Luang Prabang Smart and Integrated

Urban Strategy

FINAL DRAFT
October 2023

ASEAN AUSTRALIA SMART CITIES TRUST FUND
Asian Development Bank

ນະຄອນ ຫຼວງພະບາງ
Luang Prabang City

Australian Government
Department of Foreign Affairs and Trade

ADB

RAMBOLL

Project name	LAO: Luang Prabang Smart and Integrated Urban Strategy
Project no.	Task Order No. 12
Recipient	Asian Development Bank
Document type	Final Draft Report
Version	6
Date	October 2023
Prepared by	Wang Wei (Task Team Leader), Goh Wee Heng, Tara Gujadhur, Rik Ponne, James Wiley, Paul Nettleton, Faiz bin Mohd, Denise Loh, Catherine Grant, and Barbara Lama
Checked by	Hillarie Cania
Approved by	Antony Gibson, Craig Niles

CONTENTS

TABLES, FIGURES, AND BOXES

TABLES

FIGURES

BOXES

ABBREVIATIONS

AASCTF	ASEAN Australia Smart Cities Trust Fund
ADB	Asian Development Bank
AMI	advanced metering infrastructure
ASEAN	Association of Southeast Asian Nations
CDIA	Cities Development Initiatives for Asia
CHOS	City Headquarter of Security
DARE	Digital Accessibility Rights Evaluation
DEWATS	decentralized wastewater treatment system
DICT	Department of Information, Culture and Tourism
DLSW	Department of Labour and Social Welfare
DMA	district metering area
DPI	Department of Planning & Investment
DPWT	Department of Public Works and Transport
DRM	disaster risk management
DRR	disaster risk reduction
DTC	Department of Technology and Communications
DWS	Department of Water Supply
GEDSI	gender equality, disability, and social inclusion
GIS	geographic information system
GPT	gross pollutant trap
HIA	heritage impact assessment
HSR	high speed railway
ICH	intangible cultural heritage
ICT	information and communication technology

LPSIUS	Luang Prabang Smart and Integrated Urban Strategy
MaaS	mobility-as-a-service
MPWT	Ministry of Public Works and Transport
MTC	Ministry of Technology and Communications
NRW	nonrevenue water
NTU	nephelometric turbidity units
O&M	operation and maintenance
OPWT	Office of Public Works and Transport
OUV	outstanding universal value
PRC	People's Republic of China
PSMV	Plan de Sauvegarde et de Mise en Valeur
PWD	person with disability
PWTO	Public Works and Transport Office
SCADA	supervisory control and data acquisition
SEZ	special economic zone
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USO	Urban Services Office
WTP	water treatment plant

NOTES:

(i) In this report, "$" refers to US dollars.

(ii) The Asian Development Bank recognizes "China" as "the People's Republic of China," and "Laos" as "the Lao People's Democratic Republic."

(iii) All photos by Ramboll, unless stated otherwise. Cover photo is from Adobe Stock.

EXECUTIVE SUMMARY

Photo: Adobe Stock.

Nestled in the northern region of the Lao People's Democratic Republic, Luang Prabang is one of the larger cities in the country. Infused with local Buddhist culture and traditions, its heritage boasts a unique mix of distinctive, low-rise vernacular and French colonial architecture, and a tropical riverine and forested landscape. Since Luang Prabang's designation as a World Heritage Site in 1995, its tourism and its population growth has resulted in outward city expansion and new economic opportunities. However, growth also brought about urban challenges in traffic congestion, littering, and indiscriminate wastewater discharge, overcrowded tourism sites, and wetland and pond loss, affecting the city's livability and heritage. As population and visitor numbers continue to grow, such problems unabated will inevitably worsen. These problems are accentuated by structural issues, such as a lack of funding, fragmented decision-making, and weak coordination between agencies.

The Luang Prabang Smart and Integrated Urban Strategy was prepared by the Luang Prabang provincial government, with the ASEAN Australia Smart Cities Trust Fund assistance and is based on extensive consultations with public and private stakeholders during mid-2022 through mid-2023. It outlines a smart city strategic infrastructure plan to achieve Luang Prabang's ambition to become a more livable heritage city for all. This ambition statement encapsulates the city's key attributes: its heritage, urban fabric, and its people. Three strategic pillars: (i) Integrated Tourism and Heritage Destination, (ii) Clean and Safe Environment, and (iii) Sustainable Villages and a 15-Minute City, guide the specific strategies and smart city projects required to realize Luang Prabang's livable heritage city ambition.

Under the pillar Integrated Tourism and Heritage Destination, Luang Prabang is envisaged as a sustainable destination that protects and leverages its built, natural, and intangible cultural heritage. Smart city projects include a dynamic electronic ticketing system for tourist attractions, real-time site monitoring, and heritage impact assessment guidelines. The Clean and Safe Environment pillar will provide Luang Prabang residents and visitors with the infrastructure and services needed to ensure a livable urban environment, such as clean water, clean streets, and safe sanitation. Smart city projects include smart septic tank systems, storm drains with gross pollutant traps, and electric waste collection vehicles. Under the Sustainable Villages and 15-Minute City pillar, Luang Prabang's urban management and transport systems will be transformed to strengthen community participation and reduce congestion and pollution. Smart city projects include self-sustaining urban villages where residents assemble to live, work, play, learn, and enjoy public spaces. Pedestrianization of the World Heritage Site, traffic simulation to improve transport planning, and smart shuttle services are also prioritized. An overarching integrated spatial planning approach factoring heritage, tourism, and sustainability considerations, and a comprehensive geographic information system will guide these efforts.

The strategy will be implemented under the supervision of a steering committee chaired by the provincial governor and supported by multisector working groups. Each working group will oversee one of the three strategic pillars, ensuring that smart city initiatives across the different domains are aligned with the overarching ambition and contribute to urban sustainability, resilience, social inclusion, and livability outcomes.

1 INTRODUCTION

1.1 ASEAN AUSTRALIA SMART CITIES TRUST FUND OVERVIEW

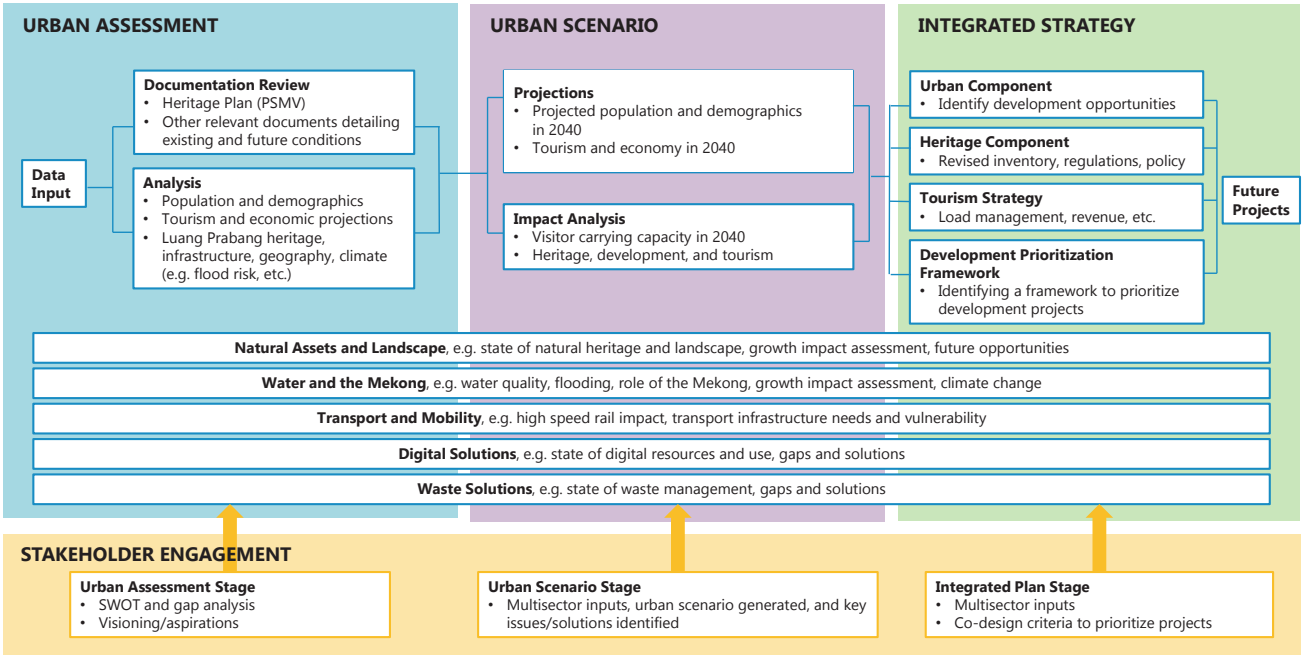
The Luang Prabang Smart and Integrated Urban Strategy identifies smart city solutions to facilitate sustainable urban and tourism growth, address urban management problems, and preserve Luang Prabang's distinctive built, natural, and intangible heritage. Tourism, heritage, water supply, sanitation, solid waste management, climate change and disaster management, transport, and information and communication technology (ICT) are the main sectors addressed.

Preparation of the strategy was supported by the Asian Development Bank (ADB)-administered Association of Southeast Asian Nations (ASEAN)–Australia Smart Cities Trust Fund (AASCTF), financed by the Government of Australia through its Department of Foreign Affairs and Trade. The AASCTF delivers innovative approaches and capacity building to facilitate the smart and equitable transformation of ASEAN cities. AASCTF objectives are to improve adaptation and adoption of digital solutions in city planning systems, service delivery, and financial management. This enables cities to be more livable, resilient, and inclusive. Experts engaged by global consulting firm Ramboll assisted the Luang Prabang provincial government to prepare the strategy.

1.2 LUANG PRABANG SMART AND INTEGRATED URBAN STRATEGY PREPARATION

Preparation of the strategy followed a three-stage process (Figure 1). In the urban assessment stage, data and documentation were analyzed to identify the city's current challenges and opportunities, including from a gender equality, disability, and social inclusion (GEDSI) perspective. Community leaders, civil society, government officials, entrepreneurs, youth, and women working in the night market were consulted in person and through online surveys to understand their aspirations for the city. In the urban scenario stage, population and visitor numbers were projected up to 2040, with urban scenarios postulating different urban growth trajectories. In the integrated strategy stage, smart city solutions were identified and prioritized to address urban problems identified in the prior stages. Implementation guidelines were co-developed with local stakeholders.

Figure 1: Luang Prabang Smart and Integrated Urban Strategy – Methodology



PSMV = Plan de Sauvegarde et de Mise en Valeur, SWOT = strengths, weaknesses, opportunities, and threats.
Source: Ramboll, 2023.

The online survey to gather stakeholders' views on urban challenges, opportunities, and development priorities showed that poor waste management, out-migration, and economic disruption were the three largest challenges confronting communities. Preserving a vibrant living local heritage, maintaining green spaces and nature, and leading a sustainable lifestyle were prioritized by residents (Table 1).

Table 1: Smart City Survey Questionnaire and Results

Question 1: What are the three biggest challenges facing your village today?	**Results** (No. of response)
a. Poor waste management	129 (60%)
b. Departure of residents	90 (42%)
c. Disruptions to the economy	86 (40%)
d. Road issues, traffic congestion	80 (37%)
e. Poor visitor management	68 (32%)
f. Non-heritage development	67 (31%)
g. Inadequate healthcare	48 (22%)
h. Poor education opportunities	42 (20%)
i. Climate change, flooding, etc.	35 (16%)
Question 2: What do you think are the three most important priorities for your village to be a livable community?	**Results** (No. of response)
a. Vibrant living local heritage	123 (59%)
b. Green spaces and nature	110 (53%)
c. Environmentally friendly / sustainable lifestyle	100 (48%)
d. Diversified economy / work	75 (36%)
e. Flourishing tourism sector	60 (29%)
f. Non-heritage development	53 (26%)
g. Inadequate healthcare	51 (25%)
h. Convenient, affordable suburbs	27 (23%)

Source: Ramboll, 2022.

1.3 SMART CITY OVERVIEW

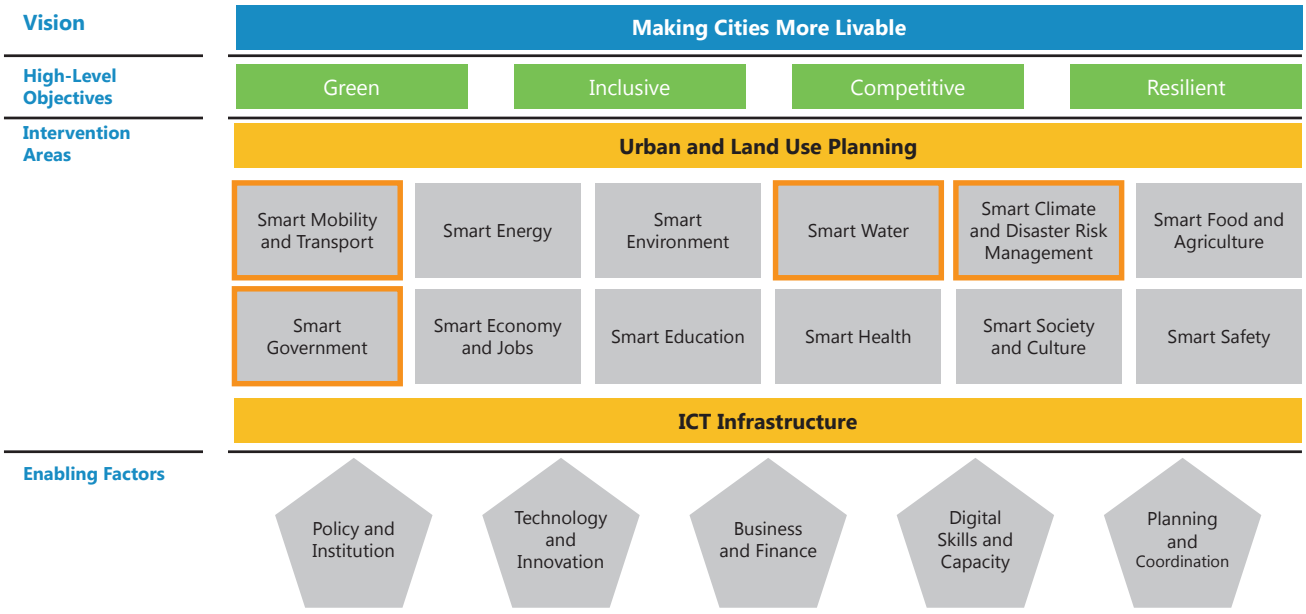
This strategy adopts the definition of a "smart city" as a city where people and the environment come first, with urban livability as the overarching objective, and smart technologies are used as means to achieve these outcomes.[1]

ADB's Smart City Analytical Framework (Figure 2) sets out the different components of a smart city. It includes:

(i) **High-level objectives**, which establish the city's desired greening, inclusive, competitiveness, and resilience outcomes.
(ii) **Intervention areas**, comprising urban subsectors where smart interventions could be introduced, including urban and land use planning, mobility, and the environment. Interventions are selected based on the city's priorities and needs.
(iii) **Enabling factors**, which refer to the underlying factors influencing successful smart city implementation. These include policy and governance structures, digital skills and capabilities, funding models, and interagency planning and coordination.

This framework was used to identify potential intervention areas where smart city solutions could be further developed. Of the 14 intervention areas in the framework, urban land use planning and ICT infrastructure (crosscutting) and smart mobility and transport, water, climate, and government (sectoral) were determined to be priority areas (Figure 2). Local stakeholder engagement also revealed tourism, heritage, and waste as additional sectors to be included in the strategy.

Figure 2: ADB's Smart City Analytical Framework



ICT = information and communication technology.
Note: Intervention areas outlined in orange fall within the scope of this strategy.
Source: Asian Development Bank. 2021. *Creating Livable Asian Cities.* Manila.

[1] ADB. 2021. *Creating Livable Asian Cities.* Manila. https://www.adb.org/publications/creating-livable-asian-cities.


ZE 040101
Second

2 LUANG PRABANG ASSESSMENT: CONTEXT AND STRATEGIC ISSUES

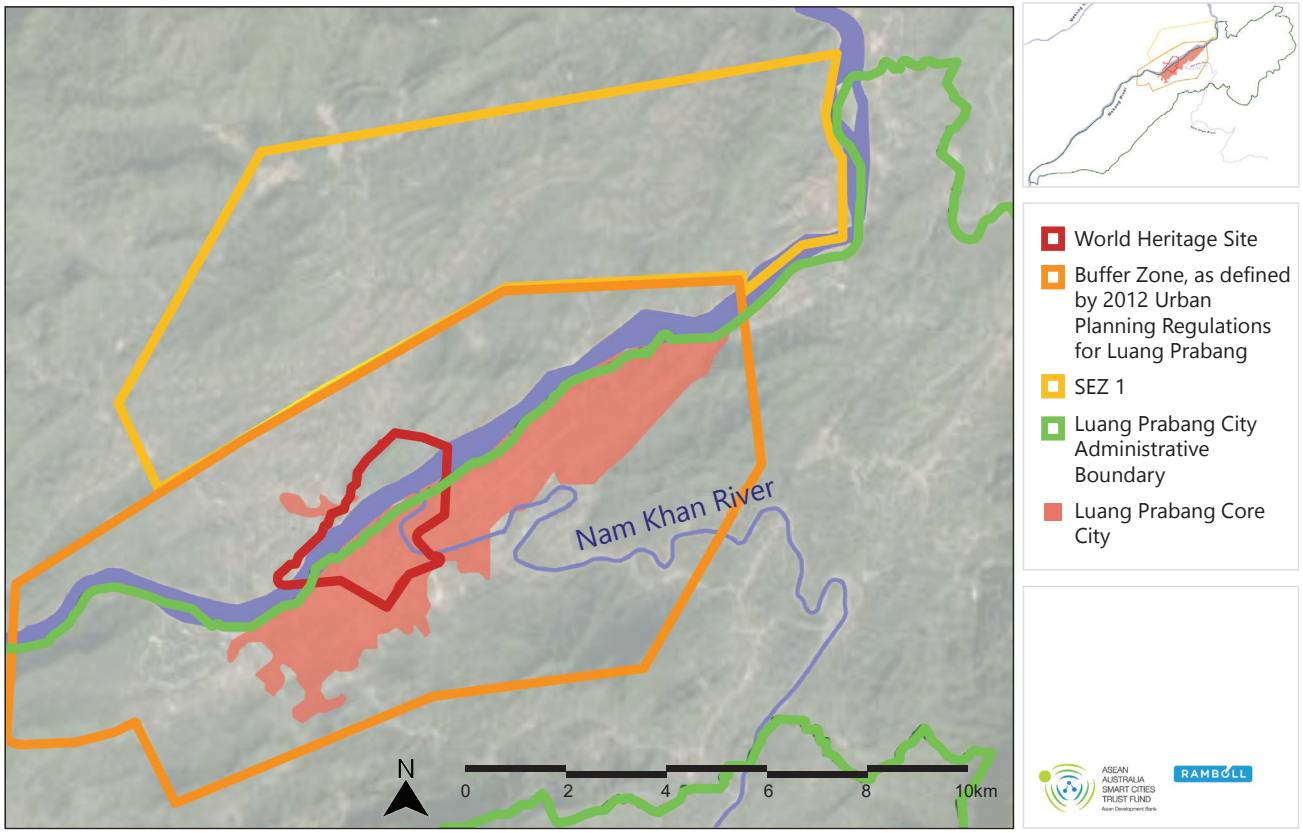
Photo: Adobe Stock.

2.1 OVERALL BACKGROUND AND CONTEXT

2.1.1 Urban Development Context

Study area. Nestled in the northern region of the Lao People's Democratic Republic (Lao PDR), Luang Prabang city is 761 square kilometers (km^2) with 114 villages, based on its 2018 decreed administrative boundaries (Figure 3).[2] The study area comprises the 3,000-hectare core city's contiguous built-up and peri-urban area, likely future growth areas, and special economic zone (SEZ) 1 in Chomphet district. As most of the city is rural and not urbanizing, the strategy focuses on the rapidly growing 820-hectare Luang Prabang World Heritage Site and its buffer zone, as defined in the 2012 Urban Planning Regulations for Luang Prabang (Figure 3).

Figure 3: Study Area



SEZ = special economic zone.
Source: Ramboll, 2023.

[2] Prime Minister Decree No. 126/PM. 11 May 2018. Vientiane.

City history. Luang Prabang was the capital of the former Lan Xang Kingdom from 1353 to 1560 when the administrative capital shifted to Vientiane. Lao PDR came under French colonial rule in the late 1800s until its independence in 1954. During that period, the French recognized Luang Prabang as the country's royal capital—a function it retained until 1975. In December 1995, the United Nations Educational, Scientific and Cultural Organization (UNESCO) designated the 820-hectare Town of Luang Prabang[3] a UNESCO World Heritage Site, to recognize its distinctive architecture, rich cultural heritage, and landscape of lush wetlands and ponds.[4]

Three plans have been developed to protect the town's heritage. The Plan de Sauvegarde et de Mise en Valeur (PSMV) was introduced in 2003[5] to guide heritage conservation, land use, and new building construction within the World Heritage Site.[6] Alongside the PSMV, the Luang Prabang World Heritage Management Division (formerly known as the Luang Prabang World Heritage Office) was formed to oversee planning and construction within the World Heritage Site. Beyond the World Heritage Site, the 2004 Schema for Coherent Territorial Development (SCOT) was drawn up to guide the city's urban development trajectory, resettlement, and commercial activities. It set the foundations for the 2012 Urban Planning Regulations for Luang Prabang, which regulates how new building and construction activity will occur within the new buffer zone around the World Heritage Site. This plan is overseen jointly by the Luang Prabang World Heritage Management Division, Department of Public Works and Transport (DPWT), Luang Prabang City, District of Chomphet, and Department of Information, Culture and Tourism (DICT).[7]

Urbanization trends. Designation as a World Heritage Site made Luang Prabang city a major tourist attraction. From 2010 to 2019, Luang Prabang Province experienced an almost 200% increase in international tourist arrivals, reaching 638,101 in 2019.[8] Most visitors stay in and around the World Heritage Site.[9] Between 1995 and 2015, the city's population grew from 53,800 to 90,313 persons, a 67.9% increase. Rural–urban migration is also influencing urbanization as rural residents are attracted by tourism jobs.

While bringing great opportunities, the surge in tourism-related development has also led to socioeconomic dislocation and challenges to the city's physical and social fabric. The city's more vulnerable residents (ethnic groups, older persons, women-headed households, households living in poverty, among others) live on the city's margins, exacerbating the socioeconomic divide.[10]

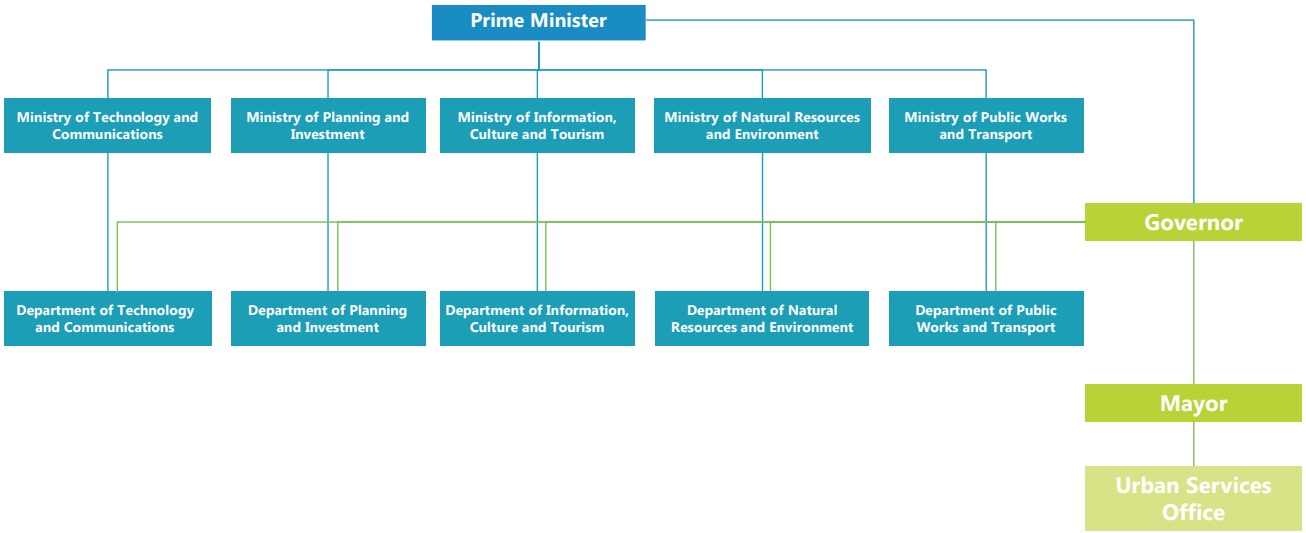
More recently, Luang Prabang received several new megaprojects. These include the Lao–People's Republic of China (PRC) High Speed Railway (HSR) (which opened in December 2021), multiple hydropower projects, and the planned expressway between Vientiane Capital and the PRC. A memorandum of understanding to develop a 4,850-hectare SEZ for tourism and residential developments was also recently signed. This includes land in Chomphet district, around the HSR station, and near Kuangsi Waterfalls.[11]

Governance structure. Key departments and offices oversee the planning and development of Luang Prabang and the provision of supporting infrastructure, with the Luang Prabang governor and mayor maintaining oversight (Figure 4). Each department serves as a Luang Prabang provincial department and a branch agency of a central ministry.

---

[3] In 2013, the UNESCO approved slight modifications to the boundaries of the World Heritage Site to include more of the mountain ranges to the north of the Mekong River.
[4] UNESCO. 1995. *Town of Luang Prabang*. Paris: UNESCO. https://whc.unesco.org/en/list/479/.
[5] Prime Minister Decree No. 175/PM. 6 November 2003. Vientiane.
[6] Chinon Development and City Planning Agency. 2004. Ten Years of Decentralised Cooperation between the Cities of Chinon and Luang Prabang. Sponsored by UNESCO. Paris.
[7] Prime Minister Decree No. 31/PM. 1 February 2012. Vientiane.
[8] Department of Information, Culture, and Tourism. 2021. *2000-2021 Tourism Report*. Luang Prabang.
[9] Ministry of Information, Culture and Tourism. *2013. 2013 Statistical Report on Tourism in Lao PDR*. Vientiane. MICT. 2019. *Statistical Report on Tourism*. Vientiane.
[10] Fumagalli, M. 2019. Luang Prabang: Climate Change and Rapid Development. *Cities*. 97.
[11] Ministry of Planning and Investment. 2021. *Special Economic Zones in Lao PDR*. Vientiane. https://laosez.gov.la/pdf/SEZ_PCL_2021_en.pdf.

Figure 4: Authorities Overseeing Urban Development in Luang Prabang



Source: Ramboll, 2023.

2.1.2 Urban Forecasts and Scenarios

Population projections. Referencing official statistics published by the Ministry of Planning and Investment in its *Population and Housing Census and Statistical Yearbook*, Luang Prabang buffer zone's population is projected to grow from 68,207 to 83,262 persons during 2020 to 2040. Two household-size scenarios are used (Table 2). The smaller household-size scenario assumes a household size decline of 0.18 persons per household every 5 years, which was observed between 2005 and 2015. As such, by 2040, there would be 4.28 persons per household, translating to 19,454 households in the core city. The constant household size scenario assumes the 2040 average household size of five persons, as observed between 2015 and 2020. In this scenario, there would be 16,652 households in 2040.

Table 2: Luang Prabang Buffer Zone's Projected Population and Number of Households

		Year							
		Reported			Projected				
		1995	2005	2015	2020	2025	2030	2035	2040
Population		37,006	53,438	64,508	68,207	72,591	75,496	79,496	83,262
Declining Household Size Scenario	**Average Household Size**	5.90	5.90	5.00	5.00	4.82	4.64	4.46	4.28
	Household	6,272	9,057	12,902	13,641	15,060	16,368	17,824	19,454
Constant Household Size Scenario	**Average Household Size**	5.90	5.90	5.00	5.00	5.00	5.00	5.00	5.00
	Household	6,272	9,057	12,902	13,641	14,518	15,189	15,899	16,652

Source: Population and Housing Census of Lao PDR (for population and average household size for 1995, 2005, and 2015) and Ramboll (for projection of average household size and number of households from 2020 onward).

Visitor projections. Three visitor projections scenarios were developed (Table 3). The SEZ-driven scenario assumes that the SEZ will drive visitor and length of stay growth due to the planned tourist attractions, resulting in 3.7 million total international and domestic visitor arrivals per year by 2040. The typical management scenario assumes strong regional market growth with current visitor management systems, resulting in repeated short stays and around 3.2 million visitors by 2040. The proactive management scenario has similar assumptions to the typical management scenario, but with a tourism management system adapted to prioritizing attracting fewer but higher-spending visitors to avoid overwhelming the city. In this scenario, an estimated 2.9 million visitors will arrive by 2040.

Table 3: Annual Visitor Arrival Projections for Tourism Scenarios

Year	SEZ-Driven Scenario	Typical Management Scenario	Proactive Management Scenario
2022	537,719	537,719	537,719
2025	1,007,835	799,884	712,591
2030	1,456,844	1,426,624	1,139,867
2035	2,313,933	2,135,302	1,835,768
2040	**3,701,443**	**3,214,716**	**2,956,522**

SEZ = special economic zone.
Source: Asian Development Bank and Ramboll estimates.

Urban land projections. Translating the number of households into urban land requirement projections indicates that the smaller household size and the constant household size scenarios need 436.0 hectares and 225.8 hectares of additional land respectively (Table 4). The urban land requirement estimates include housing and supporting amenities such as roads, social facilities, and commercial establishments, and is based on a typical dwelling unit size of 300 square meters.[12] Estimates use a housing-to-supporting facilities land ratio of 40:60.[13]

Visitor accommodation land projections. Visitor projections for the typical management and proactive management scenarios are converted into room demand figures after accounting for stay duration (i.e., how long each tourist is likely to stay), seasonality (i.e., the peak and off-peak seasons across the year), and accommodation profile trends (i.e., whether tourists would stay in guesthouses, resorts, or hotels). Due to the uncertainty of when SEZ development will commence, the SEZ-driven scenario is not considered. Based on each accommodation type's land needs, the typical management scenario indicates that 99.0 hectares of new accommodation land will be needed in 2040 and the proactive management scenario will require 91.6 hectares of new accommodation land in 2040 (Table 4).

[12] Department of Public Works and Transport. 2022. Verbal communication.
[13] Based on actual land distribution in Ban Thongchaleune, Ban Aham, and Ban Viengxay.

