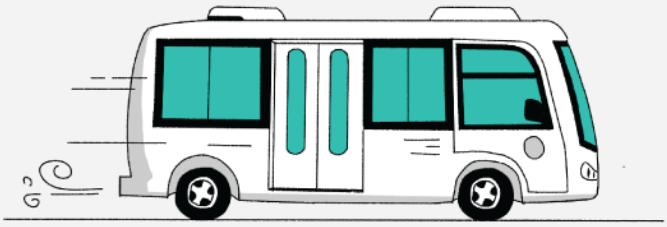

Lao PDR: Fostering Green Mobility in Luang Prabang

Vision, Strategies & Financing

June 2022

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Abbreviations

Abbreviation	Definition
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BRT	Bus Rapid Transit
CDIA	Cities Development Initiative for Asia
CEPTED	Crime Prevention Through Environmental Design
CTF	Climate Trust Fund
DHUP	Department of Housing and Urban Planning
DICT	Luang Prabang Provincial Department of Information and Culture
DOR	Department of Roads
DOT	Department of Transport
DPL	Department of World Heritage
DPWT	Department of Public Works and Transport
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GIS	Geographic Information System
GMI	Green Mobility Index
JICA	Japan International Cooperation Agency
LPSEZ	Luang Prabang Special Economic Zone
MICT	Ministry of Information, Culture and Tourism
MOF	Ministry of Finance
MPI	Ministry of Planning and Investment
MPWT	Ministry of Public Works and Transport
NMT	Non-Motorized Transport
NSEDP	National Socio-Economic Development Plan
O&M	Operations and Maintenance
PCU	Project Coordination Unit
PDR	People's Democratic Republic
PSMV	1999 Plan de Sauvegarde et de Mise en Valuer or Safeguarding and Preservation Plan
SEDP	Socio-Economic Development Plan
TR	Technical Report
UDAA	Urban Development Administration Authority
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USO	Urban Services Office
UTMS	Urban Transport Management Section
VCOMS	Vientiane City Office for Municipal Service
VCSBE	Vientiane Capital State Bus Enterprise
VSUTP	Vientiane Sustainable Urban Transport Project
WHZ	World Heritage Zone
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WHZ	World Heritage Zone

Context

Luang Prabang City Profile

Luang Prabang is a city in northern Lao People's Democratic Republic (PDR), with its declared UNESCO World Heritage Zone (WHZ) since 1995. Luang Prabang is one of the main tourist attractions in Lao PDR with a total population of 66,800 in the urbanized city area (with a total area of 857km^2) and 463,000 in the province of the same name (with a total area of 16,875km^2).[1] District-level forecasts are only out to 2035. Luang Prabang District is expected to grow to around 115,000 residents by 2035, some 25% growth compared to 2015, and maintain its position as the largest in the Province.[2] By 2045, the provincial population is projected to increase by some 70,000 residents (from that in 2015), equivalent to an average annual increase of 0.5%.[3]

Socio-Economic Context

Key socio-economic data are as follows:

- **Population Growth and Composition**[4] – Luang Prabang Province's population has been relatively steady over the 2010-2019 period, with minimal growth in population. An annualized growth rate of 0.4% over this period was recorded, which is lower than the national average of 1.5%. The male-female ratio in 2019 is 50.3% to 49.7%, which is slightly higher than the national average of 50.1% to 49.9%. The male-female ratio of Luang Prabang Province in 2019 is 50.3% to 49.7%, which is slightly higher than the national average of 50.1% to 49.9%. Finally, the disabled population in the province comprises about 4.2% of the populace, compared to 2.2% in Vientiane and 2.8% nationally.

- **Poverty Conditions** – As a country, poverty head counts in Lao PDR have declined from 24.6% in 2012/2013 to 18.3% in 2018/2019 based on a recent World Bank poverty review.[5] This World Bank study found that poverty declined the fastest in the northern and southern provinces (with national poverty line at 280,910 lak/month, the urban poverty line at 295,518 lak/month, and the rural poverty line at 272,312 lak/month, respectively).

[1] City-level population based on 2015 Census numbers (Results of Population and Housing Census, Lao Statistics Bureau, 2015 (https://lao.unfpa.org/en/publications/ results-population-and-housing-census-2015-english-version), while province-level population based on 2019 census (Lao Statistics Bureau, Ministry of Planning and Investment (MPI), 2019).
[2] Source: District Population Projections 2015-2035, Lao Statistics Bureau, Ministry of Planning and Investment, 2019 (https://lao.unfpa.org/sites/default/files/pubpdf/population_projection _at_district_ level_2015-2035_english_0.pdf).
[3] Source: Lao Population Projections 2015-2045, Lao Statistics Bureau, Ministry of Planning and Investment, June 2018 (https://lao.unfpa.org/en/publications/lao-population-projection-national-and-province-2015-2045).
[4] Source: Lao Statistics Bureau, Ministry of Planning and Investment (MPI), 2019.
[5] Source: Poverty Profile in Lao PDR, Poverty Report for the Lao Expenditure and Consumption Survey 2018-2019, World Bank, 2020 (http://pubdocs.worldbank.org/en/923031603135932002/ Lao-PDR-Poverty-Profile-Report-ENG.pdf).

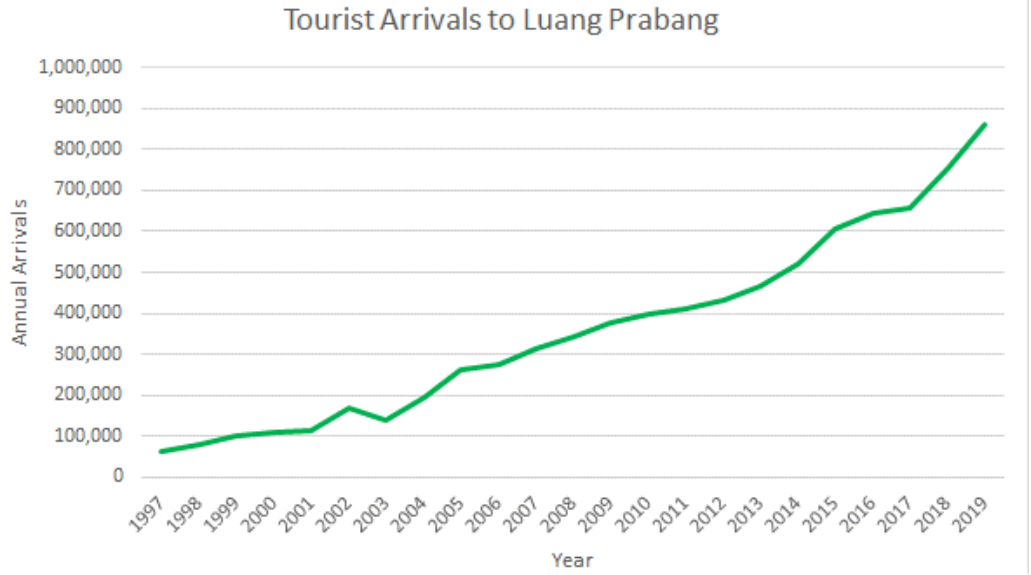
Vientiane Capital has the lowest poverty rates at 5.0% in 2019. Luang Prabang Province's poverty head count has fallen by around 10% overall (from 30.0% to 19.4%) in the intervening period, but it still has a poverty head count of between 20-25% (to be exact 20.4%).

- **GDP and GDP per Capita** – World Bank estimates 2019 GDP amounted to US$18.194 billion (in current US$) or US$13.195 billion (in constant 2010 US$), which grew 4.6% from 2018 to 2019.[6] Luang Prabang Province still lags the rest of the country, with a 2020 target of US$2,319 per capita versus US$2,978. However, the expected 50% growth from 2014-15 to the 2020 targets aligns with that of the nation.

Tourism Context

Tourism is an important revenue generator for Lao PDR's economy. Luang Prabang is the major tourism cog in the nation, handling nearly 20% of total tourist arrivals to the country – with development in the city over the last two decades driven and shaped by tourism.[7] There are 97 hotels and 400 guesthouses in the province as of 2020, with thousands employed by accommodation providers, as tour guides and as taxi/tuk-tuk drivers.[8] The City is served by an international airport, built in 2012, handling some 742,000 travelers (two-way) in 2019, with direct flights to six countries and domestic flights to Vientiane, Xieng Khouang, and Pakse, with on-going terminal improvements and planned airport facilities expansion. **Figure A** shows that total tourist numbers increased from about 62,000 to over 860,000 between 1997 and 2019, an increase of nearly 13 times (or 12.7% annually) over the course of 22 years. Arrivals to Luang Prabang are principally by air, but also include bus and river passengers.

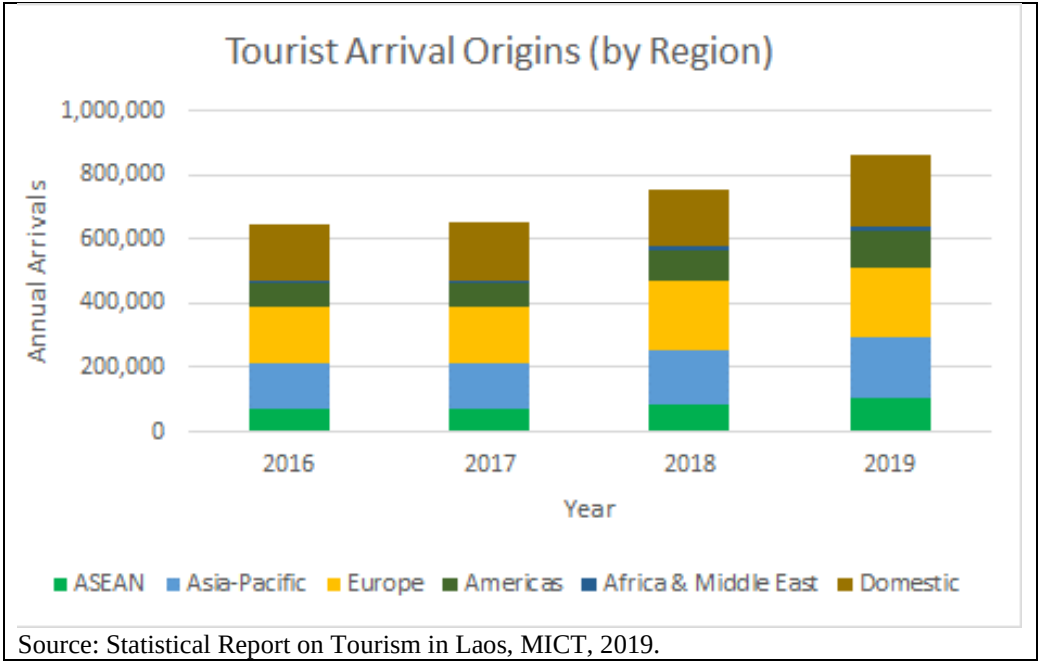
[6] Source: https://data.worldbank.org/indicator/NY.GDP.MKTP.CN?locations=KH.
[7] Source: Statistical Report on Tourism in Laos, MICT, 2019.
[8] 2020-2024 Tourism Plan, Department of Information, Culture and Transport, 2020.



Source: (i) 1997-2014 from Provincial Statistics on Tourism, DPI, 2014; and (ii) 2015-2019 from Statistical Report on Tourism in Laos, MICT, 2019.

Figure A: Arrivals to Luang Prabang Province (1977-2019)

Luang Prabang is unusual within Lao PDR for the high percentage of international arrivals from beyond the ASEAN group of nations and the levels of growth.[9] **Figure B** shows how the national trend is reversed in Luang Prabang, where arrivals from Europe, the Americas and the rest of Asia, particularly China, predominate, reflecting a much higher proportion of leisure travelers. Further, while average annual growth rate from 2016-2019 was about 4.2%, that for Luang Prabang was 10.2% over the same period, with most of this growth from China.



Source: Statistical Report on Tourism in Laos, MICT, 2019.

Figure B: Origin of Tourist Arrivals to Luang Prabang Province (2016-2019)

[9] Growth calculated as Compound Average Annual Growth (CAAG).

Luang Prabang's historic core is bounded by the Mekong River to the north and the Nam Khan River to the east and is the prime tourism attraction in the city. Some 860,000 visitors came to Luang Prabang in 2019.[10]

Several regionally-significant transport projects are underway or planned, including the Lao-China Railway (and its rail station to the southeast of the city center), an expressway from Vientiane to China, and a new bridge across the Mekong River connecting Luang Prabang and Chompet. Lastly, a new development is planned in Chompet, across the Mekong River. The new development is championed as the Luang Prabang Special Economic Zone (LPSEZ), covering an area of 4,850ha (including some areas to the south and east of the WHZ on the right bank of the Mekong).[11] Collectively, these projects may influence both land use and development patterns in Luang Prabang, as well as mobility patterns and the number of visitors to Luang Prabang.

Transport Context

Various modes of transport are observed and used in Luang Prabang. This ranges from walking, cycling, to motorized means such as motorbikes, tuk-tuks, taxis, sedans, minivans/minibuses, as well as tourist and long-distance buses, etc. Key mode share findings are as follows:

- The most recently documented mode share assessment was from a 2012 JICA Study polling local residents of Luang Prabang on travel behavior. This Study finds that motorbike is the prevailing commute mode for residents at 63%, followed by walking at 17%, and paratransit (tuk-tuk, motorized tricycle, etc.) at 12%, respectively. For mechanized modes only, motorbike accounts for around 80% of trips. In addition, typical commute time averaged around 10 minutes in normal conditions and up to 15 minutes in congested conditions.[12]

- In addition to the prior mode split survey, focus group meetings (55 respondents) were held in March 2021 to understand green mobility conditions with a special attention to obtain gender perspectives. Respondents were asked to identify the three most frequent modes used by local residents – with motorbike the most heavily used mode, followed by bicycle and private car. Rationale for selecting a particular mode focused mainly on convenience (with over 60% of respondents), then comfort (at 35%), followed by safety (4%). Rationale for women focused more on convenience, while men mainly focused on comfort. Tuk-tuk was identified as a particularly popular mode for tourists.

[10] Source: Statistical Report on Tourism in Laos, Ministry of Information, Culture and Tourism (MICT), 2019.
[11] Source: https://www.phousy.com/Files/Name2/CONTENT317992051339.pdf
[12] Source: Basic Data Collection on Low-Emission Public Transport System in Lao PDR, JICA, 2012.

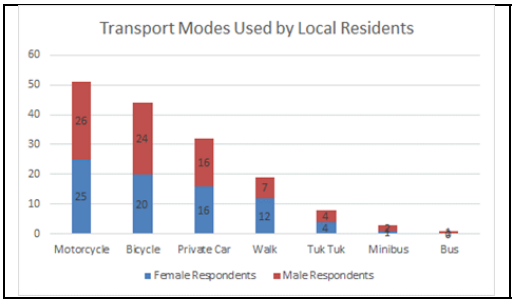


Figure C: Most Popular Modes Observed for Local Residents

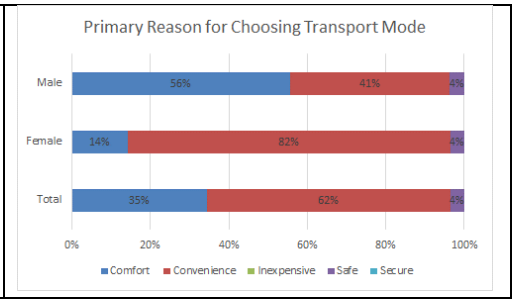


Figure D: Primary Reason Local Residents Choose Particular Mode

In conclusion, two and three-wheel motorized vehicles (i.e., motorbikes or tuk-tuks) represent the predominant travel mode in Luang Prabang. Motorbikes dominate for local resident trip-making. Tuk-tuks are also a key mode for tourists. The volume of two- and three-wheel vehicles, contribute significantly to congestion and emissions in Luang Prabang.

