃຊ້ນ້ຳສ້າງ ຕື້ນຊຶ່ງມີຄວາມເລິກ ແຕ່ 7-10 ແມັດ, ສ້າງບາດານ ແລະ ໃຊ້ນ້ຳຫ້ວຍນ້ອຍ.

ເພື່ອຜັນຂະຫຍາຍແຜນພັດທະນາເສດຖະກິດສັງຄົມຂອງລັດຖະບານ, ໂດຍສະເພາະແຜນພັດທະນາເສດຖະກິດສັງຄົມຂອງແຂວງ ແລະ ວຽກສານສ້າງໄດ້ຖືກປະຕິບັດເທື່ອລະກ້າວ ໂດຍສະເພາະວຽກງານກໍ່ສ້າງພື້ນຖານໂຄງລ່າງ ດ້ານນ້ຳປະປາ.

ໂຄງການນ້ຳປະປາຈະມີຄວາມສາມາດຕອບສະໜອງນ້ຳສະອາດໃຫ້ແກ່: ບັນດາບຸກຄົນທີ່ດຳລົງຊີວິດຢູ່ໃນເຂດພື້ນທີ່ໂຄງການ ແລະ ເຂດບໍລິເວນໃກ້ຄຽງລວມມີ 16 ໝູ່ບ້ານ ລວມທັງສະຖານທີ່ລາດຊະການ, ສະຖານທີ່ທ່ອງທ່ຽວ ແລະ ເຂດບ້ານພັກທີ່ທັນສະໄໝ.

- ອີງຕາມ ແນວທາງຂອງພັກແລະລັດຖະບານທີ່ເລັ່ງໃສ່ການພັດທະນາທຸກເຂດແຂວງ, ຄືເມືອງ ແລະ ທ້ອງຖິ່ນໃນທົ່ວປະເທດ ໃຫ້ຫລຸດພົ້ນອອກຈາກຄວາມທຸກຍາກແລະຫຼຸດພົ້ນອອກຈາກປະເທດດ້ອຍພັດທະນາໃນປີ 2020.
- ອີງຕາມ ທິດທາງຄາດໝາຍສູ້ຊົນແຕ່ນີ້ຮອດປີ 2020 ຂອງພັກແລະລັດຖະບານໃຫ້ປະຊາຊົນແຕ່ລະຕົວເມືອງໃນຂອບເຂດທົ່ວປະເທດ80% ໃຫ້ໄດ້ຊົມໃຊ້ນ້ຳປະປາ.

2 **ວິທີການສຶກສາ**

ວິທີການສຶກສາ ເພື່ອສ້າງບົດລາຍງານການສຶກສາເບື້ອງຕົ້ນ ກ່ຽວກັບ ຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ຂອງໂຄງການ ກໍ່ສ້າງລະບົບນ້ຳປະປາເມືອງ ປະກອບດ້ວຍ: ກະກຽມແບບຟອມເກັບກຳຂໍ້ມູນ, ສ້າງແຜນການ, ວັດຖຸອຸປະກອນທີ່ຈຳເປັນ.

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

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

ອຸປະກອນສຳຫຼວດປະກອບມີ:

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

- ກ້ອງ Leveling instrument SOKKIA
- ແມັດ Measuring tape
- ວິສາວະກອນສຳຫຼວດ

ການຈັດວາງຂໍ້ມູນ, ວິເຄາະຄິດໄລ່ 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 ອຸນຫະພູມສະລີມ ສະເລ່ຍປະຈຳປີສູງເຖິງ 15-30 ອົງສາເຊ, ການຜິດດ່ຽງອຸນຫະພູມລະຫວ່າງກາງເວັນ ແລະ ກາງຄືນມີປະມານ 10 ອົງສາເຊ. ຈຳນວນຊົ່ວໂມງ ທີ່ມີແສງແດດຕໍ່ປີປະມານ 2,300-2,400 ຊົ່ວໂມງ (ປະມານ 6.3-6.5 ຊົ່ວໂມງຕໍ່ມື້), ຄວາມຊຸ່ມຊື່ນສຳພັດຂອງອາກາດ ມີປະມານ 70 - 85%, ປະລິມານ ນ້ຳຝົນໃນປີນີ້ແທກໄດ້ 1,076.8 ມມ.

ຕາຕະລາງ: 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	20.66	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	21.00	[illegible]	22.50

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		Savarnakhet		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	53.00	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)

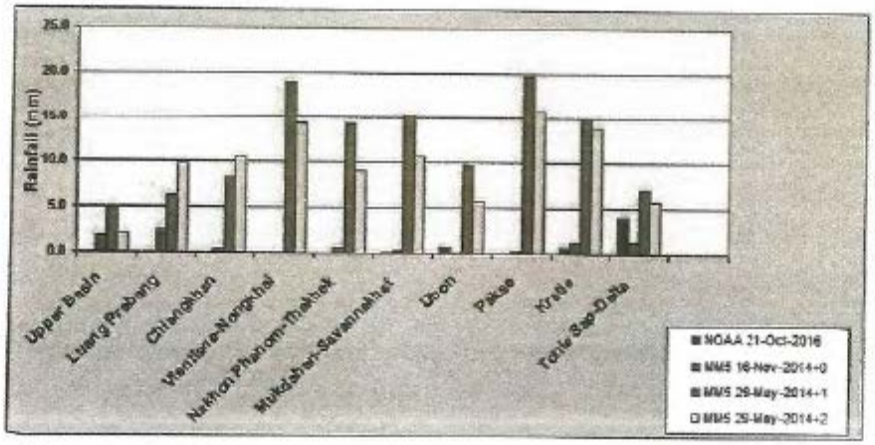
3.1.2 ພູມສັນຖານ

ເມືອງ ໄຊພູທອງເປັນເມືອງໜຶ່ງໃນ 15 ເມືອງແຂວງ ສະຫວັນນະເຂດ, ເປັນເມືອງທົ່ງພຽງທີ່ຕັ້ງຢູ່ທິດໃຕ້ ຂອງແຂວງ ສະຫວັນນະເຂດ ຊຶ່ງຫ່າງຈາກເທດສະບານແຂວງ ປະມານ 46 ກມ , ມີເນື້ອທີ່ທັງໝົດ 638,37 ກມ², ທິດເໜືອຕິດກັບເມືອງ ໄກສອນ, ທິດໃຕ້ຕິດກັບເມືອງ ສອງຄອນ, ທິດຕາເວັນອອກຕິດກັບເມືອງ ຈຳພອນ, ທິດຕາເວັນຕົກຕິດກັບນ້ຳຂອງ

ຮູບທີ 1: ລັກສະນະພູມສັນຖານບໍລິເວນໂຄງການ

3.1.3 ປະລິມານນ້ຳຝົນ

ແຂວງ ສະຫວັນນະເຂດ ແມ່ນນອນຢູ່ໃນເຂດພູມອາກາດມໍລະສຸມ ເຊິ່ງປະກອບມີ 2ລະດູແຕກຕ່າງ ກັນ ເຊັ່ນ :ລະດູແລ້ງ ແລະ ລະດູຝົນ ,ລະດູແລ້ງເລີ່ມແຕ່ເດືອນຫ້າ ແລະ ສຸດລົງໃນເດືອນເມສາ ,ລະດູຝົນ ເລີ່ມແຕ່ເດືອນພຶດສະພາ ຫາ ເດືອນຕຸລາ ສ່ວນເດືອນພຶດສະພາ ຫາ ເດືອນມະຖິນ ເປັນເດືອນຂ້າມຜ່ານຈາກລະດູ ໜຶ່ງ ຫາ ອີກລະດູໜຶ່ງ .ໃນຊ່ວງລະດູແລ້ງອາກາດມີການປ່ຽນແປງ ແລະ ແຕກຕ່າງກັນຫຼາຍ ລະຫວ່າງເດືອນ ຫ້າ ຫາ ເດືອນກຸມພາ ພູມອາກາດຈະໜາວເຢັນ ຫຼັງຈາກນັ້ນອາກາດຈະຮ້ອນເຂົ້າຈົນຮອດຕົ້ນເດືອນ ພຶດສະພາ. ສະເລ່ຍປະລິມານນ້ຳຝົນ ໄດ້ສະແດງໄວ້ໃນກຣາຟຕໍ່ໄປນີ້:



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

ຮູບທີ 2: ກຣາຟສະແດງປະລິມານນ້ຳຝົນ

3.1.5 ອັດຕາການໄຫຼຂອງນ້ຳ

ແມ່ນ້ຳຂອງ ໃນຊ່ວງ ນີ້ ມີປະລິມານ ຕ່ຳສຸດ ແມ່ນ ປະມານ 2,000ມ³ຕໍ່ວິນາທີ ໃນທ້າຍ ເດືອນ ເມສາ ຫາຕົ້ນເດືອນ ພຶດສະພາ ຂອງທຸກໆປີ ຕະລອດເວລາ ຂອງການວັດແທກ ຄົບຮອບ 10ປີ ເຊິ່ງ ມີປະລິມານສູງສຸດ ປະມານ 25,000ມ³ຕໍ່ວິນາທີ ໃນຊ່ວງລະຫ່ວາງທ້າຍເດືອນ 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 ນີ້ນສະແດງໃຫ້ເຫັນວ່າ ຄຸນນະພາບຂອງນ້ຳຂອງແມ່ນມີສັກກະຍະພາບ ແລະ ມີປະລິມານນ້ຳພຽງພໍສາມາດສະໜອງນ້ຳໃຫ້ໂຮງງານຜະລິດນ້ຳປະປາໄດ້ຕະຫຼອດປີ.