Table 4: 2040 Urban and Visitor Accommodation Land Requirements

	2040 Urban Land		2040 Hotel Land	
	Declining Household Size Scenario	**Constant Household Size Scenario**	**Typical Management Scenario**	**Proactive Management Scenario**
Area Required (hectares)	436.0	225.8	99.0	91.6

Source: Ramboll, 2023.

Land availability analysis. By 2040, Luang Prabang needs to develop an additional 527.6 hectares of land from within and outside the buffer zone. This is derived by adding 436.0 hectares of urban land from the declining average household size scenario to the 91.6 hectares of hotel land from the proactive management scenario. Both scenarios have been used to compute land availability as they are the likely and preferred scenarios that would result in a more livable and sustainable Luang Prabang.

Urban scenarios. Projecting how Luang Prabang could develop spatially in 2040, two scenarios were examined. In the business-as-usual scenario, Luang Prabang's core city continues to sprawl, encroaching into protected mountainous and forested areas. In the polycentric development scenario, urban growth occurs in new urban nodes outside the core city, such as around the HSR station and near Kuangsi Waterfalls. Combining elements of both scenarios, an alternative scenario was developed. In this scenario, urban growth will take place in four new urban nodes within and outside the buffer zone (Table 5). These are (i) Ban Done Keo, (ii) around Souphanouvong University (the Northeast Node), (iii) around the HSR station, and (iv) near Kuangsi Waterfalls (the Southwest Node). A fifth node in Chomphet could be developed when the planned bridge across the Mekong River connecting Luang Prabang and Chomphet is completed.

Table 5: Luang Prabang Development Focus Areas, 2040

Zone	Primary Functions	Land Required (hectare)
Southwest	Low density mixed-use development area	103.7
Northeast	Community-focused neighborhood development area	23.6
Ban Done Keo	Community-focused neighborhood development area	220.3
High Speed Rail	Transit development mixed-use hub	180.0
	Total	**527.6**

Source: Ramboll, 2023.

2.1.3 Strategic Issues

Rapid urbanization, tourism and population growth, and new megaprojects. These have brought tremendous economic and social development opportunities to Luang Prabang. However, they have also put the World Heritage Site under immense development pressure and stressed urban services.

Road congestion and unsafe streets. The average commute time is 10 minutes under normal traffic conditions, but this lengthens by 50% to 15 minutes during peak periods.[14] This is particularly problematic in the World Heritage Site during peak tourist periods due to illegally parked minivans waiting to pick up customers, narrow streets, and many hotels and tourist attractions within a concentrated area. In 2019, Luang Prabang Traffic Police reported 487 vehicle accidents, with 155 injuries and 100 fatalities. Lack of traffic crossings, dedicated walkways, and unsafe driving behaviors create dangerous conditions for pedestrians and cyclists, which disproportionately impacts persons with disability (PWDs) and other more vulnerable groups (e.g., children, pregnant women, older persons). The last census noted that PWDs comprised 4.2% of Luang Prabang's population (footnote 14). There is limited universal access within the city and many sidewalks are obstructed. Only six junctions have accessibility ramps, and the city lacks traffic lights or tactile pavements.

Improper solid waste disposal and untreated wastewater discharge. Of the total solid waste generated in Luang Prabang, only 68% is collected and sent to the town dump. Less than 1% is recovered and sold as recyclables and the remainder is either burned in situ or illegally dumped. Littering is common, causing untidy streets, choked drains, and localized flooding. Together with openly burned yard waste and plastic, this tarnishes the city's image.[15] Inadequately treated foul-smelling septic tank effluent also discharges into roadside drains and ponds. Low public awareness and environmental education, insufficient solid waste collection coverage, poorly maintained septic tanks, and weak enforcement of waste management regulations are underlying causes.

People congestion. Rapid visitor growth and weak visitor management have led to tourism site and facilities congestion. Congestion leaves many tourists and residents dissatisfied, and in some cases creates unsafe conditions. For example, Phousi Hill often has large crowds packed onto a small viewing deck to watch the sunset. This negatively impacts the site's religious sanctity and increases the risk of injuries while atop the hill or descending the steep access path. Such conditions, if left unchecked, will worsen with more visitors.

Heritage loss. Many residences in the World Heritage Site have been converted into guesthouses and for other commercial uses, resulting in splintered communities and threatening the living heritage of the area. Of 183 ponds inventoried in the PSMV, only around 100 remain, with the remaining backfilled for development purposes, while others are filled with silt, debris, and pollution.[16] The recent opening of international chain stores selling imported accessories, toys, and gadgets has raised concerns about over-commercialization and local business loss along Sisavangvong Road.

---

[14] World Bank. 2022. *Lao PDR – Fostering Green Mobility in Luang Prabang*. Washington, DC.
[15] Urban Services Office (USO). 2021. *2021 Solid Waste Data*. Luang Prabang.
[16] GRET. 2021. Wetlands Improvement and Sanitation Enhancement in Luang Prabang. Partner Meeting Presentation. 26 January; UNESCO. 2022. Report on the Joint WHC-ICOMOS Reactive Monitoring Mission to Luang Prabang. Paris. 4–9 April.

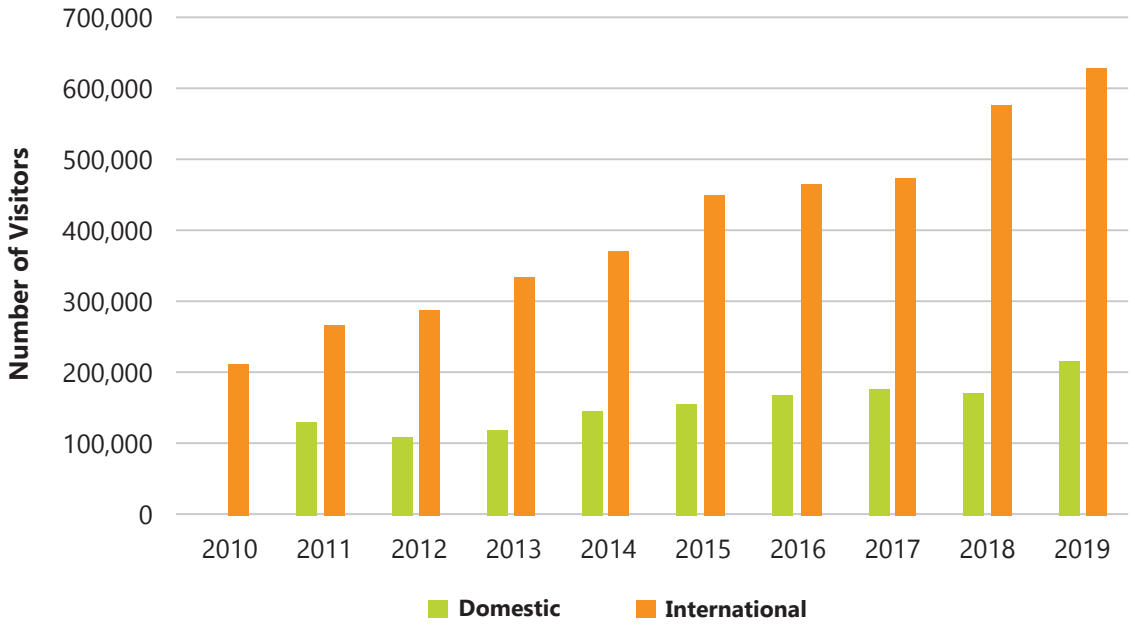
Uncontrolled urban growth and its impact. Conversion of protected agricultural land and forests along the core city's fringes into new residential and commercial areas raises concerns about natural heritage loss. Visitor and population growth will increase demand for new developments and construction, which could further threaten the city's heritage integrity and livability if not properly managed. Growth is contributing to increasing housing costs and rents, which particularly impacts students and workers from rural areas that live in the city, many of whom rent space in private dormitories and collective-one-floor houses located near education facilities and working places. A recent study found increasing prices are making it harder for the people who work in Luang Prabang to live there and disproportionately affect ethnic and other vulnerable groups.[17] These communities are integral to the city's vibrant culture. Consultations with ethnic groups, youth, and women in 2022 highlighted opportunities to redesign and rebuild Luang Prabang as a more inclusive, accessible, and equitable city.[18]

2.2 TOURISM MANAGEMENT

2.2.1 Status

Luang Prabang is Lao PDR's premier tourism destination. In 2019, the province was estimated to have received 638,000 international visitors and 222,000 domestic visitors,[19] generating approximately $266 million in revenue and making tourism a key driver of Luang Prabang's economy (Figure 5).[20]

Figure 5: Luang Prabang Tourist Arrivals, 2010–2019



Source: Ministry of Information, Culture and Tourism. 2014 and 2019. *Statistical Report on Tourism in Laos.* Vientiane.

---

[17] Phoummasak,K., Kongmanila, X. and Zhou, C.. 2014. The Socio-Economic Impact of Tourism and Entrepreneurs in Luang Prabang Province, Lao PDR. *International Journal of Business and Management.* 9. pp. 282.

[18] Ramboll and The Asia Foundation (ASEAN Australia Smart Cities Trust Fund). 2022. *REG: Smart Cities – Inclusive Cities Capacity Building Program: Stakeholder & Issues Mapping Report.* https://events.development.asia/system/files/materials/2022/02/202202-smart-cities-inclusive-cities-capacity-building-program-stakeholder-and-issues-mapping-report.pdf (development.asia).

[19] MICT. 2021. *2020 Statistical Report on Tourism in Laos.* Vientiane.

[20] DICT. 2020. *Annual Tourism Statistics Summary 2019.* Luang Prabang.

The coronavirus disease (COVID-19) pandemic closed Lao PDR's borders, with a devastating impact on the city, its businesses, and residents. Tourism employed 54,000 people before the COVID-19 pandemic, 63% of whom were women.[21] Tourism also underpins Lao PDR's handicraft sector, which mainly employs women. During the COVID-19 pandemic, more than 78% of tourism enterprises closed in Luang Prabang and over 80% of enterprises had reduced their workforce by more than 50%.[22] In 2020, international visitors to Luang Prabang dropped by 88% to approximately 78,000 people and in 2021, there were zero recorded international tourists (footnote 19).

When Lao PDR reopened its borders to international tourism in May 2022, international and domestic travel regulations resembled those of the pre-COVID-19 situation. The resumption of direct flights between Luang Prabang and Bangkok commenced in June 2022 and Lao–China HSR domestic passenger services have been operating since December 2021. Tourism strongly rebounded in 2022, with the town receiving 537,719 tourists, 82% of whom came by train.[23]

Luang Prabang Province has 228 officially recognized tourism sites, and the town itself has 276 guesthouses, 78 hotels, and 12 resorts, totaling 5,269 rooms.[24] A total of 97 tour companies and 594 tour guides are registered.[25] While this has been sufficient to meet demand most of the year, high visitor intensity during October to February and the Lao New Year in April stresses the city's infrastructure and services during these periods. With the HSR being a highly popular and affordable way to travel, it is anticipated that overcrowding will become an even greater challenge.

DICT is the primary government body responsible for overseeing the Luang Prabang tourism sector. However, some of its mandate overlaps with that of the former Luang Prabang World Heritage Office, Department of Planning and Investment, Department of Commerce and Industry, DPWT, and the Mayor's Office, among others. The formation of the Luang Prabang World Heritage Management Division under DICT is aimed at improving coordination regarding tourism-heritage issues.[26]

An important issue that requires better zoning is the need to create more affordable and well-managed space for women and ethnic groups to set up micro and small enterprises. The Luang Prabang night market is one of the city's main tourism attractions and is a good example of how to use urban space to create inclusive economic opportunities. However, local ethnic vendors face increasing rents and demand for space is high.

2.2.2 Subsector Assessment

Seasonality. Luang Prabang's visitation patterns are highly seasonal, varying from about 3,000 visitors per day in February to a low of 1,800 per day in September.[27] The city receives 70% of annual visitors during the October–February high season, when accommodations' occupancy rates reach 81.3%. It is expected that the rising share of regional and domestic tourists, which tend to travel in groups and prefer motorized transportation, will exacerbate traffic congestion and overcrowding during the high season.

---

[21] The Asia Foundation. 2022. *The Impact of the COVID-19 Pandemic on Inequality in Asian Cities*. San Francisco.
[22] ADB. 2020. *The Impact of COVID-19 on Tourism Enterprises in the Lao People's Democratic Republic*. Manila.
[23] DICT. 2023. Luang Prabang Provincial Tourist Arrivals by Mode of Transport. Luang Prabang.
[24] DICT. 2022. Luang Prabang Tourism Statistical Report: Third Quarter 2022. Luang Prabang.
[25] DICT. 2022. Tourism Statistics. Luang Prabang. https://tourismluangprabang.gov.la/statistic.
[26] Prime Minister Decree 1167/PM. 12 August 2022. Vientiane.
[27] DICT. 2020. Tourist Arrivals by Air, Boat, and Road in 2019. Luang Prabang.

Visitor monitoring and management data. Luang Prabang lacks the systems needed to provide real-time data for visitor monitoring and management, including detailed data on visitor typologies and visitor behavior. Advance ticketing for tourist attractions is not available for independent travelers and online ticketing is not available for publicly managed tourist attractions. Limits on the number of daily visitors or the duration that visitors can spend at an attraction have not been set. In 2022, the DICT set up an online statistics and documentation system to integrate and digitize tourism information, but further work is needed to improve data collection and reporting.

Tourism site maintenance funding. Significant tourism taxes, visa fees, and entry ticket fees to tourism sites are remitted to the Provincial Treasury. However, normal annual budget allocations to public agencies for tourism site maintenance is often insufficient.

Zoning. Many residential areas and wetlands risk being converted to commercial use, threatening community cohesion and heritage characteristics. Development and implementation of guidelines on the ratio of guesthouses, hotels, restaurants, shops to residences, and allowable products for sale in public markets, particularly the night market, are needed to create a more equitable and heritage-friendly city.

Special economic zones. Current SEZ planning is not coordinated, nor are detailed plans publicly disclosed. SEZ plans may not adhere to urban planning and development regulations, conflicting with the city's spatial planning goals.

Walkability. Luang Prabang's core heritage area is easily traversed by walking, bicycle, boat, and other forms of small, motorized transport. However, this compactness makes the core city susceptible to traffic congestion, overcrowding, and commercial conversions. There is a need and opportunity to develop areas outside the World Heritage Site to relieve such pressures.

2.3 HERITAGE MANAGEMENT

2.3.1. Status

Lao PDR is a signatory to the UNESCO 1972 World Heritage Convention and is committed to ensuring the identification, protection, conservation, preservation, and transmission to future generations of the cultural and natural heritage within its territory.[28] Lao PDR's first World Heritage nomination was "The Town of Luang Prabang."[29]

Since 1995, Luang Prabang has evolved into a thriving, world-class tourist destination, generating substantial benefits for its residents. Dedicated site managers, particularly the Luang Prabang World Heritage Management Division, and international assistance have ensured that despite remarkable tourism growth, Luang Prabang's heritage values have generally been preserved and enhanced.

Despite these efforts, out of the 611 traditional buildings included in the 1995 nomination dossier, 15 (2.5%) have been lost due to demolition, collapse, or fire, and 142 (23.2%) are in a moderate to poor condition.[30] These issues are indicative of the Luang Prabang World Heritage Management Division's challenges regarding regulatory enforcement, having adequate disaster risk management measures, and sufficient funding to support heritage building rehabilitation efforts. Approaches to managing complex living heritage sites like Luang Prabang have evolved significantly over time. UNESCO and the government now see Luang Prabang as a historic urban landscape.[31] The PSMV needs to be updated to reflect these new approaches and rapidly intensifying development pressures.

---

[28] UNESCO. 2023. Convention Concerning the Protection of the World Cultural and Natural Heritage. 31 January. Paris. https://whc.unesco.org/en/conventiontext/.

[29] Inscribed in 1995 with the following citation reflecting its outstanding universal values (OUV): "Luang Prabang represents, to an exceptional extent, the successful fusion of the traditional architectural and urban structures and of the European colonial rules of the 19th and 20th centuries. Its unique townscape is remarkably well-preserved, illustrating a key stage in the blending of the two cultural traditions." UNESCO. 1995. Report of the World Heritage Committee's nineteenth session. Berlin. 4–9 December.

[30] UNESCO. 2022. Report on the Joint WHC-ICOMOS Reactive Monitoring Mission to Luang Prabang. 04–09 April 2022. Paris.

[31] UNESCO. 2013. New Life for Historic Cities: The Historic Urban Landscape Approach Explained. Paris. https://whc.unesco.org/en/activities/727/.

2.3.2 Subsector Assessment

Heritage management plans. The PSMV provides a solid framework for heritage building protection and conservation. However, it does not cover all attributes that express Luang Prabang's outstanding universal values (OUV), such as its natural environment and the town's intangible cultural heritage (ICH).[32] An inventory that systematically documents these attributes as well as conservation guidelines and provisions for managing them is needed.

Inventory and data management. The static nature of the existing heritage inventory, consisting of maps and lists published in PDF documents, hampers updating and complicates systematic chronological tracking. Data on conservation state, changes, and past conservation work, and monitoring results cannot be easily linked to the inventory entries. The Luang Prabang World Heritage Management Division is updating and improving the geographic information system (GIS) mapping of the World Heritage property and its heritage assets, but progress is slow due to limited capacity and budget, with focus on the building inventory mapping and updating only.

Capacity development. The Luang Prabang World Heritage Management Division implements and enforces the PSMV. It has the expertise and experience with planning and directing built heritage conservation and screening and advising on restoration and construction activities within the World Heritage Site. However, it needs to build its skills and knowledge on streetscape, landscape, and ICH management.

To cater to increasing tourist arrivals, buildings within the World Heritage Site have over time been repurposed for tourism-related activities, causing a significant decline in residential and government use and departure of residents and their traditional lifestyles. In recent years, visitor congestion poses a risk to heritage conservation, and visitor and local community safety. UNESCO has repeatedly flagged this as an issue since 2007.[33] The DICT recently started preparing a tourism management plan to address the shared heritage and tourism management concerns. Funding and expertise are needed to help implement the plan.

Since the PSMV governs only the World Heritage Site, developments outside it (i.e., within the buffer zone or in the larger territorial context) that may impact the OUV are not directly within the Luang Prabang World Heritage Management Division's mandate, and hence do not undergo the same level of scrutiny required for developments within the World Heritage Site. To resolve this, heritage concerns need to be integrated into larger planning frameworks overseen by other agencies.

Heritage site preservation and management requirements set out by the UNESCO World Heritage Committee have also evolved since the PSMV was prepared, and presently include climate change and other disaster risk preparedness and provisions for heritage impact assessment.[34] As these issues are currently not included in the PSMV, and there is limited local expertise, the Luang Prabang World Heritage Management Division and other related authorities must build their capabilities to assess new infrastructure proposals and manage disaster risks.

---

[32] UNESCO. 2013. ICOMOS Report for the World Heritage Committee, 2013, 37th Ordinary Session. Phnom Penh. June.
[33] UNESCO. 2007. Decisions Adopted by the 33rd Session of the World Heritage Committee. Sevilla. 22–30 June 2009.
[34] UNESCO. 2021. *The Operational Guidelines for the Implementation of the World Heritage Convention.* Paris.

Sustainable finance. The Law on National Heritage includes provisions for a National Heritage Fund to finance management, protection, conservation, restoration, and rehabilitation activities. However, operationalizing the fund has been challenging. Without a functioning Heritage Fund or other regular, substantial source of funding, Luang Prabang lacks the means to adequately finance the Luang Prabang World Heritage Management Division's operations, particularly if given a broader mandate. Funding is also needed to support private building owners' conservation and restoration efforts.

2.4 WATER SUPPLY

2.4.1 Status

Safe drinking water access preserves human health and is a basic human need. Sustainable Development Goal (SDG) 6 reflects this emphasis on water, recognizing that social development and economic prosperity depend on sustainable water resource management. Safeguarding access to safe water supply can make Luang Prabang a more livable and equitable city.

Water supply coverage and nonrevenue water (NRW)[35] in the city were at 85.8% and 28.3% in 2020, respectively.[36] A project is underway to boost the capacity of the Phanom water treatment plant (WTP) from 12,000 cubic meters (m^3)/day to 14,000 m^3/day by 2024, build a new reservoir to replace the existing Phousi Reservoir, and upgrade the district's water distribution network.[37] This will help the city achieve the national target of 90% water supply coverage by 2030.

While water supply planning is undertaken nationally by the Department of Water Supply (DWS) within the Ministry of Public Works and Transport (MPWT),[38] urban water supply operation and maintenance is carried out by the 17 provincial water utilities, also known as Nam Papas.[39] The Water Supply State Enterprise of Luang Prabang (WSSE-LPB) operates and maintains water supply assets (i.e., treatment, reservoir, distribution pipelines, and service connections) within the Luang Prabang buffer zone and collects water tariffs from users.[40] The Provincial Assembly regulates WSSE-LPB operations and tariffs with oversight from the DWS. Private water service providers, Asia Nampapa Luang Prabang Co., Ltd., and Demco De Lao Co., Ltd, service areas outside the buffer zone.

WSSE-LPB is pursuing service delivery digitalization. It recently introduced a mobile water bill payment option in addition to the in-person payment option at its office. Water supply infrastructure assets, such as water supply pipelines and valves, are also digitized in geospatial formats.

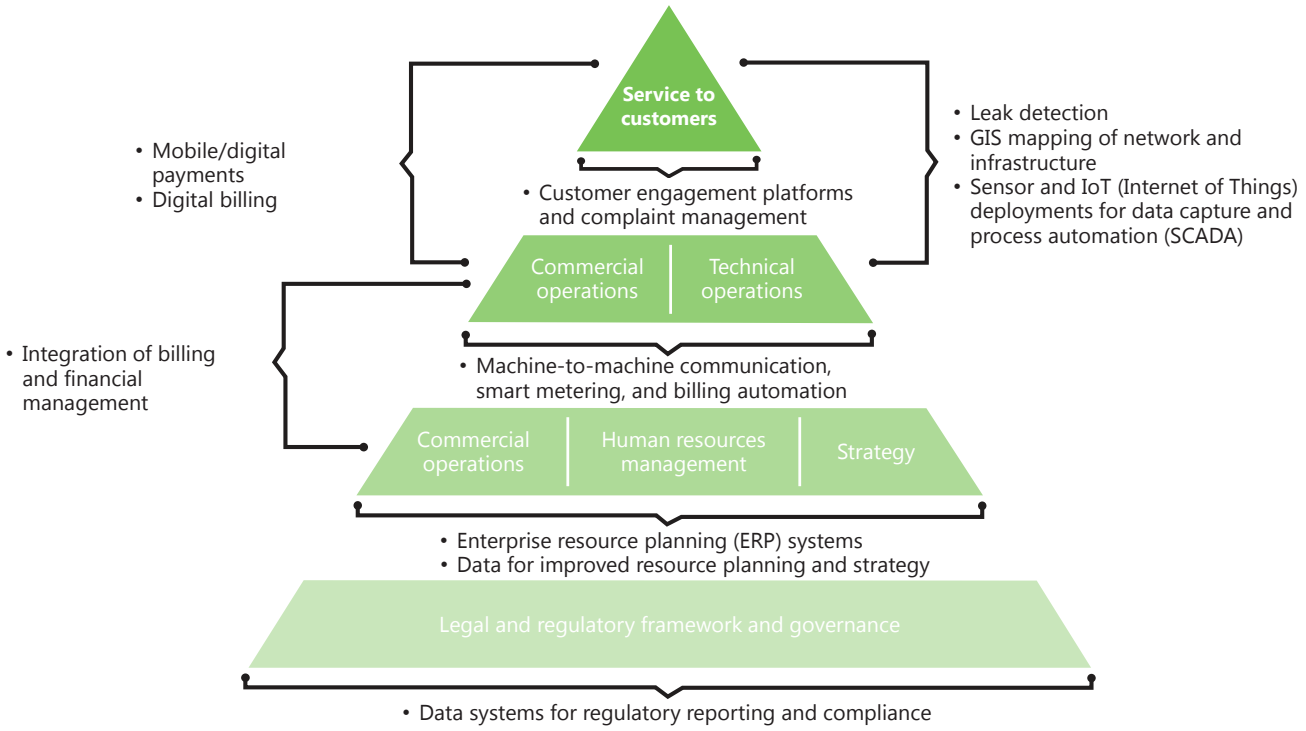
2.4.2 Subsector Assessment

Aging assets. Aging water supply infrastructure and water meter failure or inaccuracy are causing increased NRW, resulting in revenue loss and increased operational costs. According to WSSE-LPB's 2020 Annual Report,[41] the proportion of electrical-mechanical facilities beyond service life is 42.6%, while the proportion of pipelines beyond service life is 23.5%. Upgrading the distribution pipeline network and adopting smart water solutions to enhance water supply can reduce high pipeline leakage rates (Figure 6).

---

[35] NRW is the difference between the amount of water pumped into the distribution system and the amount of water billed to consumers.
[36] Nam Papa Water Supply Enterprise Luang Prabang Province. 2020. *Annual Report of the State Water Corporation of Luang Prabang Province.* Luang Prabang.
[37] Japan International Cooperation Agency (JICA). 2019. *Lao People's Democratic Republic Preparatory Survey on The Project for Expansion of The Water Supply System In Luang Prabang City.* Final report. Tokyo.
[38] DWS' responsibilities include planning, programming, mobilizing finance, developing technical guidelines for design, construction, operation, and maintenance, and aiding the provincial water utilities.
[39] World Bank. 2010. *Lao People's Democratic Republic Water Supply and Sanitation Sector Review.* Washington, DC.
[40] WSSE-LPB. 2020. *Corporate Plan 2020-2025.* Luang Prabang.
[41] WSSE-LPB. 2020. *Annual Report of the State Water Corporation of Luang Prabang Province.* Luang Prabang.

Figure 6: Smart Water Supply Solutions



Source: World Bank. 2021. *The Utility of Future Diagnostic Assessment and Action Planning Methodology - Working Paper*. Washington, DC.

Water quality. Treated water turbidity exceeded the permissible turbidity level of 5 nephelometric turbidity units (NTU) eight times over 5 years (2013 to 2017). This is likely due to seasonal variability in raw water intake turbidity from river sources close to the WTPs and the insufficient capacity of the sedimentation basins. The WTP intake of raw water can range from 10 to 180 NTU in the dry season and rises to 3,000 NTU in the wet season (May to October).[42] Increased turbidity leads to public complaints about treated water quality.

Water pollution. Illegal discharge of wastewater and pesticides into surface water systems negatively impact the quality of raw water intake to WTPs.[43] The poorer the quality of raw water intake, the higher the WTP's operational cost. Collaboration is required across multiple government departments, including the Luang Prabang Provincial Health Department, MPWT, Urban Services Office (USO), Agriculture and Forestry Office, Department of Natural Resources and Environment, and WSSE-LPB, to regulate wastewater and pesticide discharge into surface water bodies. Infrastructure is needed to treat effluent from septic tanks and remove pesticides from agricultural runoff before being discharged into surface water bodies.

[42] NewTap. 2017. *Namkhan Water Treatment Plant Luang Prabang City.* 3 January. Luang Prabang. NewTap_038.pdf (jwrc-net.or.jp).
[43] WSSE-LPB. 2022. Verbal communication.

2.5 SANITATION

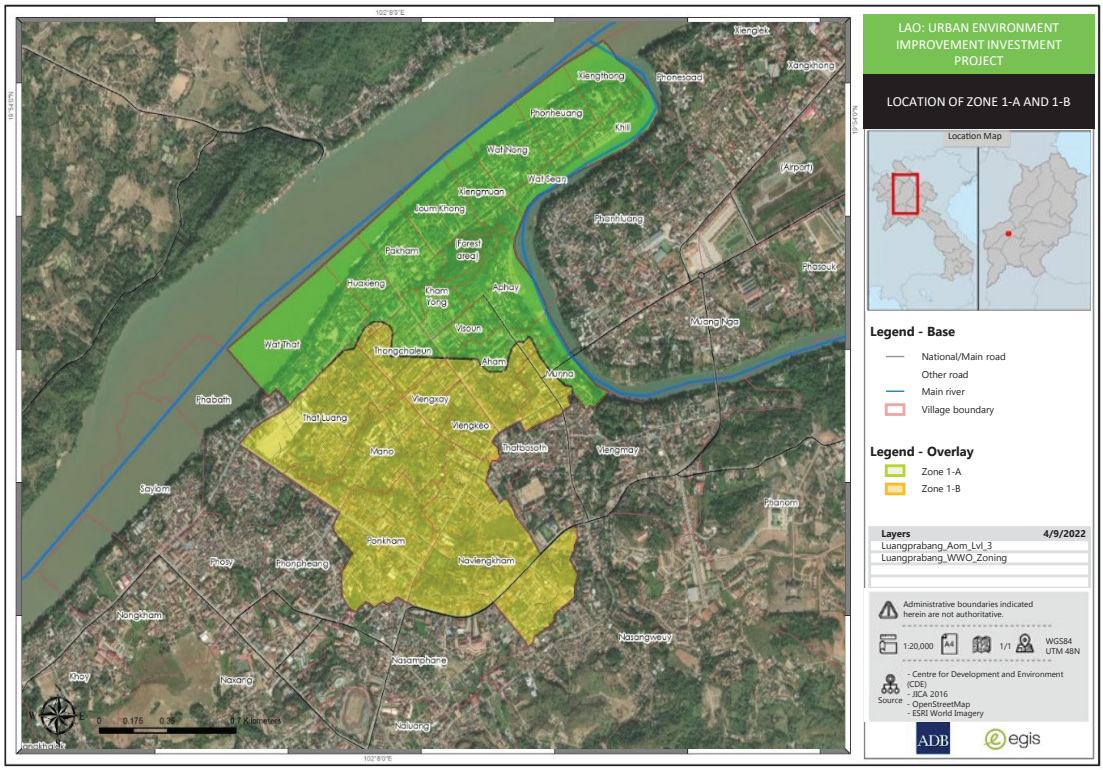
2.5.1 Status

Together with safe drinking water access, sanitation is a fundamental right impacting public health under SDG 6. Sanitation, in the Luang Prabang context, is providing sufficient and safe excreta treatment facilities while ensuring people can access handwashing facilities with soap and water to reduce disease spread. Luang Prabang stakeholders have also identified improper wastewater discharge into existing ponds and rivers as a concern.