Increasing Mobility Challenges

Against this backdrop, Luang Prabang is facing critical mobility challenges as it continues to grow outward and develop, with increases in population and tourism expected. A key question is how to handle this future development, even though two- and three-wheel vehicles dominate. At the same time though, Luang Prabang must preserve its unique and intrinsic heritage as a "living heritage district" that attracts visitors and is the lifeblood for the city – its United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Zone (WHZ), focused on the heritage and cultural patrimony around the Peninsula formed by the confluence of the Mekong and Nam Khan rivers.

Critical challenges for Luang Prabang include:

- **Juxtaposition of Living Heritage District Preservation and Accommodating Future Tourism Growth** – Residents of Luang Prabang live and work within the historic zone, which is also interspersed with heritage sites and attractions and is the primary tourist zone as well with cafes, restaurants, tourist stalls, and accommodations. Residents and tourists alike use the same roads, walk the same sidewalks, and eat in the same places in Luang Prabang's WHZ as its residents. Within the WHZ, development and changes to the road are highly restricted, which can limit expansions that would enable larger tourist volumes to be accommodated.
- **Current Infrastructure Less Friendly for Green Mobility -** The walk network is perceived as insufficient, unsafe, and uncomfortable due to limited paved/segregated sidewalks and discontinuities. No signalized junctions exist in the city, while zebra crossings are not uniformly provided.
- **Road Safety and Driving Behavior Affects Active Mobility** – Traffic Police in Luang Prabang Province reported 487 vehicle accidents in 2019, resulting in 155 severe injuries and 100 deaths. Traffic/driving behavior has a negative impact on road/street safety, congestion, emissions, and heritage.

- **Limited Mobility Options Encourages Motorbikes and Driving –** Motorbikes comprise over 63% of trips for residents, where alternate mobility options are lacking (i.e., public transport), encouraging driving and motorbikes.[13] The lack of options and priority infrastructure for green mobility may exacerbate congestion, emission and road safety issues given future growth and tourist increases.

- **Limited Access-for-All Amenities** –About 4.2% of the population is considered disabled (i.e., visually, hearing, or mobility impaired) based on a 2015 census.[14] Many sidewalks have obstructions including trees, parked vehicles, etc. that create difficulties for disabled. Some six junctions have installed accessibility ramps to facilitate crossings for disabled and other disadvantaged groups. No traffic signals exist in the city to facilitate crossing movements. No tactile pavement is installed. The lack of safe access-for-all amenities makes crossing the street and walking in Luang Prabang more difficult, inconvenient, and dangerous for all types of users.

- **Emissions and Air Quality Issues from Transport** – In 2014, transport accounted for over 60% of the total greenhouse gas emission in Lao PDR.[15] The transport contribution is largely from two-wheelers, which make up nearly 85% of the total fleet, growing annually at around 8%.[16] Tuk-tuks, a popular mode for tourists, are another source of emissions.

- **Mobility and Congestion Issues around Heritage Sites** – Luang Prabang's main heritage area is a flat, relatively walkable Peninsula area with multiple tourist destinations – with activity centered around the Night Market on Sisavangvong Blvd throughout the day and night. Issues include congestion and illegal parking on both the roadway and sidewalk.

- **Significant Population and Tourism Growth Expected, Translating into Higher Demand for Travel and Strains on the Transport System** – Luang Prabang's population is expected to grow by 25% by 2035, mainly to the northeast towards the Airport.[17] In addition, new development areas to the southeast and across the Mekong in Chompet may place additional strains on the transport system. Visitors are expected to increase due to the Lao-China Railway (130,000 new visitors annually) and a planned regional expressway from Vientiane to China.[18]

[13] Source: Basic Data Collection on Low-Emission Public Transport System in Lao PDR, JICA, 2012.
[14] Source: Results of Population and Housing Census, Lao Statistics Bureau, 2015 (https://lao.unfpa.org/en/publications/ results-population-and-housing-census-2015-english-version;
[15] Source: https://unfccc.int/sites/default/files/resource/867493251_Lao%20Peoples% 20 Republic BUR1-1 Draft%20Biennial%20Update%20ReportBUR_Lao%20 PDR_24July2020.pdf
[16] Source: Laos Statistics Department, 2021 (https://laosis.lsb.gov.la/statHtml/statHtml.do?orgId=856&tblId=DT_YEARBOOK_Q005&language=en&conn_path=I3)
[17] Source: Lao Population Projections 2015-2045, Lao Statistics Bureau, Ministry of Planning and Investment, June 2018 (https://lao.unfpa.org/en/publications/lao-population-projection-national-and-province-2015-2045).
[18] Source: From Landlocked to Land-Linked Unlocking the Potential of Lao-China Rail Connectivity, World Bank, 2020.

As tourism is the lifeblood of Luang Prabang and a key contributor to the national GDP, addressing these mobility issues is paramount to allowing Luang Prabang to continue to grow and handle tourism, while also meeting local mobility needs of residents and workers. Global experience indicates that continuing to deal with urban mobility using a vehicle/road-based approach is impractical and undesirable. ***Cities are increasingly adopting green mobility as a tool to address these challenges along with strategic land use and other policy/strategy measures – and in particular for tourism-led cities such as Luang Prabang, can help to minimize impacts on heritage/historic monuments, while more sustainably handling growth in tourist volumes and overall travel demand. Green mobility seeks to reduce impacts of mobility in terms of greenhouse gas (GHG) emissions, air pollution, and noise through active mobility (i.e., walking, cycling and other non-motorized transport (NMT) modes), public transport, and e-mobility infrastructure and services.***

Review of global best practice and UNESCO heritage cities revealed several common chords for green mobility that can resonate with Luang Prabang:

- **Green mobility systems are multimodal and not just focused on a single mode.** Jeju has a multimodal system with backbone public transport, an extensive cycle network around the island, and pedestrian-only areas.
- **Transport and sustainable tourism can go "hand-in-hand" and promote the city and its sites.** Chinon/Jeju all promote cycling trails as a regional experience, not just a means of transport conveyance.
- **Clear city support is needed at all levels to facilitate green mobility and build "sentiment".** Tallinn provides free public transport and has a bicycle plan/strategy with clear mode share goals that inform investments.
- **Public involvement in planning and education campaigns creates "buy-in" and "public sentiment" towards green mobility.** Tallinn developed its transport plan through an interaction process involving over 4,000 participants. Car-free and walk-days can be leveraged to educate the public.
- **Green mobility designs incorporate safe access-for-all and resilience to allow the system to be used by all and that accounts for climate change.** Jeju adopted NMT policies through its Age-Friendly Jeju initiative, while Melaka/Tallinn adopted resilience elements into their overall strategies.
- **Enabling institutional, legal, and regulatory frameworks are key foundational pieces for green mobility.** Vision and goal setting, performance monitoring, integrated heritage/mobility plans, cross-cutting coordination bodies, and dedicated funding pools are common strategies.

Green Mobility Index

City-Level Benchmarking

As part of the study, a city-level index was developed to benchmark the city versus other comparable UNESCO heritage cities around the world to identify areas for improvement. The city-level index combines both quantitative and qualitative elements to assess green mobility. Seven metrics were assessed as part of the

benchmarking exercise: (i) accessibility; (ii) health and well-being; (iii) green mobility sentiment; (iv) equal access to all; (v) safety and security; (vi) resilience; and (vii) convergence. Luang Prabang scores a 31 in the city-level index, a relatively low score versus the other six cities (with the best performing city, Jeju City in Korea, scoring 59). Luang Prabang performed relatively low in accessibility (due to its lack of public transport and alternate transport choices), low street density (an impediment to more extensive walk/cycle networks), integration of active mobility into policy/design standards, and lack coordinated heritage and green mobility plans.

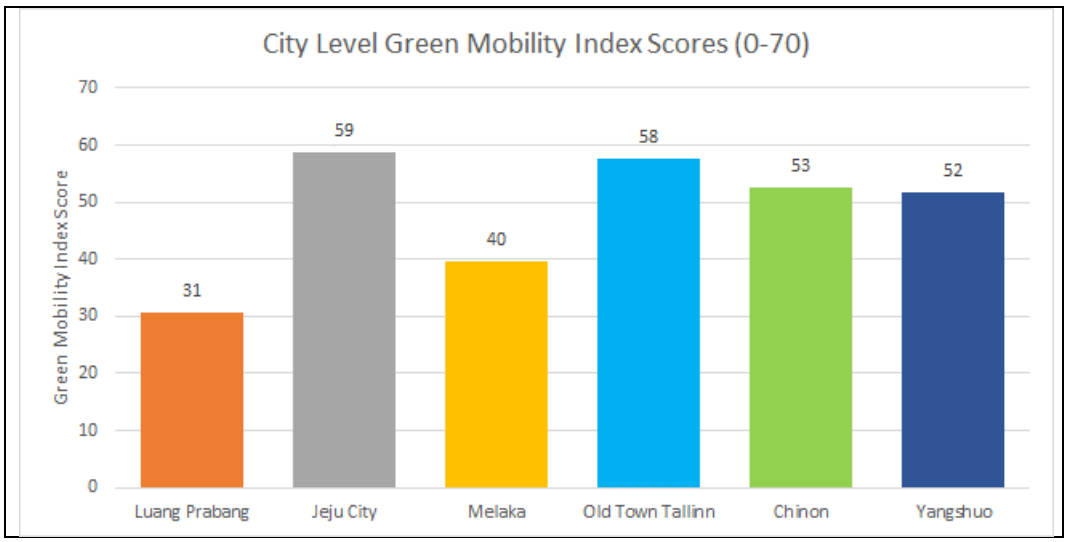


Figure 1.1: City Level Green Mobility Index Scores

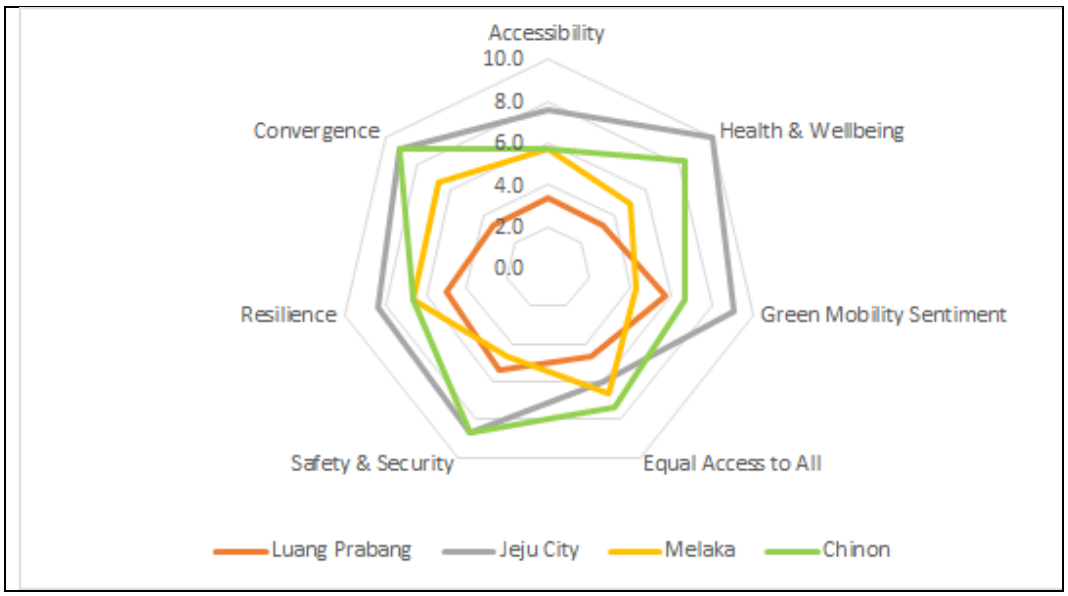


Figure 1.2: Overall City Level Scores by City

Street-Level Analysis

The street-level index assesses key walk, bike, and green mobility factors on each block, to identify highly and poorly performing street segments from a user perspective. It uses street imagery from videos/GoogleStreetView, which are then

coded into GoogleMyMaps to geo-locate attributes of sidewalks or streets (i.e., width, condition/presence of pavement, presence of lighting/ trees, etc.). Each block is scored individually on five key metrics and 14 criteria scoring pavement condition, sidewalk safety, crossing safety, disability-friendly, and public amenity. A composite score is generated for each street.

Figure 1.3: Example of City-Level Index Evaluation and Scoring Methodology

The colors in the maps below represent a sliding scale on how friendly the streets and walking paths of Luang Prabang are for green mobility (with dark green representing the most conducive segments, while red represents the least conductive segments). As the maps show, the streets **in the Peninsula are most conducive to green mobility (yellow and green), whereas clear gaps exist outside of this area evident by the predominate orange shading**.

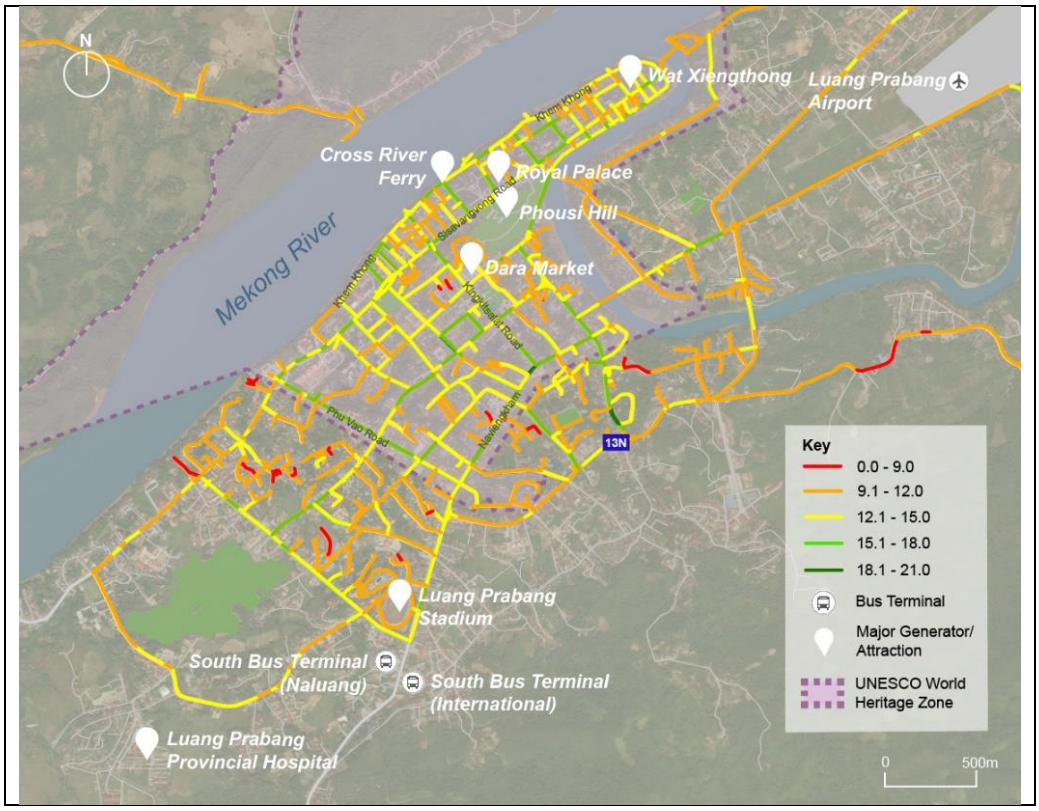


Figure 1.4: Composite Street-Level Index Score (Peninsula)