05 JUL 2017

Water Analysis report

Sampling Place: [illegible]

Location: [illegible]

Testing Date: [illegible] 2017

N	Description of analysis	Unit	Results N 1	N 2	N 3	[illegible]
	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	N. 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	96.0	X	
8	E.Coli	[illegible]	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:	Chief Chinaimo WTP:	General Manager NPNL:
M. Khounsavanh	ສຳເລີງ ມະນີວັນ	ວຽງຄຳ ວົງນະລາດ

3.1.7 ລະບົບນິເວດ

ຂອບເຂດຂອງໂຄງການຢູ່ພາຍໃຕ້ການສະໜັບສະໜູນ ແລະ ສົ່ງເສີມ ການພັດທະນາການທ່ອງທ່ຽວທາງທຳມະຊາດ, ທາງປະຫວັດສາດ ນອກຈາກນັ້ນ ບັນດາໜອງນ້ຳ, ຫ້ວຍ ຕ່າງໆທີ່ຢູ່ໃນເຂດດັ່ງກ່າວຍັງສາມາດນຳໃຊ້ໃນການເພີ່ມການຜະລິດນ້ຳ ແລະ ປ່າທີ່ມີຢູ່ຕາມລະບົບນິເວດໃຫ້ມີການເຕີບໃຫຍ່, ການປົກປັກຮັກສາຢ່າງລະມັດລະວັງເຊິ່ງເປັນຜົນດີ ຕໍ່ກັບການປະມົງ ແລະ ການພັດທະນາການທ່ອງທ່ຽວ.

ສຳລັບການປົກປັກຮັກສາສິ່ງແວດລ້ອມ, ນ້ຳເປື້ອນ ແລະ ຂີ້ເຫຍື້ອຈະຕ້ອງມີການຄວບຄຸມຢ່າງເຂັ້ມງວດໃນຂະບວນການບຳບັດກ່ອນທີ່ຈະມີການປ່ອຍອອກສູ່ສິ່ງແວດລ້ອມ.

3.2 ຊັບພະຍາກອນທຳມະຊາດ

3.2.1 ຊັບພະຍາກອນປ່າໄມ້

ສະຫວັນນະເຂດເປັນແຂວງໜຶ່ງທີ່ອຸດົມສົມບູນໄປດ້ວຍຊັບພະຍາກອນທຳມະຊາດ ເຊັ່ນ ປ່າໄມ້. ນອກນີ້ຍັງມີປ່າສະຫງວນເຊັ່ນ: ປ່າສະຫງວນແຫ່ງຊາດດົງພູວຽງ, ປ່າສະຫງວນແຫ່ງຊາດເຊບັ້ງນວນ, ປ່າສະຫງວນແຫ່ງຊາດພູຊ້າງແຫ່. ພູຊ້າງແຫ່ເປັນສາຍພູຫີນ ແລະ ເປັນຖິ່ນຖານອາໄສຂອງຊາວຜູ້ໄທ, ດົງພູວຽງເປັນທີ່ຮູ້ຈັກກັນວ່າເປັນປ່າເກົ່າແກ່ທີ່ມີຕົ້ນໄມ້ສູງໃຫຍ່, ປັງສັກສິດ ແລະ ພະທາດອີງຮັງ. ນອກຈາກນັ້ນຍັງມີສັດທີ່ໃກ້ສູນພັນເຊັ່ນ: ໂຄງ, ຄ່າງເທົາ ແລະ ນົກແກງເຊິ່ງພົບເຫັນໄດ້ຍາກໃນເຂດປ່າສະຫງວນແຫ່ງອື່ນໆ.

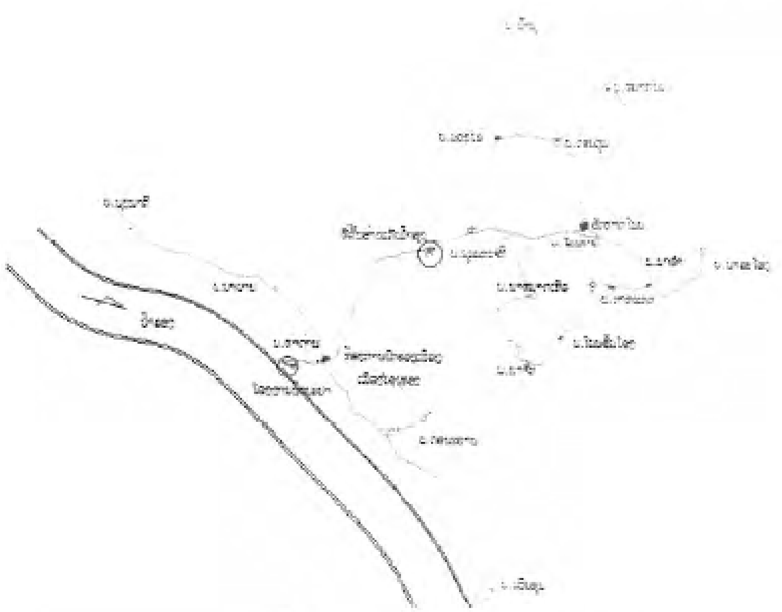
3.2.2 ຊັບພະຍາກອນພືດ-ສັດປ່າ ແລະ ພືດພັນທຳມະຊາດ

ແຂວງ ສະຫວັນນະເຂດ ເປັນແຂວງ ທີ່ມີອາກາດຮ້ອນ ,ແຫ້ງແລ້ງ ເຊິ່ງເປັນສາເຫດອັນສຳຄັນທີ່ເຮັດໃຫ້ມີຜົນກະທົບຕໍ່ສິ່ງທີ່ມີຊີວິດ .ເຂດປ່າຜະລິດແມ່ນເປັນແຫຼ່ງຜະລິດອາຫານໃຫ້ແກ່ຊຸມຊົນເປັນການສ້າງລາຍຮັບໃຫ້ແກ່ຄອບຄົວ ແລະ ທັງເປັນບ່ອນຫາຢູ່ຫາກິນຂອງປະຊາຊົນເປັນຕົ້ນແມ່ນ :ໜໍ່ໄມ້ ,ຜັກ ,ເຫັດ.....ໆລໆ ການແຕ່ລະດູການ.

4 ລາຍລະອຽດຂອງໂຄງການ

4.1.1 ທີ່ຕັ້ງ ແລະ ເຂດບໍລິການຂອງໂຄງການ

ໂຄງການນີ້ຕັ້ງຢູ່ເມືອງ ໄຊພູທອງ ແຂວງ ສະຫວັນນະເຂດ ມີຈຸດທີ່ຕັ້ງຂອງໂຮງງານຂຶ້ນກັບການປົກຄອງຂອງບ້ານ ທ່າດານ ໂຄງການດັ່ງກ່າວພວກເຮົາໄດ້ສຶກສາຄວາມເປັນໄປໄດ້ທາງດ້ານເສດຖະກິດ-ສັງຄົມ, ທາງດ້ານເຕັກນິກຕ່າງໆ. ງານເຈາະເຈາະແຫຼ່ງນ້ຳແມ່ນໄດ້ສຶກສາເອົານ້ຳຂອງ ເພາະນ້ຳຂອງມີປະລິມານນ້ຳທີ່ສາມາດຕອບສະໜອງໄດ້ຕະຫຼອດປີ ສ່ວນລະບົບໂຮງງານແມ່ນຕັ້ງຢູ່ບໍ່ໄກຈາກສະຖານີສູບນ້ຳ ນ້ຳທີ່ຜະລິດອອກຈາກລະບົບໂຮງງານແມ່ນປ່ອຍໃຫ້ນ້ຳໄຫຼເຂົ້າຫາອ່າງເກັບນ້ຳສະອາດ (ອ່າງເກັບນ້ຳໄດ້ດື່ມ). ແລ້ວໃຊ້ປ້ຳສົ່ງຂຶ້ນຫາອ່າງນ້ຳສູງ ຫຼັງຈາກນັ້ນແມ່ນປ່ອຍຫາເຂດບໍລິການ ເຊິ່ງເຂດບໍລິການຂອງໂຄງການແມ່ນກວມເອົາ 16 ບ້ານຄື: ບ. ນາພານ, ບ. ທ່າດານ, ບ. ດອນຫວາຍ, ບ. ດົງທ່າຈານ, ບ. ເວີນຄູນ, ບ. ພູມະເຈດີ, ບ. ນາໜອງເຫືອ, ບ. ໂພນສາດ, ບ. ທ່າງໂພ, ບ. ດົງໝາໄຟ, ບ. ດອນດູມ, ບ. ນ້ຳພູ, ບ. ນາຄຳ, ບ. ຕາກແດດ, ບ. ໂພນສົ້ມໂຮງ, ບ. ນາພະໂພງ.