Sanitation coverage in the World Heritage Site is almost 100%. However, the sanitation system is rudimentary, consisting of soakaway pit latrines and septic tanks without a sewerage system to separate wastewater and stormwater.[44] Almost 70% of the properties in Zone I-A, as defined in the PSMV, use pit latrines, with the remaining 30% using septic tanks. In Zone I-B, 80% use septic tanks and the remaining 20% use pit latrines (Figure 7). Enhanced wastewater treatment systems, such as large septic tanks or anaerobic baffled reactors, have been installed in some large and new resorts. However, such systems make up a minor proportion of the total sanitation infrastructure.

More than 90% of fecal sludge is not safely managed as sludge is not regularly emptied from septic tanks. As a result, contaminated effluent discharges directly into natural ponds or the Nam Khan or Mekong River. The USO empties 7% of septic tanks each year, with the collection frequency determined by property owners. The collected sludge is disposed of at the city landfill without further treatment.

Figure 7: World Heritage Site Sanitation Sub-Zones Delineation



Source: Asian Development Bank. Technical Assistance 9554 Southeast Asia Urban Services Facility. Manila.

---

[44] Cities Development Institute for Asia (CDIA). 2020. *Lao Livable Cities Project Preparation Study: Suppl. Appendices Vol 2.* Manila.

2.5.2 Subsector Assessment

Policy and regulatory environment. Lao PDR lacks a clear sanitation policy and regulatory guidance. While the Law on Water Supply provides an overall basis for sanitation service provision, it lacks sanitation service performance standards and guidelines. This is problematic as most septic tanks in Luang Prabang were designed and built to meet housing and small business needs and are unable to serve active commercial businesses. Without upgrades and modifications, contaminated discharge will continue.

Sanitation oversight. Sanitation oversight responsibilities vary from province to province. In Luang Prabang, the USO is the key entity. Even so, its role is mainly a desludging service provider. Although WSSE-LPB personnel possess transferable skills and knowledge, they are not involved in sanitation infrastructure, nor is data systematically collected on septic tank conditions across the city. The Department of Health is also concerned with sanitation. All agencies involved require training and capacity development to better plan, manage, operate, and maintain sanitation infrastructure. Tariff reforms to sustainably finance sanitation services are also needed.

2.6 SOLID WASTE MANAGEMENT

2.6.1 Status

All urban households and organizations produce solid waste, which must be regularly collected, recycled, or disposed of properly to maintain sanitary and healthy living conditions. Uncollected and improperly handled waste and litter are unsightly and contribute to flooding, and air, water, and soil pollution. Scheduled household solid waste collection in Luang Prabang is currently provided on a fee-for-service basis by USO and one private company in only 83 of the city's 114 villages.

Luang Prabang generates approximately 43,400 tons of solid waste per year (tpy) or about 118.9 tons per day (tpd). However, only about 68%—approximately 29,900 tpy or 82 tpd—is collected for disposal through the proper waste management process.[45] More than 50% of total waste generated comprises dry waste (e.g., leaf cuttings) and wet organic waste (e.g., food scraps). Recyclable wastes, such as glass, paper and cardboard, and plastics make up 32% of total waste generated. Collected waste is dumped at the 17.4-hectare Kilometer-8 landfill, haphazardly, uncovered, and not compacted. Leachate treatment is insufficient, and materials recovery limited.

2.6.2 Subsector Assessment

Solid waste collection and management. Luang Prabang's increasing resident and tourist population will put further pressure on solid waste collection and management services and infrastructure. The 2040 resident population projections would result in a 250% waste generation increase. If only 70% of this waste is collected, 90.3 tpd will be either left as litter or dumped illegally, exacerbating local flooding, and water and land pollution issues. Tourist seasonality would also mean that waste disposal levels will vary across different times of the year. More quality and affordable solid waste collection services, a modern landfill, and reduce, reuse, and recycle programs are needed to improve the solid waste management system.

---

[45] USO. 2021. 2021 Data. Luang Prabang (accessed 20 July 2022).

Urban Services Office finance. The Luang Prabang USO is responsible for solid waste management, including collection and disposal, landfill management, tree trimming and public parks upkeep, and collection fleet maintenance. However, it requires more qualified staff and financial resources to fulfill its mandate. In 2019, the USO collected an average of KN179,036,056 ($15,039) monthly, which was insufficient to cover its operation and maintenance (O&M) expenditures. Moreover, a private service provider was in 2022 awarded a concession to collect solid waste collection fees resulting in lower USO income.[46] Luang Prabang needs to increase the amount of resources available to the USO. Solutions include mandating solid waste collection services, which would also reduce illegal waste dumping, improving revenue collection methods, and generating additional income streams from recovering recyclables and selling composted organic waste.

2.7 CLIMATE CHANGE AND DISASTERS

2.7.1 Status

Climate change refers to long-term temperature and weather pattern shifts, such as rising sea levels or more intense rainfall.[47] Since the 1800s, the burning of fossil fuels through human activities has been the main driver of climate change. Climate change-induced disasters impact a city's ability to function normally and require alternative responses, such as emergency services deployment. Such situational preparation should be integrated into a city's development plans.[48] How this is done depends on the city context and the climate risks, such as flooding, cyclones, and droughts.

Luang Prabang's location and tropical climate pose climate risks, with the most prevalent being severe rainfall and floods.[49] Embankment erosion occurs along the Mekong River and Nam Khan River, causing significant property damage. Of the two rivers, the Nam Khan is more prone to erosion, at approximately 1 meter per year, due to its steeper and less vegetated slope.[50] Annual average Nam Khan erosion damage amounts to $532,000. In response, the DPWT is constructing erosion protection measures along both riverbanks.[51] Other disaster risks include windstorms, which bring down powerlines and overhead utilities, and extreme temperatures, with average maximum temperatures recently rising to 35˚C.

Alongside the challenges of combating disaster and climate impacts, it is recognized that women operate most micro and small enterprises in Luang Prabang and require socioeconomic resilience-building support. This requires a focus, not only on how climate and disaster-related laws, policies, and programs can be more gender responsive, but also on improving gender equality in key socioeconomic areas that impact women's resilience.[52]

Agencies involved in disaster risk management (DRM) include the Department of Disaster Management and Climate Change under the Ministry of Natural Resources and Environment. The National Disaster Prevention and Control Committee serves as the DRM interagency committee at the national and local level. A Provincial Disaster Prevention and Control Committee, District Disaster Prevention and Control committees, and Village Disaster Prevention and Control committees handle DRM and emergency management at the provincial, district, and village levels. Further, a Climate Risk and Early Warning Systems Initiative launched in 2021 seeks to address gaps in the existing meteorological and hydrological early warning systems.

---

46 USO. 2022. USO Data. Luang Prabang (accessed 20 July 2022).
47 United Nations. 2023. What is Climate Change. New York City. https://www.un.org/en/climatechange/what-is-climate-change.
48 United Nations Framework Convention on Climate Change (UNFCCC). 2021. Introduction. Bonn. https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction.
49 United Nations Office for Disaster Risk Reduction (UNDRR). 2019. *Disaster Risk Reduction in Lao PDR: Status Report 2019.* Geneva.
50 World Bank. 2021. *Preliminary Study and Design, Southeast Asia Disaster Risk Management Project (DRMP).* Washington, DC.
51 MPWT. 2022. Mekong and Nam Khan Disaster Management Project in Luang Prabang Capital, Luang Prabang Province (Subproject). Luang Prabang.
52 ADB. 2022. *Women's Resilience in the Lao People's Democratic Republic: How Laws and Policies Promote Gender Equality in Climate Change and Disaster Risks Management.* Manila. https://www.adb.org/publications/women-resilience-lao-pdr.

2.7.2 Subsector Assessment

Lack of coordination in disaster management. To manage risks in an uncertain context, effective climate action and DRM proactively integrate different expertise to address climate change, natural hazards, biological hazards, and technological hazards. Currently, these disciplines are not well coordinated in Luang Prabang. The National Disaster Prevention and Control Committee focuses on emergency response post-disaster, with disaster prevention initiatives opportunistically implemented when funds are available. This often leads to siloed approaches to risk management.[53]

Serious budget deficits exist in sustaining disaster risk reduction efforts. The Department of Meteorology and Hydrology has identified underfunding as an issue, as it lacks the resources to maintain observation stations, procure technology, and train personnel. More public resources and partnerships with private organizations or financial institutions are needed to raise funds dedicated for disaster risk reduction (DRR) and capacity building.

Weak gender equality, disability, and social inclusion mainstreaming. The Law on Gender Equality 2019 incorporates important equality principles and provides for overcoming cultural beliefs that inhibit women's advancement. Importantly, the law mandates gender mainstreaming in laws and policies across all areas of work. The law is accompanied by an ambitious policy for implementation—the National Action Plan on Gender Equality 2021–2025. It includes a range of gender positive targets, such as introducing quotas for women and girls over a broad spectrum of activities, including for leadership roles in climate change and DRR. With more detailed action plans for each set of targets and new complaints procedures, the law and action plan can underpin effective integration of gender considerations. This can lead to an increase in the participation of women in decision-making on issues relating to climate and disaster resilience. In developing DRM-related smart projects and policies, clear targets and commitments to gender equality across a range of environmental and socioeconomic issue areas should be introduced.

Ad hoc disaster risk governance. The DRR mandate has been transferred back and forth between the National Disaster Management Office and the Department of Disaster Management and Climate Change. Clearer disaster management governance, together with clarity on agency roles and responsibility and standard procedures for disaster response are required in Luang Prabang.

2.8 TRANSPORT

2.8.1 Status

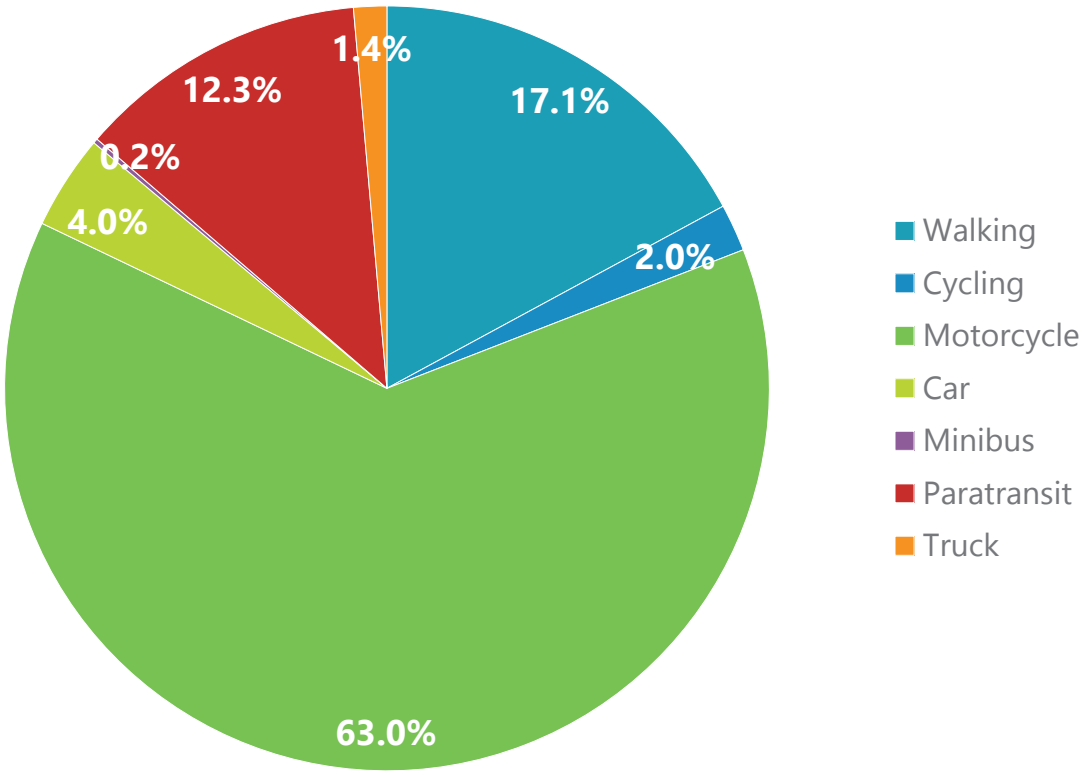
Transport is the backbone of a city, providing structure to the city's physical form and a safe and efficient means to move people and goods.[54] It contributes about a quarter of global energy-related greenhouse gas emissions, making green transport a solution to manage the global climate crisis.[55] Understanding Luang Prabang's transport system—its network, infrastructure, and mobility services—is therefore crucial to climate proofing the city.

The types of transport predominantly used in Luang Prabang comprise private vehicles or walking. Motorcycles make up 63% of resident trips, with walking taking up 17%, and *tuk-tuks* (three-wheel motorized vehicles) or similar private services making up 12% (Figure 8).[56]

---

[53] UNDRR. 2020. *Integrating Disaster Risk Reduction and Climate Change Adaptation in the UN Sustainable Development Cooperation Framework.* Geneva.
[54] UN-Habitat. 2012. *Urban Patterns for a Green Economy: Leveraging Density.* Nairobi.
[55] United Nations Department of Economic and Social Affairs. 2023. Sustainable Transport. New York. https://sdgs.un.org/topics/sustainable-transport.
[56] JICA. 2012. *Basic Data Collection Study on Low-Emission Public Transport System in Lao PDR.* Consultant's final report. Tokyo.

Figure 8: Luang Prabang's Main Transport Types



Source: Japan International Cooperation Agency. 2012. *Basic Data Collection Study on Low-Emission Public Transport System in Lao PDR*. Tokyo.

Many tourists use minivans, especially between the airport or HSR station and the World Heritage Site. Buses and minivans make up the main modes of domestic intercity travel. Over 690,000 international tourists entered the city via Luang Prabang International Airport annually between 2017 to 2019. In 2022, 86% of all visitors arrived by train.[57]

Within the World Heritage Site, most road carriageways are between 4 meters to 7 meters and paved, with sidewalks and streetlights. Beyond the World Heritage Site, only 15% of 130 kilometers of inspected roads are paved and well maintained, while 77% have no sidewalks. Luang Prabang's road network is unsignalized, relying on roundabouts to funnel traffic at major intersections. Only six intersections have demarcated pedestrian crossings, all within the World Heritage Site, which makes it unsafe for pedestrians and cyclists. There is also a lack of parking facilities within the World Heritage Site.

Average commute time is 10 minutes under normal traffic conditions. This increases by 50% to 15 minutes during peak periods, especially within the World Heritage Site, due to the many hotels and tourist attractions within this area. Continued private vehicle dependence and poor infrastructure and transport services are key challenges.

Three agencies lead transport planning and management in Luang Prabang: the MPWT, the DPWT, and the USO. The MPWT is responsible for planning and constructing national roads, while the DPWT is responsible for maintaining the roads outside the city center. For local roads, the DPWT is responsible for planning, constructing, and funding, while the USO is responsible for road cleaning.

[57] DICT. 2020. Statistics. Luang Prabang. https://tourismluangprabang.gov.la/statistic.

2.8.2 Subsector Assessment

Transport planning. There is no clear strategic infrastructure plan[58] to guide improvements to transport services and infrastructure, even as travel demand grows. The closest strategy available is the National Socio-Economic Development Plan (2021–2025), which recommends 51 new national transport infrastructure projects.[59] At the local level, the DPWT has opportunistically identified a few key road corridors for future implementation, such as a new road through Ban Done Keo to link up to the airport. Luang Prabang's recent green mobility vision emphasizes an accessible, comfortable, inclusive, and resilient green mobility system, which now needs to be translated into an urban mobility plan with clear priorities.[60] This is to be accompanied by more readily available and updated traffic data, such as traffic volumes, with gender and socioeconomic disaggregated travel patterns.

Demand trends. As tourism recovers from COVID-19 and new megaprojects—especially intercity infrastructure—are operational, changing tourist travel trends will likely stress local transport services and infrastructure. Regional tourists may drive more to Luang Prabang once the new Lao–PRC Expressway is completed. Currently, visitors' personal vehicles already make up 8% of all transport modes in/out of Luang Prabang Province, of which a sizable majority comes from Yunnan, PRC. The HSR will increasingly be the main entry point for many international tourists into Luang Prabang. Increased transport service demand between the HSR station and the World Heritage Site will also cause congestion, as will regional tourists' shorter stays which create demand for motorized fast travel between accommodations and attractions. This could reinforce dependence on minivans, which has increased 5.5 times to 894 registered minivans in 2022 from only 158 in 2013.[61]

Use of private motorized vehicles. Residents' further dependence on private motorized vehicles could worsen traffic problems. Approximately 80% of residents commute to work using a motorized vehicle—be it a motorcycle, car, minibus, or *tuk-tuk* (footnote 59). With increased residential population, Luang Prabang's poor road infrastructure quality, and the city's dependence on private motorized vehicles will only worsen local traffic congestion, road safety, and poor air quality. Continued urban sprawl will further entrench people's reliance on private motorized vehicles as the need to travel longer distances becomes more pronounced.

Traffic accidents. In 2019, the traffic police reported 487 vehicle accidents, of which 155 were classified as severe injuries and 100 as fatalities. While this is partly attributed to unpaved roads and the absence of formal traffic control systems, driver education and regulatory awareness need improvement.

---

[58] A strategic infrastructure plan identifies and prioritizes capital projects, such as the construction or improvement of roads, bridges, and other infrastructure.
[59] Lao PDR. 2021. *9th Five-Year National Socio-Economic Development Plan (2021–2025).* Vientiane.
[60] World Bank. 2022. *Lao PDR – Fostering Green Mobility in Luang Prabang. Washington*, DC.
[61] DPWT. 2022. Verbal communication.

2.9 INFORMATION AND COMMUNICATION TECHNOLOGY

2.9.1 Status

ICT is the city's data and communication backbone, which is integral to daily living, business, and education. ICT affects how people communicate and supporting city functions, such as urban services delivery, and government and business operations.[62] In smart cities, devices such as mobile phones, laptops, or sensors, connect through the ICT network to backend repositories, where data is stored, analyzed, and used to improve work processes and better deliver urban services.[63]

Currently, the Luang Prabang ICT system comprises fixed phone line, 4G/LTE mobile cellular, and internet access services, with supporting infrastructure including fiber optic cable network, telecommunication towers, etc. At least 79% of all households have access to download speeds of 30 megabytes per second (mbps), the national average download speed,[64] while there are more than 50 mobile cellular subscriptions per 100 residents.[65] However, the provincial broadband speed of 30 mbps is lower than that of the Vientiane Capital, where it can exceed 100 mbps. Overall, Luang Prabang Province's ICT infrastructure quality lags the national average at 1.1 out of 5, compared to the country score of 1.8 on its Digital Maturity Assessment.[66]

ICT services are provided by three main state and/or privately-owned telecommunication providers: Unitel at 46.7% market share, Lao Telecommunication Company (Laotel/LTC) at 40.5%, and Enterprise Telecommunication Lao Public Company at 11.2% (footnote 64). Using Unitel's data as an example, 4G/LTE coverage is available in Luang Prabang core city. This declines to 3G at the city's fringe and some remote parts of the city are without services. Cost-wise, the lowest entry-level monthly mobile data package is priced above the ITU-UNESCO 2% of income per capita affordability threshold (footnote 64). Fixed broadband prices cost an average of $53.40 per month in 2020, almost $20 higher than that of neighboring Cambodia and $30 higher than that of Thailand.[67]

The Global Initiative for Inclusive ICTs' "Digital Accessibility Rights Evaluation (DARE)" Index was last published in 2020. The DARE Index is a benchmarking tool for disability advocates, governments, civil society, international organizations, and policymakers to trace country progress in making ICT accessible for all, in compliance with Article 9 of the Convention on the Rights of Persons with Disabilities. The DARE Index measures three categories of variables in each country: country commitments (legal, regulatory, policies and programs); country capacity to implement (organization, processes, resources); and actual digital accessibility outcomes for PWDs in 10 areas of products and services. The Lao PDR scored 18.5 out of 100 on the DARE Index and has a global ranking of 116 out of 137 countries assessed.[68]

---

62 United Nations Task Team on Habitat III. 2015. *Habitat III Issue Papers, 21 – Smart Cities.* New York.
63 GlobalLogic. 2019. *The Role of Telecommunications in Smart Cities.* Noida. https://www.globallogic.com/il/wp-content/uploads/2019/12/The-role-of-telecommunications-in-smart-cities.pdf.
64 World Bank. 2022. *Positioning the Lao PDR for a Digital Future: Priority Measures to Accelerate Digital Economy Development.* Washington, DC.
65 UNDP. 2022. *Digital Maturity Assessment – Lao PDR, Vientiane.* New York City.
66 Nperf. 2022. Unitel Mobile Cellular Data Network in Luang Prabang. https://www.nperf.com/en/map/LA/1655559.Luang-Prabang/208651.Unitel-Mobile/signal/?ll=19.80611605972942&lg=102.182464599609 39&zoom=11.
67 Center for Strategic and International Studies (CSIS). 2022. *Digitalizing Laos: Improving Government Transparency, the Business Environment, and Human Capital.* Washington, DC.
68 The Global Initiative for Inclusive ICTs. 2020. Lao PDR. https://g3ict.org/country-profile/lao-peoples-democratic-republic.

Only approximately 5% of ministries and provinces provide annual capacity building and training programs to enhance the digital and ICT skills of marginalized and vulnerable groups. In addition, limited steps have been taken to encourage marginalized and vulnerable groups to increase their participation in such programs. Civil society organizations, such as the Lao Disabled People's Association and Proud to Be Us Lao PDR (a group that advocates for LGBTIQA+ people), emphasize more needs to be done to understand the social, cultural, and technological challenges and barriers faced by marginalized and vulnerable groups. Further, there are no mechanisms or frameworks in place to measure satisfaction regarding e-government services among these groups, and no input or feedback is collected from them regarding e-services.

COVID-19 amplified existing GEDSI digital deficits, which are highly evident in the post-COVID-19 context. Digital literacy rates were already low pre-COVID-19, especially among girls. According to the 2017 Lao Social Indicator Survey, the most recent major household survey, only 11% of young men and 9% of young women (aged 15–24) engaged in at least one ICT activity in the last 3 months. And while the explosion of the internet and the emergence of low-cost "smart" computing devices has revolutionized teaching and learning around the world—particularly post-COVID-19, this IT revolution is yet to take root in Lao schools. In fact, there are hardly any computers or smart devices in primary or secondary schools and even less so in rural areas. No digital literacy classes are offered. There are signs of change emerging. As a response to the pandemic, lockdowns, and prolonged school closures, the first ever national digital teaching and learning platform, "Khang Panya Lao," was established. Khang Panya Lao houses all national curriculum content and a large suite of national and international learning resources available in the Lao language.[69] Further, the post-COVID-19 situation for women is equally concerning—less than one-third of women have bank accounts with a financial institution, limiting access to digital payment systems and services. Only 2.2% of women-led businesses use ICT to sell their products compared to 3.3% of men-led businesses.[70] Improved digital services have potential to expand women's access to business and finance.

2.9.2 Subsector Assessment

Information and communication technology strategic infrastructure plan. While there is strategic leadership nationally to drive Lao PDR's digital transformation, ICT infrastructure rollout in Luang Prabang is ad hoc and driven by telecommunication providers. The Ministry of Technology and Communications (MTC) was created in October 2021 from the merger of the Ministry of Science and Technology and Ministry of Posts and Telecommunications to provide oversight on Lao PDR digital transformation initiatives. National policies such as the National Digital Economy Plan (2021–2025) and National ICT Policy (2015–2025) were also introduced to drive digital adoption, innovation, and transformation, and ICT infrastructure expansion across the country. However, DTC, the provincial arm of the MTC, does not have a Luang Prabang ICT strategic infrastructure plan to guide the type of ICT infrastructure to be implemented. Instead, telecommunication firms are responsible for new cable laying, requiring only DTC's approval prior to works.

---

[69] UNICEF. 2023. In Lao PDR, a digital transformation of education has begun. www.unicef.org.

[70] M. Khan, I. Marciulionyte, and S. Tanaka. 2023. Joint Op-Ed: United in Our Efforts to Accelerate Towards Gender Equality! *Delegation of the European Union to the Lao PDR*. 7 March. https://www.eeas.europa.eu/delegations/lao-pdr/joint-op-ed-united-our-efforts-accelerate-towards-gender-equality_en.

DTC does not collect data on where such cables have been laid, making it difficult to ascertain locational gaps in fiber optic cable network or telecommunication cell towers. An inventory of existing ICT infrastructure and its attributes, and an ICT infrastructure implementation strategic infrastructure plan are needed to provide a foundation to facilitate subsequent smart city project implementation, ensuring that all persons can access digital services equitably.

Capacity development. Currently, only 60% of ministry and provincial staff have basic ICT and digital skills, including using software for presentations and finding, managing, and storing digital information. The lack of relevant ICT expertise hinders ministries and departments in using smart systems to deliver public services and infrastructure. This limits Luang Prabang's ability to roll out smart city projects. Improving ICT capacity through professional development opportunities and digital skills certifications is critical to strengthen digital capabilities and drive public urban service digitalization.

Affordability. High prices disproportionately affect marginalized and vulnerable groups, such as women and youths, who cannot afford to pay for the high cost of internet and are less able to access e-services, education, and employment opportunities. Addressing ICT service affordability requires regulatory reform to facilitate infrastructure sharing between telecommunication providers. These include encouraging passive infrastructure players to plan and develop network corridors and facilities jointly through "dig-once" policies[71] and mandating utility sharing between providers. Moreover, an underlying obstacle to digitalization is the education sector and its digital skills disconnect. More needs to be done at the tertiary level to equip youth with the knowledge and skills needed to become the managers and digital developers of the near future.[72] E-business, e-banking, and e-learning have great potential for expanding GEDSI groups' access to finance, business, and education, but technology must be combined with effective financial, digital, and entrepreneurship literacy and accessibility considerations. GEDSI mainstreaming capacity building within government departments is also critical to facilitating and operationalizing existing and emerging GEDSI provisions in legal and policy frameworks.

2.10 CITY ASSESSMENT

2.10.1 Lessons and Good Practices

PSMV is an exemplary plan supported by good governance and enforcement. Since the PSMV's introduction in 2003, Luang Prabang has managed the World Heritage Site's development activity rigorously, requiring building owners to seek approval for land use changes, building alterations, and new structures. This is possible due to legislative backing from the Law on National Heritage[73] and the Luang Prabang World Heritage Management Division's enforcement efforts, together with UNESCO oversight and other partnership efforts to safeguard Luang Prabang's heritage. An effective smart city strategy requires a similar strong governance framework to manage urban development, including a clear institutional setup to lead and drive project implementation.

---

[71] "Dig-once" policies seek to coordinate the delivery of infrastructure projects such that they are carried out simultaneously instead of individually to minimize disruption and inconvenience to citizens. This can be achieved by integrating the space requirements for all infrastructure upfront (e.g., installing an empty conduit at construction stage) (The World Bank and World Economic Forum).

[72] Runde, D. F., et al. *Digitalizing Laos: Improving Government Transparency, the Business Environment, and Human Capital.* Center for Strategic and International Studies. https://www.csis.org/analysis/digitalizing-laos-improving-government-transparency-business-environment-and-human-capital.

[73] Law on National Heritage. 2005. Amended in 2014 and 2021. Vientiane.

Water Supply State Enterprise of Luang Prabang digitization. The Water Supply State Enterprise of Luang Prabang (WSSE-LPB) can effectively manage Luang Prabang's water supply by ensuring financial sustainability for its operations.[74] Because of this, WSSE-LPB is arguably one of the more digitally advanced Luang Prabang institutions, having invested in building its digital capability, such as enabling water bill mobile payments and incorporating geospatial analytics into work processes.

2.10.2 Multisector Assessment

2.10.2.1 Summary of Strengths, Weaknesses, Opportunities, and Threats

Luang Prabang's rapid development has brought urban challenges, such as traffic congestion, crowding, littering, improper wastewater discharge, and heritage loss, impacting the city's overall livability and functionality. If not managed well, continued population increase and visitor and urban growth will exacerbate these problems. A summarized strengths, weaknesses, opportunities, and threats analysis is presented below.

Strengths. Luang Prabang is world-renowned as a UNESCO World Heritage Site. Its positioning as a unique heritage destination has allowed tourism to contribute significantly to its socioeconomic development. Basic infrastructure, services, and supporting facilities are in place to support tourism and everyday living. The city is also well-connected to neighboring countries by air and train. These are supported by governance structures and supporting plans that guide urban and heritage development.

Weaknesses. Although the city has grown tremendously over the past decades, infrastructure investment, maintenance, and urban service delivery have not kept up with demand. The piped water supply network and water treatment plants, roads, and sanitation facilities are aging and require better maintenance. Meanwhile, the World Heritage Site struggles with crowding and traffic congestion. Projected population and tourism sector growth will further stress infrastructure and urban services, especially as the city expands outward, impacting forested and mountainous land and requiring new infrastructure investments and expanded urban services. Uncoordinated decision-making, outdated plans that do not incorporate intangible heritage, and a lack of resources and capacity pose further challenges to the sustainable growth of Luang Prabang.

Opportunities. Megaprojects provide opportunities to diversify and grow Luang Prabang's economy, which currently depends heavily on tourism. The Lao–China HSR has boosted commuter and freight connectivity within Lao PDR and with neighboring countries, which enables Luang Prabang to offer new industrial and logistics opportunities. There are opportunities to develop new tourism offerings, with an emphasis on sustainable tourism supported by sustainable and smart infrastructure. Further, there are opportunities to digitalize education and training and bridge the digital divide using locally developed online platforms. Different development partners are supporting Luang Prabang with new urban infrastructure projects, including support for smart and digital solutions, accompanied by technical and digital capacity building.

---

[74] WSSE-LPB. 2020. *Corporate Plan 2020–2025.* Luang Prabang.

Threats. It is unclear how travel trends will change post-COVID-19. More regional visitors favoring shorter stays and driving could increase minivan demand and worsen traffic problems. SEZ planning and implementation is uncoordinated, and it is unclear how SEZs are integrated with Luang Prabang's urban development trajectory, including infrastructure and urban service planning. COVID-19, windstorms, and floods have impacted the city, having a disproportional impact on women, older persons, PWDs, and other marginalized and vulnerable groups. The cumulative impacts of recent Mekong River and Nam Khan River hydropower developments on the city are unclear. With climate change potentially exacerbating the intensity and frequency of hydrometeorological hazard events (e.g., floods, droughts, hurricanes), adapting the city for climate resilience is critically important.

2.10.2.2 Systemic Constraints

Luang Prabang's urban challenges are rooted in certain systemic constraints, which if not addressed, will continue to impact urban infrastructure and service delivery. Many of these systemic issues are also highlighted in the earlier subsector assessments and acknowledged by agencies during engagement sessions.