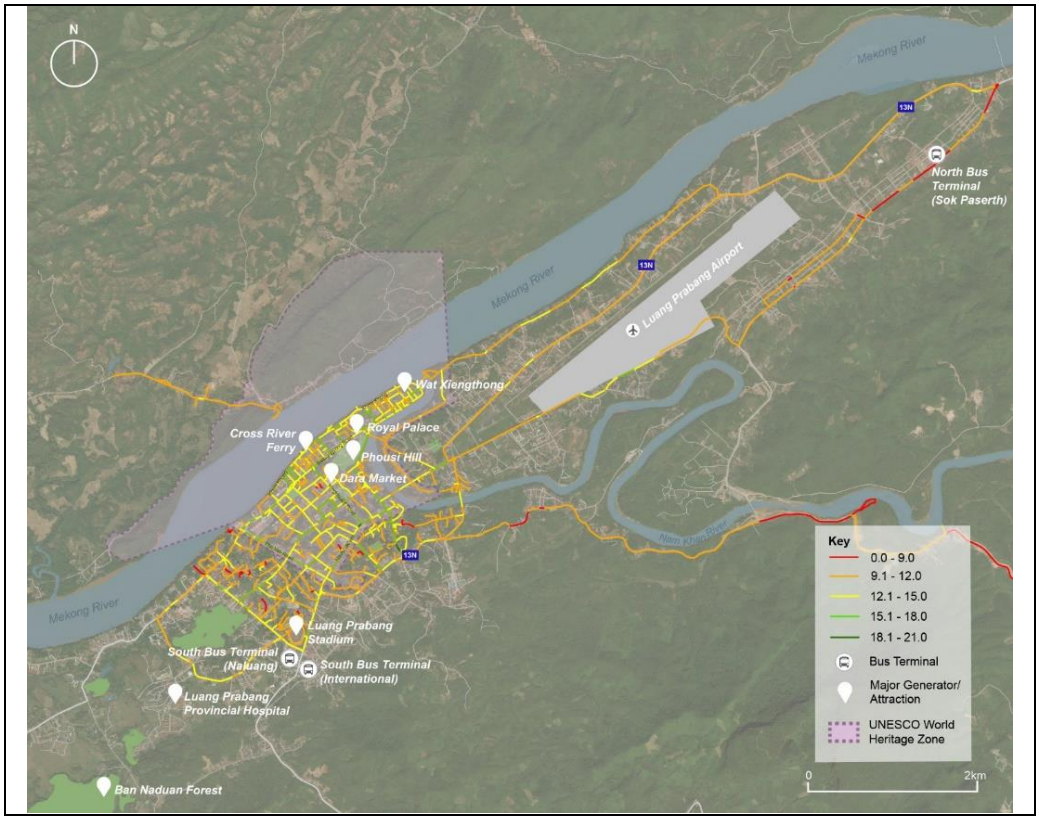


Figure 1.5: Composite Street-Level Index Score (Study Area)

Forward Look

Luang Prabang has an important choice whether to keep developing and encouraging a vehicle-based growth strategy or to adopt another more sustainable approach. Green mobility – focusing on sustainable modes that minimize impact on the environment including human-powered modes as well as more efficient public transport and e-mobility - offers a chance to reduce transport related emissions and associated air quality issues. It also offers a chance, if properly planned, design and implemented to shift the tide and build green mobility "sentiment" and use.

This Green Mobility Strategy builds upon these efforts by laying the strategy, vision, and actions that may help shepherd Luang Prabang towards achieving a more green and sustainable transport system. Key conclusions include the following:

- **Green Mobility Vision Built on "Integration"** – Integration of modes and integration horizontally and vertically in terms of inter-linked strategies helping to move green mobility forward instead of separate actions.
- **Indicative Investment Priorities Consist of Approximately US$71.0 Million of Activities over the Next Ten Years** – The indicative investment priorities are delineated into: (i) Phase 1 (1-7 years) at US$39.5 million; and (ii) Phase 2 (8-10 years) at US$31.5 million. The biggest ticket item is road improvements, followed by a public transport system, sidewalk (including lights, trees, and street furniture), and cycle improvements. Bridge and bus proposals shall undergo further study.
- **Extensive Cycle and Walk Networks Leverage On-Going Road and River Improvement Projects -** The CDIA Study is improving roads, burying overhead cables, improving streetscapes, etc. It would be remiss if these projects were not leveraged in the greater active mobility system. Thus, active mobility linkages directly to these corridors create a more extensive and wide-reaching network. Walk improvements on Route 13N may include pedestrian beacons to allow safer crossings at night.
- **Road Enhancements Further Improve All-Weather Network and Facilities Green Mobility** – Some 12.5km of road improvements are proposed beyond those proposed by the CDIA Study and local government proposals. This may improve air quality, improve passability during the rainy season, and create more amenable active mobility conditions.
- **Two Priority Green Mobility Corridors Highlighted to Serve as Foundations for this Transformation** – The Sisavangvong / Sakhaline Road & Kingkitsalat / Kitsalat Road corridors are identified as priority corridors for green mobility – plans have been formulated to transform these corridors into people-centric ones safe, convenient, and amenable to all types of green mobility – with the former being completely pedestrianized. The total expected magnitude costs of these are US$1.1 million for Sisavangvong / Sakhaline Corridor and US$800,000 for Kingkitsalat Road.
- **Pilot Projects Focusing on Parking and Slow Zones Proposed Across Peninsula Can Be Steppingstone for Wider Implementation** – A pilot

project can demonstrate and prove feasibility of an approach. Given issues such as safety, increasing visitors, and lack of pedestrian-friendly environment, a pilot scheme is proposed adopt a "slow zone" to accommodate active modes, centered around the pedestrian zone along Sisavangvong / Sakhaline Road. A parking management zone is proposed in the same area, complemented by off-street parking lots within the city center and along major roads entering the city (to serve as intercepts whereby drivers may then use connecting public transport into the city).

- **Suite of Institutional Strengthening and Financing/Funding Initiatives Identified to Create Enabling Environment for Green Mobility –** Last but not least, foundational institutional and financing/funding elements are proposed to create an environment that can sustain green mobility initiatives from planning, to funding, to implementation, and to operation. This includes a variety of institutional and capacity building efforts seeking to more strongly reinforce green mobility as a key goal in developing regional and city transport plans and budget allocation, training, and capacity building of staff in green mobility and the funding procurement process, as well as outreach with the public to build green mobility sentiment.

The risks of doing nothing and continuing the status quo are considerable and threaten the livelihoods of residents of Luang Prabang and the economic growth – green mobility offers the opportunity to begin a transition to clean, sustainable mobility enabling the city to meet future growth and handle more tourists, while retaining and preserving its unique heritage and cultural patrimony.

The ultimate effectiveness of green mobility cannot be viewed in a silo. Green mobility is just one part of an integrated framework to facilitate cleaner and more sustainable mobility in Luang Prabang. Green mobility must be integrated into the wider context of urban planning, tourism development planning, and integrated/ synchronized institutions. The way the city and tourist development is planned must align with the transport infrastructure initiatives to enable compact development that decreases the inclination and necessity to drive and encourages short-distance travel on alternate modes and, where needed, provides competitive alternatives for longer distance travel. From a tourism perspective, this integration is needed to protect and retain the vital cultural and tourism patrimony in the city but still provide efficient movement for visitors.

At the institutional level, coordination is needed for all elements including between transport departments (vertically between national and sub-national levels), in addition to horizontally between different departments (i.e., Transport, Urban Planning, Finance, etc.) to ensure plans and budgets align and do not conflict with one another. A clear mandate and agenda from the city government and key agency leaders to build momentum and align all relevant stakeholders (i.e., Traffic Police, etc.) with the same green mobility vision and an effective and inclusive communications plan will drive initiatives and build support and sentiment for the green mobility transition. Robust municipal financing and/or development of intrinsic revenue systems for green mobility is necessary to ensure financial sustainability and long-term continuation of these efforts.

Boundaries of the Study

This Green Mobility Strategy lays out the vision, goals, objectives, and actions that may help shepherd Luang Prabang towards achieving a more green and sustainable transport system. The Green Mobility Strategy proposes a city-level green mobility plan that focuses on improving the user experience (i.e., convenience, comfort, safety, security, etc.) and ensuring access-for-all – with a focus on walking, cycling, and public transport. This city-level green mobility plan can serve as an input and inspiration for a larger and longer-term Transport Master Plan for Luang Prabang, which is currently lacking. Indicative investment priorities are identified with order-of-magnitude cost estimates (these costs are subject to change and should be used for discussion/planning purposes only). Potential funding options as well as specific institutional and capacity strengthening initiatives are likewise identified to ensure that an enabling "soft" framework is in place for green mobility as well. Lastly, this Green Mobility Strategy should be used as a visionary and planning document to inspire and encourage green mobility - more detailed feasibility studies are needed for specific projects including road, parking, as well as public transport initiatives.

Structure of the Report

The report is structured as follows:

Section 1, Summary of Travel Patterns, Infrastructure Assessment and Key Gaps, presents an overview of key travel patterns (based on pre-COVID-19 data), local perception survey results, and key infrastructure/institutional gaps.

Section 2, Green Mobility Vision, defines the overarching Green Mobility Vision and foundational goals and objectives to achieve this. The overarching four green mobility goals are supported by 12 objectives and 27 strategies, which target two groups – residents as well as visitors.

Section 3, Indicative Investment Priorities, presents indicative investment priorities for both Phase 1 (Year 1-7) and Phase 2 (Year 8-10) including capital cost and primary stakeholders, and key elements of the Green Mobility Vision by mode/component. Subsequently, two Priority Green Mobility Corridors are presented intended for short-term implementation demonstrating transformation of key streets to facilitate green mobility. Lastly, potential pilot projects are proposed to test new ideas and approaches to make the city more friendly to green mobility.

Section 4, Institutional and Capacity Building, presents a series of institutional and capacity strengthening initiatives to create an enabling green mobility environment. Opportunities for synergies with other donor activities are identified to potentially leverage these efforts and reduce duplication of effort.

Section 5, Financing Options, identifies potential funding / financing mechanisms and tools for the Phase 1 (Year 1-7) indicative investment priorities from **Section 3** – as these are the immediate priorities for implementation.

Section 6, Key Success Factors Going Forward, lists key success factors to enhance effectiveness of planning, implementation, and operation of green mobility initiatives, build local government support to create a facilitating environment for

green mobility at all levels, and effectively build green mobility sentiment and public support for sustainable transport behavior and pro-green mobility policies.

Section 7, Conclusion, summarizes key findings and recommendations of the Strategy and describes use and legacy of the Strategy to achieve the mobility vision.

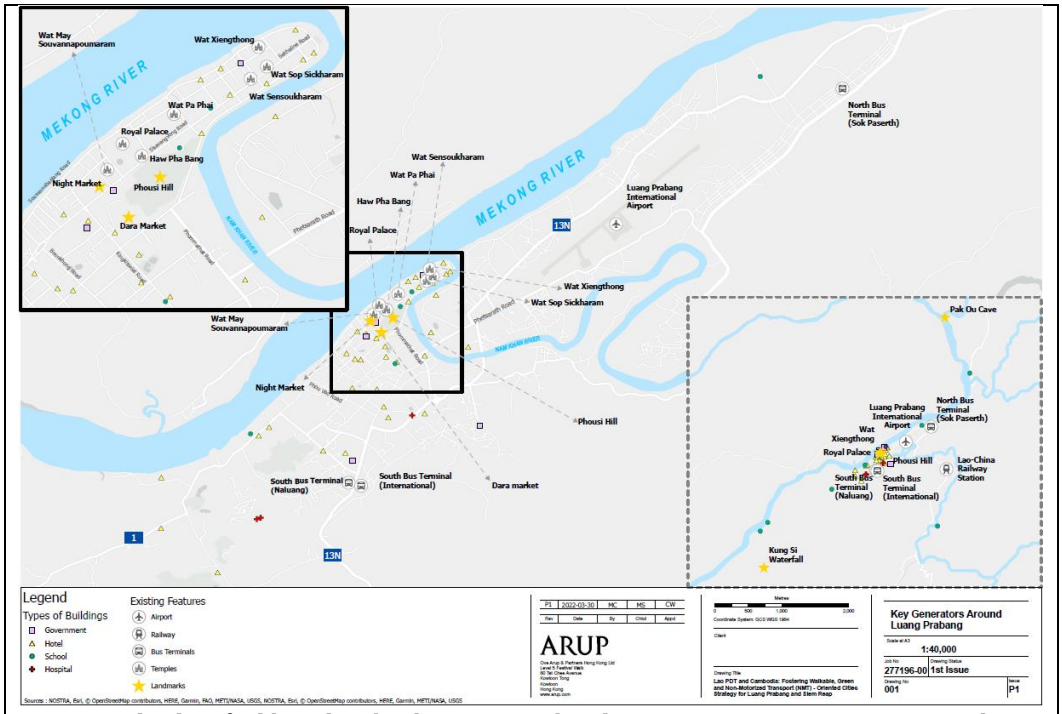
1 Summary of Travel Patterns, Infrastructure Assessment and Key Gaps

1.1 Introduction

This section reviews key generators, key travel patterns, perception surveys, as well as key infrastructure and institutional gaps in Luang Prabang as they relate to green mobility.

1.2 Key Generators and Activity Nodes

Understanding where people want to travel and visit is paramount to developing the green mobility initiatives and network around these needs. The map below presents the key generators and activity nodes in Luang Prabang, focusing on the Peninsula formed by the confluence of the Mekong and Nam Khan Rivers:



Note: Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US$30/night rate.

Figure 1.1: Key Generators Around Luang Prabang

Key generators include the following:

- The Peninsula forms the core of the historic center of the declared UNESCO WHZ and includes famous temples and religious buildings, as well as key landmarks such as the Night Market.
- Major hotels are clustered within the Peninsula, while other buildings such as schools and hospitals are located within/outside of the Peninsula.
- Other key tourist attractions outside of the Peninsula include Kuang Si Waterfalls to the southwest of the city and Pak Ou Caves to the northeast.

- Chompet District is a new development area north of the city across the Mekong River (which will be connected by the New Mekong River Bridge).
- In terms of transport hubs, Luang Prabang International Airport is located 4km northeast of the WHZ. Four long-distance bus terminals are located outside of the WHZ serving regional / international destinations. the new Lao-China Railway Station is located to the southeast of the city.

1.3 Travel Patterns

Introduction and Analysis Methods

COVID-19 has taken a tremendous toll with drastic declines in visitor volumes, and some reduced local trip activity in Luang Prabang. For instance, nearly 70,000 total passengers were registered in March 2019, versus about 15,000 in March 2020, with flights reduced from 1,200 to 400.[19] Lastly, Google COVID-19 Community Mobility Reports for Lao PDR show declines in all types of trip-making in the country. Luang Prabang Province and the country are now officially open to domestic and international tourists in January 2022 under the Lao Travel Green Zone Plan.[20]

Assuming eventual subsidence of the pandemic and rebounds in travel demand and visitor volumes, pre-COVID-19 data (i.e., prior to 2020) has been adopted to develop the Green Mobility Vision and indicative investment priorities.

To assess these conditions, anonymized geo-location data from mobile phones was obtained for Luang Prabang from January 2019 to April 2019, a four-month period including the Lunar New Year and high season.[21] Data is geo-located meaning time, location, and trajectory is collected directly from the device via apps requiring geo-location data (for instance any mapping apps, weather app, etc.), allowing for granularity in terms of exact locations. Each phone/device has a unique identification (ID) number, allowing it to be tracked over spatial or temporal contexts. Individual devices also have other information attached included the native country code, which can be used to differentiate between local residents (i.e., those living in Luang Prabang) and those visiting Luang Prabang for a short period. Data processing allows insights including relative speed, trip length, and trip duration to be estimated by connecting pings together from the same unique device.

Figure 1.2 shows that the highest density of pings is centered around the Peninsula and the area on the left bank of the Nam Khan River, including the area to the southwest of the Peninsula such as the Southern Bus Terminals near Luang Prabang

[19] Source: Department of Civil Aviation, Air Transport Division, 2019-2020
[20] Source: Laos News Agency (http://kpl.gov.la/En/Detail.aspx?id=63984)
[21] The data set contains around 32,000 unique IDs for Luang Prabang, including surrounding areas (equating to about 7% of the entire provincial population of around 463,000), as well as over 4,000 "traveler" IDs, who are assumed to be visitors as they are only detected for a short period of time relative to the four month dataset (equating to about 4% of all international air arrivals over this period, about 98,000). As the dataset is for the high season, it is assumed that this time period represents the most critical timeframe in terms of visitor volumes and thus serves as the basis for the analysis and recommendations under this Study.