ຮູບທີ4: : ແຜນຈຸດທີ່ຕັ້ງ ແລະ ຂອບເຂດຂອງໂຄງການ

4.2 ອົງປະກອບ ແລະ ຂະບວນການຜະລິດ

ໂຄງການກໍ່ສ້າງລະບົບນ້ຳປະປາເມືອງ ໄຊພູທອງ ມີກຳລັງການຜະລິດ 3,600 ມ³/ມື້ ເຊິ່ງມີອົງປະກອບ ແລະ ຂະບວນການຜະລິດ ດັ່ງນີ້ ການສົ່ງນ້ຳຈາກໂຮງງານໄປເຂດບໍລິການແມ່ນ ໃຊ້ປ້ຳສູບສົ່ງ, ຖ້າເຫຼືອໃຊ້ແມ່ນໃຫ້ຂຶ້ນໄປພັກໄວ້ອ່າງເກັບນ້ຳສູງ. ເພື່ອອຳນວຍຄວາມສະດວກການບໍລິການນ້ຳໃຫ້ທົ່ວເຖິງຈະໄດ້ສ້າງ Booster pump ເພື່ອສົ່ງນ້ຳໃຫ້ບ້ານທີ່ຢູ່ໄກເຊິ່ງຈະກວມເອົາ 04 ບ້ານຄື: ບ້ານ ມ່ວງໄຂ່ (ເປັນຈຸດຕັ້ງ Booster pump) , ບ້ານ ດົງໝາກໄຟ, ບ້ານ ບໍ່ຫູ ແລະ ບ້ານ ດອນຕູມ.

4.2.1 ລະບົບຫົວງານ

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

ສະຖານທີ່ຕັ້ງໂຮງງານ

ສະຖານທີ່ຕັ້ງສະຖານີສູບນ້ຳ

ຮູບທີ 5: ທີ່ຕັ້ງໂຮງງານ ແລະ ສະຖານີສູບນ້ຳ

4.2.2 ຂະບວນການລ້າງຕະກອນ

ສຳລັບການອອກແບບ ລະບົບປະສົມໄວ ແມ່ນໃຊ້ອອກແບບຕິດຕັ້ງ Parshall flume ຂະໜາດ ຄວາມກ້ວາງ ຂອງ ຊ່ອງຄອງ ເທົ່າກັບ 25 mm.

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

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

ອ່າງຮັບນ້ຳດິບ (Receiving Well): ເປັນອ່າງທີ່ຖືກອອກແບບໃຫ້ຮັບນ້ຳທີ່ຖືກປ໊ຳສົ່ງມາ ນ້ຳຂອງ ກ່ອນ ປ່ອຍເຂົ້າສູ່ໃຈກາງ ກ່ອນຂ້ຳສູ່ອ່າງປະສົມໄວ.

ອ່າງປະສົມ (Mixing tank): ອ່າງປະສົມນ້ຳດິບກັບສານສົ້ມທີ່ໄຫຼຜ່ານມາຈາກອ່າງຮັບນ້ຳດິບ ຊຶ່ງຈະໃຊ້ ລະບົບຕີດ້ວຍແຮງນ້ຳ.

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

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

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

ຂະບວນການຕົກຕະກອນ: ເປັນຂະບວນການທີ່ໃຊ້ເພື່ອແຍກນ້ຳ ແລະ ຕະກອນອອກຈາກກັນໂດຍການ ຕົກຕາມແຮງດຶງດູດຂອງໜ່ວຍໂລກ ໃນການຜະລິດນ້ຳປະປາສ່ວນຫຼາຍຂະບວນການນີ້ຈະຖືກໃຊ້ເພື່ອແຍກຕະ ກອນທີ່ສາມາດຕົກລົງພື້ນອ່າງດ້ວຍນ້ຳໜັກຂອງຕົນເອງ (Settleable solids) ປະສິດທິພາບຂອງລະບົບຈະ ຂຶ້ນກັບຫຼາຍປັດໃຈເຊັ່ນ: ຄຸນນະພາບຂອງ ນ້ຳດິບ, ປະລິມານຂອງຕະກອນໃນນ້ຳ, ນ້ຳໜັກຂອງຕະກອນ, ຄຸນ ລັກສະນະສະເພາະຂອງອ່າງຕົກຕະກອນ.

ໃນກໍລະນີນີ້ ອ່າງຕົກຕະກອນໄດ້ອອກແບບໃຫ້ເປັນອ່າງລີ່ຫຼ່ຽມທີ່ມີການໄຫຼຕາມທາງນອນ, ໃນການອອກ ແບບຕ້ອງຮັກສາ QA (ປະລິມານການໄຫຼຕໍ່ເນື້ອທີ່ຜິວຂອງອ່າງ), ຄວາມສູງຂອງອ່າງ ແລະ ເວລາທີ່ໃຊ້ໃນ ການຕົກຕະກອນ, ຄວາມໄວການໄຫຼຂອງນ້ຳຕາມທາງນອນ ຄ່າທີ່ໃຊ້ໃນການອອກແບບໄດ້ສະແດງໃນຕາຕະລາງ ຊຸມນີ້:

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), ຕອງຊ້າ (slow sand filtration). ໃນກໍລະນີນີ້ ໄດ້ອອກແບບເປັນການຕອງໄວ ຍ້ອນວ່າຄວາມຂຸ່ນຂອງນ້ຳສູງ ແລະ ຕ້ອງການນຳໃຊ້ພື້ນທີ່ສຳລັບການກໍ່ສ້າງອ່າງຕອງ ໜ້ອຍ.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 ໃນອັດຕາສັດສ່ວນ ລວງກວ້າງ ເທົ່າກັບ 3.5 ແມັດ ແລະ ລວງຍາວເທົ່າກັບ 14 ແມັດ ແລະ ລວງເລິກສະເລັ່ຍຂອງອ່າງເທົ່າກັບ 3.3 ແມັດ ຈຳນວນ ສອງອ່າງ.

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

ປ່າຍທີ່ຮອງຮັບນ້ຳໃສເຂົ້າຫາອ່າງຕອງ (Weir): ເລືອກໃຊ້ອາງທີ່ຕັ້ງຢູ່ທ້າຍອ່າງນ້ຳນອນເພື່ອເກັບກັກເອົານ້ຳ ດ້ານເທິງທີ່ໄດ້ແລ່ອໄຫຼລົງໄປຕອງທີ່ອ່າງຕອງ.

4.2.3 ການຕອງນ້ຳ

ລະບົບຕອງຊາຍໄວ ໃນອັດຕາການຕອງ 5m3/m2/hr ໂຮງງານຜະລິດນ້ຳປະປາ 1,000 ມ³ຕໍ່ວັນ ເນື້ອທີ່ ຕອງຊາຍທັງໝົດ 16,10 m^2 ແບ່ງເປັນສອງອ່າງ ທີ່ມີຂະໜາດ 2.30m x 3.5m. ແຜນຕອງໄດ້ອອກ ແບບກຳນົດໃຫ້ນຳໃຊ້ ຊະນິດຫົວຕອງ ແບບ Nozzles.

ຮ່ອງລະບາຍນ້ຳລ້າງ: ເປັນຮ່ອງທີ່ຢູ່ເທິງກາງອ່າງຕອງເພື່ອຮອງຮັບການລະບາຍນ້ຳທີ່ເປື້ອນອອກໃນເວລາ ທີ່ລ້າງອ່າງຕອງແຕ່ລະຄັ້ງ.