Lack of funds. The most common constraint raised by agencies is the lack of reliable domestic funding to plan, operate, maintain, and implement urban infrastructure and services. Under the current budgetary management system, with few exceptions, funds collected—for instance, attraction entry fees—need to be routed back to the provincial budget, before being reallocated to agencies for daily operations. New financing approaches are needed, including reforms to streamline the use of collected fees for reinvestment and public–private collaboration.

Lack of planning and enforcement. In several subsectors, there is no clear strategy, policy, and/or regulation to define technical standards, and guide infrastructure and urban service rollout. Where there are existing plans and regulations, such as the 2012 Urban Planning Regulations for Luang Prabang or local parking rules, enforcement is weak due to a lack of capacity and resourcing. Plans such as the PSMV and 2012 Urban Planning Regulations for Luang Prabang are becoming increasingly outdated, making it impractical to address the city's new and emerging challenges.

Fragmented decision-making and lack of coordination. Decision-making processes require improved interagency coordination. The lack of information systems and resource sharing between agencies hinders collaborative planning and implementation. For the urban strategy to be effective, a clear implementation governance structure is needed with an overarching decision-maker to provide strategic direction, champion implementation, and manage trade-offs.

Capacity constraints. Public managers require more advanced skills and knowledge to roll out new smart city initiatives and use digital tools and systems. Hence, improving the government's digital capabilities is critical.

Need for closer private sector collaboration. While urban infrastructure remains firmly within the government's domain, urban services are also delivered by the private sector. Closer collaboration between the public and private sectors is one solution to strengthen financial and resource sustainability, while opening new job opportunities.

Inadequate GEDSI mainstreaming. The implementation of GEDSI-related laws and policies needs mainstreaming. Similarly, substantive mechanisms for addressing inclusion of marginalized and vulnerable groups are not present across legal and policy frameworks. To progress on GEDSI, improvements and expansion are needed in data collection and reporting, and knowledge services to support more effective policymaking. Ministries and government departments also need more inclusive consultation and communication strategies to better use feedback.

3 A LIVABLE HERITAGE CITY: LUANG PRABANG SMART AND INTEGRATED URBAN STRATEGY

3.1 OVERVIEW

Luang Prabang's ambition is to be a livable heritage city for all, encapsulating the city's key attributes: its heritage, urban fabric, and its people. Overarching objectives to promote sustainability, inclusivity, and resilience support the city's ambition. Guiding its recovery from COVID-19, Luang Prabang's ambition draws on findings from stakeholder engagements and existing strategic documents, such as Vision 2030 and Luang Prabang Provincial Socio-Economic Development Plan VIII (2021–2025), Master Planning Study for Smart City Development in Luang Prabang City, Lao PDR, and the ASEAN Smart Cities Network Smart City Action Plan.[75]

Three strategic pillars, which have specific strategies and smart city projects, support the realization of Luang Prabang's livable heritage city ambition:

(i) **Integrated tourism and heritage destination.** Recognizing the intertwined nature of both sectors, this pillar seeks to adopt a smart and coordinated approach toward tourism and heritage management to properly safeguard Luang Prabang's cherished built and natural heritage and vibrant local communities, while facilitating sustainable tourism growth.

(ii) **Clean and safe environment.** Aspiring to be a clean and safe city free of litter and with well-managed public spaces, this pillar seeks to improve solid waste and wastewater management and promote smart climate and disaster risk solutions appropriate for the local context.

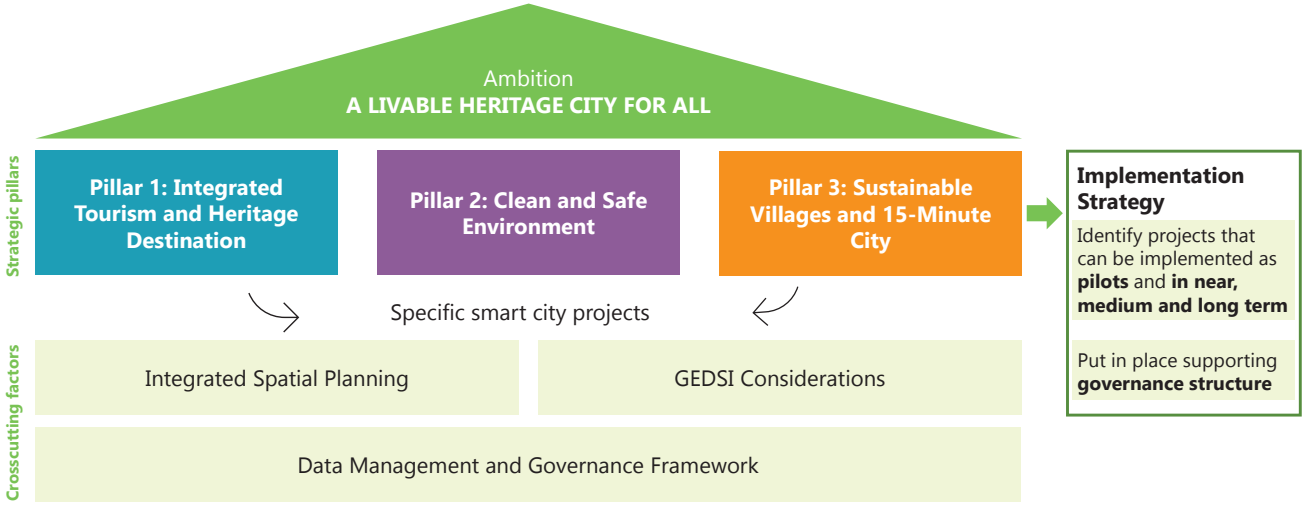
(iii) **Sustainable villages and 15-minute city.** Smart urban development and transport will support projected population and tourist growth, ensuring that new development areas consider sustainable design principles and cater to the needs of a diverse population.

---

[75] Department of Planning and Investment (DPI). 2019. *Achievement of the Implementation of the Luang Prabang Provincial Socio-economic development plan for 2019, Priorities for 2020 and Preparation of the 9th Provincial SEDP.* Luang Prabang. Ministry of Land, Infrastructure and Transport (Japan). 2022. *Master Planning Study for Smart City Development in Luang Prabang City, Lao PDR – Final Report.* Tokyo; ASEAN. 2020. *Luang Prabang Smart City Action Plan.* https://asean.org/wp-content/uploads/2020/01/ascn/Luang-Prabang.pdf.

The strategies and smart city projects proposed under the three strategic pillars are supported by three crosscutting factors: (i) integrated spatial planning, (ii) GEDSI considerations, and (iii) a data management and governance framework (inputs and validation) for urban planning and management (Figure 9).

Figure 9: Overview of Integrated Strategy



GEDSI = gender equality, disability, and social inclusion.
Source: Ramboll, 2023.

To provide clear guidance for implementation, this strategy is organized according to a hierarchy of linked (i) strategic objectives, (ii) activities, and (iii) smart city projects, which are grouped under each of the three strategic pillars.

3.2 PILLAR 1: INTEGRATED TOURISM AND HERITAGE DESTINATION

Luang Prabang will be a vibrant, sustainable tourism destination that supports its local communities and its unique intangible, built, and natural cultural heritage, with the following strategic objectives:

- Strategic objective 1.1: Heritage and Tourism Sites are Well Maintained, and Crowds Managed.
- Strategic objective 1.2: Living Communities on the Peninsula are Maintained.
- Strategic objective 1.3: Outstanding Universal Heritage Values are Enhanced.

To achieve these objectives, the city will implement the following activities and projects:

- Activity 1.1.1: Integrate Heritage and Tourism Considerations into Policy and Planning.
- Activity 1.1.2: Actively Monitor and Manage Heritage and Tourism.
- Activity 1.2.1: Disperse Visitors and Commercial Activity Beyond the World Heritage Site.
- Activity 1.2.2: Encourage Local Products.
- Activity 1.3.1: Build Financial Resilience.

3.2.1 Strategic Objective 1.1: Heritage and Tourism Sites are Well Maintained, and Crowds Managed

3.2.1.1 Activity 1.1.1: Integrate Heritage and Tourism Considerations into Policy and Planning

Policies will integrate urban and regional planning mechanisms and be operationalized across governance structures, which may mean specifying new decision-making processes. The specific smart city projects are as follows:

(i) **Comprehensive inventory of outstanding universal values.** The existing heritage inventory will be updated and integrated into a GIS platform and expanded to include all assets that convey the Luang Prabang's OUV. Other assets include landscape, streetscape, ICH, and eventually movable heritage, e.g., artifacts and relics. With support from UNESCO, the existing inventory update and digitization is already underway. Additional resources are needed to inventory and map additional assets and enhancement of the digital inventory system to enable automatic updating, analysis to inform management decisions, and reporting. GEDSI mainstreaming will be achieved through consultations with, and tailored surveys from, women, ethnic minorities, and disadvantaged groups. Specific identification of heritage assets that can be attributed to women, ethnic minorities, and disadvantaged groups will also be included in the inventory. Moreover, heritage inventory teams will include women, ethnic minorities, and other disadvantaged groups.

(ii) **Documentation and safeguarding policies and regulations for all assets expressing outstanding universal value.** The existing documentation of built heritage and wetlands, and zoning regulations for the World Heritage property in the PSMV will be updated. Systematic documentation will be undertaken for additional assets that convey OUV and safeguarding policy, regulations, and reference materials will be prepared for these assets and integrated into the PSMV. An ICH volume is a priority. GEDSI mainstreaming will comprise integrating GEDSI criteria into safeguarding actions and documentation approaches, particularly for ICH.

(iii) **Heritage impact assessment regulations and guidelines.** Heritage impact assessment (HIA) regulations and guidelines will be introduced to mitigate against negative impacts on the World Heritage Site from development inside the property, the buffer zone, or its wider setting. Developments such as riverbank improvements and hydropower projects will be assessed to identify potential adverse impacts on the OUV attributes, authenticity and integrity of the site, and assess how they can be avoided or mitigated. These will be incorporated into the PSMV and integrated into urban and subnational planning mechanisms. This will ensure that any new urban development considers heritage as part of the planning process (Section 3.5). GEDSI mainstreaming will be achieved through integrating GEDSI assessment criteria into HIA guidelines and framework.

(iv) **Heritage disaster risk management policy and plans.** To ensure that the World Heritage Site is resilient against disasters, heritage-focused DRM policy and plans will be introduced, set within the larger DRM and climate adaptation framework described under Pillar 2: Clean and Safe Environment, and incorporated into the PSMV. These will focus on heritage asset protection, such as fire and flood prevention and response for listed heritage buildings, protection of museum collections from natural hazards and theft. Specific smart technologies to detect, report, and trigger rapid responses to fires or floods and to monitor sites to deter crime will be introduced. GEDSI mainstreaming actions will include integrating GEDSI indicators and approaches into DRM measures to ensure that these consider the needs of the vulnerable and marginalized in disasters.

(v) **Tourism management plan.** In 2021, to properly manage the tourism impacts and capitalize on opportunities, the World Heritage Committee requested Luang Prabang to develop a tourism management plan.[76] DICT is preparing a plan for completion in 2023. A spatial component incorporating new tourism sites and routes inside and outside the World Heritage Site and development mechanisms will be included, relevant aspects of which will be incorporated into the urban land use plan. To capitalize on COVID-19 recovery, the plan would need to be applied urgently to prevent tourism overcrowding and its impacts.[77] To mainstream GEDSI, mechanisms specifically supporting women-led tourism businesses and businesses led by ethnic minorities, and PWD groups, such as local handicrafts, microenterprises will be developed.

3.2.1.2 Activity 1.1.2: Actively Monitor and Manage Heritage and Tourism

Luang Prabang will actively monitor and manage heritage and tourism through digital tools and practical management frameworks. The specific smart city projects are:

(i) **Tourism site dynamic ticketing systems.** Luang Prabang will study the roll out of a dynamic ticketing system by implementing a pilot project at Phousi Hill (Box 1). Major tourism sites worldwide use online ticketing systems with timed entry, advance booking and payment, and maximum visitor number limits. This facilitates communication with tourists by providing information in multiple languages and enabling itinerary planning. GEDSI will be mainstreamed by ensuring ticketing mechanisms do not disenfranchise local people and communities who are involved in, and benefit from non-digital arrangements.

(ii) **Real-time tourism site monitoring**. Real-time monitoring, assessment, and response systems will be deployed to actively manage tourism sites. This includes digital tools, such as video cameras and sensors, which work closely with the dynamic online ticketing system and community monitoring approaches, such as local guides and student monitors. Phousi Hill will be the first pilot (Box 1), with other heavily visited attractions such as Xieng Thong Temple and the Luang Prabang National Museum as other candidates for such trials. Monitoring tourism impacts with a GEDSI lens will be conducted to assess whether impacts are falling disproportionately on women and poorer populations.

---

[76] UNESCO. 2021. Decisions adopted during the Extended forty-fourth session of the World Heritage Committee, Fuzhou (People's Republic of China). Online meeting. 16–31 July 2021.

[77] McKinsey & Company and WTTC. 2017. *Coping with Success: Managing Overcrowding in Tourism Destinations.* https://www.mckinsey.com/~/media/mckinsey/industries/travel%20logistics%20and%20infrastructure/our%20insights/coping%20with%20success%20managing%20overcrowding%20in%20tourism%20destinations/coping-with-success-managing-overcrowding-in-tourism-destinations.pdf.


Photo: Adobe Stock.

Box 1: Phousi Hill Dynamic Online Ticketing System and Real-Time Monitoring Project

Phousi is a religious site at the top of a hill overlooking the World Heritage Site. It is also a popular sunset viewing destination, experiencing significant congestion during peak times.

With a dynamic ticketing system and real-time monitoring in place, the Department of Information, Culture, and Tourism can:

- Actively manage visitor numbers and behavior on Phousi Hill;
- Improve visitor experience on Phousi Hill and reduce negative impacts to religious site, infrastructure, and local heritage; and
- Increase revenue and investment into Phousi tourism and heritage management.

Source: Ramboll, 2023.

(iii) **Digital tourism statistics.** In 2022, the Luang Prabang DICT developed an online database of tourism information and statistics to increase data accessibility.[78] The site provides updated visitor arrivals, tourism business details, visitor modes of travel, and historical comparison information, inputted and collected manually. Luang Prabang will improve its digital tourism statistics system by expanding data points collected and linking it to automatically updated data from the airport, railway, accommodation businesses, and tourism sites. Data collection will include disaggregated data on gender, PWDs, and older persons. Indicators could include number of women, PWDs, and older persons visiting and using the facilities to inform decision-making.

[78] DICT. 2022. Tourism Statistics. Luang Prabang. https://tourismluangprabang.gov.la/statistic.

(iv) **Visitor management assessment and strategy tool.** To identify baselines, set priorities, and monitor overall progress, Luang Prabang will introduce a Visitor Management Assessment & Strategy Tool (VMAST),[79] which will provide regular, comprehensive, and rapid assessments of heritage and tourism indicators. Advocated by UNESCO to manage visitors in heritage sites, this framework analyzes tourism and heritage from four aspects: governance and management, environmental sustainability, economic sustainability, and social and cultural sustainability, with indicators that can be selected for self-assessment. One of the Luang Prabang World Heritage Management Division staff members is already trained in and holds a VMAST account. The findings of a biannual internal review process using VMAST will be reported to the Luang Prabang World Heritage Committee. Select GEDSI indicators for regular monitoring and management will be developed to ensure that benefits for women, disadvantaged groups, and poorer communities are maximized.

(v) **Heritage signboards with QR codes.** There is currently no visible signage to inform the public when they are entering or leaving the heritage or buffer zone. Placing multi-language signboards along the border of the heritage and buffer zones can clearly demarcate the heritage zones, while the inclusion of QR codes on the signboards can invite the public to explore and understand the OUV of Luang Prabang's heritage. This helps to reinforce awareness and pride in the heritage status of Luang Prabang and signal the importance of heritage preservation (Box 2).

Box 2: Heritage Signboards with QR Codes Project

The proposed heritage signboards serve the dual purpose of helping the public to recognize and appreciate the heritage site, and local authorities in communicating its boundaries and characteristics.

The key features of these heritage signboards are:

- Multi-language signboard in Lao, English, and Chinese;
- QR codes that provide multi-language heritage information and is hosted on the Luang Prabang World Heritage Management Division website; and
- Placed at key border intervals to clearly demarcate the Luang Prabang World Heritage Site and Buffer Zone.

Source: Ramboll, 2023.

3.2.2 Strategic Objective 1.2: Living Communities on the Peninsula are Maintained

3.2.2.1 Activity 1.2.1: Disperse Visitors and Commercial Activity Beyond the World Heritage Site

The specific smart city projects are as follows:

(i) **New tourism itineraries beyond the World Heritage Site.** Luang Prabang will develop new tourism itineraries to extend stays and disperse visitors beyond the handful of key sites. These itineraries will draw and accommodate sizable visitor numbers and be linked by transportation that does not require backtracking. New attractions will capitalize on local assets and will be complemented by digital maps that inform tourists of the route and attraction information.

[79] World Heritage Catalysis AS. 2023. VMAST. 9 February. https://www.vmast.net/.

GEDSI mainstreaming measures will include identifying socially inclusive routes and attractions, including those operated by women and disadvantaged groups. Assistance will be provided to women and disadvantaged groups to develop businesses and activities.

(ii) **Concession and investment guidelines.** To develop new tourism attractions and commercial areas in strategically identified locations, Luang Prabang will draw up more rigorous tender and investment guidelines for future concession tenders. These regulations will include urban development guidelines in line with priorities, such as development areas, building setbacks and car parking requirements, and tender screening criteria. Proposals that focus on gender equality, disability, social inclusion, and local employment will be encouraged. Development guidelines will include inclusive features associated with accommodation, facilities, and attractions.

3.2.2.2 Activity 1.2.2: Encourage Local Products

Local product protection zones. The sale of primarily local products in the heritage area will support local handicraft enterprises and ICH. Since many of these small craft businesses are women and ethnic minority owned and operated, this is an effective way to strengthen GEDSI. Luang Prabang will introduce a "Lao-made products only" section at the night market and zones to limit the number of foreign-owned or international chain businesses within the World Heritage Site. Non-local oriented products and services will be directed to commercial developments beyond the World Heritage Site boundaries.

3.2.3 Strategic Objective 1.3: Outstanding Universal Heritage Values are Enhanced

3.2.3.1 Activity 1.3.1: Build Financial Resilience

Digital heritage pass and charge. Luang Prabang will introduce a heritage pass and charge for all visitors into the World Heritage Site to provide a sustainable funding source to support heritage and tourism management and upkeep. The pass would enable visitor access to key attractions and could be part of a digital, dynamic ticketing system, which would allow visitors to purchase the pass, pay entrance fees, and reserve visiting timeslots through an app. GEDSI mainstreaming measures include ensuring financial management systems do not disenfranchise local communities and stakeholders that currently benefit from tourism site income.

3.3 PILLAR 2: CLEAN AND SAFE ENVIRONMENT

Luang Prabang will be a clean and safe city for residents and visitors, with the following strategic objectives:

- Strategic objective 2.1: Access to Clean Water and Surroundings is Enabled.
- Strategic objective 2.2: Disaster Management System is Improved.

To achieve these objectives, the city will implement the following activities and projects:

- Activity 2.1.1: Enhance Water Supply Service.
- Activity 2.1.2: Improve Solid Waste Management Systems.
- Activity 2.1.3: Introduce a Sustainable Sanitation Management Program.
- Activity 2.2.1: Introduce a Climate and Disaster Risk Reduction Program.

3.3.1 Strategic Objective 2.1: Access to Clean Water and Surroundings is Enabled

3.3.1.1 Activity 2.1.1: Enhance Water Supply Service

The specific smart city projects are as follows:

(i) **District metering areas.** Luang Prabang will introduce and integrate district metering areas (DMAs) into the water system to reduce leakages. DMAs can be rolled out in stages, starting with new development areas, followed by existing urban areas. GEDSI mainstreaming will be conducted through effective data collection, including employing various modes of survey such as targeted questionnaires, key informant interviews, etc., to understand how water supply issues (e.g., intermittence of water supply, etc.) adversely affect vulnerable groups and enable solutions to be developed for more equitable access and service delivery.

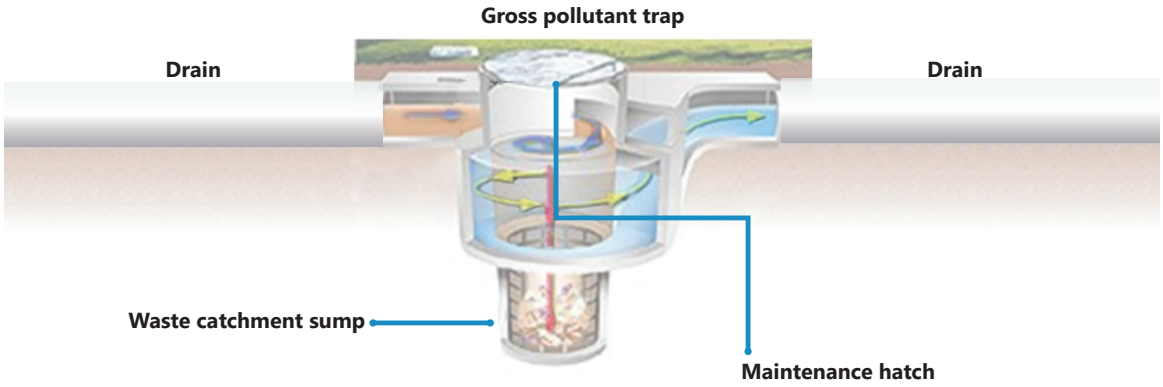
(ii) **Smart water grid systems and water quality sensors.** Luang Prabang will introduce supervisory control and data acquisition (SCADA) to monitor real-time water supply consumption and performance, to reduce real (i.e., physical loss) and apparent (i.e., unmetered consumption, metering errors) leakages. Water quality sensors in SCADA systems monitor and detect abnormal changes in water quality such as microbial contamination and pesticides, ensuring treated water quality is consistently compliant with standards. Water quality sensors will be introduced to support SCADA.

3.3.1.2 Activity 2.1.2: Improve Solid Waste Management Systems

The specific smart city projects are as follows:

(i) **Gross pollutant traps.** Luang Prabang will install gross pollutant traps (GPTs) in drains to physically separate and capture gross pollutants and coarse sediments, allowing treated effluent to flow cleanly through to the drain (Figure 10). GPTs can be adapted to the catchment area it serves, ranging from 1 meter by 1 meter (for a catchment area of less than 1 hectare) to 8 meters by 8 meters (for a catchment area of 250 hectares) (Box 3).

Figure 10: Gross Pollutant Trap Concept



Source: EcoClean Technology.

Box 3: Gross Pollutant Trap Project

Gross pollutant traps will be piloted in roadside drains to improve current solid waste collection systems by managing accumulated drain litter which have been found to obstruct water flow in drains and impact effluent quality.

Through the physical processes of screening and sedimentation, gross pollutant traps physically separate and capture gross pollutants and store them in the waste catchment sump, allowing treated effluent to flow cleanly through to the drain. The installation of gross pollutant traps can contribute to:

- Improved drain conditions with reduced occurrences of clogged drains and localized flooding.
- Improved water quality in surface water systems.

Source: Ramboll, 2023.

(ii) **Electric rubbish collection trucks.** Luang Prabang will introduce electric rubbish collection trucks to replace out-of-order trucks, improving solid waste collection regularity. However, as USO has shared that their truck maintenance capability is low, new trucks would have to be accompanied by a capacity building exercise to train staff responsible for truck operation and maintenance.

(iii) **Landfill upgrade.** Luang Prabang will modernize its existing landfill by constructing new climate resilient lined cells, leachate and septage treatment facilities, and facilities for materials recovery and composting, among others. Assessment of the informal waste sector will be included, such that negative impacts on vulnerable groups are avoided.

3.3.1.3 Activity 2.1.3: Introduce a Sustainable Sanitation Management Program

A sustainable sanitation management program, in line with the national strategy to strengthen the sanitation sector, will be rolled out for Luang Prabang.[80] A strategic infrastructure plan to support sustainable sanitation management is illustrated in Figure 11 and the specific smart city projects are as follows:

Figure 11: Luang Prabang Sustainable Sanitation Management Strategic Infrastructure Plan

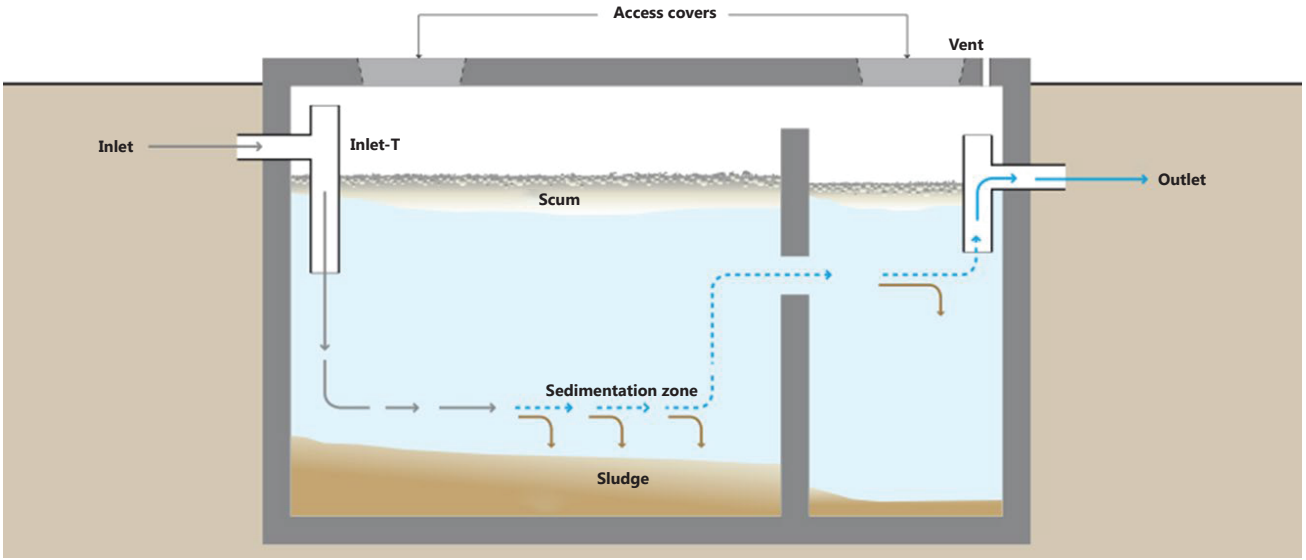
DEWATS = decentralized wastewater treatment systems.
Source: Ramboll, 2023.

[80] MICT. 2021. *National Urban Sanitation Sector Development Strategy for Lao PDR 2022–2030.* Vientiane.

(i) **Sanitation capacity building.** Luang Prabang will develop a sanitation capacity building module to teach staff technical skills and knowledge related to sanitation infrastructure development, operation, and maintenance. This could also include collaboration with research institutions to learn best practices and share knowledge, including advanced sanitation technologies. GEDSI mainstreaming in capacity building will include ensuring GEDSI disaggregated data is presented in the module, and that the module is reflective of GEDSI group needs, solutions, and benefits in relation to sanitation.

(ii) **Smart septic tanks.** Luang Prabang will pilot installation of septic tanks fitted with sensors for real-time water level monitoring so that owners can be reminded to desludge regularly, which will prevent seepage of untreated effluent into the ground and waterways (Figure 12). A cloud-based app could be developed to allow owners to share septic tank overflow data with USO for follow-up.

Figure 12: Typical Septic Tank Cross Section



Source: SMD Fluid Controls. https://www.fluidswitch.com/2015/08/10/home-septic-systems-and-the-importance-of-septic-tank-alarms/.

(iii) **Smart septic tank public education campaign.** Augmenting the new smart septic tank rollout, Luang Prabang will implement a smart septic tank public education campaign. Comprising educational programs and workshops, this campaign would provide owners with basic tank maintenance knowledge and teach them what to do when their sensors go off. It could also be available in a digital format. This campaign will accompany the smart septic tank roll out, including its pilot deployment (Box 4). The campaign will be designed so that it targets vulnerable groups, including accessibility and inclusivity aspects.

Box 4: Smart Septic Tank Project

Smart septic tanks will be piloted in the World Heritage Site, especially where commercial developments were converted from residential uses without septic tank upgrades. Fitted sensors will identify abnormal water levels, with alarms to identify owners of septic tank overflow or spillage.

This would enable improved sanitation for the World Heritage Site, specifically:

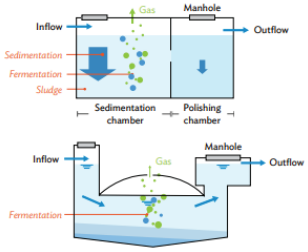
- Improved water quality in surface water bodies, and
- Improved health in the community.

Source: Ramboll, 2023.

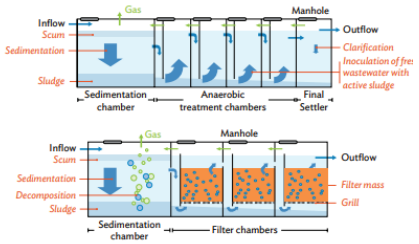
(iv) **Decentralized wastewater treatment systems.** Luang Prabang will introduce decentralized wastewater treatment systems (DEWATS) to treat wastewater effectively by communities, improving sanitation standards across the city. DEWATS comprise four treatment stages (Figure 13), which can be managed by communities and financed by small maintenance fees collected from household users. DEWATS have been successfully used in other Lao towns and villages.[81]

Figure 13: Typical Decentralized Wastewater Treatment Systems Process

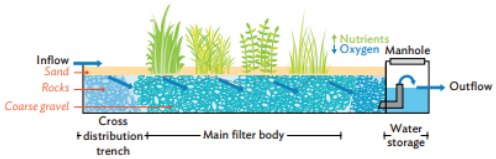
Primary anaerobic treatment – in sedimentation ponds, settlers, septic tanks, and/or biogas digesters



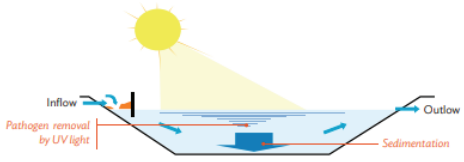
Secondary treatment – in anaerobic baffled reactors (ABR) and anaerobic filters (AF)



Secondary and tertiary aerobic/facultative treatment – in horizontal or vertical; gravel filters or in constructed wetlands (surface flow filters)



Post-treatment – in aerobic polishing ponds and facultative pond systems



Source: BORDA Lao PDR. 2018. *DEWATS Module Description, Operation Manual*. Vientiane.

[81] BORDA Lao PDR. 2018. *DEWATS Module Description, Operation Manual*. Vientiane.