Stadium. Denser detections are also observed around the Airport and the area between the Airport and the Nam Khan River.

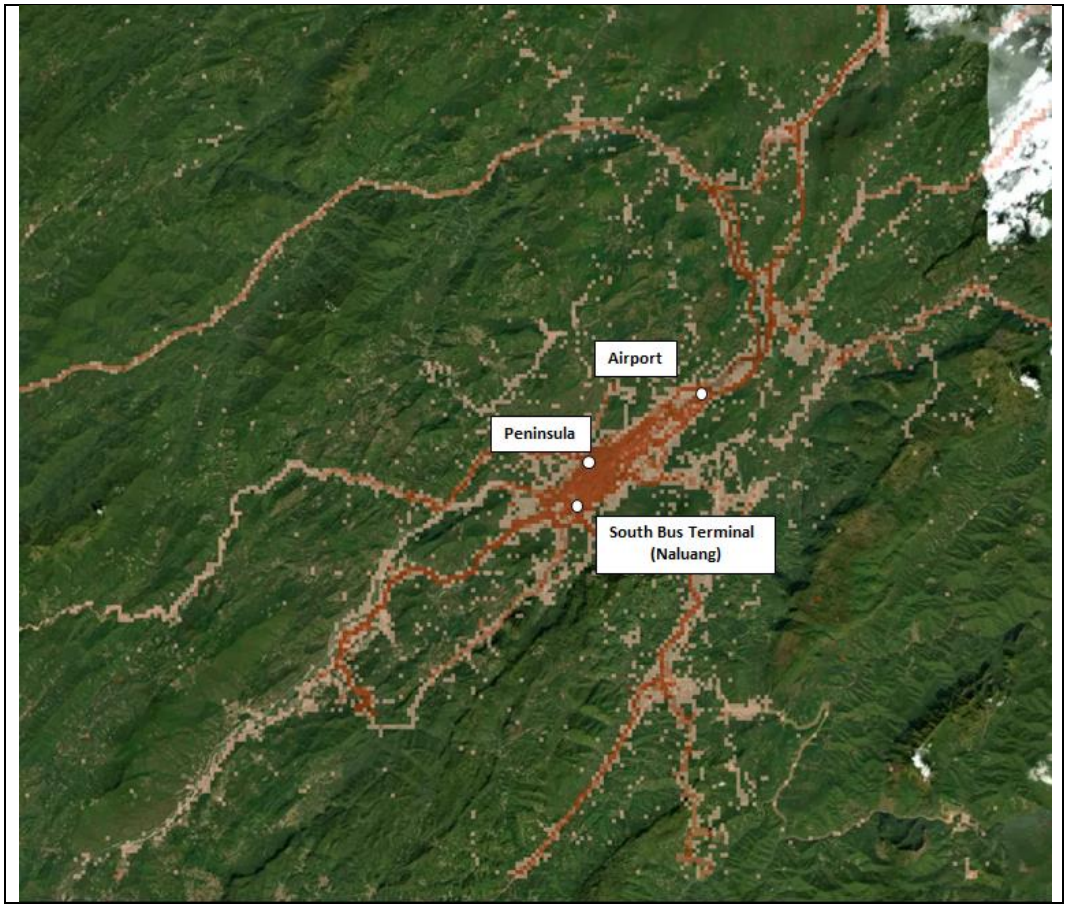
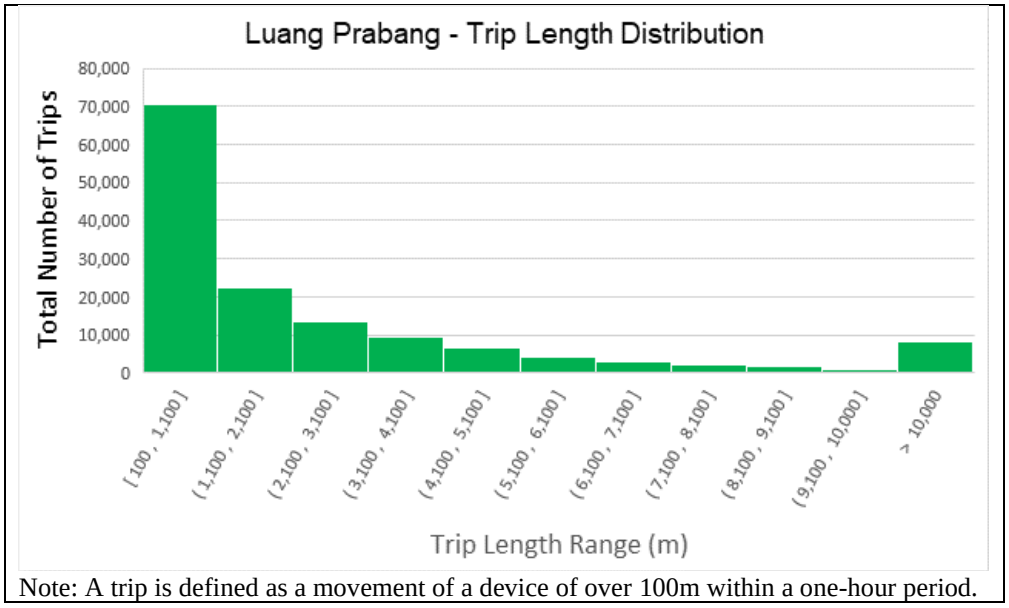


Figure 1.2: Snapshot of Cumulative Detections around Luang Prabang Showing High Activity around the Peninsula and Vicinity (January-April 2019)

Trip Length

Figure 1.3 shows the distribution of trips over 100m (distance is "as the crow flies" as exact trip path cannot always be determined from data due to gaps between consecutive ping detections of the same unique device). Trips are fairly skewed towards shorter distance trips, with the median trip length at 1.1km, while average is 2.8km. For those trips over 1km, the average length is 4.9km.



Note: A trip is defined as a movement of a device of over 100m within a one-hour period.

Figure 1.3: Trip Length Distribution (by Meters)

Origin/Destination and Trip Chaining Insights

The following graphics show the trips between key areas in the Study area, generated by combining two or more pings from the same device within one hour to identify common origins and destinations.

Medium-Distance Trips (1.0-5.0km)

Figure 1.4 shows medium-distance trips to/from the Peninsula (this trip was chosen due to high density of pings as shown in **Figure 1.2**). These trips are not assigned to the road network but represent the origin-destination of trips. Trips are evident between the southwest area outside of the WHZ and the Peninsula, as well various trips along Route 13N and from the Airport to areas around the southwester end of the Peninsula near Kingkitsalat Road. Sisavangvong and Phu Vao roads also register relatively dene pings.

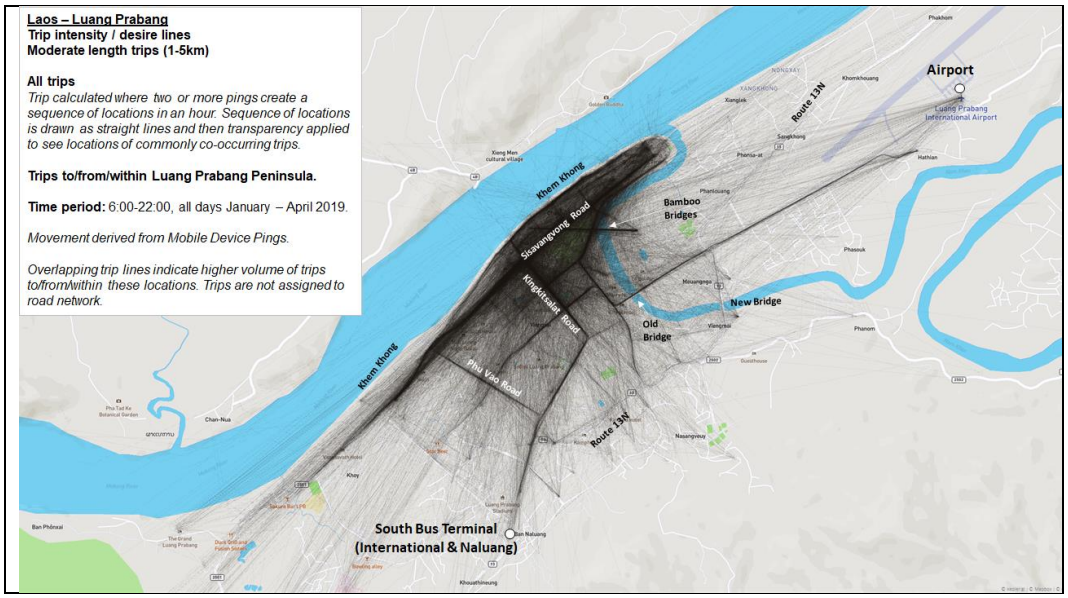


Figure 1.4: Medium-Length Trips to/from Peninsula

Median-distance trips such as those shown in the figures above are most probably taken on motorbikes as well as tuk-tuks. An effective cycle priority network that links to existing/planned bike facilities and targets treatments on key corridors into and out of the city center would have the best chance to capture such medium-distance trips.

All Trips (Regardless of Distance)

Figure 1.5 and **Figure 1.6** show all trips detected to/from specific locations around the Peninsula and the Airport. The red lines represent trips to/from the Airport, while black represents those to/from the Peninsula, the heart of the WHZ. Desire lines are not assigned to the road network. Key findings include:

- **Trips to/from Peninsula** – Strong desire lines (shown in black) are apparent to the Peninsula from areas to the southeast of the WHZ, particularly along Khem Khong. Trips to/from the Airport are also visible in the bright red colors overlaid on the black along Kingkitsalat Road and Sisavangvong Road.
- **Trips within Peninsula** - Desire lines follow the main roads in the Peninsula with Khem Khong along the Mekong waterfront, Kingkitsalat Road, and Sisavangvong Road, as well as around Phousi Hill.
- **Trips to/from Airport** – Desire lines to/from the Airport (shown in red) use the New Bridge and Old Bridge to cross the Nam Khan River and have trip ends in the Peninsula and to the south.

Results suggest that:

- Longer-distance origin/destination patterns could be potential routes for a public transport system (i.e., to/from the Airport and Peninsula).
- Density of the streets southwest of the Peninsula such as Kingkitsalat Road, Phu Vao Road and Khem Kong show relatively dense trips (in black) and may be attractive for public transport as well as cycle priority corridors, which is also shown by the medium-distance trip intensity.

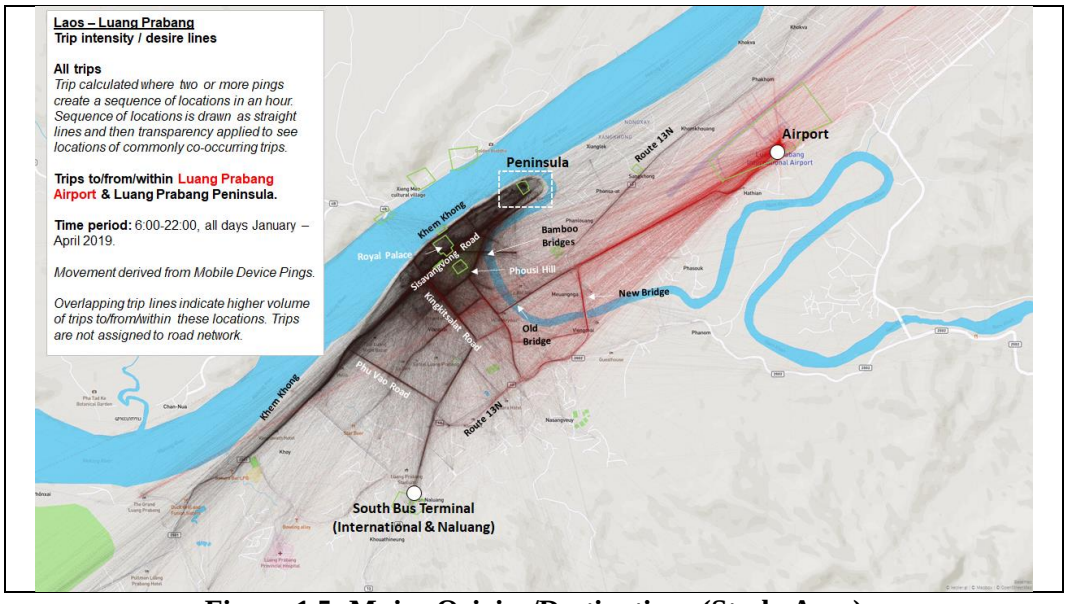


Figure 1.5: Major Origins/Destinations (Study Area)

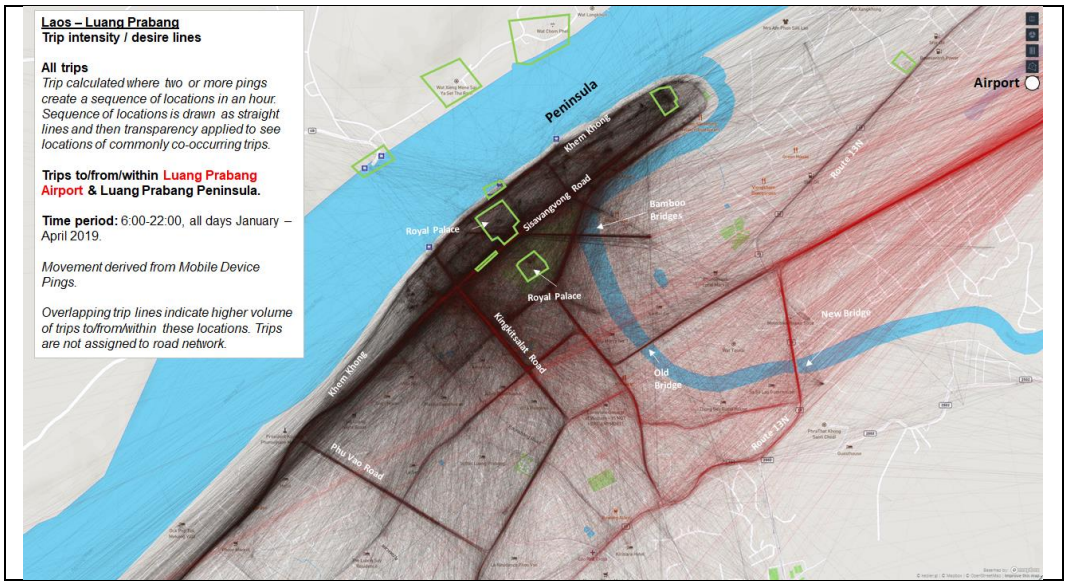


Figure 1.6: Major Origins/Destinations (Peninsula)

The figure below shows all trips to/from the Peninsula by visitors (left) and residents (right). Visitor trips show highest activity along Sisavangvong Road. The resident trips show highest activity along Sisavangvong Road; however activities stretch down southwest to near the Luang Prabang Technical College (which shows some linkage between the Peninsula and the College). These suggest potential routings for public transport and/or for bike priority corridors.

Figure 1.7: All Trips to/from Peninsula (Visitor (Left) vs. Resident (Right))

District Analysis Insights

Resident & Visitor Detections

Mobile data analysis and prior studies identified the Peninsula as a hub of activity in the day, but also at night as Sisavangvong Road is closed and pedestrianized from 5:00-11:00PM on weekdays and 9:00AM-9:00PM on weekends.