4.2.4 ອ່າງເກັບນ້ຳສະອາດ

ອ່າງເກັບນ້ຳສະອາດ (ClearWaterTank and ForWardingPump): ອ່າງເກັບນ້ຳສະອາດແມ່ນອ່າງທີ່ ເກັບນ້ຳໄວ້ບໍລິການ ແລະ ໃສ່ຢາຂ້າເຊື້ອການຂ້າເຊື້ອແມ່ນໃຊ້ແຄນຊຽມໄຮໂປຄູໄຮ (Calcium Hypochlorite, $Ca(ClO)_2$) .ອອກແບບເວລາເກັບກັກ 8 ຊົ່ວໂມງ ແລະ ແບ່ງອອກເປັນ 02 ອ່າງຄື: ອ່າງເກັບນ້ຳສະອາດຢູ່ໂຮງງານ 1,000 $ມ^3$ ແລະ 300 $ມ^3$. ທັງສອງອ່າງເປັນແບບອ່າງສີ່ຫຼ່ຽມມົນທົບ ໂຄງສ້າງຄອນກຣີດເສີມເຫຼັກ.

4.2.5 ອ່າງເກັບນ້ຳສູງ (Elevated Tank):

ອ່າງເກັບນ້ຳສູງ (Elevated Tank): ອ່າງເກັບນ້ຳສູງ ຂະໜາດ 400 $ມ^3$ ຊຶ່ງຕັ້ງຢູ່ຈຸດທີ່ສູງ , ມີລະດັບດິນ ທຳມະຊາດ 1164 ແມັດ ເປັນສາງບໍລິການນ້ຳໃຫ້ຜູ້ຊົມໃຊ້ນ້ຳ ຢູ່ເຂດບໍລິການຂອງໂຄງການ, ອ່າງດັ່ງກ່າວປະກອບ ດ້ວຍອຸປະກອນຕ່າງໆເຊັ່ນ: ລະບົບທໍ່ນ້ຳເຂົ້າ-ອອກ, ທໍ່ນ້ຳລົ້ນ, ທໍ່ລະບາຍ, ປະຕູນ້ຳ, ລູກລອຍ ແລະ ອຸປະກອນອື່ນໆທີ່ຈຳເປັນ. ອ່າງເກັບນ້ຳສູງ ຈະສູງ 25 ແມັດ. ເປັນລະຖາບໍ່ບໍລິການນ້ຳຕະຫຼອດ 24 ຊົ່ວໂມງ ໃຫ້ ຜູ້ຊົມໃຊ້ນ້ຳຢູ່ໃນເຂດບໍລິການຂອງໂຄງການດັ່ງກ່າວ ດ້ວຍການປ່ອຍໃຫ້ນ້ຳໄຫຼແບບທຳມະຊາດ.

4.2.6 ລະບົບສາຍທໍ່ແຈກ

ທໍ່ ແລະ ອຸປະກອນຕ່າງໆ ທີ່ອອກແບບເພື່ອຕິດຕັ້ງຢູ່ໂຮງງານຜະລິດນ້ຳແມ່ນ ໄດ້ອອກແບບໃຫ້ນຳໃຊ້ ວັດສະດຸປະເພດ HDPE ເພື່ອຮັບປະກັນອາຍຸການໃຊ້ງານໃຫ້ຍາວນານ. ອຸປະກອນທີ່ໃຊ້ປະກອບມີ ປະຕູນ້ຳ, ຂໍ້ຕໍ່ລົດ ແລະ ຂໍ້ງໍ 90, 45 ແລະ ອື່ນໆ. ລາຍລະອຽດ ໄດ້ກຳນົດ ມາດຕະຖານເຕັກນິກ ໄວ້ດັ່ງລຸ່ມນີ້:

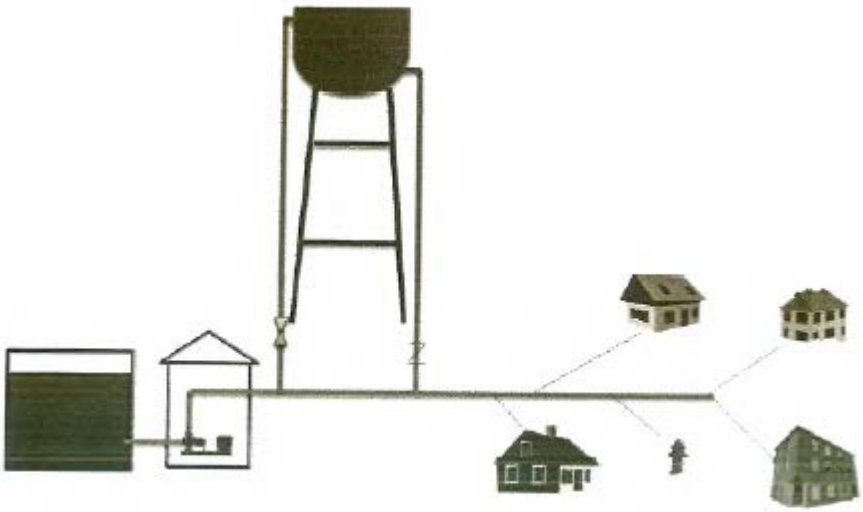
- ທໍ່ HDPE PN10
- DCI K9

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	ລະດັບ ຄວາມສຳຄັນ	ຄວາມຖີ່/ໄລຍະເວລາ	ລະດັບຜົນກະທົບຕໍ່ການດຳລົງຊີວິດ	ປະເມີນຄວາມຜົນກະທົບ (ບວກ/ລົບ)
ໄລຍະກໍ່ສ້າງ						
ການກະກຽມສະຖານທີ່	ທຳມະຊາດ	ການບຸກເບີກເນື້ອທີ່ດິນທຳມະຊາດ ແລະ ປ່າໄມ້ ທີ່ເປັນທຳມະຊາດອາດຖືກທຳລາຍໂດຍໂຄງການເຊັ່ນ: ການປຸກສ້າງທີ່ພັກຊົ່ວຄາວໃຫ້ກຳມະກອນ ແລະ ຜູ້ທີ່ເຮັດວຽກໃນໂຄງການ, ລະບົບທີ່ອາບ, ລະບົບໄຟຟ້າ ແລະ ລະບົບແຈກຢາຍນ້ຳ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ການປ່ຽນແປງລະບົບນິເວດດິນ ຈາກການບຸກເບີກພື້ນທີ່ຂຸດຄົ້ນໃກ້ຄຽງ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ການປ່ຽນແປງລະບົບນິເວດນ້ຳໃຕ້ດິນເນື່ອງຈາກການບຸກເບີກພື້ນທີ່ຂຸດເຈາະບໍລິເວນກໍ່ສ້າງ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ເກີດມີມົນລະພິດທາງອາກາດເຊັ່ນ ຄວັນລົດ (ຈາກລົດ ແລະ ເຄື່ອງຈັກ ທີ່ໃຊ້ໃນການບຸກເບີກພື້ນທີ່) ແລະ ຂີ້ຝຸ່ນຈາກການຂຸດດິນ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
	ສັງຄົມ	ການສັນຈອນເພີ່ມຂຶ້ນເນື່ອງຈາກການນຳລົດ ແລະ ເຄື່ອງຈັກມາໃຊ້ໃນການບຸກເບີກພື້ນທີ່.	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ການເພີ່ມຂຶ້ນຂອງປະຊາກອນໃນບໍລິເວນໂຄງການເນື່ອງຈາກການເຂົ້າມາເຮັດວຽກຂອງກຳມະກອນ	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
		ການກໍ່ສ້າງ ແລະ ທຸລະກິດຂະໜາດນ້ອຍຂື້ນໃນບໍລິເວນໂຄງການ.	ໜ້ອຍ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ບວກ
ການນຳໃຊ້ພາຫະນະ ແລະ ເຄື່ອງຈັກຕ່າງໆ	ທຳມະຊາດ	ນ້ຳມັນປົນເປື້ອນຈາກການສ້ອມແປງລົດ ແລະ ເຄື່ອງຈັກຢູ່ພື້ນທີ່ໂຄງການອາດຈະຮົ່ວໄຫຼໄປປົນເປື້ອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ຕ່ຳ	ລົບ