3.3.2 Strategic Objective 2.2: Disaster Management System is Improved

3.3.2.1 Activity 2.2.1: Introduce a Climate and Disaster Risk Reduction Program

The program will include (i) climate and disaster risk capacity building, promoting coherence between climate and disaster risk management; and (ii) risk governance system development, adopting an all-hazards approach.[82] Subsequently, a flood resilience initiative adopting integrated flood management techniques will propose solutions to detect, monitor, protect, and mitigate against flood disasters. The specific smart city projects under this initiative are as follows:

(i) **Hazard and risk assessment.** Understanding of the underlying causes and impacts of hazards, notably floods and storms, will be improved. Luang Prabang will undertake a hazard and risk assessment, which includes developing hydrological and hydrodynamic models calibrated to the city's geographic and meteorological context to map areas in the city with high risks, e.g., riverbanks with high erosion risk. GEDSI indicators will be defined and meaningful consultation with GEDSI stakeholders incorporated throughout the analysis.

(ii) **Flood risk zoning.** Luang Prabang will introduce flood risk zones into the spatial planning process. Development would be discouraged within these zones, with any new buildings adhering to updated building codes, based on flood frequency and extent identified. Building socially inclusive approaches into spatial design will include studying where vulnerable populations live and work in the city to inform spatial design and planning solutions.

(iii) **Flood defense mechanisms.** Luang Prabang will identify flood defense mechanisms for implementation, such as dike infrastructure, detention tanks or nature-based solutions, to prevent urban area inundation. Gross pollutant traps, as described in section 3.3.1.2, is a simple mechanism to prevent drains from clogging up and reduce localized flooding.

(iv) **Smart early flood response system.** Luang Prabang will develop a comprehensive and inclusive flood response system. Measures such as gender inclusive early warning protocols, evacuation plans, and emergency measures such as sandbags, would be studied and tailored to Luang Prabang's requirements. Clear disaster management governance outlining department roles and responsibilities, workflows, and processes will be included.

(v) **Social inclusion study, with GEDSI mainstreaming considerations.** Luang Prabang will implement a social inclusion study to ensure that flood resilience measures are adapted to support and better meet the needs of vulnerable groups. The study will include clear targets and goals to mainstream GEDSI considerations, e.g., percentage of vulnerable groups supported by flood defense mechanisms, demonstrating commitments to gender equality and vulnerable groups.

---

[82] An "all hazards approach" is an integrated emergency preparedness approach that builds preparedness capacity and capability for all emergencies and disasters, including internal emergencies, human emergencies (or both) and natural hazards.

3.4 PILLAR 3: SUSTAINABLE VILLAGES AND 15-MINUTE CITY

Luang Prabang will be a city accessible to all, including pedestrians and cyclists, and made up of self-sustaining urban villages where residents live, work, play, learn, and enjoy public spaces. This pillar's strategic objectives include:

- Strategic objective 3.1: Urban Commute Shortened to 15 minutes or Less.
- Strategic objective 3.2: Traffic Fatalities are Minimized.
- Strategic objective 3.3: Conversion of Forested and Mountainous Land for Urban Development is Minimized.

To achieve each of these objectives, the following activities and projects will be introduced:

- Activity 3.1.1: Introduce Strategic Transport Planning.
- Activity 3.1.2: Implement Signalized Traffic Management System.
- Activity 3.1.3: Provide Alternative Transport Options and Choices.
- Activity 3.2.1: Prioritize Pedestrians and Cyclists in Specific Precincts.
- Activity 3.2.2: Introduce Traffic Education.
- Activity 3.3.1: Foster Sustainable Urban Growth.
- Activity 3.3.2: Digitize Construction Permitting Processes.

3.4.1 Strategic Objective 3.1: Urban Commute Shortened to 15 Minutes or Less

3.4.1.1 Activity 3.1.1: Introduce Strategic Transport Planning

Luang Prabang will introduce strategic transport planning to articulate its long-term sustainable transport strategy and will identify practical approaches. The smart city projects are:

(i) **Integrated transport strategy.** This strategy will consider how people and goods are moved in its urban context and will propose an oversight agency and implementation plan to stage new infrastructure. It could adopt a multimodal transport approach that considers public transport, cycling, micromobility, and on-demand services as an integrated transport service package, and could consider how transport services are accessible for all users. Future transport technologies, such as smart sensors, electric mobility, and automated vehicles, could be included in the future transport vision. As part of the various strategies, identification of socially inclusive solutions such as barrier-free access routes will be prioritized, considering different development scenarios and timelines.

(ii) **Strategic transport model.** The strategic transport model will simulate vehicles across the full city transport network to identify the benefits of proposed land use changes. This could inform potential investment decisions in specific localities. GEDSI needs will be inputted to the model through stakeholder consultations.

3.4.1.2 Activity 3.1.2: Implement Signalized Traffic Management System

Luang Prabang will implement a signalized traffic management system to improve the city's traffic flow. The smart city projects are:

(i) **Digital traffic database.** Luang Prabang will implement a digital traffic database to collect traffic data, such as traffic speeds and traffic volumes, to identify problematic intersections. As a start, vendors could source data through surveys and on-site data collection equipment and sensors. In the longer-term, data collection could be automatically captured through sensors and traffic survey cameras and complemented by artificial intelligence to process traffic video footage. Such data would also be used for microsimulation purposes. Data required to study GEDSI within the transport network can be collected through various surveys, focus groups, and key informant interviews.

(ii) **Traffic microsimulation.** Luang Prabang will develop and run a traffic microsimulation to test new traffic solutions' efficacy and quantify its benefits. Once satisfactory results and sufficient funds are obtained, road network changes can be implemented. The peninsula in the World Heritage Site will be the first microsimulation zone (Box 5).

Box 5: Verification of Proposed Pedestrianization using Vehicular and Pedestrian Simulation Project

Conducting traffic microsimulation using software and pedestrian models will help to inform the following:

- Verify the street identified for pedestrianization is apt (Sakkaline Street vs. Sisavangvong Road; refer to Box 6).
- Determine the length of the street to be pedestrianized.
- Identify any impact on surrounding streets due to the pedestrianization and if so, explore solutions to be implemented to mitigate any impact.

Source: Ramboll, 2023.

(iii) **Signalized intersections and movement corridors.** Luang Prabang will install traffic signals at key intersections and along major corridors to manage and control vehicle movements at all times of the day in a safe manner. This will be an ambitious project due to the many supporting works that must occur alongside signalization and will include new supporting infrastructure and systems. Travel speed, journey time reliability, and number of accidents and incidents could be key performance indicators adopted to measure the signalized traffic system's performance. Zones with vulnerable groups of people such as older persons and school zones will be designed to have longer pedestrian crossing timings. Road speed limits can also be moderated to ensure safety for these groups of people. These types of solutions will need to be premised in consultation with GEDSI stakeholders.

(iv) **Traffic simulation capacity building.** This module will comprise technical workshops and lectures, with trained modelers coming together at the end of the module to form an expert taskforce to share traffic simulation techniques and tips. Senior modelers can, through the taskforce, mentor junior modelers. Traffic modeling and simulation courses could also be introduced in high schools and universities.

3.4.1.3 Activity 3.1.3: Provide Alternative Transport Options and Choices

Public buses, shuttles, and other mobility services will be provided to augment the transport options available and ensure accessibility for all. The specific smart city projects are:

(i) **Public bus services and shuttles.** Public bus services complemented by shuttles in low-demand areas will be introduced. A hierarchy of bus routes at different capacities and frequencies will be introduced, with significant transport and movement corridors served with high-capacity and frequency buses while low to medium volume transport corridors are serviced via feeder buses and shuttles. The project would require route analysis and modeling, timetabling, and scheduling, as well as analysis of network plan and infrastructure requirements together with supporting operational and maintenance requirements. Bus routes could be trialed along selected routes before expanding, depending on demand and uptake. Zero emissions buses, in particular electric buses, could be introduced. GEDSI will be mainstreamed through data gathering and consultation to understand GEDSI context and needs for public bus services and shuttles.

(ii) **Mobility-as-a-service.** Luang Prabang will encourage mobility-as-a-service (MaaS) options to provide point-to-point transport options. These include ride-hailing and ride-sharing solutions in high-capacity vehicles that are able to respond on-demand. Such transport services are best provided by private firms such as Loca, which can use algorithms and technology to optimize their fleet size and plan optimal routes. GEDSI mainstreaming efforts will be taken to ensure public transport services are safe and made available in the zones and times needed.

(iii) **Smart park-and-ride facilities.** To reduce cars from entering and congesting the World Heritage Site, Luang Prabang will implement park-and-ride facilities in selected sites near the future Lao–China Expressway, given the expected increase in private vehicles driven by tourists. As a start, Luang Prabang will forecast travel demand to size the facility and identify locations that best limit impact on local traffic. This would need to be accompanied by traffic regulations that prohibit cars from entering the World Heritage Site and a digital shuttle booking system. Barrier-free designs to foster inclusivity of GEDSI stakeholders will be included. Shuttle services will be made available to vulnerable groups such as older persons, children, and women. Solutions will be based on GEDSI stakeholder consultation and identification of needs and requirements (Box 6).

Box 6: Smart Park-and-Ride Facilities Project

A park-and-ride facility provides vehicle parking at appropriate locations, with the final journey into the city undertaken by public transport or shuttle services. Smart tools, such as apps, allow for digital parking payment, booking of shuttle services, and collecting data on parking utilization.

With the implementation of smart park-and-ride facilities in Luang Prabang, the city will be able to:

- Reduce nonresident cars from entering the World Heritage Site and congestion in the area, and
- Increase inclusivity for GEDSI stakeholders through barrier-free designs and making shuttle services available to vulnerable groups.

Source: Ramboll, 2023.

3.4.2 Strategic Objective 3.2: Traffic Fatalities are Minimized

3.4.2.1 Activity 3.2.1: Prioritize Pedestrians and Cyclists in Specific Precincts

Luang Prabang will use smart tools and systems to prioritize pedestrians and cyclists in specific precincts. The specific smart city projects are:

(i) **Car-lite peninsula study.** To improve traffic conditions for residents, businesses, and tourists, Luang Prabang will study implementing a car-lite peninsula within the World Heritage Site. This study includes traffic microsimulation and pedestrian modeling to investigate reducing private vehicle access impact and the necessary infrastructure upgrades to improve pedestrian and cycling experience. New regulations to restrict private vehicles would also be required. Sisavangvong Road could be the pilot road to be studied. Barrier-free routes can be designed to cater for GEDSI needs.

(ii) **Cycling network.** Luang Prabang will study and implement new walking and cycling infrastructure. The focus of the study will be on infrastructure provision, i.e., one-way vs. two-way cycle lanes and links, end-of-trip facilities, etc. This project is aligned with the World Bank's green mobility recommendations. Barrier-free routes can be designed to cater for GEDSI needs.

3.4.2.2 Activity 3.2.2: Introduce Traffic Education

Traffic education campaign. Luang Prabang will implement a transport education campaign to inform people of new transport systems and network modifications, such as driving rules around signalized intersections. New traffic rules and regulations with stringent enforcement activity will be created to support and drive behavioral change. The campaign will be designed to target all schoolchildren, women, the elderly, and the more vulnerable members of the community. Smart apps and digital websites will be developed to support the campaign.

3.4.3 Strategic Objective 3.3: Conversion of Forested and Mountainous Land for Urban Development is Minimized

3.4.3.1 Activity 3.3.1: Foster Sustainable Urban Growth

Luang Prabang will develop urban policies and regulations to foster sustainable urban growth. The specific smart city projects are:

(i) **Urban growth boundary.** Luang Prabang will introduce an urban growth boundary to limit urban expansion. This is a regulatory tool that restricts urban development, protecting sensitive ecological areas. However, flexibility will be incorporated to allow city expansion, where appropriate. The urban limit identified in the 2012 Urban Planning Regulations for Luang Prabang could inform the adopted urban growth boundary.

(ii) **Smart urban village guidelines.** Luang Prabang will introduce smart urban village guidelines identifying smart technologies listed in the strategy, such as smart mobility and sanitation systems, which can be applied at a more local scale to new urban villages, e.g., around the HSR station. Assessment of the GEDSI context, supported by broad-based consultation, will be key inputs to the guidelines.

(iii) **Urban design guidelines.** Luang Prabang will introduce urban design guidelines for sensitive sites and villages, such as the peninsula and around the HSR station. Taking reference from the New Urban Agenda, these urban design guidelines will set consistent standards for building height, building form, setback, active edge, and development floor area, among others.[83] Implementation will complement urban planning regulations, such as the updated 2012 Urban Planning Regulations for Luang Prabang or the PSMV. Public officials responsible for implementing the guidelines wil be trained in evaluation and assessment of development proposals.

3.4.3.2 Activity 3.3.2: Digitize Construction Permitting Processes

Digital construction permit application. Currently, applicants for new constructions must apply for permits from the Luang Prabang World Heritage Management Division, DPWT, or the Office of Public Works and Transport (OPWT), depending on the land size and location. Luang Prabang will implement a digital construction permit application process to streamline the application process. Applicants will input key information related to the site and proposed works into an app or website and pay the application fee digitally. The system will automatically route the case to the correct agency for processing. Harmonizing each agency's workflow and enforcing noncompliance will be critical to realize this one-stop process.

3.5 INTEGRATED SPATIAL PLANNING

To provide a holistic citywide overview and manage urban challenges collectively, Luang Prabang will pursue integrated spatial planning. Agencies will harmonize planning efforts and deconflict competing agendas to plan for the city and ensure smooth urban service delivery. There are two specific smart city efforts.

---

[83] UN Habitat. 2020. *The New Urban Agenda.* Nairobi.

Luang Prabang Integrated Urban Master Plan and Framework. The PSMV and the 2012 Urban Planning Regulations for Luang Prabang will be updated and combined as one unified urban plan and extended to include the whole of Luang Prabang city. Second, the plan will consider subsector considerations holistically within a single spatial framework, which can be administered for all urban developments and will include:

(i) Heritage and tourism considerations, acknowledging Luang Prabang's OUV, enhancing World Heritage Site protective measures to consider landscape and ICH, and planning new tourism infrastructure beyond the World Heritage Site.

(ii) Sustainable transport systems, planning for new transport infrastructure and systems to support urban growth, such as park-and-ride facilities, public transport infrastructure, and new roads.

(iii) Climate-responsive plans, identifying high flood and disaster risk sites up-front and proposing appropriate and inclusive development measures.

(iv) Infrastructure systems, identifying new solid waste, water treatment, ICT, and other infrastructure facilities to keep the city functioning.

(v) Urban expansion opportunities, which identifies the location of new homes, shops, and amenities.

(vi) Urban growth boundary, which details the extent of the city's growth.

(vii) GEDSI considerations to be factored in as part of the plan preparation process.

This new Luang Prabang Integrated Urban Master Plan and Framework:

(i) Adheres to Ministerial Order on Urban Planning Regulations (2006) and Law on Urban Planning (2017).

(ii) Uses spatial plans to identify different land uses, considering sustainable urban planning principles.

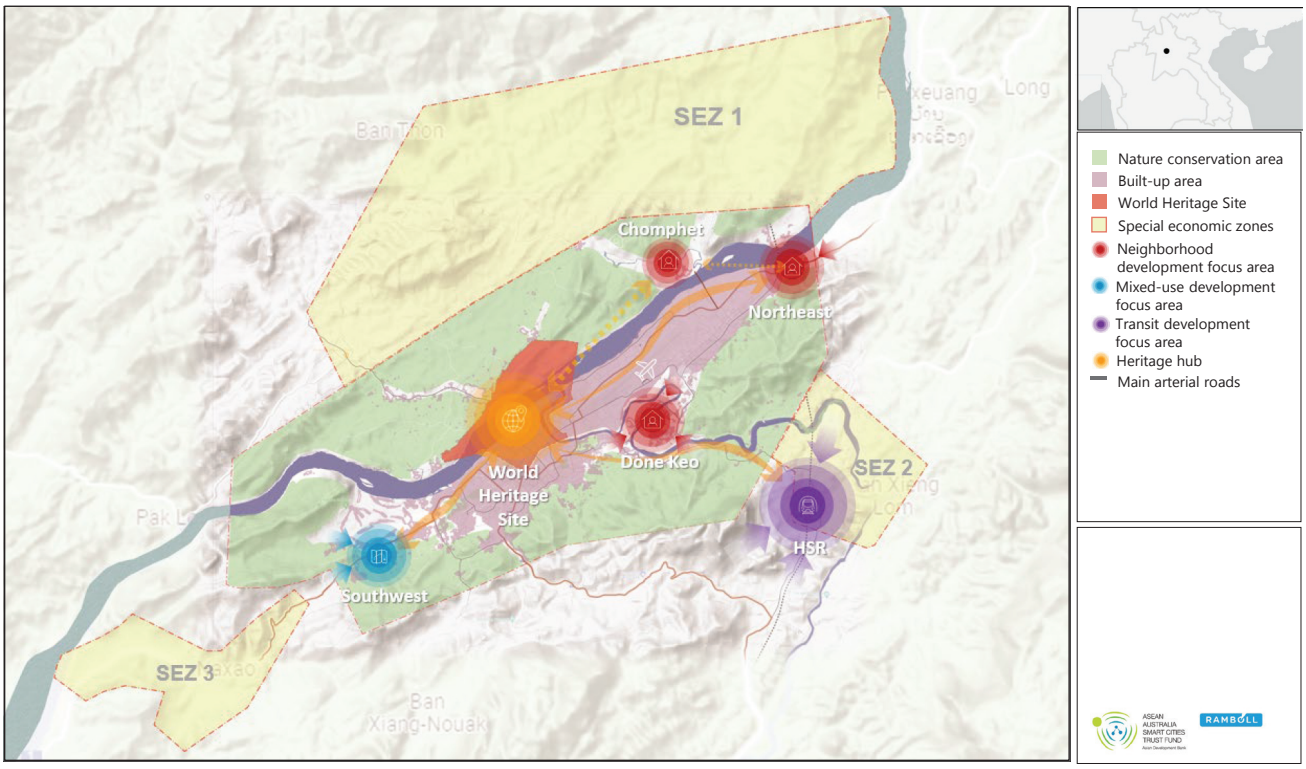
(iii) Takes a consistent approach to land use zoning. Additional controls in the form of overlays could be introduced to regulate related concerns, such as protecting commercial trade within the World Heritage Site and preserving ponds and wetlands.

(iv) Introduces urban development controls, such as setback and building height regulations.

(v) Applies controls to urban design guidelines.

Figure 14 provides a 2040 spatial scenario. Aligning with existing development plans, the spatial scenario prioritizes five new nodes in Ban Done Keo, southwest Luang Prabang, northeast Luang Prabang, around the HSR station, and in Chomphet for urban development, to provide an additional 527.6 hectares of land to meet residential and tourism projections. These five nodes will be for housing and mainly tourism-related uses using sustainable urban planning principles and connected to the existing World Heritage Site through improved infrastructure.

Figure 14: Luang Prabang Spatial Plan



Source: Ramboll, 2023.

Interdepartmental geographic information system. To facilitate data sharing and enable urban planning and decision-making processes, Luang Prabang will develop an interdepartmental GIS to house the Luang Prabang Integrated Urban Master Plan and Framework. GIS is a digital planning support system that processes geospatial data, allowing users to create, manage, analyze, and make maps, and is widely used in many city planning authorities worldwide.[84] The Luang Prabang World Heritage Management Division and WSSE-LPB are two agencies that already use GIS in their work, and this is to be expanded to create an interdepartmental GIS. This requires identifying an appropriate host of this GIS, and ensuring it is funded and regularly updated and maintained.

[84] Anthony Gar-On Yeh. 2008. *GIS as a Planning Support System for the Planning of Harmonious Cities.* UN-Habitat Lecture Award Series No. 3. Nairobi.

3.6 DATA MANAGEMENT AND GOVERNANCE FRAMEWORK

A clear data management and governance framework that considers data quality, data security, and data standards and processes also need to be in place to support the implementation of smart city strategies, especially those that cut across all three pillars. A Smart Data Management and Governance Framework will be developed to sustain, scale, and replicate efficient data storage, usage, analysis, and sharing across all users in the long term.

The development of the framework will entail defining the roles, responsibilities, and processes involved in managing data, which will include:

(i) **Conducting a comprehensive analysis of the current data ecosystem.** Mapping out the user journey of how data flows between the private sector, city government, and citizens, identifying key data points and potential bottlenecks in the data flow.

(ii) **Developing a data management framework**. Defining roles, responsibilities, and processes involved in managing data; ensuring data quality, security, and compliance with relevant standards and regulations.

(iii) **Establishing protocols for data sharing and collaboration.** Developing agreements on data ownership, access, and usage; building the necessary digital capabilities within city agencies.

(iv) **Developing an information and communication technology road map.** This includes infrastructure, such as server rooms and improved telecommunications infrastructure, to support the data management framework rollout.

Smart city platform. The smart city platform can serve as the central hub that controls the flow of information within the smart city ecosystem—enabling smart applications and ICT solutions to be integrated. The platform would comprise three key elements: the front-end user interface, sensors and other physical devices and infrastructure, and backend computational services and the core digital platform.

3.7 IMPLEMENTATION ARRANGEMENTS

Provincial governor. The provincial governor will appoint the Luang Prabang Smart and Integrated Urban Strategy (LPSIUS) steering committee and working groups and approve and provide ultimate oversight of the implementation of smart city projects under the strategy. The governor will endorse appropriate projects for inclusion in the provincial government's budget plans and raise financing from development partners, the private sector, and other sources to fund the strategy.

Luang Prabang smart and integrated urban strategy steering committee. The LPSIUS steering committee, chaired by the Luang Prabang mayor, will provide oversight, facilitate coordination, direct collaboration, and monitor implementation progress. It will direct the LPSIUS overarching integrated spatial planning smart city projects and oversee the LPSIUS working groups. Committee members will include senior officials (director general or deputy director general level) from DPI, DPWT, DICT, Department of Natural Resources and the Environment (DONRE), DTC, USO, and from Chomphet Mayor's Office. The Luang Prabang Mayor's Office will provide secretariat services to the committee, which will meet quarterly, and as needed. Representatives from other organizations (public and private) and development partners involved in implementation of the smart city projects may also be invited at the chair's discretion.

Luang Prabang smart and integrated urban strategy working groups. The working groups will facilitate coordination and collaboration between related departments and offices on the formulation of, securing funding for, approval and implementation of smart city projects. Three working groups will be established, one for each of the strategy's pillars, with members from all relevant departments and offices involved in implementation of the smart city projects under that pillar. Membership may change from time to time based on the nature and needs of the projects. The working groups will be chaired by the lead agencies for each pilar. DICT will chair Pillar 1 on Integrated Tourism and Heritage Destination; USO and DPWT will co-chair Pillar 2 working group on Clean and Safe Environment; and DPWT will chair Pillar 3 working group on Sustainable Villages and 15-Minute City.

Department of Housing and Urban Planning, Ministry of Public Works and Transport. The Department of Housing and Urban Planning has statutory responsibility for the preparation of urban plans, and as such will lead the Integrated Urban Master Plan and Framework overarching smart city project, working closely with the three LPSIUS working groups in the spirit of the strategy's integrated city planning approach.

The roles and responsibilities of the entities responsible for implementation of the strategy and associated risk management plan are summarized in Table 6 and Table 7 respectively. A key responsibility will be the mainstreaming of GEDSI considerations in the project roll out. The organizational structure is presented in Figure 15.

Table 6: Implementation Roles and Responsibilities

Implementing Person/Organization	Roles and Responsibilities
Luang Prabang Provincial Governor	• Appoint LPSIUS Steering Committee. • Approve any changes to the composition of LPSIUS working groups. • Approve and provide ultimate oversight of the implementation of smart city projects under the strategy. • Coordinate with DPI to ensure smart city projects under the strategy are included in planning and coordination with development partners and government budgets are allocated for smart city initiatives. • Coordinate with MPWT/DHUP on implementation of urban land use planning project. • Review the strategy implementation progress.
LPSIUS Steering Committee (chaired by Luang Prabang Mayor)	• Provide policy guidance and advice on formulation and implementation of smart city projects under the strategy. • Oversee implementation in conformity with the strategy's objectives and scope. • Direct the strategy's overarching integrated spatial planning projects. • Coordinate closely with MPWT/DHUP on the implementation of the overarching Integrated Urban Master Plan and Framework Smart City Project and facilitate coordination and collaboration on this project between with the three LPSIUS working groups. • Supervise the LPSIUS working groups in their implementation of the smart city projects. • Confirm compliance with national and provincial and local regulations and policies. • Support LPSIUS working groups with identification of development partner and private sector support for smart city projects. • Assist in coordination among local government agencies involved in strategy implementation and related projects. • Ensure LPSIUS working groups undertake GEDSI mainstreaming considerations. • Review progress and monitoring reports and ensure that information on progress is disseminated to relevant government agencies and address any planning and coordination issues.

Continued on next page.

Table 6: continued

Implementing Person/Organization	Roles and Responsibilities
LPSIUS Working Groups (3): • Pillar 1: Integrated Tourism and Heritage Destination (chaired by DICT) • Pillar 2: Clean and Safe Environment (co-chaired by DPWT and USO) • Pillar 3: Sustainable Villages and 15-Minute City (chaired by DPWT)	For each pillar working group: • Facilitate coordination and collaboration between related departments on the formulation and implementation of smart city projects under the strategy. • Identify and secure development partner and private sector support for implementation of smart city projects. • Monitor progress of implementation of projects. • Coordinate reporting on progress, issues, and results of smart city projects on a regular basis to the LPSIUS Steering Committee. • Mainstream GEDSI considerations in smart city projects.
Development Partners	• Align support with the strategy's directions and smart city projects. • Support formulation and implementation of smart city projects.
Private Sector Partners	• Partner, where appropriate, with government agencies on the design and implementation of smart city initiatives.

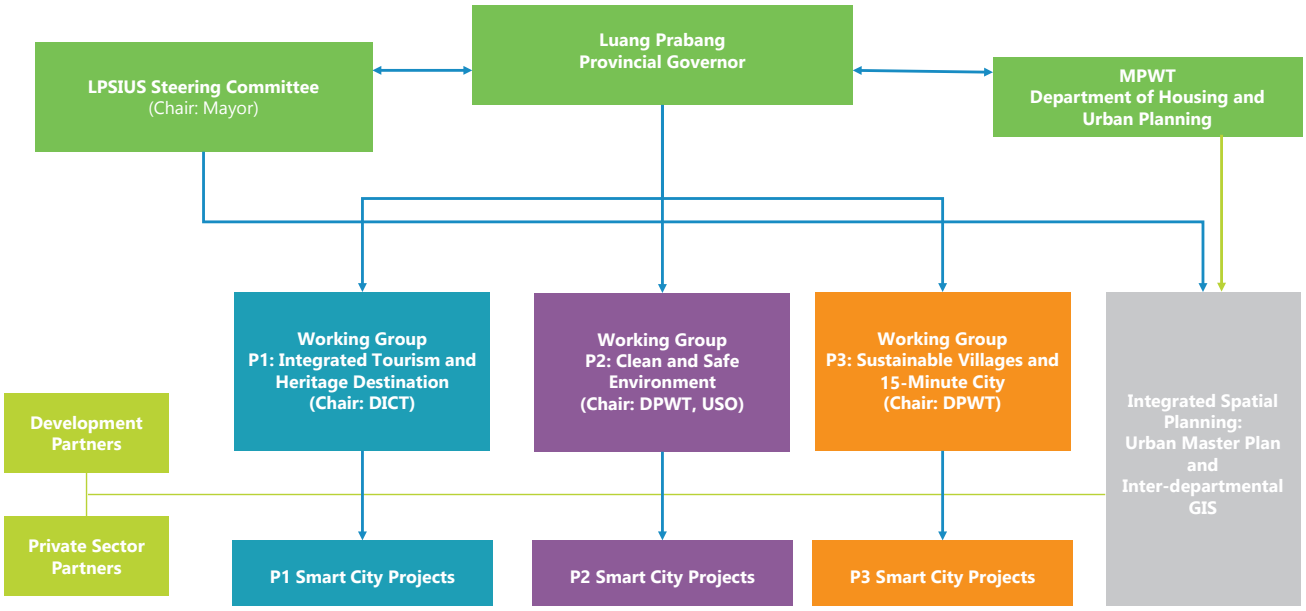
DHUP = Department of Housing and Urban Planning; DICT=Department of Information, Culture and Tourism; DPI = Department of Planning and Investment; DPWT = Department of Public Works and Transport; GEDSI = gender equality, disability, and social inclusion; LPSIUS = Luang Prabang Smart and Integrated Urban Strategy; MPWT = Ministry of Public Works and Transport; USO = Urban Services Office.
Source: Ramboll, 2023.

Table 7: Risk Assessment and Risk Management Plan

Risk Description	Ranking (H/M/L)	Mitigation Measures
Another pandemic or other global shock affects funding streams, tourism, and government priorities.	M	Identify a broad range of financing mechanisms, and project steering committee meetings ensure relevance of project activities to current situation.
Ambiguities in the roles and responsibilities of the steering committee and the working groups weakens effectiveness of integrated approach.	M	Appoint clear lead agency for each working group. Steering committee and working group leads will appoint lead technical officers responsible for specific projects.
Insufficient public funds allocated for implementation of smart city projects.	M	Introduce public–private partnership, concession, and fee-based financing mechanisms for all projects, reducing reliance on public budgets.
Government restructuring results in changes to authority and responsibilities of key implementation agencies.	M	Regular guidance (from the steering committee) on project implementation and adjust project roles if needed.
Luang Prabang city authorities unable to implement or compel actions requiring provincial or central-level approval.	L	Provincial governor oversight and commitment to project. Steering committee to adjust project roles if city authorities face challenges in this regard.
Digital skills and capacity are insufficient to effectively implement smart city initiatives.	M	Include capacity strengthening components to smart city projects relying on digital skills and capacity.
ICT infrastructure and services are inadequate for the planned smart city initiatives depending on fast and stable internet connectivity.	L	Seek public–private partnership with internet service providers and online service providers to ensure ongoing investment in digital infrastructure and services.
Private sector lacks interest or capacity to partner on implementation of smart city projects.	L	Engage with Lao and Luang Prabang Chamber of Commerce and Industry and tourism organizations to strengthen policy measures and marketing incentives to promote standards adoption. Industry associations are invited to participate in ASEAN and GMS tourism working group meetings.
Overall	**M**	

ASEAN = Association of Southeast Asian Nations; GMS = Greater Mekong Subregion; H = high risk; ICT = information and communication technology; L = low risk; M = moderate risk.
Source: Ramboll, 2023.