The following graphics show device pings detected in the AM (6:00AM-11:00AM) and the PM (6:00PM-11:00PM), overlaid on the street-level index maps from Technical Report – Luang Prabang Green Urban Mobility, which indicate green mobility friendliness of the given streets (encompassing quality of surfacing, sidewalk and crossing safety, public amenities such as trees and weather protection, as well as safe access-for-all – with red representing less conducive streets for green mobility, while green represents more conducive).

The AM period ping detections show relatively high activity along much of Sisavangvong Road (for the alms giving ceremony) from south of Kingkitsalat Road to near the tip of the Peninsula, as well as on Khem Kong and Kingkitsalat Road itself. Phousi Market in the southwest as well as Phu Vao Road also exhibit relatively denser activities. It is evident that detections also occur along many streets with relatively poor (orange) street-level performance including many of the roads linking Khem Khong along the Mekong waterfront and Sisavangvong Road. In addition, the street between Phousi Market and Phu Vao Road also exhibits relatively higher density activity on a poorly performing segment (in orange).

The PM period ping detections show much denser detections in the Peninsula area, focusing along Sisavangvong Road, which is pedestrianized at this time for the Night Market. Particularly dense activity is detected at the junction with Kingkitsalat Road, the south end of the Night Market. The side streets on the Peninsula between Khem Khong and Sisavangvong Road also who moderate activity, although the underlying street network performs poorly in this area.

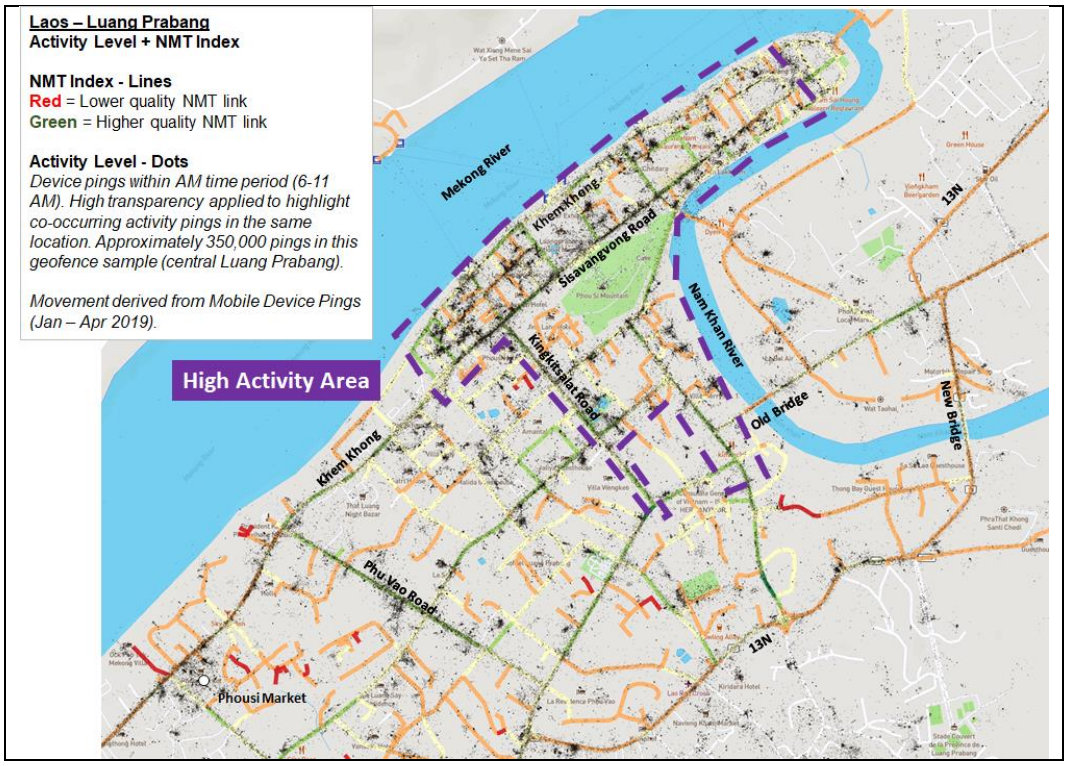


Figure 1.8: District Activity (Peninsula – 6:00-11:00AM)

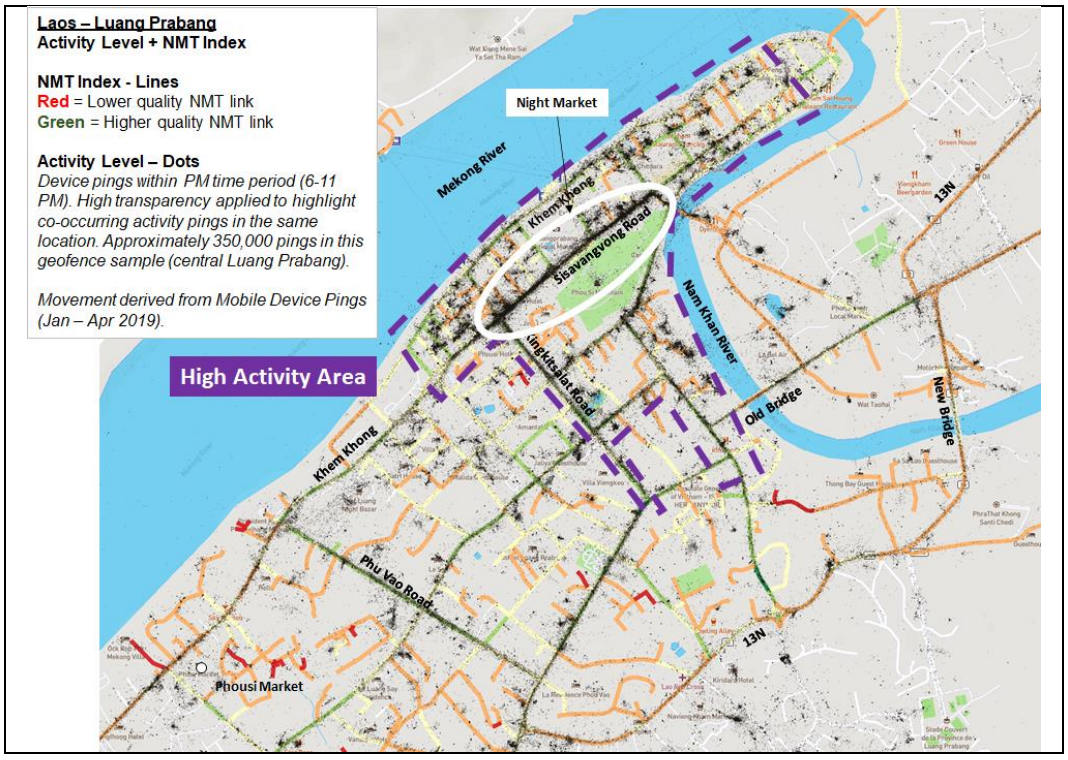


Figure 1.9: District Activity (Peninsula – 6:00-11:00PM)

Visitor Detections

The data was further investigated to understand visitor trips/detections in the city center during the evening to identify potential priority corridors for non-residents heading to/from restaurants, hotels, etc. **Figure 1.10** show that the prevalent patterns shown in **Figure 1.9** also occur for visitors, with concentrations at the Night Market along Sisavangvong Road.

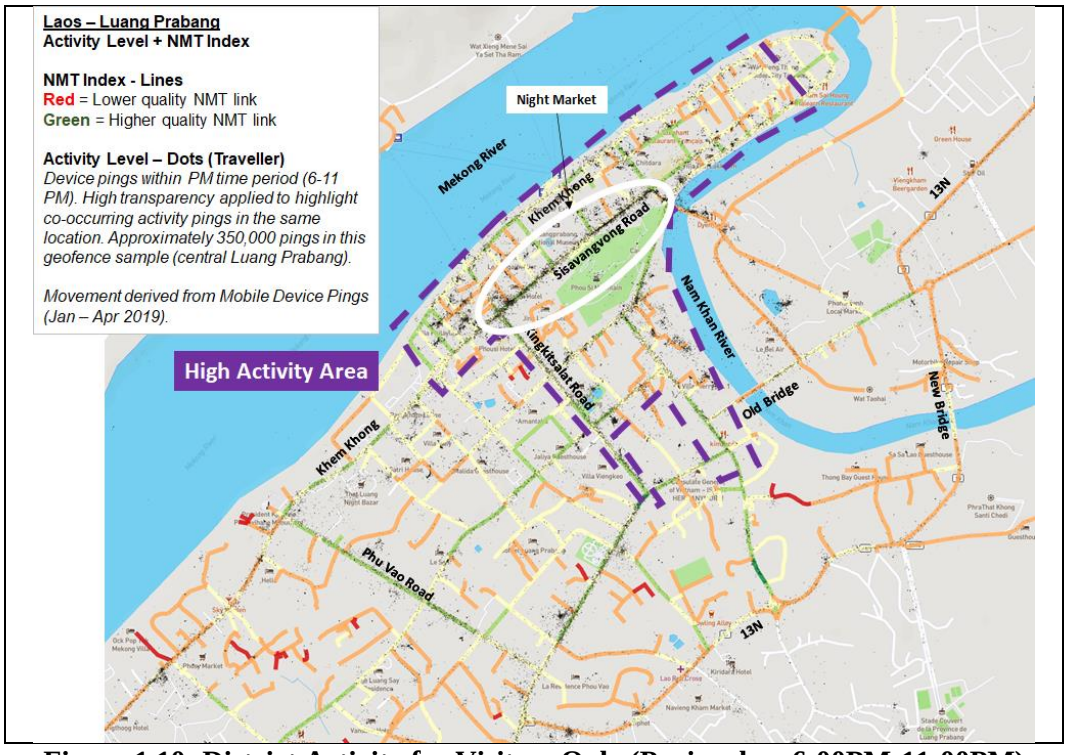


Figure 1.10: District Activity for Visitors Only (Peninsula – 6:00PM-11:00PM)

Results suggest that:

- Clustered pings along street segments may suggest creation of key pedestrian priority corridors or areas that could be established during the night or throughout the day.
- Priority walk areas could benefit from targeted sidewalk widening, restrictions on illegal parking on the sidewalk (or parking bans altogether), as well as improved amenities including lights and trees.
- Alternatively, new paths or alignments could be suggested if the current streetscape is unsuited for sidewalk widening (i.e., due to land acquisition).
- Enhancements to side streets may also be warranted, leading to/from tourist accommodations to enhance walk comfort, safety, and security.
- Clustered pings around junctions suggest a suite of crossing improvements could improve the pedestrian experience, such as zebra crossings, signage, as well as pedestrian signals. They may also suggest the need to identify alternate loading/unloading locations to improve traffic.
- The extent and density of pings outside of the Night Market area along Sisavangvong Road at Kingkitsalat Road suggests targeting this area for improvement measures to better manage/regulate loading/unloading.

Temporal Insights

Figure 1.11 below shows the arrival hour for different sites around the city and WHZ (both visitors and local residents). Key attractions on the Peninsula including the Royal Palace and the Wat Xieng Thong Temple have fairly similar morning peaks, with the temple having higher activity in the afternoon. Mt. Phousi experiences a peak around 5:00PM to see the sunset, while the Night Market is most active around 7:00-8:00PM. Lastly, two outlying attractions experience similar peaking at around 10:00AM, with the Pak Ou Caves registering double the detections.

Arrival snapshots provide insight on potential operation of a public transport system, specifically service span (i.e., operating hours) and peak vehicles in service.

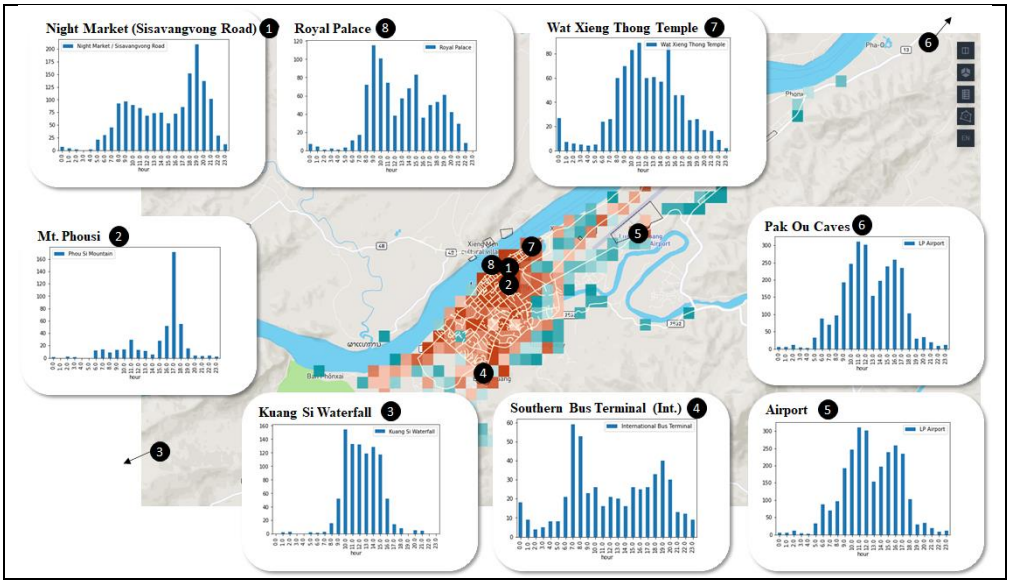


Figure 1.11: Volume of Detections by Arrival Times at Various Locations

1.4 Gender and Disadvantaged Group Feedback

Key Gaps and Issues Identified

Interviews and focus group meetings were conducted in 2021 to assess green mobility sentiment and to identify key issues and potential solutions. The interviews included surveys of 55 local Lao tourist and youths living in Luang Prabang (aged 13-25) – this is referred to as the Interview Survey Panel. In addition, four focus groups (known as the Focus Group) were set up as follows: (i) two focus groups with elderly aged 60-75 (total of 8 male and 8 female participants); and (ii) two focus groups with women and men living along streets and shopowners (aged 25-55) (total of 8 male and 8 female participants).

Key findings are summarized below:

Table 1.1: Summary of 2021 Interview Survey Panel Perceptions

Project	Description
Traffic and Driving Behavior	• Around 30% of respondents noted that traffic/driving behavior in Luang Prabang has a negative impact (with negative impacts including road/street safety, congestion, air/noise emissions, and heritage impact).
Traffic Volume and Road Safety	• Some 40% of respondents thought traffic volumes was high or very high, while 75% of respondents thought vehicles/drivers failed to operate safely. Almost 80% of respondents thought drivers fail to obey road rules.
Sidewalk / Walk Experience	• Half of respondents do not consider sidewalks safe, secure, convenient, and comfortable. There is a significant gap in the gender perception, with about 25% of men agreed with this statement, in contrast to 70% of women.
Crossing Facilities	• Almost three-quarters of respondents use zebra crossings but indicated that vehicles yielded for them less than 25% of the time. • Only 4% of respondents use zebra crossings and indicate that vehicles yield for them 75% or more of the time. • Two percent of respondents do not use zebra crossings.

Source: 2021 Focus Group Perception Surveys conducted in March 2021.

Table 1.2: Summary of 2021 Focus Group Perceptions

Project	Description
Mode Preferences and General Trend	• People aged over 65 prefer to walk or ride bicycles within the WHZ and around the city • Over the last 10-20 years, more cars and fewer bikes have been observed.
Traffic and Driving Behavior	• Drivers often fail to yield for pedestrians or cyclists.
Traffic Volume and Road Safety	• Safety is a key concern and is a reason for reduced cycling. • People avoid walking at night due to cars and motorbikes.
Sidewalk / Walk Experience	• The Nam Khan River is a popular and pleasant place to walk. • Shop signs block footpaths, forcing pedestrians to walk in the road. • Sidewalks are not considered safe or convenient, and often have obstructions (including motorbikes, chairs and stands). • Some roads lack streetlights (i.e., "road along the Mekong to Wat Xiengthong". • As accessible ramps are not provided, wheelchair movement is difficult.
Crossing Facilities	• At crosswalks, respondents are fearful vehicles may not stop/yield to them.
Parking	• Residents park in narrow alleyways for days and not in designated areas.