		ນ້ຳເປື້ອນຈາກການຮົ່ວໄຫຼຂອງ ນ້ຳມັນລົດ ແລະ ເຄື່ອງຈັກອາດຈະຊຶມລົງໄປເປັນເປື້ອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ຕ່ຳ	ລົບ
	ສັງຄົມ	ເກີດສຽງດັງລົບກວນໃນເວລານຳໃຊ້ພາຫະນະ ແລະ ເຄື່ອງຈັກໃນເວລາກໍ່ສ້າງ	ກາງ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
ການຍົກຍ້າຍເຂົ້າມາ ບໍລິເວນໂຄງການຂອງກຳມະກອນ ແລະ ຜູ້ທີ່ເລັດລອດໃນໂຄງການ	ທຳມະຊາດ	ຂະຫຍະເປື່ອຍເນົ່າ 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) ຈາກວິດຖ່າຍຂອງຜູ້ທີ່ຍົກຍ້າຍເຂົ້າມາ (Black water) ອາດຈະຊຶມລົງດິນແລ້ວເປັນເປື້ອນນ້ຳໃຕ້ດິນ.	ສຳຄັນ	ຖາວອນ	ກາງ	ລົບ
		ນ້ຳເປື້ອນທີ່ເກີດຈາກຂີ້ເຫຍື້ອ, ສິ່ງເສດເຫຼືອຈາກການກໍ່ສ້າງ ແລະ ນ້ຳເປື້ອນຈາກວິດຖ່າຍ ເກີດການປົນເປື້ອນກັບນ້ຳຝົນ ແລ້ວໄຫຼໄປຕາມແຫຼ່ງນ້ຳໜ້າດິນ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
	ສັງຄົມ	ນ້ຳເປື້ອນສົ່ງກິ່ນເໝັນລົບກວນຜູ້ທີ່ອາໄສຢູ່ບໍລິເວນໂຄງການ	ສຳຄັນ	ໄລຍະກໍ່ສ້າງ	ສູງ	ລົບ
		ການຈະລາຈອນເພີ່ມຂຶ້ນເນື່ອງຈາກພາຫະນະເພີ່ມຂຶ້ນຕາມຈຳນວນຄົນທີ່ຍົກຍ້າຍເຂົ້າມາ	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
ວຽກຂຸດເຈາະ (Excavation works)		ເກີດສຽງດັງລົບກວນໃນເວລານຳໃຊ້ພາຫະນະ ແລະ ເຄື່ອງຈັກຂຸດເຈາະໃນເວລາກໍ່ສ້າງ	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
		ມີມົນລະພິດທາງອາກາດເຊັ່ນ ຂີ້ຝຸ່ນ ຈຳນວນຫຼວງຫຼາຍທີ່ເກີດຈາກການຂຸດດິນ, ຂົນດິນ.	ກາງ	ໄລຍະກໍ່ສ້າງ	ກາງ	ລົບ
ການສ້າງສະຖານີສູບນ້ຳ	ທຳມະຊາດ	ເກີດການປົນເປື້ອນກັບນ້ຳຝົນເນື່ອງຈາກການລົບກວນໜ້າດິນ	ກາງ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
		ເກີດມີການເຊາະເຈື່ອນຂອງດິນໃນບໍລິເວນທີ່ມີການກໍ່ສ້າງ	ສຳຄັນ	ໄລຍະກໍ່ສ້າງ	ຕ່ຳ	ລົບ
	ສັງຄົມ	-	-	-	-	-

ປະເພດຂອງຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ	ລະດັບຄວາມສຳຄັນ	ຄວາມຖີ່/ໄລຍະເວລາ	ລະດັບຜົນກະທົບຕໍ່ການດຳລົງຊີວິດ	ປະເພດຂອງຜົນກະທົບ (ບວກ/ລົບ)
ໄລຍະດຳເນີນການ				
ເຮັດໃຫ້ລັກສະນະຂອງດິນມີການປ່ຽນແປງ ເນື່ອງມາຈາກການປ່ອຍນ້ຳເສຍຈາກການລ້າງຄວາມສະອາດຕ່າງໆ ເຊິ່ງມີການເຈືອປົນຂອງສານສົ້ມແມ່ນ້ຳ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
ການປ່ອຍນ້ຳເສຍທີ່ມີສານສົ້ມເຈືອປົນເຮັດໃຫ້ດິນມີລັກສະນະແຂງ ແລະ ເຮັດໃຫ້ເກີດມີຄ່າ PH ສູງ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
ເຮັດໃຫ້ປະຊາຊົນເກີດຄວາມກັງວົນໃນການປ່ອຍນ້ຳເສຍຂອງໂຮງງານໃນ ເວລາທີ່ມີການທຳຄວາມສະອາດຕ່າງໆ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
ການຮົ່ວຊຶມຂອງນ້ຳມັນຈາກເຮືອນປໍ້າອາດຈະກະທົບຕໍ່ນ້ຳໃຕ້ດິນໃນເວລາທີ່ມີຝົນຕົກໜັກ.	ກາງ	ໄລຍະດຳເນີນການ	ຕ່ຳ	ລົບ
ການທຳງານຂອງປໍ້າສູບນ້ຳເຮັດໃຫ້ເກີດສຽງດັງ.	ກາງ	ຖາວອນ	ຕ່ຳ	ລົບ
ຈະກໍ່ໃຫ້ເກີດຜົນກະທົບທາງດ້ານບວກຕໍ່ກັບສະພາບເສດຖະກິດ ແລະ ສັງຄົມ ຂອງຊຸມຊົນເຮັດໃຫ້ເກີດຄວາມຈະເລີນໃນທ້ອງຖິ່ນ ສາມາດຍົກລະດັບຄຸນນະພາບຊີວິດຂອງປະຊາຊົນ ໃຫ້ດີຂຶ້ນເຮັດໃຫ້ເສດຖະກິດໃນຄອບຄົວດີຂຶ້ນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
[illegible] ລາຍໄດ້ເພີ່ມຂຶ້ນຈາກນັກທ່ອງທ່ຽວ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ

		ຜົນກະທົບໃນດ້ານເສດຖະກິດ ແລະ ສັງຄົມ ຂອງຊຸມຊົນໃນຊ່ວງດຳເນີນການຂອງໂຄງການ ຈຶ່ງເປັນຜົນກະທົບທາງບວກຫຼາຍກວ່າເຊັ່ນ: ຊ່ວຍໃຫ້ເກີດການພັດທະນາດ້ານການຊົມໃຊ້ນ້ຳສະອາດ, ຫຼຸດຜ່ອນການເຈັບເປັນອັນເນື່ອງຈາກການນຳໃຊ້ນ້ຳເຂົ້າໃນກິດຈະກຳຕ່າງໆ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
ດ້ານການທ່ອງທ່ຽວ	ສັງຄົມ	ພາຍຫຼັງການສຳເລັດ ຈະກໍ່ໃຫ້ເກີດຜົນກະທົບທາງດ້ານບວກຕໍ່ກັບສະພາບເສດຖະກິດ ດ້ານການທ່ອງທ່ຽວ ສາມາດສ້າງລາຍຮັບດ້ານການບໍລິການ ທີ່ພັກ-ຮ້ານອາຫານເພີ່ມຂຶ້ນ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
		ສ້າງຄວາມເຊື່ອໝັ້ນໃຫ້ນັກທ່ອງທ່ຽວ ດ້ານສຸຂະອານາໄມ.	ສຳຄັນ	ໄລຍະດຳເນີນການ	ສູງ	ບວກ
ດ້ານສາທາລະນະສຸກ	ສັງຄົມ	ພາຍຫຼັງສຳເລັດ ຈະມີການເປີດບໍລິການນ້ຳສະອາດໃຫ້ປະຊາຊົນໄດ້ໃຊ້ ເປັນການຫຼຸດຜ່ອນການເກີດພະຍາດທີ່ມາກັບນ້ຳ ເຊັ່ນ: ພະຍາດທ້ອງຮ່ວງ 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 ຈຶ່ງບໍ່ອາດຈະເກີດເຫດບັງເອີນທີ່ຈະກະທົບຕໍ່ສິ່ງແວດລ້ອມໄດ້. ເຖິງຢ່າງໃດກໍ່ຕາມ, ໃນຊ່ວງໄລຍະເວລາໃນການກໍ່ສ້າງ, ຈະມີຜົນກະທົບທາງດ້ານລົບບາງຢ່າງຕໍ່ກັບສະພາບແວດລ້ອມດັ່ງນີ້:

- ການຂົນສົ່ງອຸປະກອນຕ່າງໆໃນການກໍ່ສ້າງ ຫຼື ຂຸດຄອງເພື່ອວາງທໍ່ຈະເປັນສາເຫດເຮັດໃຫ້ມີຝຸ່ນ, ສຽງດັງ, ລົດຕິດ. ເຖິງຢ່າງໃດກໍ່ຕາມຜົນກະທົບດັ່ງກ່າວນີ້ກໍ່ຈະບໍ່ເປັນອັນຕະລາຍ, ມັນກໍ່ຍັງມີຄວາມຈຳເປັນທີ່ຈະຕ້ອງໄດ້ຈຳກັດຜົນກະທົບຂອງພວກມັນທີ່ມີຕໍ່ສະພາບແວດລ້ອມ.
- ຂີ້ເຫຍື້ອທີ່ເກີດຈາກວຽກງານການກໍ່ສ້າງຕ່າງໆ ທີ່ປ່ອຍອອກສູ່ສິ່ງແວດລ້ອມຈະເປັນຜົນກະທົບທາງດ້ານລົບ ນອກຈາກວ່າຈະມີການຄວບຄຸມສິ່ງເສດເຫຼືອເຫຼົ່ານັ້ນຢ່າງຈິງຈັງ.
- ໃນລະຫວ່າງການດຳເນີນງານຂອງສະຖານີສູບນ້ຳ ແລະ ລະບົບການຂ້າເຊື້ອພະຍາດ, ມັນມີຄວາມຈຳເປັນທີ່ຈະຕ້ອງປະຕິບັດຕາມກົດລະບຽບການປ້ອງກັນການລະເບີດ ແລະ ໄຟໄໝ້ ເຊັ່ນ ໄຟຊັອດ ຫຼື ທໍ່ສົ່ງນ້ຳແຕກຊຶ່ງເປັນສາເຫດເຮັດໃຫ້ເກີດມີລົດຕິດ ແລະ ສົ່ງຜົນກະທົບ ຕໍ່ກັບສະພາບການດຳລົງຊີວິດ ແລະ ການຜະລິດຂອງປະຊາຊົນໃນເຂດດັ່ງກ່າວ.