Figure 15 : Luang Prabang Smart and Integrated Urban Strategy Organizational Structure



DICT = Department of Information, Culture and Tourism; DPWT = Department of Public Works and Transport; GIS = geographic information system; LPSIUS = Luang Prabang Smart and Integrated Urban Strategy; MPWT = Ministry of Public Works and Transport; P1 = Pillar 1; P2 = Pillar 2; P3 = Pillar 3; USO = Urban Services Office.
Source: Ramboll, 2023.

3.8 PROJECT PRIORITIZATION FRAMEWORK

The identified smart city projects are prioritized using the following six criteria:

(i) **Project complexity.** Complexity is assessed by technology levels, number of agencies involved, and systemic changes needed for success. For example, gross pollutant traps are a simple project. The technology is noncomplex and the project requires minor infrastructure and new workflow for only one agency. On the other hand, a smart traffic management system is highly complex requiring extensive new infrastructure (i.e., new traffic lights, road improvements, cable laying), a widespread public education campaign, and enforcement by many agencies.

(ii) **Project implementation costs.** Low-cost projects are those with cost estimates below $1 million, medium cost from $1 million to $2 million, and high cost above $2 million.

(iii) **Path dependence,** that is, whether the project is contingent on the successful completion of another project prior to implementation. As an example, a GIS planning system will first require an updated planning system before data can be digitized.

(iv) **Institutional impacts** consider how institutional capability to roll out and deliver public urban services are improved.

(v) **GEDSI impacts** consider how gender equality and marginalized groups' lives and welfare are improved.

(vi) **Project urgency** considers the urban problem's criticality. Higher priority projects will address urgent problems.

Projects are categorized into pilot, near-term, medium-, and long-term as follows:

(i) **Immediate (2023–2024).** Projects that are identified as urgent by local stakeholders, which need to be prioritized for immediate implementation as pilot projects. These are low-cost projects, have ready funding sources, no path dependence, and can be implemented readily. Institutional and GEDSI impacts may be low at this stage as both tangible and intangible benefits may be difficult to evaluate within the immediate time frame. However, these projects could be scaled up in the future to increase their impact.

(ii) **Near Term (2024–2026).** Projects identified as priority areas by stakeholders but need not be implemented immediately. They are low-cost with some level of path dependence. Their institutional and GEDSI impacts also vary, depending on the level of intervention and project scale.

(iii) **Medium Term (2026–2030).** More complex projects with higher costs, high path dependencies, and considered non-urgent. Their institutional and GEDSI impacts also vary, depending on the level of intervention and project scale.

(iv) **Long Term (2030s and Beyond).** More complex projects with higher costs, very high path dependencies, and considered non-urgent. Their institutional and GEDSI impacts also vary, depending on the level of intervention and project scale.

Project data sheets for the six identified pilots are included in Appendix 1, while Appendix 2 contains the full project listing and analysis based on the six criteria laid out under the prioritization framework.

APPENDIX 1: PILOT PROJECTS

Table A1: Pilot Projects Summary

No.	Project Title	Executing Agency	Cost ($)
1	Phousi Hill Dynamic Ticketing System and Real-Time Monitoring Project	Department of Information, Culture, and Tourism	350,000–500,000
2	Heritage Signboards with QR Codes Project	World Heritage Management Division	44,000
3	Gross Pollutant Trap Project	Public Works and Transport Office, Urban Services Office	350,000
4	Smart Septic Tank Project	Urban Services Office	500,000
5	Verification of Proposed Pedestrianization using Vehicular and Pedestrian Simulation Project	Public Works and Transport Office, City Headquarter of Security	200,000–400,000
6	Smart Park-and-Ride Facilities Project	Department of Public Works and Transport, Public Works and Transport Office	To be reviewed

Source: Ramboll, 2023.

PROJECT NO. 1: PHOUSI HILL DYNAMIC TICKETING AND REAL-TIME MONITORING PROJECT

Key Objectives

(i) Actively manage visitor numbers and behavior on Phousi Hill.

(ii) Improve visitor experience on Phousi Hill and reduce negative impacts to religious site, infrastructure, and local heritage.

(iii) Increase revenue and investment into Phousi tourism and heritage management.

Lead Agency
Department of Information, Culture and Tourism

Location
Phousi Hill – specifically ticketing locations at the west entrance (facing the National Museum) and east entrance (facing the Nam Khan)

Expected Results
Well-functioning, accessible digital ticketing system in operation that controls visitor access to Phousi Hill with dynamic pricing to maximize revenues and minimize crowding and impacts.

Rationale

Phousi Hill is one of the most popular tourism attractions in Luang Prabang, a religious site, and a popular sunset viewing spot, leading to crowding, impacts on the temple and infrastructure, and safety concerns. Major tourism sites worldwide utilize online ticketing systems with advance booking and payment, timed entry, and maximum visitor number limits. This controls and anticipates crowd volumes and adjusts prices to encourage visitation during off-peak hours. It also facilitates communication with tourists by providing information in multiple languages and enabling itinerary planning ahead of time.

This project will develop and implement a digital ticketing system at Phousi Hill, which could then be replicated at other sites in Luang Prabang such as the Royal Palace National Museum and Xiengthong Temple. Tourists will have a better visitor experience, site managers will be able to plan for and manage visitor numbers and impacts, and revenue will be maximized by charging higher prices for peak demand times, which can be used for site maintenance and staffing.

Activities will be implemented in four stages: planning, preparation, implementation, and assessment.

Planning

(i) Consult with current ticket sellers and beneficiaries (Khamyong and Phakham villages, the Department of Information, Culture, and Tourism [DICT]) to understand their systems, needs, and visitor issues that need to be integrated into an online system.

(ii) Survey visitors (international, domestic, and local residents) to understand behavior and needs.

(iii) Survey and identify maximum visitor numbers for different times of day, month, and year.

(iv) Identify whether DICT will directly manage ticketing or rights given to a private company.

(v) Create a site management plan and budget.

Preparation

(i) Identify key functionalities needed for ticketing system (and the system manager/concessionaire) – such as languages, accessibility, time slots, and ticket mode, including on-site ticketing needs for locals.

(ii) Create terms of reference and hire the site and/or app developer to create the ticketing system (or the concessionaire which will develop and manage app) and test.

(iii) Set launch date and announce to tour companies and the public.

Implementation

(i) Order and install hardware (scanning system, barriers, ticket booths).

(ii) Train ticketing staff.

(iii) Launch online system on set date, preferably low season (such as May 2024).

(iv) Monitor and troubleshoot.

Assessment

(i) Monitor and evaluate results in 3 and 6 months, soliciting feedback from visitors, residents, ticketing agents, and site managers.

(ii) Decide on improvements needed, and/or plans to expand to other sites.

Timeline

Planning:	4 months
Preparation:	6 months
Implementation:	3 months
Assessment:	6 months

Estimated Cost

Surveys and planning:	$50,000
App development:	$150,000–$250,000
Hardware and implementation:	$100,000
Assessment:	$50,000
Total:	$350,000–$500,000

PROJECT NO. 2: HERITAGE SIGNBOARDS WITH QR CODES PROJECT

Key Objectives

(i) Clearly demarcate heritage zones in Luang Prabang for the public.

(ii) Raise awareness and appreciation of Luang Prabang's outstanding universal value (OUV) and diverse heritage attributes.

Lead Agency
Luang Prabang World Heritage Management Division

Location
Various locations along the border of the heritage and buffer zones

Expected Results
Modestly sized, appropriately designed signboards demarcating Luang Prabang World Heritage Site and Buffer Zone at key border intervals.

Rationale

Currently there is no visible signage to inform the public when they are entering or leaving the heritage or buffer zone. Signboards can help reinforce awareness and pride in the heritage status of Luang Prabang and signal the importance of heritage preservation. Information in QR codes invite the public to explore and understand the OUV of Luang Prabang's heritage and value it. This is an achievable and concrete action that will both help the public to recognize and appreciate the heritage site, and local authorities in communicating its boundaries and characteristics.

Details

(i) Planning: Identify key locations for regular signage of the heritage and buffer zones.

(ii) Preparation: Develop accessible, multi-language heritage information, hosted on the Luang Prabang World Heritage Management Division (LPWHMD) website, for QR codes.

(iii) Implementation: Design, produce, and install small but clear signboards in Lao, English, and Chinese that identify the border of the heritage site and buffer zones with QR codes for more information.

Timeline

Planning:	1 month
Preparation:	2 months
Implementation:	3 months

Estimated Cost

Website information development and translation for LPWHMD for QR codes:	$3,000
Surveys, community consultation, and government meetings with select locations:	$5,000
Production and installation of approximately 30 signboards:	$36,000
Total:	$44,000

PROJECT NO. 3: GROSS POLLUTANT TRAP PROJECT

Rationale

Gross pollutant traps (GPTs) will be piloted in roadside drains to improve current solid waste collection systems by managing accumulated drain litter, which have been found to obstruct water flow in drains and impact effluent quality. The prevalence of littering, especially in the Heritage Zone, is a point of concern as it leads to large accumulation of waste in drains.

Lead Agency
Public Works and Transport Office, Urban Services Office

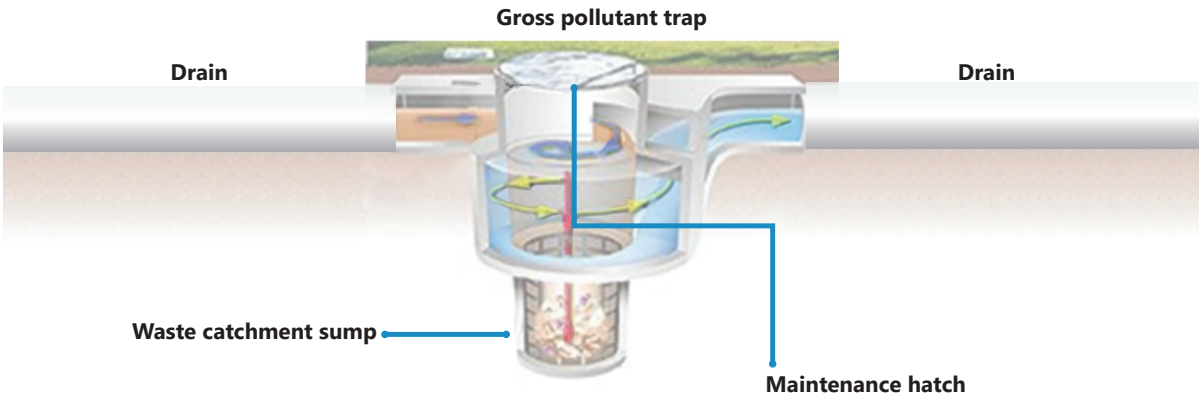
Location
To be determined

Expected Results

- Improved drain conditions with reduced occurrences of clogged drains and localized flooding.
- Improved water quality in surface water systems.

Through the physical processes of screening and sedimentation, GPTs physically separate and capture gross pollutants and store these in the waste catchment sump (as shown in the figure), allowing treated effluent to flow cleanly through to the drain. Contributing to the "Clean and Safe Environment" of the Luang Prabang Smart City vision, the installation of GPTs will support the initiative of creating clean public spaces such as roads, drains, waterways, and ponds through improved waste management processes.

Figure A1.1: Gross Pollutant Trap Concept



Source: EcoClean Technology.

Details

The project entails the following processes:

(i) A desktop study to study drainage and catchment plans so as to identify suitable areas to implement GPT units.

(ii) A site visit to validate findings from the desktop study.

(iii) The design and sizing of the GPTs according to the drain conditions and the served catchment area. GPTs can be adapted to the catchment area it serves, ranging from 1 meter by 1 meter (for a catchment area of less than 1 hectare) to 8 meters by 8 meters (for a catchment area of 250 hectares).

(iv) GPT installation.

(v) Monitoring and evaluation.

Upon successful project completion, with the GPTs' effectiveness clearly demonstrated, a follow-up project where smart GPTs (GPTs with sensors) are used may be implemented. The sensor will provide real-time alerts to the operator when the waste sump is full and requires emptying. Routine inspection and maintenance of the GPTs would be required to ensure the optimal treatment efficiency of the system.

Timeline

(i) Stage 1 – Desktop Study and Site Visit (1 month)
   (a) Study drainage and catchment plans to identify suitable areas to install GPT(s).
   (b) A site visit to evaluate identified choices for site implementation and validate findings from the desktop study.

(ii) Stage 2 – Design and Sizing (2–3 months)
   (a) Size the GPT(s) based on catchment area served.
   (b) Adapt the design of the GPT(s) to the drain(s) that it will be retrofitted to.
   (c) Develop technical documentation.

(iii) Stage 3 – Installation (2–3 months)
   (a) Procurement of GPT(s) for installation.
   (b) Installation of GPT(s).

(iv) Stage 4 – Monitoring and Evaluation (1 year)
   (a) Evaluate the effectiveness of the installation of GPT(s) in improving solid waste collection processes and assess the feasibility of citywide implementation.

Estimated Cost

Cost of a single 2 meters x 2 meters GPT unit is approximately $10,000–$20,000. Depending on the size (GPT sizes can range from 1 meter x 1 meter to 8 meters x 8 meters) and number of GPTs to be used, the cost may vary.

Preliminary estimate for overall project cost is $350,000, assuming multiple GPTs (4 to 8 GPTs) are implemented. This includes project management fees.

PROJECT NO. 4: SMART SEPTIC TANK PROJECT

Rationale

Smart septic tanks (as shown in the figure) will be piloted in the World Heritage Site (WHS), especially in areas where commercial developments were converted from residential uses without septic tank upgrades. Most tanks are not regularly desludged due to owners' lack of awareness or unwillingness, which not only damage the tanks, but also cause untreated effluent seepage into the ground and waterways.

Lead Agency
Urban Services Office

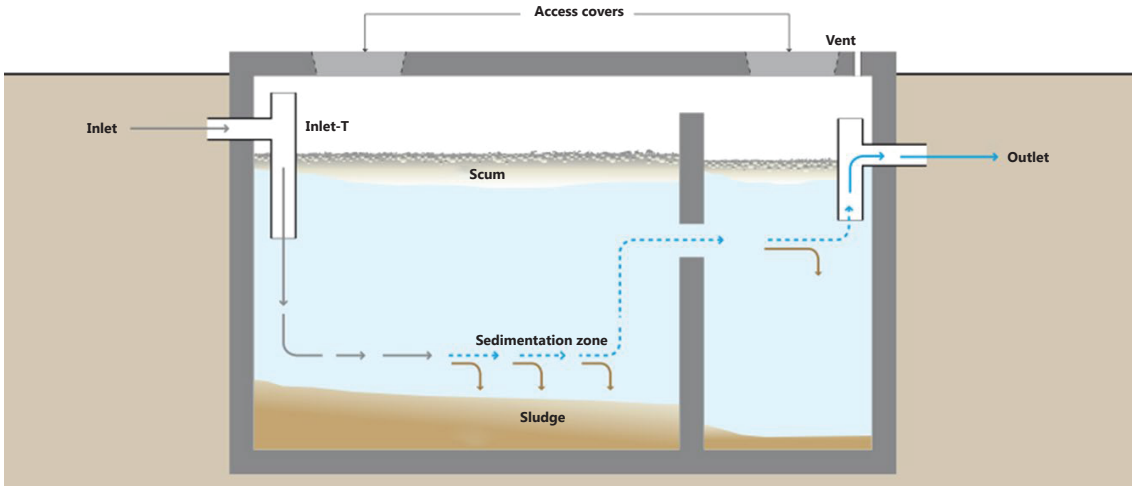
Location
To be determined

Expected Results

Improved sanitation for the World Heritage Site, specifically:

- Improved water quality in surface water bodies, and
- Improved health in the community.

Figure A1.2 : Typical Septic Tank Cross Section



Source: SMD Fluid Controls. https://www.fluidswitch.com/2015/08/10/home-septic-systems-and-the-importance-of-septic-tank-alarms/.

This project aims to address the issue of poorly maintained septic tanks which affects treatment efficiency of these tanks, and impacts effluent quality discharging into waterways and ponds. To remind owners to desludge their septic tanks, septic tanks fitted with sensors for real-time water level monitoring will help identify abnormal water levels. It will send alarms to notify owners of septic tank overflow or spillage.

Clean water and sanitation (Sustainable Development Goal 6) is critical for ensuring health and well-being of vulnerable groups; therefore, this project has high positive impact for communities in Luang Prabang. Potential pilot sites for project implementation will be determined through the following:

(i) Conduct a survey of current sewage management practices in the city to identify where there is constant effluent overflow into streams, ponds, and wetlands and/or past land use conversions.

(ii) Work with local communities and businesses to raise awareness about proper sewage management and the benefits of using septic tanks with level sensors.

(iii) Engage vendors to design and build septic tanks appropriate for the local environment and equipped with level sensors.

(iv) Train locals to properly operate and maintain the septic tanks, including monitoring the level sensors to ensure they are functioning properly.

(v) Evaluate the impact of the septic tanks on sewage management and make necessary adjustments to improve their performance.

Timeline

(i) Stage 1 – Desktop Study and Site Visit (1 month)

  (a) Study sewerage and building plans to identify suitable areas to upgrade and implement smart sensors in septic tanks.

  (b) A site visit to evaluate potential locations for implementation, validate findings from the desktop study, and engage relevant stakeholders.

(ii) Stage 2 – Design (2–3 months)

  (a) Integrate smart sensors into the design of pilot septic tanks.

(iii) Stage 3 – Installation (2–3 months)

  (a) Procure septic tank sensors.

  (b) Install septic sensors.

(iv) Stage 4 – Monitoring and Evaluation (1 year)

  (a) Evaluate the effectiveness of the smart septic tanks installation in improving maintenance of septic tank systems and improving water quality in areas where there have been constant overflow into streams, ponds, and wetlands.

Estimated Cost

Cost depends on the type of sensor used. This will be determined during the design stage (Stage 2). A basic septic sitter costs $1,395.[1]

Preliminary estimate for overall project cost is $500,000. This includes project management fees.

[1] Dynamic Monitors. https://dynamicmonitors.com/product-category/septicsitter/.

PROJECT NO. 5: VERIFICATION OF PROPOSED PEDESTRIANIZATION USING VEHICULAR AND PEDESTRIAN SIMULATION PROJECT

Rationale

To improve traffic conditions for residents, businesses, and tourists, a car-lite peninsula will be implemented within the World Heritage Site. A temporary car-free trial on Sakkaline Street is proposed, adjacent to Sisavangvong Road, which was recommended to be pedestrianized as part of the strategy.

Lead Agency
Public Works and Transport Office, City Headquarter of Security

Location
Sakkaline Street

Expected Results

- 3D vehicular and pedestrian simulation model.
- A report comprising model findings and proposed solutions.

To investigate the impact of reducing private vehicle access and necessary infrastructure upgrades required to improve pedestrian and cycling experience, a traffic microsimulation (using the Vissim software) and pedestrian model (using the Viswalk software) will be developed. The results from the simulations will provide a preliminary indication on the proposed pilot project's outcome and which solutions can be introduced to ensure the pilot project is a success. The simulation models will be used to ensure the following:

(i) To verify the street identified for pedestrianization is apt for the pilot project (Sakkaline Street vs. Sisavangvong Road).

(ii) Determine the length of the street to be pedestrianized.

(iii) Identify any impact onto surrounding streets due to the pedestrianization and if so, explore solutions to be implemented to mitigate any impact.

Area to be modeled

To develop the model, traffic and pedestrian counts will be required. Using the findings from the model, new regulations to restrict private vehicles can also be identified.

Timeline

Total duration is 9 months, with the following breakdown:

Data Collection:	2 months
Base Model Development:	2 months
Testing of Revisions and Identifying Solutions:	3 months
Stakeholder and Public Engagements:	2 months

Estimated Cost

$200,000–$400,000 depending on data collection and capacity building requirements.

PROJECT NO. 6: SMART PARK-AND-RIDE FACILITIES PROJECT

Rationale

To reduce the number of cars entering and congesting the World Heritage Site, park-and-ride facilities will be implemented in selected sites near the future Lao–China Expressway, given the expected increase in private vehicles driven by tourists. Visitors will park their private vehicles at these facilities and access the World Heritage Site through dedicated shuttles.

Lead Agency
Department of Public Works and Transport, Public Works and Transport Office

Location
To be determined

Expected Results

A report comprising of the demand forecasted, proposed location for park-and-ride and facilities required to support the pilot.

As a start, Luang Prabang will forecast travel demand to determine the size of the facilities and identify locations that best limit impact on local traffic. This will need to be accompanied by traffic regulations that prohibit cars from entering the World Heritage Site and a digital shuttle booking system.

Barrier-free designs to foster gender equality, disability, and social inclusion (GEDSI) among stakeholders will be included. Further, ensuring shuttle services are made available to vulnerable people groups such as older persons, children, women, etc., will be paramount. Solutions will be based on GEDSI stakeholder consultations and identification of needs and requirements.

Timeline

Total duration is 12 months, with the following breakdown:

Data Collection:	1 month
Forecast of Travel Demand:	1 month
Identifying Proposed Locations based on Demand:	1 month
Development of Shuttle Booking System:	2 months
Stakeholder and Public Engagements:	2 months
Construction of Facilities:	2 months
Duration of Pilot:	3 months

Estimated Cost

To be decided, following coordination with the Japan International Cooperation Agency.

APPENDIX 2: SMART CITY PROJECT LIST


LAOS
ลก 0786

Table A2.1: Pillar 1: Integrated Tourism and Heritage Destination

No.	Project Name	Project Description	Implementation Dates
1	Comprehensive Inventory of Outstanding Universal Values (OUV)	(i) Review and enhance geographic information system (GIS)-based digital inventory system to ensure existing and additional attributes and their properties can be recorded and geo-referenced, and create data fields for monitoring state of conservation, past conservation work, monitoring results, etc. (ii) Complete update and integration of existing heritage inventory into GIS-based digital inventory. (iii) Undertake inventorying and mapping of additional attributes of OUV (intangible cultural heritage, streetscape, landscape, and movable heritage) and integrate results into GIS and digital inventory. (iv) Create customizable analysis and reporting formats for state of conservation reports, and to inform management decisions. (v) Enhance capacity to maintain and operate the GIS-based digital inventory. (vi) Once established, link the heritage inventory system to the interdepartmental GIS system to facilitate data sharing and analysis.	For completing digitizing and updating the existing inventory of buildings and ponds and creating the intangible cultural heritage (ICH) inventory: **Near Term** For other attributes: **Near to Medium Term** (landscape and streetscape: 2 years, and movable heritage within 4 years).
2	Documentation and Safeguarding Policies and Regulations for All Assets Expressing OUV	(i) Complete update of safeguarding policy and regulations related to buildings and wetlands. (ii) Create additional PSMV volumes containing documentation, safeguarding policy and regulations related to streetscape, landscape and ICH, movable heritage attributes – ICH volume is a priority. (iii) Enhance institutional arrangements and capacity to integrally manage all attributes expressing OUV.	For updating the policies and regulations for buildings and ponds and creating the ICH inventory: **Near Term** For other attributes: **Near to Medium Term** (landscape and streetscape: 2 years, and movable heritage within 4 years).

Executing Agency	Cost Estimates ($)	Assessment
Department of Information, Culture and Tourism (DICT)	400,000	**Complexity: Complex** The identification, inventory, and mapping of additional attributes of OUV will require different expert teams. Moreover, the upgrade of the GIS-based inventory is technologically complex and may require expertise not available locally. **Cost: Low** No infrastructure costs but need for external expertise. **Path Dependency: No** DICT can implement this with its own authority. **Institutional Impact: Medium** Complete up-to-date GIS-based heritage inventory and map will improve the ability to analyze positive and negative impacts from urban developments on the OUV, especially when the heritage inventory is linked to, or integrated in, the planned interdepartmental GIS. **Gender Equality, Disability, and Social Inclusion (GEDSI) Impact: Low** Digital inventorying of heritage attributes with low direct community impact. **GEDSI solutions include:** (i) Conducting consultations, surveys, and input mechanisms with women, ethnic minorities, and disadvantaged groups; (ii) Specifically identifying heritage assets that can be attributed to women, ethnic minorities, and disadvantaged groups to be included in inventory; and (iii) Ensuring the heritage team includes women, ethnic minorities, and other disadvantaged groups to conduct outreach and consultations. **Urgency: High** Lack of a comprehensive, digital inventory of all attributes conveying OUV hampers assessment of impacts from developments on heritage values. UNESCO has urged the authorities to improve its capabilities in this area.
DICT	50,000	**Complexity: Intermediate** The documentation and drafting of safeguarding policies for the new categories of attributes expressing OUV will require a number of different expert teams, but is primarily internal and policy-oriented. **Cost: Low** No infrastructure costs but needs external expertise. **Path Dependency: No** **Institutional Impact: Medium** Safeguarding policy and regulations for all attribute groups that express OUV will improve the ability to inform urban planning and management and facilitate enforcement. **GEDSI Impact: Medium** GEDSI criteria will be integrated into safeguarding actions and documentation approaches, particularly for ICH. **Urgency: High** Policies and regulations need to be in place as a prerequisite for the planned urban master planning smart city project in which heritage concerns will be proactively considered.

Continued on next page.

Pillar 1: continued

No.	Project Name	Project Description	Implementation Dates
3	Heritage Impact Assessment (HIA) Regulations and Guidelines	(i) Review the National Heritage Law, Operational Guidelines for the World Heritage Convention, Guidance and Toolkit for Impact Assessment in a World Heritage Context and other relevant literature. (ii) Consult with relevant government offices. (iii) Draft HIA regulations and guidelines to identify potential adverse impacts on the attributes of OUV, authenticity and integrity of the site, and assess how they can be avoided or mitigated, applicable to the world heritage property, the buffer zone, and the wider setting (integrate with other environmental impact assessment mechanisms as appropriate). (iv) Incorporate final HIA regulations and guidelines into the PSMV. (v) Integrate the HIA regulations into urban and regional planning mechanisms to ensure that any new urban development considers heritage as part of the planning process.	**Near Term.** As capacity building work has started, preparation of the policy and guidelines can and will start as soon as possible.
4	Heritage Disaster Risk Management (DRM) Policy and Plans	(i) Review International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM)'s Disaster Risk Management manual (currently being updated to provide a strong foundation on aspects of risk preparedness for World Heritage Sites, be it from disasters or climate change impacts) and other relevant literature. (ii) Informed by the ICCROM manual and others, and in coordination with agencies involved in overall DRM planning for Luang Prabang, undertake DRM planning and policy development particularly focusing on protection of all assets expressing OUV from disasters. (iii) Implement measures and smart technologies to detect, report and trigger rapid responses to threats or actual immediate risks such as fires or floods and to monitor sites to deter and catch thieves. (iv) Build capacity on DRM for heritage attributes, O&M of the smart technologies, including sustainable financing.	**Near to Medium Term.** Within 3–4 years.

Executing Agency	Cost Estimates ($)	Assessment
DICT	50,000	**Complexity: Intermediate** Reference manuals exist, and work on HIA capacity building has begun with support from UNESCO. However, integrating HIA in decision-making processes for interventions in the buffer zone and wider setting will require interagency collaboration and establishing frameworks. **Cost: Low** No infrastructure costs but need for external expertise. **Path Dependency: No** DICT can implement this with its own authority, but interdepartmental coordination will be required. **Institutional Impact: Medium** An effective HIA system will ensure that the heritage OUV will be safeguarded in the process of designing and implementing urban improvements. A well-preserved heritage town is the basis for a successful and sustainable tourism industry and the well-being of its residents. **GEDSI Impact: Medium** HIA is primarily a technical process, but it is crucial that the process is inclusive of minority and disadvantaged groups and their heritage. There is a need to integrate GEDSI assessment criteria into guidelines and framework of HIA. **Urgency: High** Lack of or inadequate HIA has been flagged by UNESCO. Not addressing this urgently risks the placing of Luang Prabang on the World Heritage List in Danger.
DICT	50,000	**Complexity: Intermediate** DRM for World Heritage sites is multi-faceted and will require detailed risk assessment and tailored solutions for all attribute types. Integration with overall DRM for Luang Prabang will also require coordination with other agencies. **Cost: Low** No infrastructure costs but need for external expertise. **Path Dependency: No** DICT can implement this with its own authority, but interdepartmental coordination will be required. **Institutional Impact: Medium** Effective DRM will contribute to better safeguarded heritage town and a safer environment for its residents, businesses and institutions, and visitors. **GEDSI Impact: Medium** DRM is primarily a technocratic process but has opportunities for direct community impact. There is a need to ensure DRM measures integrate GEDSI indicators and approaches to ensure no disproportionate impacts on disadvantaged groups. **Urgency: Medium** Has not been specifically prioritized but will be needed to manage disaster risk.

Continued on next page.

Pillar 1: continued

No.	Project Name	Project Description	Implementation Dates
5	Tourism Management Plan	(i) Desktop review including Tourism Spatial Plan, GMS Tourism Strategy, and relevant tourism development proposals. (ii) Review tourism management plans of similar destinations. (iii) Gather and analyze tourism statistics and data sets relevant to Luang Prabang. (iv) Consult with relevant government offices, engage with community leaders, private sector, and development partners. (v) Analyze growth projections and tourism trend information. (vi) Develop a destination management framework for Luang Prabang, considering carrying capacity and sustainability criteria. (vii) Create an implementation plan and priorities.	**Near Term.** Work has commenced.
6	Tourism Site Dynamic Ticketing Systems	(i) Identify maximum visitor numbers for Phousi Hill. (ii) Create an online timed ticketing system for Phousi to control maximum visitor numbers and allow for planning by tourists and site operators. Online system to be in Lao, English, Thai, Chinese, Korean, and French. (iii) Implement dynamic pricing to charge more for high demand times and last-minute bookings.	For Phousi: **Immediate,** as a pilot project. For other sites: **Near to Medium Term** (4 years once experience with Phousi is reviewed.)

Executing Agency	Cost Estimates ($)	Assessment
DICT	40,000	**Complexity: Intermediate** Plan development will require desktop work, engagement with government offices and local communities as well as the private sector, and balance competing interests and long-term goals with short-term activities. **Cost: Low** No infrastructure costs but need for external expertise. **Path Dependency: No** DICT can implement this with its own authority. **Institutional Impact: Medium** The tourism management plan is a framework to guide the design and roll out of various smart city projects, particularly related to mobility and visitor management. **GEDSI Impact: Medium** The Plan will include mechanisms to specifically support tourism activities and businesses led by and benefiting women, ethnic minorities, and disabled groups, such as local handicrafts, microenterprises, non-Lao communities. **Urgency: High** The lack of a tourism management plan has been flagged by UNESCO and the World Heritage Committee has now explicitly requested such plan is prepared, making it a high priority.
DICT	500,000	**Complexity: Intermediate** Creating a digital system that is affordable, user-friendly, meets the needs of the destination, and can be maintained and operated by local authorities will be new. Will also require financing mechanisms to be administered by DICT. **Cost: Low** Creating ticketing systems in multiple languages with online payment capability, and no large-scale infrastructure. **Path Dependency: Yes** Will require approval of Provincial Governor's Office to set up new pricing system and to dedicate resources earned for the maintenance of the system and site. **Institutional Impact: Medium** Will create a new modality for site ticketing, which could then be replicated by others. **GEDSI Impact: Low** Digital solution for ticketing, with low direct community impact. There is a need to ensure the ticketing mechanism does not disenfranchise local people and communities who are currently involved in and benefiting from non-digital arrangement. **Urgency: High** Overcrowding is already a hazard and problem, and a DICT priority to address.