Project	Description
	• Parking management staff only collects fees and do not safeguard vehicles.
Key Accident Locations	• T intersection at ferry pier behind the National Palace • T junction at Wat Mai along the Nam Khan River curve and junction at Vat Sopbon • Junction at 3 Nagas Hotel and one at Wat Si Phoutthabat • T junction at the Khok Ngua Australian Bar • T junction of That Mako Mo roundabout
Congestion Points	• Four locations are identified: (i) junction in front of Avani Hotel; (ii) outside the Luang Prabang Primary School; (iii) the junction in front of the Health Department and Data Market; and (iii) the "T" junction at Watmai Market in the morning.

Source: 2021 Focus Group Perception Surveys conducted in March 2021.

A map of problematic areas is shown below with key dangerous junctions identified along Sisavangvong Road and along Khem Khong (note – the interview panel respondents identified specific streets that had poor conditions, while the focus group identified specific dangerous locations and congested junctions/sections).

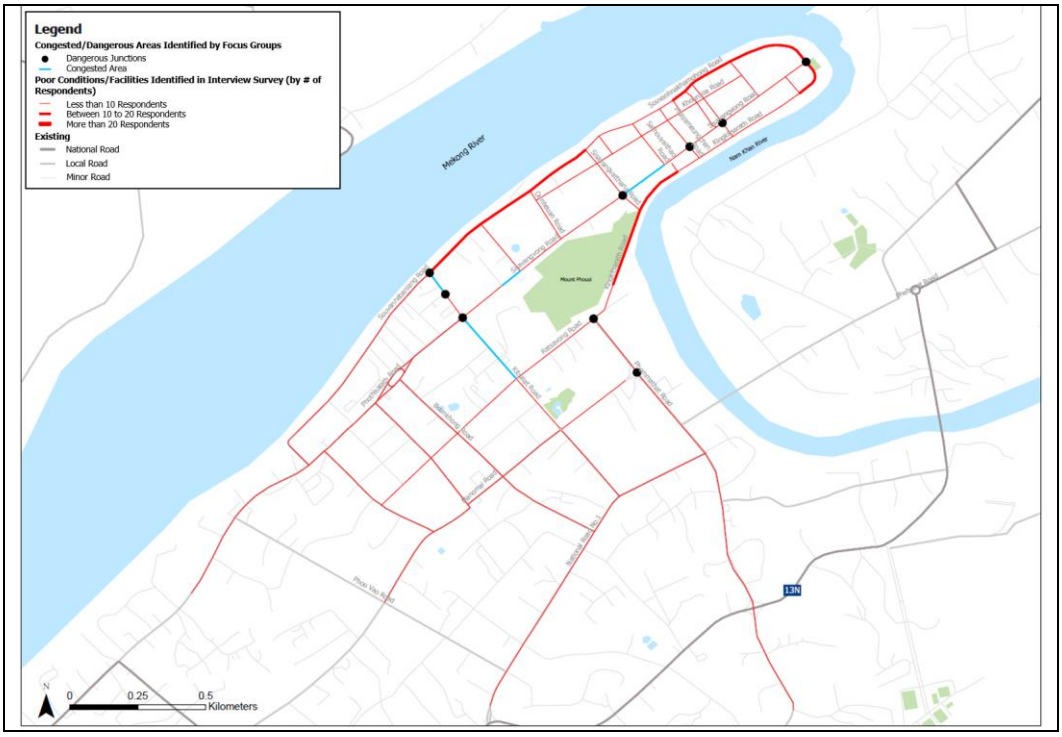


Figure 1.12: Key Problematic Areas of Luang Prabang from Interview Panel and Focus Group Perception Surveys

The findings above indicate an issue with driving behavior/safety and obeyance of road laws. Walk safety is a key concern that affects the choice to walk or bike, particularly at night – with more women than men identifying sidewalk safety, comfortable, and security is an issue. Footpaths are often blocked by obstructions (such as motorbikes) and by merchants. Crossing safety is also a key issue as respondents are fearful of vehicles that do not yield to pedestrians, even at designated zebra crossing locations. Parking on the narrow streets is exacerbated by local residents who leave their cars for several days.

Priority Improvements

Interview Survey

The interview surveys also queried respondents on top priorities for improving walk and cycle environment in Luang Prabang using a multiple-choice response. The highest priority was wider sidewalks (10.5%), tactile paving (10.4%) and more sidewalks (9.6%), followed by better signage (9.4%) and pavement markings (9.3%). Other priorities for walking include road user training (8.9%), signalized crossings (8.8%), and lighting (6.5%). Priorities for improving cycling environment include more bike lanes (8.1%) and bike parking facilities (7.9%). The respondents were also surveyed on the top priorities for improving green mobility conditions. The top priorities are public bike sharing program (10.3%), more parking spaces (10.2%) and electric bus system (10.2%), followed by public bus system (9.3%) and more parking restrictions (9.3%).

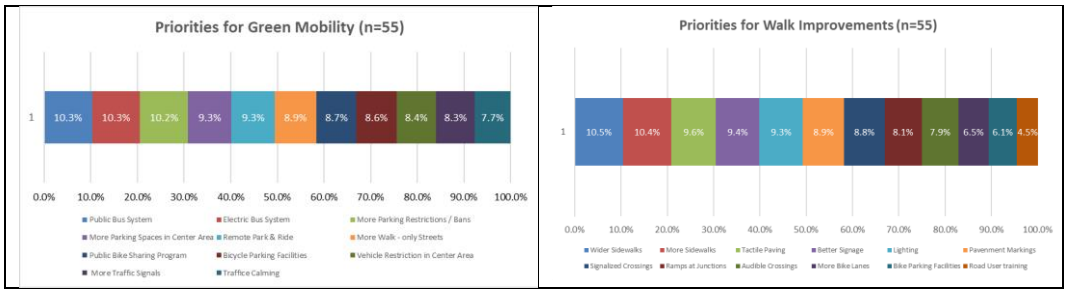


Figure 1.13: Interview Survey - Priorities for Transport Improvements (Left) and for Walk Improvements (Right)

Focus Group

Focus groups were also queried on their desired improvements in a free-flowing discussion of priorities (instead of multiple choice). Desired improvements of the six focus groups are summarized below by general category. The top desired enhancement was safer and more secure walk paths without obstacles, followed by safer crosswalks, safer parking areas, more public toilets, accessibility ramps, as well as driving behavior training.

Table 1.3: Desired Improvements Express by Focus Groups

Type of Enhancement	Female Elderly I	Female Elderly II	Male Elderly I	Male Elderly II	Female Business Group	Male Business Group	Focus Groups Identifying as Priority
Safe Walking Streets, Free of Obstacles, with Street Lighting and CCTV Cameras for Monitoring	✓	✓	✓	✓	✓	✓	6
Crosswalks With Clear Markings		✓	✓	✓		✓	4
Secure Parking Spaces (Including Vehicles and Bicycles)	✓		✓	✓		✓	4
Public Toilets		✓	✓	✓	✓		4
Ramps for Wheelchair Users	✓	✓	✓	✓			4
Training on Good Driving Behavior	✓		✓	✓	✓		4
Install Seats along Road	✓				✓		2
Connecting Services between Parking Area and City with Electric Vehicles						✓	1

Desired Locations for Improvement and Type

A map of desired locations for improvements and by type are shown in the figure below. The interview panel identified specific streets for improvement, while the focus group identified specific types of improvement desired and location. The interview surveys identified the Nam Khan and Mekong riverfronts, as well as Sisavangvong Road as the most desired areas to improve the active mobility environment. The focus groups desired improve street lighting along the entire riverfront stretch, as well as parallel roads to the Mekong riverbank. The focus groups also desired extending pedestrianization of Sisavangvong Road to the tip of the Peninsula.

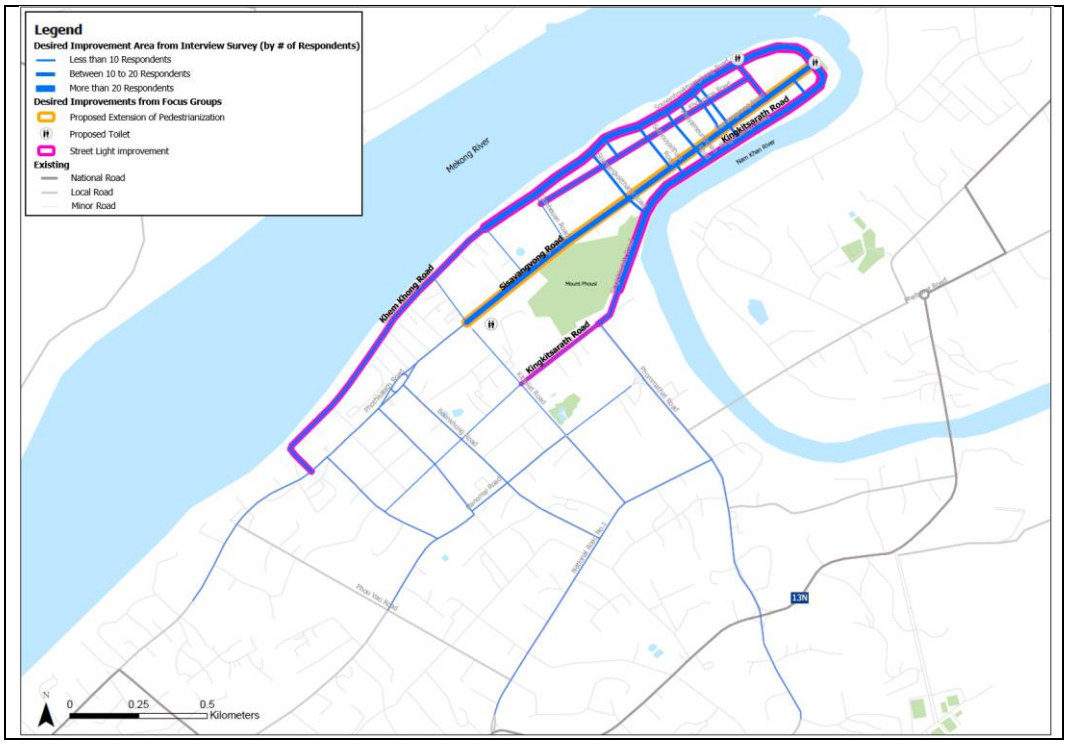


Figure 1.14: Desired Improvements on Peninsula from Interview Surveys and Focus Groups

1.5 Mobility Gap Analysis

Key mobility issues were identified in the existing conditions review in Technical Report - Luang Prabang Green Urban Mobility and are presented in terms of overarching mobility issues, those specific to green mobility, and those specific to the institutional framework around green mobility.

Overarching Mobility Issues

Overarching mobility issues in the city include:

- **Limited Mobility Options Exist, Thus Encouraging Motorbikes and Driving –** Motorbikes are the principal means of travel for most residents in Luang Prabang, where it comprised about 63% of all commute trips in

the city (but 80% of all mechanized trips).[22] Luang Prabang lacks alternate mobility options, which encourages motorbikes and driving. Although the city is building short stretches of bike lanes along the Mekong in a linear park, the city otherwise lacks bike lanes, bike parking, or bike share. The city also has no public transport system. Tourists flying into the airport northeast of the city use tuk-tuks to enter the city and for circulation around. The lack of priority and infrastructure devoted to green mobility may exacerbate congestion, emission and road safety issues given future growth and tourist increases, if such modes are not encouraged or facilitated with targeted investments.

- **Emissions and Air Quality Issues** – In 2014, transport accounted for over 60% of the total greenhouse gas emission in Lao PDR.[23] In addition, the 2020 Environmental Performance Index ranked Lao PDR as 130th out of 180 countries for air quality. The transport contribution is largely from two-wheelers, which make up nearly 85% of the total fleet, which is growing annually at around 8%.[24] Tuk-tuks are also a popular mode for tourists, which are another source of emissions. Facilitation of more sustainable modes may help to accommodate expected population and tourist growth and related increases in trip making.

- **Juxtaposition of Living Heritage District Preservation and Accommodating Future Tourism Growth** – Within the WHZ, development and changes to the road are highly restricted – for instance sidewalk widening is prohibited. So is physical reallocation of the road (i.e., converting the road from a vehicle carriageway to a raised sidewalk). Street improvements are restricted. Buses with more than 15 seats are prohibited from operating or parking in the WHZ. Thus, accommodating more tourists (i.e., from natural growth and the Lao-China Railway) would be constrained by the restrictive regulations.

- **Congestion Issues around Heritage Sites** – Congestion and illegal road/ sidewalk parking are cited as key issues in the Peninsula by local authorities and previous studies. These issues have a detrimental effect on the sanctity and feel of this heritage and historical area, as well as safety.

- **Road Safety and Driving Behavior Affects Active Mobility** – Traffic Police in Luang Prabang Province registered some 487 vehicle accidents in 2019, resulting in 155 severe injuries and 100 deaths (the latter represents the third highest rate in the country). From first-hand experience, residents are aware of these dangers. For instance, nearly 75% of respondents to a 2021 perception survey indicate that when using crosswalks, drivers typically do not yield to them. Only a quarter of respondents agreed that vehicles/drivers operate safely in Luang Prabang. Around 30% of

[22] Source: Basic Data Collection on Low-Emission Public Transport System in Lao PDR, JICA, 2012.
[23] Source: https://unfccc.int/sites/default/files/resource/867493251_Lao%20Peoples% 20 Republic BUR1-1 Draft%20Biennial%20Update%20ReportBUR_Lao%20 PDR_24July2020.pdf
[24] Source: Laos Statistics Department, 2021 (https://laosis.lsb.gov.la/statHtml/statHtml.do?orgId=856&tblId=DT_YEARBOOK_Q005&language=en&conn_path=I3)

respondents noted that traffic/driving behavior in Luang Prabang has a negative impact on road/street safety, congestion, air/noise emissions, and heritage impact. These issues may impact the choice to use an active mode.

- **Urban Expansion and Future Travel Demand** - The current issues may be magnified in the future, if the BAU mobility patterns (dominated by motorbikes) persist and growth occurs. Growth includes new development areas to the southeast (at the Lao-China Railway Station) and across the Mekong in Chompet, while some 130,000 annual visitors on the Lao-China Railway are expected, as well as visitors from a planned expressway between Vientiane and China.[25] Urban sprawl and longer travel distances may encourage BAU and possible result in more vehicles on the roads and additional related issues. The current urban development plans are not closely linked to transport investments to promote compact development linked to an overarching transport vision.

Key mobility issues thus are summarized as follows:

Table 1.4: Summary of Underlying Mobility Issues in Luang Prabang

#	Issue	Key Details
1	**Limited Mobility Options Exist, Thus Encouraging Motorcycles and Driving**	• Motorcycles are the dominant mode, representing over 80% of all motorized trips • Most tourist use tuk-tuk as their primary mode on their visit to Luang Prabang • Alternate mobility options such as public transport and bike are lacking, with limited dedicated infrastructure for green mobility
2	**Emissions and Air Quality**	• Transport accounted for over 60% of total greenhouse gas emission • Vehicle emission and poor air quality impact health of residents, active mobility comfort and attractiveness of the city
3	**Juxtaposition of Living Heritage District Preservation and Accommodating Future Tourism Growth**	• Development and changes to the road are highly restricted within the WHZ • Physical reallocation of the road / street improvements is restricted • Buses with over 15 seats are prohibited from operating or parking in the WHZ • Accommodating more tourists would be constrained by the restrictive regulations
4	**Congestion**	• The vehicle fleet especially motorcycles is growing at up to 8% annually • Significant congestion and illegal parking in the Peninsula
5	**Road Safety and Driving Behavior Affects Active Mobility**	• 487 vehicle accidents recorded in 2019, with 155 severe injuries and 100 deaths • Drivers often fail to yield to pedestrians when crossing the street • Traffic/driving behavior has a negative impact on road/street safety
6	**Urban Expansion and Future Travel Demand**	• Significant growth is forecast – potential to increase road traffic and congestion, and worsen emissions and health issues, if current mobility patterns persist in the future • Growth occurring to the southeast and across the Mekong in Chompet • 130,000 annual visitors on the Lao-China Railway are expected, plus visitors from a planned expressway between Vientiane and China

[25] Source: From Landlocked to Land-Linked Unlocking the Potential of Lao-China Rail Connectivity, World Bank, 2020.