5.3 ການປະເມີນຜົນກະທົບດ້ານບວກ ແລະ ມາດຕະການເສີມ

ການກໍ່ສ້າງລະບົບສະໜອງນ້ຳປະປາ ໃນເຂດໂຄງການນີ້ ຈະມີຜົນກະທົບດ້ານບວກ ຕໍ່ການພັດທະນາເສດຖະກິດ-ສັງຄົມຂອງພົນລະເມືອງທີ່ອາໄສຢູ່ໂດຍສະເພາະແມ່ນຢູ່ເຂດບ້ານທີ່ຢູ່ພື້ນທີ່ບໍລິການ ລະບົບດັ່ງກ່າວ ຍັງມີສ່ວນໃນການປັບປຸງ ມາດຕະຖານການດຳລົງຊີວິດຂອງປະຊາຊົນ, ຮັບປະກັນການປັບປຸງດ້ານສາທາລະນະສຸກຂອງປະຊາຊົນ ຊຶ່ງມີຜົນຢ່າງຍິ່ງຕໍ່ການພັດທະນາດ້ານການທ່ອງທ່ຽວ ແລະ ຍັງເປັນການສົ່ງເສີມການລົງທຶນເຂົ້າໃນຂົງເຂດດັ່ງກ່າວ.

ຫຼັງຈາກໂຄງການນີ້ສຳເລັດລົງ, ວຽກງານການປົກປັກຮັກສາສິ່ງແວດລ້ອມຈະບໍ່ພຽງແຕ່ສຸມໃສ່ສະພາບແວດລ້ອມທາງນ້ຳເທົ່ານັ້ນ, ແຕ່ຍັງຈະສຸມໃສ່ສິ່ງແວດລ້ອມທາງດ້ານດິນ ແລະ ສິ່ງແວດລ້ອມທາງອາກາດນຳອີກ. ສິ່ງເຫຼົ່ານີ້ແມ່ນປັດໃຈພື້ນຖານ ໃນການດຳເນີນວຽກງານຕ່າງໆຂອງການປົກປັກຮັກສາສະພາບແວດລ້ອມໂດຍລວມ ເຊິ່ງມັນຈະເຮັດໃຫ້ເປັນເຂດທີ່ບໍລິສຸດ ແລະ ເປັນເຂດທີ່ດຶງດູດຜູ້ຄົນ, ເພາະຈະມີສະຖານທີ່ທ່ອງທ່ຽວທາງທຳມະຊາດ, ທີ່ໜ້າຕື່ນເຕັ້ນແລະໜ້າສົນໃຈ. ນອກຈາກນັ້ນ, ໂຄງການສະໜອງນ້ຳສະອາດແມ່ນປັດໃຈສຳຄັນອັນດັບໜຶ່ງ ແລະ ເປັນພື້ນຖານສຳລັບການພັດທະນາໂຄງການອື່ນໆກ່ຽວກັບ ໂຄງລ່າງພື້ນຖານດ້ານເຕັກນິກ ແລະ ສະພາບແວດລ້ອມຂອງບ້ານກໍ່ຄືສະພາບແວດລ້ອມຂອງຕົວເມືອງ.

ມາດຕະຖານການດຳລົງຊີວິດຂອງປະຊາຊົນຈະໄດ້ຮັບການປັບປຸງໃນທາງທີ່ດີຂື້ນ, ມີນ້ຳປະປາຊົມໃຊ້ , ພະຍາດຕ່າງໆຈະມີການຫຼຸດຜ່ອນ ຊຶ່ງສິ່ງເຫຼົ່ານີ້ ແມ່ນມີຄວາມໝາຍຢ່າງຍິ່ງເພາະຂໍ້ມູນທາງສະຖິຕິ ໃນປະຈຸບັນໄດ້ສະແດງໃຫ້ເຫັນວ່າພະຍາດທັງຫຼາຍທີ່ມາກັບນ້ຳຄິດໄລ່ເປັນອັດຕາທີ່ມີຄວາມສ່ຽງສູງ ຢູ່ພາຍໃນກຸ່ມເຊື້ອພະຍາດທີ່ຮູ້ຈັກກັນດີເຊັ່ນ: ພະຍາດຖອກທ້ອງ ແລະ ອື່ນໆ.

6 ຜົນກະທົບໄລຍະຍາວ

6.1 ດ້ານບວກ

- ຊ່ວຍໃຫ້ແຜນພັດທະນາພື້ນຖານໂຄງລ່າງຂອງລັດຖະບານ ,ເມືອງ, ແຂວງ ,ພື້ນທີ່ໂຄງການໄດ້ຮັບການຈັດຕັ້ງປະຕິບັດ ເພື່ອລະກົາວໂດຍສະເພາະແມ່ນລະບົບສາທາລະນຸປະໂພກ ,ສິ່ງເງື່ອນໄຂອຳນວຍຄວາມສະດວກໃນການຮັກສາສຸຂະອານາໄມ ,ເປັນພື້ນຖານໃຫ້ແກ່ການພັດທະນາ ດ້ານການຄ້າ ,ດ້ານອຸດສາຫະກຳ ,ດ້ານການບໍລິການ ແລະ ການທ່ອງທ່ຽວ ໃນອານາຄົດ .
- ຊ່ວຍໃຫ້ ຊີວິດການເປັນຢູ່ຂອງປະຊາຊົນໄດ້ຮັບການປັບປຸງດີຂື້ນ ,ເພາະວ່າ ນ້ຳປະປາເປັນສິ່ງທີ່ຈຳເປັນ ແລະ ເປັນປັດໃຈໜຶ່ງທີ່ຂາດບໍ່ໄດ້ໃນການດຳລົງຊີວິດຂອງປະຊາຊົນເພື່ອມາອຸປະໂພກ ແລະ ບໍລິໂພກ .ນອກນີ້ຍັງໄດ້ນຳໃຊ້ເປັນວັດຖຸດິບຜະລິດເປັນສິນຄ້າ ແລະ ໃຊ້ໃນຂະບວນການການຜະລິດ ສິນຄ້າອຸດສາຫະກຳ ແລະ ອື່ນໆ.
- ຊ່ວຍໃຫ້ພື້ນທີ່ໂຄງການ ເປັນພື້ນທີ່ສີຂຽວເພີ່ມ ,ສະຖານທີ່ສາທາລະນະ ,ສະຖານທີ່ທ່ອງທ່ຽວ ແລະ ສະຖານທີ່ສຳຄັນຕ່າງໆ .

6.2 ດ້ານລົບ

ການຊົມໃຊ້ນ້ຳປະປາ ໃນຂະແໜງການອຸດສາຫະກຳ ນ້ຳສ່ວນຫຼາຍ ຈະກາຍເປັນນ້ຳເສຍ, ເປື້ອນ ຖ້າຫາກບໍ່ມີວິທີກຳຈັດທີ່ຖືກຕ້ອງຈະສົ່ງຜົນກະທົບຕໍ່ສະພາບແວດລ້ອມ ແລະ ແຫຼ່ງນ້ຳທຳມະຊາດໄດ້. ສຳລັບໂຄງການນີ້ເລືອ ເຫັນວ່າ ເຂດພື້ນທີ່ໂຄງການ ຍັງບໍ່ທັນມີ ໂຮງຈັກ, ໂຮງງານເຫຼົ້າ, ມີແຕ່ນ້ຳເສຍຈາກຄົວເຮືອນ ແຕ່ກໍ່ມີຈຳນວນໜ້ອຍ.