Continued on next page.

Pillar 1: continued

No.	Project Name	Project Description	Implementation Dates
7	Real-Time Tourism Site Monitoring	(i) Identify key heritage sites and activities that are candidates for tourism monitoring (i.e., Vat Xiengthong, Phousi, Kuangsi Waterfalls, Luang Prabang National Museum, Morning Almsgiving Ceremony). (ii) Prioritize sites by type and threat of impacts. (iii) Identify appropriate tools for each site. These may be digital (such as automatic sensors, CCTV, live video feeds) and low-technology (monitoring forms for site staff, regular periodic observation and reporting sessions, dedicated monitoring teams).	**Near Term.** Pilot systems and sites to be set up within next 3 years.
8	Digital Tourism Statistics	(i) Engage with DICT, Mayor's Office, and Governor's Office to identify tourism and heritage indicators and informational needs for management decision-making. (ii) Work with Tourism Development Division of DICT to identify opportunities, challenges of Luang Prabang tourism statistics gathering and compilation. (iii) Review the online Luang Prabang tourism statistics work begun in 2022 and identify realistic areas for improvement and expansion, including automatic updates from digital sources, visitor surveys, and site monitoring instruments. (iv) Prioritize needs and identify relevant divisions to source and implement the indicators over 2 years.	**Near Term.** To be implemented in tandem with site monitoring (3 years), to better inform decision-making of Visitor Management Assessment and Strategy Tool (VMAST) and Tourism Management Plan.

Executing Agency	Cost Estimates ($)	Assessment
DICT	30,000 per site (depending on method chosen)	**Complexity: Simple** Straightforward implementation of small infrastructure and periodic human monitoring solutions. **Path Dependency: No** DICT can implement this with its own authority. **Cost: Low** Individual monitoring systems are not high cost. **Institutional Impact: Medium** Regular monitoring efforts and the use of this data for decision-making will improve service delivery. **GEDSI Impact: Medium** Will ensure better monitoring of impacts on women and disadvantaged groups. These impacts will need to be assessed with a gender and social inclusion lens, i.e., how impacts are falling disproportionately on women and poorer populations. **Urgency: High** Monitoring is currently not undertaken and is important as tourism recovers post-coronavirus disease (COVID-19).
DICT	80,000	**Complexity: Simple** This will be an extension of work already begun at DICT, thus, there is a clear implementation team, needs outlined, and foundation to build upon. **Cost: Low** Key aspects of the system already live and do not require significant operational hardware or software **Path Dependency: No** DICT can implement this with its own authority. **Institutional Impact: Medium** Will help DICT to collect and share statistics for transparency and better planning by the entire sector. **GEDSI Impact: Medium** Disaggregated data (on gender, persons with disability or PWDs, and older persons) will improve the ability of the destination to meet the needs of visitors with special needs. The indicators could include number of GEDSI groups (women, PWDs, older persons) visiting and utilizing infrastructural facilities targeted to increase their accessibility. **Urgency: Medium** The process has begun and basic statistics are in the system.

Continued on next page.

Pillar 1: continued

No.	Project Name	Project Description	Implementation Dates
9	VMAST	(i) Select key VMAST indicators to monitor, integrating with the Historical Urban Landscape approach. (ii) Identify VMAST core team from heritage, tourism offices. (iii) Create a schedule and assign responsibilities for regular information gathering and meetings. (iv) Share data.	**Medium Term.** Can be implemented within 4 years to assist with more responsive management and planning.
10	Heritage Signboards with QR Codes	(i) Identify key locations for regular signage of the heritage and buffer zones. (ii) Identify or develop accessible heritage information in multiple languages for QR codes. (iii) Design and erect small but clear signboards in Lao, English, and Chinese that identify the border of the heritage or buffer zone with QR codes for more information.	**Immediate,** as a pilot project. Identified as a priority by local authorities.

Executing Agency	Cost Estimates ($)	Assessment
DICT	50,000	**Complexity: Simple** The VMAST system has already been introduced to the Luang Prabang World Heritage Management Division, and the framework has a user-friendly interface that is accessible immediately. **Cost: Low** The VMAST account is free, and simply requires planners to utilize it. No infrastructure. **Path Dependency: No** DICT can implement this with its own authority, but interdepartmental coordination will be required. **Institutional Impact: Medium** Will create a framework for broad visitor monitoring, assessment, analysis, and interventions. **GEDSI Impact: Medium** Regular monitoring of GEDSI indicators will enable site managers to be more aware of and responsive to impacts on specific communities and populations. Select GEDSI indicators will need to be regularly monitored to maximize benefits for women, disadvantaged groups, and poorer communities. **Urgency: Medium** Has not been specifically prioritized but will improve city's visitor management system.
Luang Prabang World Heritage Management Division	44,000	**Complexity: Simple** Translation, community consultation, and installation of the signboards can take place quickly within a short time frame. **Cost: Low** Involves the installation of multi-language signboards with QR codes, with no other infrastructure required. **Path Dependency: No** DICT can implement initiative on its own. **Institutional Impact: Low** Limited impact to government as this predominantly helps to raise awareness and appreciation of the heritage status of Luang Prabang among members of the public. **GEDSI Impact: Low** There is a need to ensure that: (i) Signboards do not obstruct local livelihoods or take up private land without compensation; and (ii) Signage and information are in multiple languages, and QR code information in Lao language. **Urgency: High** Identified as a priority by tourism and heritage authorities.

Continued on next page.

Pillar 1: continued

No.	Project Name	Project Description	Implementation Dates
11	New Tourism Itineraries Beyond the World Heritage Site	(i) Identify key product offers and market demand for alternative tourism attractions and activities. (ii) Identify zones with opportunities for tourism and transportation in line with the Urban Master Plan. (iii) Develop heritage interpretation activities, sites, and routes in less well-known areas of heritage property, and beyond, through direct government investment, concessions, SEZ guidelines that will draw visitors in significant numbers, generate benefits for local communities and minimize negative impacts to the Heritage property.	**Medium to Long Term.** Will be an ongoing process, in partnership with the private sector.
12	Concession and Investment Guidelines	(i) Identify priority zones for tourism development (attractions, accommodations, commercial sites) based on market needs and relevant strategies (Tourism Spatial Plan, Tourism Management Plan, Urban Master Plan). (ii) Create development guidelines and issue an invitation to tender with the Department of Planning and Investment (DPI) oversight. (iii) Vet proposals and select investment partners.	**Near to Medium Term (within 3–4 years)**. Requires Tourism Spatial Plan, Tourism Management Plan, Urban Master Plan.

Executing Agency	Cost Estimates ($)	Assessment
DICT	80,000	**Complexity: Intermediate** Mapping routes and developing new sites will require market research, surveys, coordination with urban and tourism development plans, and community engagement. **Cost: Low** Private sector investment is the priority for sustainable operation. **Path Dependency: No** Can be implemented by DICT with private sector collaboration but needs to be in line with the Urban and Tourism Master Plan. **Institutional Impact: Low** Focused on tourism development and dispersal of visitors, rather than public service delivery. **GEDSI Impact: High** Must identify tourism sites and routes that will benefit disadvantaged groups (e.g., those operated by women and disadvantaged groups), and ensure that new sites do not negatively impact or disenfranchise communities. Further assistance must be provided to women and disadvantaged groups to develop businesses and activities on these routes. **Urgency: Low** DICT would like to develop new sites and extend length of stay but management of current sites and heritage properties takes precedence.
DICT	100,000	**Complexity: Intermediate** **Cost: Low** No infrastructure costs. **Path Dependency: Yes** Coordination with the Ministry of Planning and Investment, the Department of Planning and Investment, and the Governor's Office to ensure clarity on priorities and ability to enforce these guidelines and requires completion of Tourism Spatial Plan, Tourism Management Plan, and Urban Master Plan. **Institutional Impact: High** Moving from a supply to a demand-driven approach to tourism development, and a competitive and transparent process for selecting developers, will improve the government's capability to realize its vision for the city in general and the tourism sector in particular. **GEDSI Impact: Medium** Calls for investment proposals will include gender and social inclusion criteria. This will involve: (i) Encouraging proposals with focus on gender and social inclusion; and (ii) Developing guidelines to include inclusive features in accommodation, facilities, and attractions. **Urgency: Medium** Has not been identified as an immediate priority but is needed to mobilize quality investment.

Continued on next page.

Pillar 1: continued

No.	Project Name	Project Description	Implementation Dates
13	Local Product Protection Zones	(i) Conduct assessment of current product and service offer in Luang Prabang heritage property, buffer zone, and outlying areas. (ii) Work with the DPI, Department of Commerce and Industry, and Luang Prabang Chamber of Commerce and Industry to identify priority categories of local products and services, particularly those that benefit disadvantaged groups who otherwise do not benefit from tourism and integrate into Tourism Management Plan. (iii) Create incentives for local products at night markets, shops, and vendors in town, and quotas for non-local products. (iv) In alignment with the Land Use Master Plan, allocate zones for "Lao-made only" products and separately, foreign-owned and international chain businesses.	**Near to Medium Term.** Within 3-4 years, as the encroachment of non-local products and services has already begun and is expected to exacerbate with improved transportation links.
14	Digital Heritage Pass and Charge	(i) Study and implement the legal and policy framework required to retain (a portion of) income generated from entrance tickets to tourist sites. (ii) Review heritage pass mechanisms used in other World Heritage Sites and analyze applicability for Luang Prabang. (iii) Consult with all tourist site operators (government agencies, villages) to agree on a suitable mechanism for Luang Prabang and the distribution of revenue between site operators, treasury, and heritage or tourism fund. (iv) (Re)establish the heritage or tourism fund, agree on oversight and management arrangements and use of the fund.	**Medium to Long Term.** Will require significant study, consultation, design, and piloting before being rolled out.

Source: Ramboll, 2023.

Executing Agency	Cost Estimates ($)	Assessment
DICT	150,000	**Complexity: Intermediate** Identifying priority local products and services, creating a system of quotas and incentives, and enforcing these regulations will require discussion and negotiation among agencies and stakeholders. **Cost: Low** No infrastructure costs. **Path Dependency: No** Ideally will follow the Tourism Management Plan but is not contingent on it. To link to Urban Master Plan. **Institutional Impact: Low** Focused on supporting small-scale business activity. **GEDSI Impact: High** Protecting the market access of local products (such as handicrafts, cultural activities, and regional foods) will benefit women, ethnic minorities, and disadvantaged groups who may otherwise be excluded from the tourism supply chain. This will involve: (i) Encouraging proposals with focus on gender and social inclusion; and (ii) Developing guidelines to include inclusive features in accommodation, facilities, and attractions. **Urgency: Medium** Has not been identified as an immediate priority but is needed to protect local trades and products.
Luang Prabang World Heritage Management Division	150,000	**Complexity: Complex** Would require legal and policy adjustments, and ministerial and provincial governor support. Would be a significant change to site operations and income distribution. **Cost: Low** No significant infrastructure costs. **Path Dependency: Yes** Finance law and regulations will need to be adjusted to allow for this type of financing mechanism to operate. Individual site ticketing systems would also need to be thoroughly tested first. **Institutional Impact: High** Would streamline ticketing and operationalize an advanced system of heritage site access and funding, providing the resources for improved management. **GEDSI Impact: Medium** Will create better site financing systems for investing in community-driven and responsive heritage management. **Urgency: Low** Has been identified as a priority for DICT, but with the recognition of the complexities, including addressing legal adjustments, acknowledged as a long-term goal.

Table A2.2: Pillar 2: Clean and Safe Environment

No.	Project Name	Project Description	Implementation Dates
1	District Metering Areas (DMAs)	DMAs optimize network efficiency through better leakage detection and localization of leaks or bursts through the monitoring of the flow in and out of the zones. This allows for quick and efficient leakage repair, helping to reduce nonrevenue water.	**Medium Term.** Requires more up-front work and technical capacity building than other projects.

Executing Agency	Cost Estimates ($)	Assessment
Water Supply State Enterprise of Luang Prabang (WSSE-LPB)	1,500,000	**Complexity: Complex** Although DMAs are relatively common globally, it will likely require expertise from outside of the Lao People's Democratic Republic (Lao PDR) to develop this solution. **Cost: High** High infrastructure costs for upgrading with the need for external expertise. **Path Dependency: No** This project can be implemented without waiting for other projects to finish. **Institutional Impact: High** Will increase efficiency of water supply network, enhance service delivery, and reduce operating costs for WSSE-LPB. **Gender Equality, Disability, and Social Inclusion (GEDSI) Impact: High** Enhancing delivery of clean water to communities will have a high impact on vulnerable groups. GEDSI mainstreaming will be achieved through effective data collection, including employing various modes of survey such as targeted questionnaires, key informant interviews, etc., to understand how water supply issues (e.g., intermittency of water supply, etc.) adversely affect vulnerable groups and enable solutions to be developed for more equitable access and service delivery. **Urgency: Medium** This project will help WSSE-LPB enhance its water supply service delivery, supply of clean water to communities.

Continued on next page.

Pillar 2: continued

No.	Project Name	Project Description	Implementation Dates
2	Smart Water Grid Systems	(i) Implementation of supervisory control and data acquisition (SCADA) in water treatment plants allows for control and monitoring of processes, online process optimization, and sharing of real-time data to operators. (ii) Advanced metering infrastructure (AMI) allows data from smart meters and sensor networks to be remotely collected and relayed continuously to a centralized data center such as the SCADA for real-time consumption and performance data.	**Medium Term.** Requires more up-front work, technical capacity building than other projects
3	Water Quality Sensors (i.e., biological oxygen demand, total suspended solids, conductivity, turbidity, residual chlorine sensor)	(i) Monitoring and detection of abnormal changes in water quality and water pollution (i.e., wastewater, pesticides) with installed water quality meters to ensure water quality of treated water is consistently compliant to standards. (ii) Water quality sensors do not replace the water quality management system (i.e., grab samples) but support and cross-check the system by providing real-time values.	**Near Term.** This is a simple solution that can be implemented immediately once suppliers of the sensors are identified and locations where the sensors are to be installed are identified.

Executing Agency	Cost Estimates ($)	Assessment
WSSE-LPB	2,000,000	**Complexity: Complex** Although SCADA is relatively common globally, it will likely require expertise from outside of the Lao PDR to develop this solution since they do not have any existing experience with it. **Cost: High** High infrastructure costs for upgrading with the need for external expertise. **Path Dependency: No** This project can be implemented along with other ongoing projects. This can be done in conjunction with the "Water Quality Sensors" project. **Institutional Impact: High** Will increase efficiency of water supply system, enhance service delivery, and reduce operating costs for WSSE-LPB. **GEDSI Impact: High** Enhancing delivery of clean water to communities will have a high impact on vulnerable groups. GEDSI mainstreaming will be achieved through effective data collection, including employing various modes of survey such as targeted questionnaires, key informant interviews, etc., to understand how water supply issues (e.g., intermittence of water supply, etc.) adversely affect vulnerable groups and enable solutions to be developed for more equitable access and service delivery. **Urgency: Medium** This project will help WSSE-LPB enhance its water supply service delivery and supply of clean water to communities.
WSSE-LPB	500,000	**Complexity: Simple** Adding sensors is a simple solution that WSSE-LPB could implement themselves. It can also then be integrated into a subsequent SCADA system. **Cost: Medium** Much less costly than implementing a full DMA or SCADA system. **Path Dependency: No** This project can be implemented along with other ongoing projects. This can be done in conjunction with the SCADA system for the "Smart Water Grid System" project, at a water treatment plant level. **Institutional Impact: High** Will increase efficiency of water supply system, enhance service delivery, and reduce operating costs for WSSE-LPB. **GEDSI Impact: High** Enhancing delivery of clean water to communities will have a high impact on vulnerable groups. It will be important to obtain feedback from the public about the quality of water when executing this project. This may help identify issues that poor water quality may cause with vulnerable groups. **Urgency: High** This project will help to ensure the quality of treated water from water treatment plants meets the local regulations. It can be used as a cross-check with the existing grab samples that are taken.

Continued on next page.

Pillar 2: continued

No.	Project Name	Project Description	Implementation Dates
4	Sanitation Capacity Building	(i) Training programs to be established to enhance the skills of staff and workers who are involved in the development, operation, and maintenance of sanitation infrastructure. (ii) To engage the community in the operation and maintenance of sanitation systems, particularly on-site and decentralized sanitation systems. (iii) A cloud-based app to be developed for sharing information about septic tank overflows and sending information to the responsible agencies. The app would function as a typical crowd-sourcing type app where citizens take a picture, and it is automatically geotagged and sent to relevant agencies.	**Near Term.** Requires some groundwork to develop the capacity building module, but no complex infrastructure is required, so can be done in the near term.
5	Smart Septic Tanks	(i) The USO could develop a desludging program to proactively empty septic tanks before they start to overflow. Private desludging truck operators could be engaged as part of this program. A dashboard could be developed for monitoring all desludging vehicles and operations. (ii) To improve the maintenance of septic tanks, smart septic tank systems with level sensors and real-time monitoring can be considered to alert owners using a cloud-based app to carry out maintenance.	**Immediate.** To be implemented as a pilot project.

Executing Agency	Cost Estimates ($)	Assessment
Urban Services Office (USO)	300,000	**Complexity: Simple** Does not require any complex infrastructure to implement. **Cost: Low** Cost is only related to executing capacity building workshops. If the cloud-based app is to be implemented with this, then cost of app will be included. **Path Dependency: No** This project can be implemented without waiting for other projects to finish. This can be done in conjunction with the SCADA system for the "Smart Water Grid System" project, at a water treatment plant level. **Institutional Impact: High** Will build the capacity of government agencies to manage sanitation. **GEDSI Impact: High** Clean water and sanitation (Sustainable Development Goal [SDG] 6) is critical for ensuring health and well-being of vulnerable groups. GEDSI mainstreaming in capacity building will include ensuring GEDSI disaggregated data is presented in the module, and that the module is reflective of GEDSI needs, solutions, and benefits in relation to sanitation. **Urgency: High** Good sanitation systems are urgent considering it can directly impact the health of the community.
USO	500,000	**Complexity: Simple** Does not require any complex infrastructure to implement. Sensors are straight forward. **Cost: Low** Cost of sensors are low compared to a full DMA or SCADA system. **Path Dependency: No** This project can be implemented without waiting for other projects to finish. **Institutional Impact: High** This project will support USO's operations and ensure that the environment (surface water bodies) is clean. Desludging operations can be an alternative source of income for USO if done correctly. **GEDSI Impact: High** Clean water and sanitation (SDG 6) is critical for ensuring health and well-being of vulnerable groups. The design and use of smart septic tanks such that they are inclusive for vulnerable groups will be informed by consultation with GEDSI stakeholders. **Urgency: High** Good sanitation systems are urgent considering it can directly impact the health of the community.

Continued on next page.

Pillar 2: continued

No.	Project Name	Project Description	Implementation Dates
6	Smart Septic Tank Public Education Campaign	(i) Craft a public education campaign on smart septic tanks to educate the public on the benefits of using septic tanks equipped with water level sensors. (ii) Emphasize the importance of proper maintenance of septic systems and how the water level sensor helps to ensure the system is functioning properly. (iii) Develop variety of mediums, such as brochures, posters, educational workshops, and social media posts.	**Near Term.** While it can be implemented together with Smart Septic Tanks project above, the education campaign would need to run for a longer time.
7	Smart Sludge Management	Introduce anaerobic digestors which can be considered for converting organic matter in sludge into biogas that can be used for energy production.	**Long Term.** Requires a bit more up-front work to design the system, dependent on the "smart septic tanks" project.

Executing Agency	Cost Estimates ($)	Assessment
USO	100,000	**Complexity: Simple** Does not require any complex infrastructure to implement. **Cost: Low** Does not require any complex infrastructure to execute. **Path Dependency: Yes** Dependent on implementation of smart septic tanks project. **Institutional Impact: Medium** Impact is more for the community rather than institutions, but it will help to raise awareness of USO's desludging services with the community, which can indirectly impact institutions. **GEDSI Impact: High** Clean water and sanitation (SDG 6) is critical for ensuring health and well-being of vulnerable groups. The campaign will be designed so that it targets vulnerable groups, including accessibility and inclusivity aspects. Design will be informed by consultation with these groups such that it is responsive. **Urgency: High** Good sanitation systems are urgent considering it can directly impact the health of the community.
USO	1,000,000	**Complexity: Intermediate** Anaerobic digesters are widely implemented globally but are relatively complex compared to septic tanks. **Cost: Medium** Infrastructure to implement anaerobic digestors are more costly than upgrading septic tanks. **Path Dependency: Yes** Dependent on smart septic tanks project (as regular desludging and disposal of sludge at dumpsite is required before executing this project). **Institutional Impact: Medium** Impact is more for the community rather than institutions; but it will help to raise awareness of USO's desludging services with the community, which can indirectly impact institutions. **GEDSI Impact: High** Clean water and sanitation (SDG 6) is critical for ensuring health and well-being of vulnerable groups. Anaerobic digestors can also provide an alternative energy source for communities, which can have a large social impact. **Urgency: Low** Has not been identified as an immediate priority. Requires increased technical capacity and contingent on smart septic tank project outcomes.

Continued on next page.

Pillar 2: continued

No.	Project Name	Project Description	Implementation Dates
8	Decentralized Wastewater Treatment Systems (DEWATS)	(i) Identify suitable pilot community for DEWATS. (ii) Develop clear stakeholder engagement strategy, including communication with GEDSI stakeholders. (iii) Develop DEWATS strategy and design for pilot community. DEWATS consist of four stages of treatment, including aerobic (oxygen-containing) and anaerobic (oxygen-deficient) treatment. Maintenance strategy to be included. (iv) Implement pilot DEWATS and observe results. (v) Scale to other communities.	**Medium Term.** DEWATS pilot to test out system in local community. Requires a bit more up-front work to design the system, dependent on the "smart septic tanks" project for existing developments. **Long Term.** Scale up to other communities, if successful.
9	Gross Pollutant Traps (GPTs)	(i) Incorporate GPT in the drainage system to capture sediments to allow treated effluent to flow through to the drain. (ii) Install a sensor into the GPT to provide a real-time alert to the Public Works and Transport Office (PWTO) when the waste sump is full.	**Immediate.** To be implemented as a pilot project.

Executing Agency	Cost Estimates ($)	Assessment
USO	1,000,000	**Complexity: Intermediate** DEWATS are widely implemented globally but are relatively complex compared to septic tanks. **Cost: Medium** Infrastructure to implement DEWATS are more costly than upgrading septic tanks. **Path Dependency: Yes and No** Yes (for existing developments) because smart septic tanks will be implemented first, and then DEWATS-retrofitted. No (for future developments) because DEWATS can be implemented straight away for future developments. **Institutional Impact: Medium** If DEWATS are implemented at a community level, the impact will be more for the community rather than institutions. Indirectly, it will help institutions because surface water bodies will be cleaner (i.e., less wastewater discharge to surface water bodies) **GEDSI Impact: High** Clean water and sanitation (SDG 6) is critical for ensuring health and well-being of vulnerable groups. It is critical to design DEWATS so that they are inclusive for vulnerable groups, as sanitation is a basic need. **Urgency: Low** Has not been identified as an immediate priority. Given planned septic tanks, can be implemented in the longer-term. However, a pilot DEWATS will be implemented in the medium-term, to understand learning points prior to scaling to other communities.
PWTO, USO	350,000	**Complexity: Simple** GPT as a common practice solution with minimal technical expertise needed. **Cost: Low** No significant infrastructure costs. Low operation and maintenance cost require to ensure sustainable operation. **Path Dependency: No** Can be implemented by PWTO with private sector collaboration. **Institutional Impact: Low** Focused on supporting the waste management process. **GEDSI Impact: Low** Technical solution for waste management, with low direct community impact apart from social development program for wastepickers (fewer than 20 families). **Urgency: High** To support the waste management process and reduce flooding.

Continued on next page.

Pillar 2: continued

No.	Project Name	Project Description	Implementation Dates
10	Electric Rubbish Collection Trucks	(i) Replace out-of-order trucks, improving solid waste collection regularity. (ii) Accompany with capacity building to train truck maintenance and operations.	**Near Term.** Capacity building program will be developed, and funding to be secured within the next 5 years.
11	Landfill Upgrade	(i) Upgrade landfill with modern engineering and waste treatment capabilities. (ii) Promote circular economy by introducing waste recovery facilities and explore waste-to-energy.	**Near Term.** Will be an ongoing process, in partnership with the private sector.
12	Hazard and Risk Assessment	(i) An integrated climate resilience program will start with a hazard and risk assessment to review the key hazards present in Luang Prabang, ascertain the risks posed to the city, and inform the subsequent studies in the program. (ii) Identify high risk areas, e.g., flood inundation areas by developing and calibrating relevant models. (iii) Produce hazard maps, e.g., flood maps, to serve as foundation for resilience strategies development. (iv) Update risk assessment if any climate change forecast data has been updated. (v) Define GEDSI indicators and incorporate consultation with GEDSI stakeholders.	**Near Term.** This can be started in the near term as it is a desktop study followed by stakeholder engagement.

Executing Agency	Cost Estimates ($)	Assessment
USO	100,000 per truck	**Complexity: Simple** Capacity building needed for operation and maintenance (O&M) of the new equipment. **Cost: Medium** Medium cost for supporting facilities and infrastructure. **Path Dependency: No** Can be implemented by USO with private sector collaboration. **Institutional Impact: Low** Focused on supporting service delivery. **GEDSI Impact: Low** Technical solution for services delivery, with low direct community impact. **Urgency: High** Poor service delivery already an issue for the community.
PWTO, USO	2,000,000	**Complexity: High** This will be an upgrading of the landfill site, which is currently in operation. Significant capacity building needed for sustainable operations. **Cost: High** High infrastructure costs for upgrading with the need for external expertise. **Path Dependency: No** Can be implemented by USO and PWTO with private sector collaboration. **Institutional Impact: Low** Focused on supporting the waste management process. **GEDSI Impact: Low** Technical solution for waste management, with low direct community impact. Assessment of informal waste sector to be included, such that impacts on vulnerable groups are effectively considered. **Urgency: High** Requested by USO.
Department of Public Works and Transport (DPWT)	1,000,000	**Complexity: Intermediate** Will require external consultant to execute this assessment, but it is a relatively straightforward assessment to do. **Cost: Low** Costs are low as no infrastructure required as this will just be a desktop study. **Path Dependency: No** This project can be implemented without waiting for other projects to finish. **Institutional Impact: High** Disasters are very costly to institutions, therefore this has high institutional impact. **GEDSI Impact: High** Disasters impact vulnerable groups the most, therefore this has high GEDSI impact. Critical to define GEDSI indicators early on for disaster resilience, as disasters impact vulnerable groups more significantly than the general population. **Urgency: High** Climate resilience is a priority for several government agencies.

Continued on next page.

Pillar 2: continued

No.	Project Name	Project Description	Implementation Dates
13	Flood Risk Zoning	(i) Produce flood-proof spatial plans and design, e.g., avoid locating critical infrastructure in in flood-prone areas. (ii) Develop land use processes to guide new developments and upgrading of existing developments in flood-prone areas. (iii) Prepare clear building regulations, considering high water levels to eliminate downstream flooding impact. (iv) Prepare clear action plans to relocate existing critical infrastructure and developments in flood-prone areas.	**Near Term.** Requires "High Level Hazard and Risk Assessment" to be completed first.
14	Flood Defense Mechanisms	(i) Flood defense through risk mitigation and adaptation focuses on measures that prevent stormwater from inundating urbanized areas, through implementation of infrastructure such as dikes or nature-based solutions. (ii) Detention volume can also be added through implementation of detention ponds or widening of drains or rivers. (iii) For example, the installation of GPTs can offer surface runoff pre-treatment and filter out the debris to prevent the drainage system from blocking, hence, runoff could enter the drainage and flow out of the site without obstruction.	**Near Term.** Requires "High Level Hazard and Risk Assessment" to be completed first.

Executing Agency	Cost Estimates ($)	Assessment
DPWT	500,000	**Complexity: Intermediate** Will require close coordination between the parties executing this project and government agencies, to inform existing spatial plans and policies. **Cost: Low** Does not require upgrades to infrastructure, will likely just be a review of existing policies, guidelines, spatial plans. **Path Dependency: Yes** It is best to do the high-level hazard assessment before delving into a flood risk assessment, in case there are other hazards (e.g., fires, windstorms, heatwaves) that are of higher priority than floods. Also, the flood risk assessment will be completed before proposing spatial solutions. **Institutional Impact: High** Floods are costly to institutions; therefore this has high institutional impact. **GEDSI Impact: High** Floods impact vulnerable groups the most, therefore this has high GEDSI impact. Critical to build socially inclusive approaches into spatial design. Need to study where vulnerable populations are in the city to inform spatial design and planning solutions. **Urgency: High** Climate resilience is a priority of several government agencies.
DPWT	3,000,000	**Complexity: Complex** It depends on the flood defense solutions that are to be proposed, but it can potentially be quite complex if flood gates, nature-based solutions, and dikes are proposed. **Cost: High** High infrastructure costs for upgrading with the need for external expertise. **Path Dependency: Yes** Conduct high-level hazard assessment before delving into a flood risk assessment, in case there are other hazards (e.g., fires, windstorms, heatwaves) that are of higher priority than floods. Also, the flood risk assessment will be completed before proposing flood defense solutions. **Institutional Impact: High** Floods are costly to institutions; therefore this has high institutional impact. **GEDSI Impact: High** Floods impact vulnerable groups the most, therefore this has high GEDSI impact. Critical to build socially inclusive approaches into design of flood defense solutions. **Urgency: High** Climate resilience is a priority of several government agencies.

Continued on next page.