Green Mobility Gaps

Key green mobility gaps in Luang Prabang were identified in Technical Report - Luang Prabang Green Urban Mobility, based on site surveys, video observations, and the Green Mobility Index (GMI) and include:

- **Limited Crossing Facilities** – The inventory of the City identified only six junctions with zebra crossings. No signalized junctions exist in the City. This represents a serious gap for walking and cycling – particularly for women, disabled, those totting strollers, luggage, goods, etc.
- **Limited Access-for-All Amenities** – There is no overarching policy to plan or design for women, elderly, disabled, and other disadvantaged groups within the street realm including the sidewalk.
- **Limited Provision of Paved and Formal Sidewalk –** Sidewalks in the main tourist areas of the Peninsula are paved and well maintained. However, there are some streets even in the Peninsula that lack sidewalks altogether. Of 130km of roadsides surveyed in this Study:
    - **Paved Sidewalks** –Around 15% are paved and well-maintained, while 77% have no paved sidewalk at all. Paved sidewalks create a clear, delineated path for pedestrians.
    - **Curb Height** – A formal curb physically separates the roadway and adjacent sidewalk. Nearly 69% of roadsides have no curb, while about 27% have a curb of about 150mm or higher.
    - **Sidewalk Width** – A narrow sidewalk can become congested, forcing pedestrians to walk outside of the dedicated walking area (and possibly into the street). Only around 8% of the surveyed roadsides are 1.8m or wider, allowing two wheelchair users to pass.

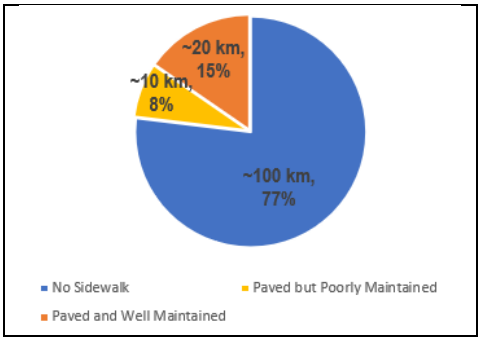


Figure 1.15: Sidewalk Pavement Condition along Surveyed Sides of the Road (130km)

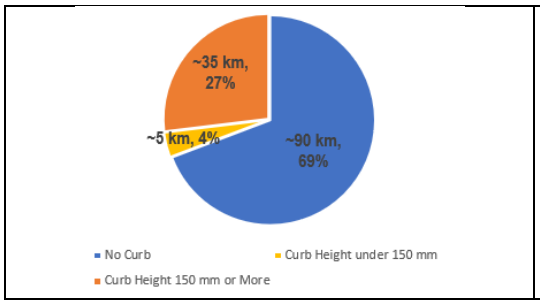


Figure 1.16: Curb Height along Surveyed Sides of the Road (130km)

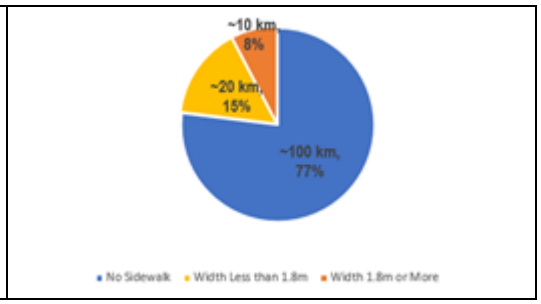


Figure 1.17: Sidewalk Width along Surveyed Sides of the Road (130km)

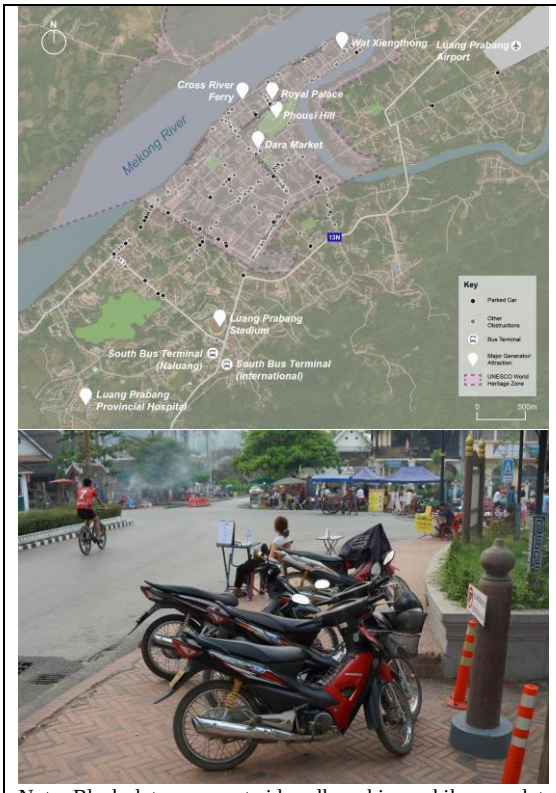
- **Walk Facilities Absent on Route 13N, a Major Mobility Corridor –** No crosswalks are provided along Route 13N, thus pedestrians are forced to run across the street or wait for a yielding vehicle. In addition, in the north near

the Airport, no formal sidewalk is provided. These situations may discourage walking (and public transport) on Route 13N.

- **Walk Priority and Facility Improvements Needed for Local Access Roads throughout the City –** Local access roads connecting to these major roads lack such facilities. This discontinuity and gap can discourage walking, cycling, and use of any future public transport system.

- **Sidewalk Obstructions Not a Significant Problem on Most Streets, But Specific Treatments May Be Needed on Select Corridors** – Although some sidewalk parking and obstruction of the sidewalk by vendors or trees is observed, this does not appear to be a systematic issue throughout the City. Obstructions are observed on certain key corridors including Phu Vao Road, Kingkitsalat Road, and Naviengham, and in tourist areas.

- **Weather Protected Paths Limited** – Weather protected pathways including trees and canopies providing overhead shading or protection are limited in the city. This is important given hot, humid, and rainy weather – all of which happens in a single day or hour.



Note: Black dots represent sidewalk parking, while grey dots represent other types of obstructions including trees, utility poles, vendors, merchandise, seating, billboards, etc.

Figure 1.18: Sidewalk Parking in Peninsula

- **Poor Lighting Provision on Local Roads and Throughout WHZ –** Street lighting is lacking on many roads with densities below 2 per 100m (or one every 50m). Poor lighting discourages active mobility, particularly for women due to security and safety concerns.

- **Lack of Cycling Facilities** – No bike lanes are provided, although segments are planned along the Mekong River. This lack of dedicated facilities discourages wider cycle use and encourages continued use of motorbikes and tuk-tuks by residents and visitors, respectively.

- **No Public Transport Service/Facilities** – No public transport is offered in the city, thus tourists rely on tuk-tuks, while residents mainly use motorbikes. Proliferation of two- and three-wheeled vehicles contributes to congestion, emissions, and safety issues on the road. Properly planned and accessible public transport can be an affordable, more comfortable, and more attractive alternate than riding a motorbike or driving over

medium/longer distances (and selected short-distance popular trips). An effective public transport system can also reduce the number of vehicles on the road and emissions.

Specific green mobility issues thus are summarized as follows:

Table 1.5: Summary of Green Mobility Issues in Luang Prabang

#	Issue	Key Details
1	**Limited Provision of Paved Sidewalks Outside of Peninsula**	• Of 130km of roadsides surveyed in this Study, 77% lack paved sidewalks • The same survey identified that nearly 69% of roadsides have no curb, while only about 27% have a curb of 150mm or higher • Only 8% of surveyed sidewalks are 1.8m or wider
2	**Limited Crossing Facilities**	• No signalized junctions exist in the city • Only six junctions have zebra crossings • Crossing onerous and potentially dangerous for women, disabled, those totting strollers, luggage, goods, etc.
3	**Limited Access-for-All Amenities**	• No overarching policy to plan or design for women, elderly, disabled, and other disadvantaged groups within the street realm exist including the sidewalk
4	**Sidewalk Obstructions on Some Streets**	• Sidewalk obstructions do not appear to be a significant systematic issue throughout the city, although parked vehicles, trees and vending activities occur on the sidewalk and block them • Obstructions are observed on Phu Vao Road, Kingkitsalat Road, and Naviengham, and in tourist areas
5	**Weather Protected Paths Limited**	• Weather protected pathways, including trees and canopies providing overhead shading or protection, are limited • These are important to encourage walking given the hot, humid, and rainy weather
6	**Poor Lighting Provision on Local Roads and Throughout WHZ**	• Street lighting is lacking on many roads with densities below 2 streetlights per 100m • Poor lighting discourages active mobility, particularly for women due to security and safety concerns
7	**Lack of Cycle Facilities**	• No bike lanes are provided, although segments are planned along the Mekong River
8	**No Public Transport Service/Facilities**	• No public transport exists in the city. • Properly planned and accessible public transport can serve as an affordable, more comfortable, and more attractive alternate than a motorcycle or car • An effective public transport system can also reduce the number of vehicles on the road and associated emissions

1.6 Institutional Issues

A set of institutional and capacity building gaps was identified based on: (i) initial review of documents and interviews with relevant stakeholders prior to the formulation of the Green Mobility Vision and indicative investment priorities; (ii) a stakeholder workshop in October 2021 to gather feedback and insights on the Vision and indicative investment priorities and related institutional and capacity issues (including MPWT, DPWT, DHUP, DOT, DPL, Province of Luang Prabang and City of Luang Prabang); and (iii) targeted follow-up meetings with key stakeholders prior to and after this October 2021 workshop.

Issues and gaps are categorized under three constituent elements and summarized in the table below:

- **Legal, Regulatory and Policy** – The review focused on identifying gaps in the legal, policy, and regulatory framework governing green mobility initiatives.
- **Decision-Making, Organizational, Engagement, and Funding/ Financing –** The review focused on the role and responsibility of different institutions in decision-making, the organizational structures governing green mobility aspects, public engagement, and education, as well as funding/financing of green mobility initiatives.
- **Training and Capacity Building** – The review focused on identifying needs for training and capacity building to address the shortage of knowledge and skills among authorities and staff to plan, prepare, fund/finance, adopt, and manage green mobility plans and initiatives.

Table 1.6: Summary of Institutional Gaps and Capacity Building Needs

Category	Broad Issue
Legal, Regulatory, and Policy Elements	
Visions, Goals and Strategic Plans	• **Lack of Overall Green Mobility Vision or Discrete Targets/Goals included in Overarching Transport Plans –** The current planning framework such as the 9th Five-Year National Socio-Economic Development Plan (NSEDP) 2021-2025 includes green mobility aspirations such as spacious sidewalks and e-mobility uptake. These are not, however, linked directly tied to an overarching green mobility vision or clear/discrete goals to inform concrete actions. Also, there is no overall policy directive nationally.
Laws / Regulations	• **Green Mobility Not Well Defined in Legal Framework (including Financing Mechanisms) -** The current legal statutes governing transport in Lao People's Democratic Republic (PDR) (i.e., Law on Land Traffic) focus on roads, but have limited mention pedestrians, cyclists, and bus transport (provincial). In addition, legal/regulatory frameworks are lacking to support financing mechanisms for green mobility development and operations. • **Green Mobility Plans and Initiatives Potentially Constrained by 1999 Plan de Sauvegarde et de Mise en Valuer or Safeguarding and Preservation Plan (PSMV) -** The 1999 PSMV governs allowable uses, modifications, and facilities in the WHZ including restricting vehicle type, sidewalk and road modification and expansion, and parking. Thus, the PSMV may limit the scope / extent of green mobility initiatives (i.e., provision of additional pedestrian space and walk areas, size of public transport vehicles, and location of bus stops in the WHA). • **Bus Transport Provisions in Legal Framework More Appropriate for Long-Distance, Provincial Buses –** Although public "bus" operations are defined in the legal framework, regulations apply principally to long-distance, regional bus services and not urban public transport service.
Design, Operational Norms and Guidelines	• **Limited Consideration of Active Mobility and Green Mobility in Road Design Standards** – The current 2018 Road Design Manual provides a comprehensive guide for planning and designing roads. The manual seeks to enhance the flow of vehicles, but there is minimal consideration of green mobility modes. Safety/security and universal access elements are not integrated into designs.
Enforcement	• **Enforcement of Illegal Parking Is Weak and Penalties Not Clearly Defined -** The Law on Land Traffic stipulates parking on sidewalks is illegal. However, weak parking enforcement has resulted in significant illegal parking on the sidewalks.
Monitoring and Evaluation	• **No Monitoring System in Place to Track Green Mobility Achievement** - Monitoring of key indicators for green mobility has not been established.
Decision-Making, Organizational, Engagement, and Funding/Financing Elements	
Clear and Discrete Responsibilities and Roles for Green Mobility Activities	• **No Clearcut Agency Responsible for Green Mobility or Public Transport –** Multiple entities have responsibilities for the sidewalk and road. No clearcut agency exists to handle green mobility or public transport. • **Overlapping Responsibilities for Road and Parking Operations and Maintenance –** MPWT is responsible for national roads, while DPWT is responsible for provincial and district road construction and maintenance. At the same time, the Urban Services Office (USO) is responsible for small-scale road improvement works, as well as cleaning. Villages are responsible for upkeep of their own village roads.

Category	Broad Issue
Project Formulation and Prioritization / Decision-Making	• **Limited Inclusion of Green Mobility in Local Prioritization Framework** – Green mobility is an aspiration in the city, but it is not directly linked to the local prioritization framework. • **National Level Prioritization Framework Lacks Green Mobility Focus** –The national framework lacks clear cut green mobility goals where green mobility projects must compete with all other sectoral projects.
Overarching Transport Authority / Cross-Cutting Coordination Mechanism	• **Cross-Cutting Committee Exists for WHZ Projects but Lacks Direct Transport Input –** The Local Heritage Committee, comprised of the Vice Governor, Provincial Government, City, and DPL) advises on projects in the WHZ. The Committee meets every two months and delegates issues to the relevant head of the local departments. DPWT is not directly involved in the meetings, although this may be desirable when developing green mobility initiatives in the WHZ.
Civic/ Community Participation	• **Limited Citizen Engagement / Participation in Development of Transport Plans –** Transport plans in Luang Prabang are first formulated by DPWT based on needs of the local area. There is limited opportunity for citizen input and engagement early in the process and to shape the discussion.
Public Outreach and Education	• **Limited Public Outreach and Green Mobility Education Campaigns** – As green mobility's momentum is building, the city lacks education campaigns to encourage green mobility (e.g., Car-Free Days). • **Engagement of Transport Operators / Drivers Key to Successful Transition to Modern Bus System –** Based on experiences in Luang Prabang, engagement of existing operators / drivers is essential to reflect their opinions, preserve the unique culture of the city, and gain their support for any public transport plans.
Private Sector Involvement	• **Public-Private Partnerships (PPP) Potentially Promising for Large-Scale Green Mobility Initiatives, But Limited Experience in the Country -** There is a limited experience in developing and formulating PPPs. • **WHZ Requirement for Environment / Heritage Impact Assessments for Projects within WHZ May Discourage Private Sector –** The two assessments are required for infrastructure projects in WHZ and design/ construction work must comply with PSMV.
Dedicated Funding for Green Mobility	• **No Dedicated Funding for Urban Transport or Green Mobility** - There is no dedicated funding exclusively for urban transport or green mobility at present. • **Entities Unable to Fulfil Responsibilities due to Limited Operations & Maintenance (O&M) Budget –** Budgetary constraints are cited as a key impediment to various mobility activities including road maintenance, particularly at the local level. There is no recurring source of O&M funding for potential green mobility initiatives (i.e., public transport or parking) – this could also affect green mobility in the future.
Financing Schemes for Green Mobility	• **Constrained Fiscal Space in Lao PDR Has Resulted in Insufficient Financing to Meet the Needs for Public Works and Transport Sector Expenditure -** There is limited planned projects in Luang Prabang for urban transport or green mobility.
Capacity Building Elements	
Training and Capacity Building	• **Capacity Building Agenda Set at National Level –** The local DPWT receives technical guidance and capacity building from the MPWT, thus national priorities may not fully align with the specific needs of the local DPWT. • **Limited Technical Expertise on Green Mobility and Urban Transport** – Current knowledge on green mobility and urban transport is relatively limited. Current gaps include: (i) green mobility planning/design; (ii) data collection using innovative techniques; (iii) road design and right-of-way allocation; (iv) public transport; and (v) traffic signals and timing. • **Limited Staff Capacity to Develop Projects and Proposals to Obtain Funding** – Given limited national budget, there is a need to explore alternate funding options at local level. However, there is limited local government expertise on developing green mobility initiatives and seeking funding for these. Identified capacity gaps include: (i) formulation of said proposals and understanding of donor requirements; (ii) managing bid processes and funding submissions; (iii) project management; and (iv) English fluency.