ການດຳເນີນການຜະລິດ ສຽງຂອງເຄື່ອງຈັກ, ການສັ່ນສະເທືອນຢູ່ ສະຖານີສູບນ້ຳຂອງ ຈະມີຜົນກະທົບຕໍ່ສັດນ້ຳໃນບໍລິເວນດັ່ງກ່າວເລັກນ້ອຍ. ນ້ຳເສຍຈາກການລ້າງອ່າງໂຮງງານ, ລ້າງອ່າງເຄມີ (ອ່າງນ້ຳທີ່ນອນ ແລະ ອ່າງຢາຂ້າເຊື້ອພະຍາດຄູ່) 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 ລະດູຝົນທີ່ບໍ່ມີຝົນຕົກເພື່ອຫຼີກການເຊາະເຈື່ອນຂອງດິນລົງສູ່ແຫຼ່ງນ້ຳ.
ການຄົມມະນາຄົມຂົນສົ່ງ	- ແຈ້ງແຜນການກໍ່ສ້າງໃຫ້ກັບໜ່ວຍງານ ແລະ ຊຸມຊົນທີ່ກ່ຽວຂ້ອງໃຫ້ຮັບຮູ້ລ່ວງໜ້າຢ່າງໜ້ອຍຕ້ອງ 1 ອາທິດກ່ອນດຳເນີນງານ. -ຕ້ອງບໍ່ວາງກອງວັດສະດຸທີ່ມີຄວາມຈຳເປັນໃນເຂດໃຊ້ລູກທາງຫຼີກລະຫວ່າງການ

	ຈະລາຈອນ ແລະ ຕ້ອງຂົນຍ້າຍວັດສະດຸອຸປະກອນທີ່ບໍ່ໄດ້ໃຊ້ວຽກງານອອກຈາກຂອບເຂດພື້ນທີ່ກໍ່ສ້າງ ຫຼື ເສັ້ນທາງເຂົ້າອອກຂອງຊຸມຊົນໃນພື້ນທີ່. - ຕ້ອງເລັ່ງການປັບປຸງ ແລະ ຟື້ນຟູສະພາບພື້ນທີ່ກໍ່ສ້າງ ແລະ ເສັ້ນທາງການສັນຈອນຖ້າເກີດກໍລະນີທີ່ໄດ້ຮັບຜົນກະທົບຈາກກິດຈະກຳການກໍ່ສ້າງໃຫ້ຢູ່ສະພາບເດີມຫຼືດີກວ່າເກົ່າ.
ການປ້ອງກັນຊັບພະຍາ ກອນປ່າໄມ້ ແລະ ສັດປ່າ	ຝ່າຍເຈົ້າຂອງໂຄງການຕ້ອງໃຫ້ຄຳແນະນຳຜູ້ຮັບເໝົາໃນການຮັກສາຕົ້ນໄມ້ໃຫ້ຍ ໄວ້ ກໍລະນີທີ່ບໍ່ມີຜົນກະທົບຕໍ່ສິ່ງກໍ່ສ້າງ ແລະ ລະບົບຜະລິດນ້ຳເພື່ອຮັກສາຄວາມຊຸ່ມຊື່ນ.
ເສດຖະກິດ-ສັງຄົມ.	- ການົດໃຫ້ຜູ້ຮັບເໝົາກໍ່ສ້າງແຈ້ງແຜນການກໍ່ສ້າງໃຫ້ອຳນາດການປົກຄອງທ້ອງຖິ່ນ ແລະ ປະຊາຊົນຮັບຮູ້ຢ່າງທົ່ວເຖິງ. - ຜູ້ຮັບເໝົາກໍ່ສ້າງຕ້ອງກຳນົດນະໂຍບາຍຈ້າງແຮງງານທ້ອງຖິ່ນຕາມຄວາມເໝາະສົມ. - ຜູ້ຮັບເໝົາກໍ່ສ້າງຕ້ອງຄວບຄຸມດູແລກຳມະກອນກໍ່ສ້າງໃຫ້ຢູ່ໃນກົດລະບຽບບໍ່ສ້າງຄວາມວຸ້ນວາຍໃຫ້ກັບປະຊາຊົນໃນຂອບເຂດພື້ນທີ່ໂຄງການ. - ອົບຮົມໃຫ້ກຳມະກອນມີຄວາມຮູ້, ຄວາມເຂົ້າໃຈໃນລະບຽບ ແລະ ເຕັກນິກການກໍ່ສ້າງ, ການປ້ອງກັນ ແລະ ອະນຸລັກຊັບພະຍາກອນທຳມະຊາດລວມທັງສ້າງຄວາມເຂົ້າໃຈໃນວັດທະນາທຳຮີດຄອງປະເພນີຂອງທ້ອງຖິ່ນເພື່ອປ້ອງກັນການປະຕິບັດກິດຈະກຳທີ່ລວກຂັດກັບວັດທະນາທຳຂອງທ້ອງຖິ່ນ. - ຖ້າເປັນການປະຊາສຳພັນການກໍ່ສ້າງໂຄງການກໍ່ສ້າງລະບົບນ້ຳປະປາ ໃຫ້ແກ່ປະຊາຊົນໃນພື້ນທີ່ໂຄງການໄດ້ຮັບຮູ້ເພື່ອຮ່ວມປະສານງານ ແລະ ຮ່ວມຕິດຕາມການກວດການປະຕິບັດວຽກງານຂອງເຈົ້າໜ້າທີ່ໃນພື້ນທີ່.
ສາທາລະນະສຸກ ແລະ ຄວາມປອດໄພ.	- ປ້ອງກັນ ແລະ ກວດກາການການເສບຢາເສບຕິດຂອງກຳມະກອນ. - ຝຶກອົບຮົມ ແລະ ທົບທວນມາດຕະການດ້ານຄວາມປອດໄພເປັນແຕ່ລະໄລຍະເພື່ອເປັນການປ້ອງກັນການເກີດອຸປະຕິເຫດຈາກການເຮັດວຽກລວມທັງຜູ້ທີ່ສັນຈອນໄປມາໃນພື້ນທີ່ກໍ່ສ້າງ.

7.2. ການຕິດຕາມກວດກາຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ການຫຼຸດຜ່ອນ.

ບາດກ້າວໃນການປະຕິບັດ ໂຄງການກໍ່ສ້າງລະບົບນ້ຳປະປາ ຕ້ອງເປັນໄປຕາມຂັ້ນຕອນຕາມສັນຍາທີ່ໄດ້ຕົກລົງກັນໄວ້ ແລະ ປະຕິບັດຕາມກົດໝາຍທີ່ກ່ຽວຂ້ອງຂອງ ສປປ ລາວ ຢ່າງເຂັ້ມງວດ ແລະ ເຈົ້າຂອງໂຄງການພາກສ່ວນທີ່ກ່ຽວຂ້ອງຕ້ອງໄດ້ມີສ່ວນຮ່ວມໃນການປະຕິບັດ ເລີ່ມແຕ່ການເລີ່ມໂຄງການ ໄລຍະປະຕິບັດໂຄງການ ແລະ

ພາຍຫຼັງທີ່ໂຄງການສຳເລັດກໍ່ຕ້ອງມີແຜນການປະເມີນຜົນເປັນໄລຍະຕາມແຜນການທີ່ວາງໄວ້. ສຳລັບການຕິດຕາມກວດກາສາມາດແບ່ງອອກເປັນ ການຕິດຕາມ:

- ພື້ນທີ່ການກໍ່ສ້າງ
- ກິດຈະກຳການກໍ່ສ້າງ
- ການກຳຈັດສິ່ງເສດເຫຼືອຈາກການກໍ່ສ້າງ
- ການເຮັດວຽກຂອງກຳມະກອນ
- ການຂົນສົ່ງ

ເຂດກໍ່ສ້າງພື້ນທີ່ໂຮງງານ ,ສະຖານີສູບນ້ຳ ແລະ ເຂດກໍ່ສ້າງວາງແລວສາຍທໍ່, ຊຸມຊົນ, ກຳມະກອນຕ້ອງໄດ້ມີຄວາມຮັບຮູ້ທາງດ້ານ ການປ້ອງກັນເຂດແດນທີ່ຈະມີເຫດພາຫຸດຕ້ານອຸປະຕິເຫດເປັນຕົ້ນແມ່ນ ການເກີດອຸປະຕິເຫດຕາມທ້ອງຖະໜົນ, ການກໍ່ສ້າງ, ການໄປມາ ແລະ ອື່ນໆ ທີ່ຈະເກີດຂຶ້ນພ້ອມດຽວກັນນັ້ນຊຸມຊົນກໍ່ຕ້ອງໄດ້ຮັບຂໍ້ມູນຂ່າວສານ, ການສັນຈອນໄປມາ, ມີເຄື່ອງໝາຍເຕືອນບອກການປ້ອງກັນອຸປະຕິເຫດ, ສ່ວນກຳມະກອນກໍ່ຕ້ອງໄດ້ມີການປ້ອງກັນໃນການອອກແຮງງານຢ່າງເໝາະສົມ ແລະ ໄດ້ຮັບການຝຶກອົບຮົມກ່ອນຈະໄດ້ເຂົ້າມາເຮັດວຽກງານ ແລະນອກຈາກນັ້ນທີ່ຕັ້ງຈະຕ້ອງໄດ້ມີການຮັກສາສຸຂະອານາໄມຂອງເຂົາເຈົ້າໃນທຸກດ້ານນຳອີກດ້ວຍ.