Pillar 2: continued

No.	Project Name	Project Description	Implementation Dates
15	Social Inclusion Study, with GEDSI Mainstreaming Considerations	(i) Conduct a social inclusion study as part of the program to ensure that flood resilience measures are adapted to support vulnerable groups. (ii) Targets to mainstream GEDSI considerations to be included.	**Near Term.** Requires "High Level Hazard and Risk Assessment" to be completed first.
16	Smart Early Flood Response System	(i) Smart early warning systems with real-time data capture can be developed based on the results of the existing flood maps to ensure that communities are equipped to respond to flood events in a timely manner. (ii) Empowering communities to act for local flood resilience measures. For example, social media can be used to increase and improve the flood awareness and self-efficacy of citizens and organizations. (iii) Involving community groups (e.g., citizens, farmers, business, schools) in flood resilience measures and flood action plans. (iv) Disaster management governance to be developed, including identifying departments with clear roles and responsibilities, articulation of workflows and processes.	**Near Term.** Requires "High Level Hazard and Risk Assessment" to be completed first.

Source: Ramboll, 2023.

Executing Agency	Cost Estimates ($)	Assessment
Department of Labour and Social Welfare (DLSW)	200,000	**Complexity: Simple** Will likely involve surveys, but no complex infrastructure required. **Cost: Low** Does not require any expensive infrastructure to implement. **Path Dependency: Yes** Conduct the high-level hazard assessment before delving into a flood risk assessment in case there are other hazards (e.g., fires, windstorms, heatwaves) that are of higher priority than floods. Also, the flood risk assessment will be completed first, to inform the social study. **Institutional Impact: High** Floods are costly to institutions; therefore this has high institutional impact. **GEDSI Impact: High** Floods impact vulnerable groups the most, therefore this has high GEDSI impact. **Urgency: High** Climate resilience is a priority of several government agencies.
DLSW	500,000	**Complexity: Intermediate** It depends on the type of early warning system proposed, but likely relatively less complex than flood defense solutions (dikes, nature-based solutions, flood gates). Requires coordination with the Ministry of Energy and Mines (in relation to hydropower dams). **Cost: Medium** Depends on the emergency response system proposed, but likely will be less costly than the "flood defense" project and more costly than "zoning" project. **Path Dependency: Yes** Conduct the high-level hazard assessment before delving into a flood risk assessment in case there are other hazards (e.g., fires, windstorms, heatwaves) that are of higher priority than floods. Also, the flood risk assessment will be completed before proposing emergency response solutions. **Institutional Impact: High** Floods are costly to institutions; therefore this has high institutional impact. **GEDSI Impact: High** Floods impact vulnerable groups the most, therefore this has high GEDSI impact. Critical to build socially inclusive approaches into design of emergency warning systems and be closely coordinated with the "Flood Defense" and "Flood Risk Zoning" projects. **Urgency: High** Climate and disaster resilience is a priority of several government agencies.

Table A2.3: Pillar 3: Sustainable Villages and 15-Minute City

No.	Project Name	Project Description	Implementation Dates
1	Integrated Transport Strategy	(i) Develop an integrated future transport strategy which considers a multimodal transport network, i.e., private vehicles, public transport (buses), cyclists, pedestrians, etc.; best practice planning approaches such as "movement and place" and the interaction between transport and urban planning; the role of innovative and future technologies, i.e., electric vehicles, etc.; and how to ensure that the transport network is reliable, connected, and accessible for all users. The strategy will set the vision for the next 20 to 40 years, as well as outline the objectives and the strategic infrastructure plan to achieving the vision. (ii) Develop transport network plans, integrated but also for individual modes, for the city, and surrounding areas, in collaboration with the urban and city planning department, to assist in mapping the future vision. This will support the targeting of priority transport projects.	**Near Term.** Works to develop an integrated transport strategy to start as soon as possible to map the future vision and subsequently prioritize transport projects.
2	Strategic Transport Model	(i) Develop a strategic travel model for Luang Prabang using captured and forecasted traffic and travel data. (ii) Train and upskill department officials and employees who will develop, operate, and manage the strategic transport and travel model.	**Medium to Long Term.** Various transport inputs are required before the model can be developed hence it will be the most useful if developed medium to long term.

Executing Agency	Cost Estimates ($)	Assessment
Department of Public Works and Transport (DPWT)	1,300,000	**Complexity: Complex** Developing an integrated future strategy would require DPWT to share the same transport vision with other stakeholders such as the Ministry of Public Works and Transport (MPWT). Technically this is at an intermediate level, however, the complexity comes in with the consultation and alignment across multiple departments and stakeholders. Multiple stakeholder engagements will be required to derive a vision and subsequently to agree upon proposed strategies. **Cost: Low to Medium** No infrastructure costs but need for external expertise and thorough consultation. **Path Dependency: No** Future strategy can be developed with other stakeholder engagements. **Institutional Impact: High** With a vision and strategy set in place, the DPWT will have various goals to work toward in achieving the ultimate vision and prioritize transport projects. **Gender Equality, Disability, and Social Inclusion (GEDSI) Impact: Medium** The strategies developed will be aimed at improving people's travel experience and if implemented, they will directly benefit. Consultations and surveys will also be conducted to identify socially inclusive solutions. **Urgency: High** With various other developments proposed within Luang Prabang to boost the economy, it is crucial that the mobility network is prepared to support the developments. Hence, a strategy is very urgent to direct the development of the mobility network.
DPWT	1,300,000	**Complexity: Complex** Developing a transport model will require a detailed understanding of the simulation software which department officials will need to be trained in. Other parameters such as traffic volumes and plans for the model area will be required before developing the model. **Cost: Low to Medium** No infrastructure costs but need for external expertise for training and development of the model. **Path Dependency: Yes** Training of officials and collection of data input is required before a model of the existing scenario can be developed. To develop a model of future scenarios, the future vision needs to be developed. **Institutional Impact: Medium to High** With a strategic transport model, various transport scenarios and solutions can be tested and compared as the city develops, and population and travel demand increases. This can become a very useful planning tool. **GEDSI Impact: Low** A model will not directly impact the community till the projects are implemented. Consultation with GEDSI stakeholders is required to serve as input to the model to ensure that the model reflects GEDSI considerations. **Urgency: Low** Other projects will take priority over this project.

Continued on next page.

Pillar 3: continued

No.	Project Name	Project Description	Implementation Dates
3	Digital Traffic Database	(i) In conjunction with the rollout of smart infrastructure at intersections and along corridors, develop a smart database to capture and analyze the data being captured. (ii) Establish key performance indicators to be reported against based on the data for real-time and accurate understanding and reporting of the network's performance, i.e., travel time reliability, number of incidents, modal split percentage, etc.	**Near Term.** Traffic data will be collected regularly, and record created to support studying movement patterns in the transport network.
4	Traffic Microsimulation	Develop a traffic microsimulation for the city.	**Near Term.** Will require various transport inputs to develop model. Pilot area will be the peninsula.

Executing Agency	Cost Estimates ($)	Assessment
DPWT, Public Works and Transport Office (PWTO)	1,300,000	**Complexity: Intermediate** Traffic data collection is not a tedious process if the appropriate digital tools are used. However, installing smart sensors, creating a central data hub, and analyzing the data will require training. **Cost: Medium to High** Traffic survey equipment are expensive. Additional costs may be incurred if the survey jobs are to be outsourced to an external company. Creating a database hub with the required hardware and facilities can be expensive. **Path Dependency: No and Yes** No. The manual collection of data through surveys and data acquisition by third party service providers can be done now. Yes. The support and analysis systems can be set up independently, but capturing and collecting the data depends on the roll out of the smart sensors and infrastructure, etc. **Institutional Impact: High** With the collected traffic data, various forecasts can be made, and they could also be used as parameters in simulations, which would allow the institution to make a more informed decision. **GEDSI Impact: Low** The database will not have a direct impact on the community. Data required to study GEDSI within the transport network can be collected through various modes of survey and consultation to ensure GEDSI needs are reflected. **Urgency: High** Traffic data is very important to identify travel behaviors and traffic patterns, subsequently studying and making informed decisions. This is an important baseline study for other transport planning.
PWTO, City Headquarter of Security (CHOS)	535,000	**Complexity: Intermediate** Developing a transport model will require a detailed understanding of the simulation software, which department officials will need to be trained in. Other parameters such as traffic volumes and plans for the model area will be required before developing the model. **Cost: Low** No infrastructure costs but need for external expertise for training and software. **Path Dependency: Yes** Training of officials and collection of data input is required before a model of the existing scenario can be developed. To develop a model of future scenarios, the future vision needs to be developed. **Institutional Impact: Medium** With a simulation model, various transport solutions can be compared and subsequently be pitched to potential investors. **GEDSI Impact: Low** Models will not directly impact the community until the projects are implemented. **Urgency: High** With various other developments proposed within Luang Prabang to boost the economy, it is crucial that the mobility network is prepared to support the developments. Hence, the use of microsimulation models to inform planning and development decisions to the mobility network is needed.

Continued on next page.

Pillar 3: continued

No.	Project Name	Project Description	Implementation Dates
5	Signalized Intersections and Movement Corridors	(i) Undertake a detailed assessment of intersections and transport corridors to identify the key intersections and major corridors at and along which signals, smart sensors, and data collection infrastructure will be installed. (ii) Develop traffic models to test and refine the proposed signalized upgrades to determine the optimum network configuration, intersection configurations and layouts, queuing lane lengths, signal phasing, etc. (iii) Install the signals, smart sensors, and data capturing infrastructure and undertake the necessary infrastructure upgrades at the identified intersections and along transport corridors. (iv) Setup the support systems and technology required to control and manage the signalized system from a central traffic management control center or similar. (v) Train and upskill department officials and employees who will manage and control the signalized system.	**Medium Term.** While there is an increase in congestion and traffic accidents, signalization requires extensive traffic data to be collected, traffic models to be developed, and employee capacity to be upgraded prior to implementation.
6	Traffic Simulation Capacity Building	(i) Train and upskill department officials and employees who will develop, operate, and manage the simulations. (ii) Train and upskill department officials and employees who control, operate, and management the traffic management system.	**Near Term.** Training is critical before signalization can be implemented. This will then enhance the transport network efficiency.

Executing Agency	Cost Estimates ($)	Assessment
PWTO, CHOS	1,300,000	**Complexity: Complex** Before signalized junctions can be implemented, a series of studies is required which includes simulations. Once the signalized junctions are implemented, operation and maintenance of the system requires technical skills. **Cost: High** Besides having to pay for the studies, implementation and maintenance of the infrastructure, signals, and controls software are expensive. **Path Dependency: Yes** Implementation of signalized intersections is dependent on prior studies and upskilling of employees who will be operating the systems. **Institutional Impact: High** Signalization will further optimize the transport network ensuring efficient movement of transport and goods. **GEDSI Impact: High** Signalization will also improve safety for pedestrians and cyclists. Zones with vulnerable groups of people such as older persons and school zones, etc., and longer pedestrian crossing timings can be implemented. Road speed limits can also be moderated to ensure safety for these groups of people. **Urgency: Medium** With the increase in congestion and traffic accidents, there is a need to study signalization feasibility.
PWTO, CHOS	1,300,000	**Complexity: Intermediate** Experts (potentially from overseas) will be required to train and upskill the officials. **Cost: Medium** Experts (potentially from overseas) will be required to train and upskill the officials. **Path Dependency: No** Training can begin without the completion of any prior tasks. **Institutional Impact: High** Training is critical before signalization can be implemented, which will then enhance the transport network efficiency. **GEDSI Impact: Low** No direct impact to the community until the signalization is implemented. **Urgency: High** Training is critical to facilitate traffic modeling and before signalization can be implemented, which will then enhance the transport network efficiency.

Continued on next page.

Pillar 3: continued

No.	Project Name	Project Description	Implementation Dates
7	Public Bus Services and Shuttles	(i) Undertake a study to identify the key movement corridors and destinations to and from which people commute to determine an initial public transport bus network. Consider using zero emissions buses, preferably battery electric buses. Travel demand modeling can be performed to optimize the routes, bus stop locations, fleet size and service scheduling. (ii) Identify and locate a suitable site for a bus depot and design based on fleet size and charging requirements. (iii) Investigate the ticketing system and requirements for users of the public transport bus system. (iv) Determine the policy and legislative requirements to allow for public transport services in Luang Prabang.	**Near Term.** The planning studies will be started urgently with the implementation following after.
8	Mobility-as-a-Service (MaaS)	(i) Undertake a study to determine the feasibility of on-demand and/or other smart mobility solutions in Luang Prabang. This would require consultation and engagement with government and private operators to agree on the operational requirements and service agreements. There could be opportunity to incentivize the use of electric vehicles to provide the on-demand and ride-sharing services to promote the sustainable transport shift. (ii) Determine the policy and legislative requirements to allow for public transport services in Luang Prabang.	**Long Term.** MaaS will be a longer-term project in terms of prioritization. Other mobility projects, i.e., public buses, park-and-ride, etc. can be established first.

Executing Agency	Cost Estimates ($)	Assessment
PWTO	1,300,000	**Complexity: Complex** There is a level of technical complexity in determining the bus routes and servicing schedule, bus fleet size, depot requirements, and operational and ticketing model. **Cost: High** Bus fleet procurement, infrastructure upgrades and operation costs. **Path Dependency: Yes** Dependent of the integrated transport strategy and traffic data. **Institutional Impact: High** Providing public transport will have a significant impact on PWTO. **GEDSI Impact: High** Providing public transport will greatly improve accessibility and connectivity for the public. There is a need to conduct data gathering and consultation to understand GEDSI context and needs. **Urgency: Yes** Public transport is an alternative to reduce car and van dependence, especially by visitors within the World Heritage Site.
DPWT, PWTO	1,180,000	**Complexity: Complex** There is a level of technical complexity in developing a MaaS platform, which incorporates all modes and services to provide a quality service. This will require internal and external expertise. **Cost: Medium** No physical infrastructure costs but development of the software systems and platforms to create and support MaaS can be expensive. **Path Dependency: Yes** Dependent on the integrated transport strategy and traffic data. **Institutional Impact: High** Providing MaaS will have significant impact on PWTO, DPWT, and the operations department. **GEDSI Impact: High** Providing a MaaS offering will greatly improve accessibility and connectivity for the public. This would include: (i) Solutions to cater for slow mobility and less mobile users; and (ii) Ensuring public transport services are made available in zones with vulnerable groups of people, such as the elderly and children (school zone), etc. **Urgency: Low** Other services and mobility options are more of a priority. Private sector MaaS providers exist.

Continued on next page.

Pillar 3: continued

No.	Project Name	Project Description	Implementation Dates
9	Smart Park-and-Ride Facilities	(i) Undertake a study to identify and determine optimum locations for future park-and-ride facilities to accommodate the forecasted visitor demand. (ii) Feasibility study into the design of the facilities, i.e., facility layout and configuration, number of park-and-ride bays, services required, and operational requirements. (iii) Study to include scheduling of services to and from the park-and-ride facilities to the various key destinations. (iv) Investigate the ticketing and tariff system and requirements for users of the park-and-ride facilities. (v) Determine the policy and legislative requirements to allow for park-and-ride services in Luang Prabang.	**Immediate.** To be implemented as a pilot project. This project will help address the increasing congestion problems in Luang Prabang.
10	Car-Lite Peninsula Study	(i) Conduct a study into the conversion of the Peninsula and Sisavangvong Road into a car-lite, pedestrian and cyclist friendly precinct with limited private motorized vehicular access. (ii) The study would require traffic and pedestrian modeling to understand flows and movements within and around the car-lite precinct. (iii) Assess the potential providing supporting feeder bus and shuttle services to bring and take visitors to and from the area with dedicated pickup and drop-off areas assigned for such services. (iv) Vehicles would only be permitted with passes for full-time residents, disabled, and deliveries.	**Near Term.** This project will help with addressing the increasing congestion problems.

Executing Agency	Cost Estimates ($)	Assessment
DPWT, PWTO	1,100,000	**Complexity: Intermediate** This solution will require studies to identify the best park-and-ride locations, infrastructure requirements, and implementation of smart technology. **Cost: High** Infrastructure for parking facilities, implementation of smart technology, and creating a task force to operate the technology will be costly. **Path Dependency: Yes** Studies will first need to be conducted, after which parking spaces need to be introduced before implementing the policy. **Institutional Impact: Medium** Traffic congestion may be reduced which would result in optimum movement of goods and people. **GEDSI Impact: Medium** With the park-and-ride system, congestion on the roads may be reduced, allowing for a safer travel experience to other road users. There is a need to consider: (i) Barrier-free designs to foster inclusivity of GEDSI stakeholders; and (ii) Ensuring shuttle services are made available to vulnerable people groups such as older persons, children, women, etc., and are based on GEDSI stakeholder consultation and identification of needs and requirements. **Urgency: High** This project will help with addressing the increasing congestion problems caused by foreign and domestic nonresident visitors driving private vehicles into Luang Prabang.
PWTO	1,300,000	**Complexity: Complex** Various studies and simulations will be required to weigh the benefits of creating a car-lite precinct before implementing it. **Cost: Medium** Training locals to develop a model or engaging external parties to do a model will incur costs. However, there will be no significant implementation costs. **Path Dependency: Yes** Traffic data and studies are required before a car-lite area can be implemented. **Institutional Impact: Medium** Traffic congestion may be reduced, which would result in optimum movement of goods and people. **GEDSI Impact: High** Creating car-lite precincts will provide a more conducive and safer network for slow mobility transport. Barrier-free routes can be designed to cater to GEDSI needs. **Urgency: High** This project will help with addressing the increasing congestion problems within the World Heritage Site.

Continued on next page.

Pillar 3: continued

No.	Project Name	Project Description	Implementation Dates
11	Cycling Network	(i) Undertake a study to develop strategic network plans and designs for connected and accessible cycling networks within identified precincts within Luang Prabang. (ii) Prioritize key linkages for construction and/or upgrading to facilitate a shift to adopting cycling as a safe and preferred mode. (iii) Ensure that the strategic plans align with the Integrated Transport Strategy.	**Long Term.** Project does not address any immediate challenges.
12	Traffic Education Campaign	(i) Develop educational campaigns and programs to assist residents of Luang Prabang to understand the rules and regulations of the new transport systems and services to be provided, i.e., how and what various traffic signals mean, how the bus services are to be used, etc. (ii) Upskill and educate government and DPWT and PWTO officials in the traffic rules, technical capabilities to operate and manage the proposed smart solutions (modeling, traffic management systems, etc.), bus driving training, traffic law enforcement, etc. (iii) Investigate the potential for working with schools and universities to design specific programs and courses to upskill students and government employees in the required technical areas required.	**Near Term.** Educational campaigns can begin once the strategies are confirmed, and various supporting infrastructures are ready to be implemented. Campaigns must be timed right along with the timeline of the proposed strategies to ensure people benefit from the campaign.

Executing Agency	Cost Estimates ($)	Assessment
PWTO	1,300,000	**Complexity: Simple** Desktop study aligned with the integrated transport strategy proposed. **Cost: Medium** There will be infrastructure upgrades required. **Path Dependency: No** Study can proceed without having to wait for completion of any other projects. **Institutional Impact: Low** Does not directly impact the efficiency of the institution. **GEDSI Impact: Medium to High** With the provision of cycling paths, these users will be ensured safety and hence encouraged to cycle more. Barrier-free routes can be designed to cater for GEDSI needs. **Urgency: Low**
DPWT, PWTO	1,300,000	**Complexity: Intermediate** Educational campaigns need to be conducted regularly to encourage change in public's travel behavior patterns. Various rounds of workshops will also be required to aid in the upskilling of government officials. **Cost: Medium** No infrastructure costs but need for external expertise for training and community engagement. **Path Dependency: Yes** The campaigns can only be rolled out once the various transport strategies are ready to be implemented. **Institutional Impact: High** The educational campaigns are crucial in ensuring people follow the rules and hence allow for the transport network to work optimally. **GEDSI Impact: High** Educational campaigns will also highlight how various groups of transport users are to be prioritized at different areas of the network ensuring equality between the different types of users. Ensure the education campaigns are targeted for all groups of people including schools, community spaces etc. **Urgency: High** Educational campaigns can begin once the strategies are confirmed and various supporting infrastructures are ready to be implemented. Campaigns must be timed right along with the timeline of the proposed strategies to ensure people benefit from the campaign.

Continued on next page.

Pillar 3: continued

No.	Project Name	Project Description	Implementation Dates
13	Urban Growth Boundary (UGB)	(i) Develop policy to restrict development at the fringe of the urban area or UGB. It will exclude the preserved nature zones. (ii) Introduce a development process that prohibits urban development outside the UGB. (iii) Digitize the UGB on a geospatial format that can be used in GIS. (iv) Setting the UGB will be based on careful analysis of ecological sensitivity, environmental carrying capacity, and land use efficiency. (v) The urban limit identified in the 2012 Urban Planning Regulations for Luang Prabang could be the adopted UGB.	**Near Term.** Requires Tourism Spatial Plan and the Tourism Management Plan.
14	Smart Urban Village Guidelines	(i) Propose smart technologies to improve living conditions applicable to a new urban village, e.g., electric vehicle charging, smart sanitation systems, etc. (ii) Draft guidelines that can be scaled to other villages.	**Medium Term.** Will be an ongoing process, in partnership with the private sector.

Executing Agency	Cost Estimates ($)	Assessment
DPWT, PWTO	Part of the Luang Prabang Integrated Urban Master Plan and Framework	**Complexity: Complex** High-level urban plan, which requires ministerial and provincial governors' support in the establishment of new regulation and policy. **Cost: Medium** Cost needed for digitalization process and creating GIS system. No large-scale infrastructure. **Path Dependency: Yes** Coordination with DICT and Governor's Office to ensure clarity on priorities. Needs to be developed in tandem with the Tourism Spatial Plan and Tourism Management Plan. **Institutional Impact: Medium** This would create a framework for land use and citywide development control. **GEDSI Impact: Low** UGB is primarily a high-level development control framework with minimal community impact. **Urgency: High** The UGB needs to be in place to limit the continuous uncontrolled urban sprawl.
PWTO	500,000	**Complexity: Complex** Requires discussion and negotiation among agencies and stakeholders to develop guidelines and translated into a clear, implementable plan. **Cost: Low** No infrastructure costs but need for external expertise. **Path Dependency: No** Can be implemented by PWTO with private sector collaboration. **Institutional Impact: Medium** Will require identifying a new development model to implement smart technologies, which could then be replicated in other villages. **GEDSI Impact: Medium** Identify areas that will affect vulnerable groups and ensure that the proposed development does not negatively impact the communities. **Urgency: Medium** Has not been specifically prioritized but will be helpful to guide the development of planned villages to support future growth. If successful, can be scaled.

Continued on next page.

Pillar 3: continued

No.	Project Name	Project Description	Implementation Dates
15	Urban Design Guidelines (UDGs)	(i) Develop consistent design standards for urban components, including the development guidelines for building, open spaces, public realm, and landscape. (ii) Urban design guidelines for the peninsula and the new urban villages around the high speed railway station could be the focus areas to establish the UDGs.	**Medium Term.** Will require data collection and site survey before establishing the guidelines.
16	Digital Construction Permit Application	(i) Propose detailed land development application and approval process. (ii) Establish database for development guidelines to monitor the development activities.	**Long Term.** Will require capacity building, technical expertise, and support for the digitalization process. Funding needs to be secured for operation and maintenance in the future.

Source: Ramboll, 2023.

Executing Agency	Cost Estimates ($)	Assessment
DPWT	500,000	**Complexity: Simple** Relatively straightforward to establish the guidelines. Implementation enforcing these guidelines will require discussion and negotiation among agencies and stakeholders. **Cost: Low** No infrastructure costs but need for external expertise. **Path Dependency: No** DPWT can implement this with its own authority, but interdepartmental coordination will be required. **Institutional Impact: Medium** Establish new design-controlled guidelines, which could then be replicated by others. **GEDSI Impact: Medium** Include universal design that will cater to the needs of all regardless of age, disability, or other factors. Inclusive design elements required to support vulnerable groups in all components. **Urgency: Low** The Plan de Sauvegarde et de Mise en Valeur is currently in place and the proposed UDGs will be used as the supplementary document to enhance the existing regulation.
DPWT, PWTO	200,000	**Complexity: Intermediate** Creating a digital system that is affordable, user-friendly, and can be maintained and operated by local authorities will be new. Will also require financing mechanisms to be administered by DPWT and PWTO. **Cost: Medium** Cost needed for digitalization process. No large-scale infrastructure. **Path Dependency: No** DPWT and PWTO can implement this with their own authority, but interdepartmental coordination will be required. **Institutional Impact: High** Would improve enforcement and enhance monitoring of the development activities. **GEDSI Impact: Low** Digital solution for regulatory control and enforcement, with low direct community impact. There is a need to ensure that relevant GEDSI indicators and criteria are incorporated in guidelines and processes. **Urgency: Low** Has not been identified as an immediate priority.

Table A2.4: Integrated Spatial Planning

No.	Project Name	Project Description	Implementation Dates
1	Luang Prabang Integrated Urban Master Plan and Framework	(i) Establish a comprehensive planning framework, which guides the strategic development direction of the key aspects: heritage and tourism, sustainable transport system, climate-responsive infrastructure, and sustainable urban development. (ii) Develop a holistic urban plan, which integrates the key aspects of Luang Prabang urban development: heritage and tourism, transport system, and land use and infrastructure system. (iii) Details of the urban master plan and framework needs to include spatial plan, land use zoning system, and urban development control. Specific plans for new areas, e.g., around the high speed railway (HSR) station, to be drafted. (iv) Engagement with stakeholders to be included as part of the plan development process.	**Near Term.** Requires Tourism Spatial Plan and Tourism Management Plan.
2	Interdepartmental Geographic Information System (GIS)	(i) Create an interdepartmental data sharing platform and use this to inform decision-making toward development planning. (ii) The system is hosted and managed by agencies, and the individual data sets are provided and managed by the respective sectoral offices and ministries.	**Near Term.** Will require capacity building, technical expertise, and support in digitalization process. Funding needs to be secured for operation and maintenance in the future.

Source: Ramboll, 2023.

Executing Agency	Cost Estimates ($)	Assessment
Ministry of Public Works and Transport, (MPWT); Department of Housing and Urban Planning (DHUP)	1,000,000	**Complexity: Complex** High-level master plan which requires coordination of many agencies (Department of Public Works and Transport [DPWT], Department of Information, Culture and Tourism [DICT], Department of Planning and Investment, etc.) at ministerial and provincial levels. **Cost: Low** No infrastructure costs. **Path Dependency: Yes** Coordination with different agencies to ensure clarity on priorities. Need to be developed in tandem with the Tourism Spatial Plan and Tourism Management Plan. **Institutional Impact: Medium** Will create a framework for development control covering all aspects of urban development. **Gender Equality, Disability, and Social Inclusion (GEDSI) Impact: Medium** Identify development strategies that will benefit vulnerable groups. Include mechanisms specifically supporting activities and businesses led by and benefiting women, ethnic minorities, persons with disabilities, and other marginalized and vulnerable groups. **Urgency: High** Integrated master plan framework needs to be in place to facilitate and guide coordinated smart city development.
MPWT, DHUP	1,000,000	**Complexity: Complex** Advanced technology tools which require capacity building and supporting infrastructure (software and hardware) for the system to operate efficiently. **Cost: Medium** Budget needed for supporting infrastructure (computer) and operating system (GIS). No large-scale infrastructure. **Path Dependency: Yes** Data collection and consolidation will need to operate independently within the agencies before uploading onto the centralized system. **Institutional Impact: Medium** Will help agencies to collect and share data for better planning and decision-making. **GEDSI Impact: Low** Digital solution for data management, with low direct community impact. Include disaggregated demographic data such as gender, age, and disability in the system. **Urgency: Medium** An interdepartmental GIS is needed to facilitate sharing of data and improved urban planning decision making by departments.

Table A2.5: Data Management and Governance Framework

No.	Project Name	Project Description	Implementation Dates
1	Smart Data Management and Governance Framework	Establish a clear data management and governance framework considering data quality, security, standards, and processes to support implementation of smart city strategies, especially those that cut across all three pillars.	**Near Term.** Will require capacity building, technical expertise, and support in digitalization process.
2	Smart City Platform (SCP)	(i) Develop an SCP to serve as the central hub that controls the flow of information within the smart city ecosystem. (ii) Consider data architecture, storage systems, and other data governance and workflows developed in the Smart Data Management and Governance Framework.	**Long-Term.** Requires Smart Data Management and Governance Framework to be in place. Likely to require a financing structure different from typical infrastructure projects.

Source: Ramboll, 2023.

Executing Agency	Cost Estimates ($)	Assessment
Department of Technology and Communications (DTC)	1,000,000	**Complexity: Complex** The framework must be put in place to support other smart city projects to enable data collection and sharing. **Cost: Medium** Requires external expertise to investigate data sources and requirements and proposed data governance framework and systems to facilitate data sharing. **Path Dependency: No** **Institutional Impact: High** Project will develop a standardized approach toward data collection, sharing, and coordination. **Gender Equality, Disability, and Social Inclusion (GEDSI) Impact: Medium** Potential to benefit vulnerable groups through front-end applications. Addressing GEDSI-related public needs and opportunities to ensure an equal, diverse, and inclusive city. **Urgency: Medium** Has not been specifically prioritized but will be conducted in tandem with the interdepartmental geographic information system.
DTC	2,000,000	**Complexity: Complex** An operations center must be established to maintain and operate the SCP, which implies the integration of services from the multitude of external (and internal) vendors. **Cost: Medium** Requires software development or license and need for external expertise. **Path Dependency: Yes** This project depends on the Smart Data Management and Governance Framework to be developed prior to implementation. **Institutional Impact: High** SCP will operationalize the collection, storage, processing, analysis, and sharing of data across city agencies. **GEDSI Impact: Medium** Potential to benefit vulnerable groups through front-end applications. Addressing GEDSI-related public needs and opportunities to ensure an equal, diverse, and inclusive city. **Urgency: Low** Has not been specifically prioritized. Will require the Smart Data Management and Governance Framework to be developed before implementation.

ABOUT THE ASEAN AUSTRALIA SMART CITIES TRUST FUND

The ASEAN Australia Smart Cities Trust Fund (AASCTF) assists ASEAN cities in enhancing their planning systems, service delivery, and financial management by developing and testing appropriate digital urban solutions and systems. By working with cities, AASCTF facilitates their transformation to become more livable, resilient, and inclusive, while in the process identifying scalable best and next practices to be replicated across cities in Asia and the Pacific. The Trust Fund is supported by the Government of Australia through the Department of Foreign Affairs and Trade, managed by the Asian Development Bank, and implemented by Ramboll.

ASEAN AUSTRALIA SMART CITIES TRUST FUND
Asian Development Bank

Australian Government
Department of Foreign Affairs and Trade

ADB