8 ລະບຽບການຈັດຕັ້ງປະຕິບັດ ແລະ ຕິດຕາມ

ລະບຽບການຈັດຕັ້ງປະຕິບັດ ລະບຸກຳນົດ ແລະ ບົດບັນຍັດ ແມ່ນປູພາຍໃຕ້ກົດໝາຍທີ່ເປັນຂໍ້ຈຳກັດ 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, ກຊພສ (ລົງວັນທີ 7 ທັນວາ 2009). ແລ້ວສົ່ງໃຫ້ພະແນກຊັບພະຍາກອນຂອງ ແຂວງ ເປັນຜູ້ກວດກາ, ອອກໃບຢັ້ງຢືນໃຫ້ ແລະ ຕິດຕາມກວດກາ.

9 ແຜນການຈັດການ ແລະ ກວດກາ ຜົນກະທົບສິ່ງແວດລ້ອມ ແລະ ການຫຼຸດຜ່ອນ

ຕາຕະລາງທີ ໄດ້ສະແດງໃຫ້ເຫັນຕົວຊີ້ວັດທີ່ສົ່ງຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມ ທຳມະຊາດ ແລະ ສັງຄົມ, ຄວາມຖີ່ໃນການຕິດຕາມ, ຜູ້ທີ່ມີຄວາມຮັບຜິດຊອບໃນການຕິດຕາມ ແລະ ກວດກາເພື່ອຫຼຸດຜ່ອນຜົນກະທົບທີ່ເກີດຂຶ້ນໃນໂຄງການຕະຫຼອດການດຳເນີນງານຂ້າໃນແຕ່ລະຜົນກະທົບ.

ຕາຕະລາງ 5: ແຜນການຕິດຕາມ, ກວດກາ ແລະ ມາດຕະການຫຼຸດຜ່ອນຜົນກະທົບ

ຜົນກະທົບທີ່ຕ້ອງໄດ້ຕິດຕາມ	ລາຍລະອຽດຂອງການຕິດຕາມ	ເວລາການກໍ່ສ້າງ			ເວລາດຳເນີນການຜະລິດ		
		ຄວາມຖີ່	ຕົວແທນຮັບຜິດຊອບ	ມູນຄ່າທີ່ກຳນົດປະຈຳປີ	ຄວາມຖີ່	ຕົວແທນຮັບຜິດຊອບ	ມູນຄ່າທີ່ກຳນົດປະຈຳປີ
ຄຸນນະພາບນ້ຳ	ການປ່ຽນແປງຄຸນນະພາບນ້ຳທີ່ຂອງທີ່ສົ່ງຜົນກະທົບຕໍ່ການຊຸມຊົນ				ໜຶ່ງຄັ້ງຕໍ່ປີ	ນ້ຳປະປາ ເມືອງ ໄຊຍູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນການຜະລິດປະຈຳປີ
	ການກວດສອບຄຸນນະພາບນ້ຳດິບກ່ອນເຂົ້າໂຮງງານ (ໃນປີທຳອິດ ຫຼື ໄລຍະການຜະລິດ)	ຕາມການກຳນົດຂອງມາດຕະຖານຄຸນນະພາບນ້ຳດິບ ຂອງ ຄຸນນະພາບນ້ຳໜ້າດິນ ຕາມມາດຕະຖານສິ່ງແວດລ້ອມ ແຫ່ງ ສປປ ລາວ (2009)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການກວດສອບຄຸນນະພາບນ້ຳສະອາດກ່ອນອອກຈາກໂຮງງານ (ໃນປີທຳອິດ ຫຼື ໄລຍະການຜະລິດ)	ຕາມການກຳນົດຂອງມາດຕະຖານຄຸນນະພາບນ້ຳ ຂອງ WHO (2014)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການກວດສອບຄຸນນະພາບນ້ຳດິບກ່ອນເຂົ້າໂຮງງານ				ຕາມການກຳນົດຂອງມາດຕະຖານຄຸນນະພາບນ້ຳດິບ ຂອງຄຸນນະພາບນ້ຳໜ້າດິນ ຕາມມາດ ຕະຖານສິ່ງແວດລ້ອມ	ນ້ຳປະປາ ເມືອງ ໄຊຍູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນການຜະລິດປະຈຳປີ

					ແຫ່ງສປປລາວ(2009)		
	ການກວດສອບຄຸນະພາບນໍ້າສະອາດກ່ອນແຈກຈ່າຍໃຫ້ຊຸມຊົນ				ຕາມການກຳນົດຂອງມາດຕະຖານຄຸນະພາບນໍ້າຂອງ WHO (2014)	ນໍ້າປະປາ ເມືອງ ໄຊພູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
	ການກວດສອບນໍ້າເປື້ອນ ທີ່ອອກຈາກໂຮງງານຜະລິດນໍ້າໃນໄລຍະດຳເນີນການ				ຕາມການກຳນົດຂອງມາດຕະຖານການປ່ອຍນໍ້າເປື້ອນ ໃນມາດຕະຖານສິ່ງແວດລ້ອມແຫ່ງ ສປປ ລາວ (2009)	ນໍ້າປະປາ ເມືອງ ໄຊພູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
ປະລິມານນໍ້າປະປາທີ່ພຽງພໍ	ການກວດສອບປະລິມານນໍ້າກ່ອນເຂົ້າໂຮງງານດ້ວຍເຄື່ອງວັດແທກການໄຫຼ ແລະ ເຄື່ອງວັດແທກຄວາມດັນ (ໃນໄລຍະທີ ສອງ)	ປະຈຳວັນ	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການຕິດຕາມໃນເວລາດຳເນີນການ				ປະຈຳວັນ	ນໍ້າປະປາ ເມືອງ ໄຊພູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
ມົນລະພິດທາງອາກາດ	ການກວດສອບເຄື່ອງຈັກທີ່ຝຸ່ນອັນຕະລາຍຕໍ່ຊຸມຊົນ	ຕາມການກຳນົດຂອງມາດຕະຖານການປ່ອຍມົນລະພິດທາງອາກາດ ຂອງ ມາດຕະຖານສິ່ງແວດລ້ອມ ແຫ່ງ ສປປ ລາວ(2009)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			

ລັດວິສາຫະກິດ ວິສະວະກຳ ນ້ຳ ແລະ ສິ່ງແວດລ້ອມ

ມົນລະພິດທາງສຽງ	ການກວດສອບຄວາມແຮງຂອງສຽງທີ່ສົ່ງຜົນກະທົບຕໍ່ຊຸມຊົນ	ຕາມການກຳນົດຂອງມາດຕະຖານການປ່ອຍມົນລະພິດທາງສຽງຂອງມາດຕະຖານສິ່ງແວດລ້ອມ ແຫ່ງ ສປປ ລາວ(2009)	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການກວດສອບຄວາມແຮງຂອງສຽງຈາກເຂື່ອນນ້ຳ ແລະ ຂະບວນການຜະລິດທີ່ສົ່ງຜົນກະທົບຕໍ່ຊຸມຊົນ				ຕາມການກຳນົດຂອງມາດຕະຖານການປ່ອຍມົນລະພິດ ທາງສຽງຂອງມາດຕະຖານສິ່ງ ແວດລ້ອມ ແຫ່ງ ສປປ ລາວ (2009)	ນ້ຳປະປາ ເມືອງ ໄຊບູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
ສິ່ງເສດເຫຼືອ	ການຈັດການຂີ້ເຫຍື້ອຈາກການກໍ່ສ້າງ	ໜັ່ງຕັ້ງຖ່າຍທິດ ຜູ້ທີ່ກ່ວາ	ຜູ້ຮັບເໝົາ	ຢູ່ໃນມູນຄ່າຂອງການກໍ່ສ້າງ			
	ການຈັດການຂີ້ເຫຍື້ອຈາກການຜະລິດ				ໜັ່ງຕັ້ງຖ່າຍທິດຖິ້ມກ່ວາ	ນ້ຳປະປາ ເມືອງ ໄຊບູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ
	ການຈັດການຕະກອນຈາກການຜະລິດ				ໜັ່ງຕັ້ງຕໍ່ປີ	ນ້ຳປະປາ ເມືອງ ໄຊບູທອງ	ຢູ່ໃນມູນຄ່າຂອງການດຳເນີນຜະລິດປະຈຳປີ