2 Green Mobility Vision

2.1 Introduction

This section presents the overarching Green Mobility Vision for Luang Prabang. The Vision leads to a set of goals, objectives, strategies, and finally indicative investment priorities. The linkage between these as is follows:

- **Vision** - Describes the future green mobility network and system and how it is expected to benefit and reinvigorate Luang Prabang. Essentially, how may Luang Prabang look like in the future if all aspirations for green mobility are achieved.
- **Goals** - Broad, long-term aim, setting the direction to achieve the vision.
- **Objectives** – Specific achievements or steps that collectively seek to achieve the goals.
- **Strategy** – Broad actions that when implemented can achieve the objectives.
- **Actions** – Specific and detailed activities as part of a strategy, which are time-based, have an associated cost, and responsible implementation parties (forming the indicative investment priorities).

As noted, the Green Mobility Vision and various actions (and thus indicative investment priorities by phase) can serve as inspiration for and constitute one part of a larger and longer-term Transport Master Plan for Luang Prabang, which is currently lacking.

2.2 Vision Statement

In the future, Luang Prabang will have an:

Accessible, Comfortable, Inclusive, and Resilient Green Mobility System, Focusing on People Movement, Enhancing the Environment, and Preserving its Living Heritage, Supported by an Enabling Framework

2.3 Goals and Objectives

Four Key Goals

The Green Mobility Vision proposed above is supported by four overarching goals, which target two groups – residents (and their needs for a convenient and accessible green mobility system catering to their daily commutes and leisure trips) as well as visitors (and their needs for a convenient and entertaining green mobility experience linking to major visitor locations and transport hubs). These goals seek to enhance green mobility for both users – where applicable specific benefits to visitors and/or residents will be elaborated.

Table 2.1: Description of Four Key Goals

#	Goal	Description
1	People	Creating a people-centric, integrated green mobility system that moves all people safely, securely, and effectively.
2	Environment	Reducing emissions and improving air quality by facilitating the transition to green mobility by building sentiment and changing behavior, while also responding to climate change.
3	Heritage & Tourism	Preserving and respecting the living heritage of Luang Prabang, while accommodating future tourists more sustainably through green mobility
4	Institutional	Creating an enabling framework to facilitate and encourage green mobility

These four goals and key underlying objectives and broad strategies are presented below. Key linkages between green mobility goals and key issues are shown below and explained below.

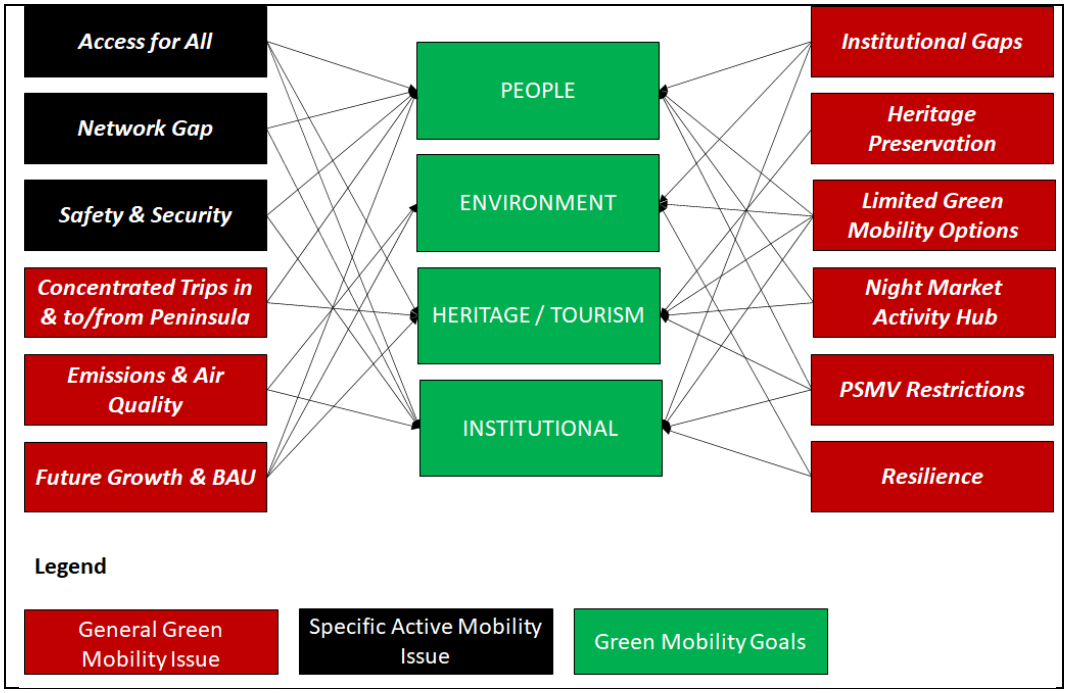


Figure 2.19: Linkage between Green Mobility Goals and Key Issues

Goal#1: People

Key Message:

Creating a people-centric, integrated green mobility system that moves all people safely, securely, and effective.

Description/Rationale:

The purpose of a transport system is to move people efficiently and effectively over different trip distances. The purpose of a green mobility system is to achieve this using green transport modes – including active mobility, other NMT modes, as well as public transport and E-mobility. This goal seeks to achieve a cohesive and continuous green mobility network that prioritizes the user experience – to create a people-centric design that is safe, secure, and comfortable for all.

Walking and cycling serve as the backbone for the short and medium-distance trips, while public transport serves as the backbone for longer-distance system as well as

for trips between key generators that cannot be walked. Infrastructure and services are a key component of People. Dedicated and segregated walk and bike corridors and a contiguous and linked multimodal networks may create safer operating environments that can encourage greater use of these modes. This may include reallocation of road space towards these modes as well as for public transport through the creation of priority lanes or other priority features.

Recommended Objectives/Strategies to Achieve Goal

The goal is supported by three objectives and various underlying strategies.

Objective 1A: Continuous and Protected Active Mobility Network

A continuous and protected active mobility network, segregated from vehicles, is a key element of creating an attractive and usable system. The street-level index analysis identifies gaps in the walk network including areas without paved sidewalks and those with poor surfacing quality. Surveys find sidewalks are considered inconvenient, with gaps and quality of pavement a key issue. Bike lanes do not exist in the city currently (outside of planned lanes along linear parks on the Mekong). In addition, some streets in Luang Prabang are unpaved – making cycling difficult due to rough surfaces. During the rainy season, unpaved roads often have large puddles, making walking/cycling more difficult. No bike parking or bike share program exists.

This objective may be achieved by filling walk gaps and upgrading pavements and surfacing where appropriate. Street furniture such as streetlights, trees, benches, parklets, and signage may create a safe and comfortable walk environment. Protected walk and cycle corridors/areas may be established where appropriate to create priority and physically segregate active mobility users from motor vehicles. A new bridge over the Nam Khan is proposed – although feasibility studies are proposed under this Vision given the long-term timeline for this (this may replace the Old Bridge or may be at another location further towards the mouth of the Mekong). Bike amenities may be provided to complement the network including toilets (as requested by focus groups), and bike parking and bike share. Linkage to key destinations may benefit residents (i.e., government buildings, schools, and hospitals), while those to tourist destinations/accommodations may benefit visitors,

Strategy #	Strategy
1A1	Create Continuous and Protected Walk Network
1A2	Create Bike Priority Network
1A3	Provide Walk/Bike Amenities to Complement Network (including Toilets, Bike Share and Bike Parking)

Objective 1B: Safe, Secure and Comfortable Experience for All

A safe, secure, and comfortable green mobility environment is more likely to attract users and increase use of active mobility. Lao PDR has one of the worst safety records when compared to 2019 figures from the IRTAD's Annual Road Safety Report.[26] The street level index and perception surveys find that crossing safety is a key issue – no junctions are signalized, while zebra crossings are provided at select junctions. Perception surveys find that crossings are considered dangerous by a large portion of respondents, while road safety is an on-going issue and respondents are wary of driver behavior. Creating a safe and secure environment free from danger and harassment is

[26] Source: https://www.itf-oecd.org/sites/default/files/docs/irtad-road-safety-annual-report-2020_0.pdf

vital to encourage women and disadvantaged to use active modes and public transport. At the same time, the green mobility system needs to accommodate the needs of all – regardless of ability – into the planning and operation of green mobility modes. Lastly, given Luang Prabang's climate – with hot and humid weather interspersed with torrential downpours – creating a comfortable walk environment is needed during all times of the day for protection from the elements.

This objective may be achieved by improving crossing safety (with a suite of treatments including zebra crossing, pedestrian lights/beacons, and signalized junctions as well as traffic calming), improving security for all user groups to minimize dangers/harassment (including enhanced lighting and surveillance), integrating universal access principles into designs (such as accessible ramps and tactile pavement), and creating an all-weather/all-year network (with more extensive tree coverage and overhead canopy). Comprehensive road improvements are proposed including paving, drainage, sidewalk and crossing improvements in both urban and rural contexts to create alternate paths and reduce loading on specific corridors. Integrating road safety into designs, conducting road safety audits, and developing a road safety monitoring system are proposed. Residents may benefit from safer and more comfortable access in their daily lives and commutes, while visitors may benefit from improved access to visitor destinations and within hotel areas.

Strategy #	Strategy
1B1	Make Crossings Safer
1B2	Bolster Sense of Security for Women and Disadvantaged Groups
1B3	Integrate Universal Access into Streets
1B4	Create All-Weather / All-Year Network
1B5	Enhance Road Network and Safety

Objective 1C: Integrated, Multimodal System, Emphasizing Efficient People Movement

An effective and attractive green mobility system may be integrated and multimodal, providing seamless interchange between modes. Active mobility may serve as the primary short-distance and medium-distance mode, while green public transport may serve longer-distance trips, as well as provide as a more comfortable (i.e., with seats and air conditioning) and higher-capacity mode between key trip generators. Jeju's integrated public transport system services longer-distance and heritage trips outside the city, supported by extensive cycle and walk networks.

Currently, no public transport system is operated in the city. Continuing in a BAU fashion, where smaller vehicles dominate may place more strains on current roads such as Route 13N and congested areas such as along Sisavangvong Road and the Night Market. Perception surveys indicate that public transport is one of the desired potential improvements. The city has requested a green public transport system to ease the burden on the Peninsula. Mobile device data suggests strong linkages exist between the city center and the Airport, currently served by tuk-tuks principally for tourists (and minivans), and the Peninsula and areas to the southwest. In the future, linkage across the Mekong to the new Chompet development and the Lao-China Railway (8km to the east) would create additional road congestion issues. At the same time, delay and slow travel speeds can threaten the attractiveness of public transport, thus mitigating these potential impacts is important.

This objective may be achieved by creating a new public transport system serving key attractions and generators (including linking the Peninsula, Airport, Lao-China Railway, and other key destinations), ensuring seamless connections and interchange between

modes. The system may benefit residents commuting to work or traveling, as well as visitors traveling to/from the Airport, Railway Station, and WHZ.

Strategy #	Strategy
1C1	Operate Green Public Transport Serving Key Attractions and Generators
IC2	Create Seamless and Integrated Interchange between Modes

Goal#2: Environment

Key Message:

Reducing emissions and related issues by facilitating the transition to green mobility by building sentiment and changing behavior, while also responding to climate change.

Description/Rationale:

Today, most travel is by motorbikes, with tourists using tuk-tuks as well, both generating significant emission and air quality issues. This goal thus seeks to reduce emissions from existing transport modes, while also growing and nurturing green mobility "sentiment" of the public to eventually change long-term behavior, while at the same time responding to climate change.

Green mobility sentiment and support is fundamentally driven by city policies and decisions. Clear land use policies supporting green mobility and focusing investments and priority on efficient and effective systems is a start. Advocating transition to electric modes (or E-mobility) and less polluting models is an important lever cities/governments can deploy. Restrictive policies and measures on vehicle use and parking can also be effective – if accompanied by attractive and convenient alternate modes. Lastly, raising public awareness and educating the public on the benefits of active mobility or green mobility can build the groundswell support for greater adoption of green mobility in Luang Prabang.

Recommended Objectives/Strategies to Achieve Goal

The goal is supported by four objectives and various underlying strategies.

Objective 2A: Establish Green Mobility Foothold in New Areas

New development areas are prime targets to create a foothold for green mobility. Building the urban fabric around green mobility can fundamentally alter travel patterns and build green sentiment. Currently, Luang Prabang is not well equipped for green mobility as found by the street-level index, with areas outside of the Peninsula impacted by connectivity gaps, lack of sidewalks, limited crossings, etc. New developments in Chompet across the Mekong as well as at the Lao-China Railway station that are planned in a BAU fashion, whereby motor vehicles are prioritized, may result in a populace accustomed to driving.

This objective may be achieved by focusing development and neighborhoods around green mobility in areas such as Chompet, the railway station, and other growth areas and integrating green mobility into urban design guidelines.

Strategy #	Strategy
2A1	Plan New Development Areas Centered around Green Mobility

Objective 2B: Accelerate Transition to Green Mobility and Minimize Adverse Environmental Effects of Transport

Reducing current vehicle fleet emissions is one strategy to reduce overall transport emissions, while the transition to green mobility is occurring. At present, most trips are on motorbikes, with motorbikes comprising over 80% of the entire vehicle fleet, which is growing each year. As green mobility sentiment rises due to city policies and public understanding and trialing of green mobility, existing modes may still remain dominant for the foreseeable future (given the inherent flexibility and convenience of motorbikes).

Opportunity exists to accelerate E-mobility to green the vehicle fleet by creating a committee to develop the e-mobility strategy and leveraging private sector involvement to create pilot projects. Aligning with national strategies and on-going efforts may be essential. At the same time, opportunity exists to reduce emissions of the existing vehicle stock through restrictive policy measures focusing on emission limits for vehicles. This objective may be achieved through a combination of these efforts.

Strategy #	Strategy
2B1	Accelerate E-mobility as Viable Mobility Option
2B2	Encourage Transition to Less Polluting Vehicles

Objective 2C: Enhance Curb Management and Transform Curb Use to Prioritize Green Mobility

Urban space prioritized for green mobility instead of vehicles and parking can generate green mobility sentiment and encourage its adoption, as well as improve the fabric of the city and the public and active mobility of a city. Cities have taken this opportunity to reduce road widths to create additional space for parklets or public use (as depicted by the example photo in Auckland).

Curb management is another key issue – particularly parking. On-street parking is provided in Luang Prabang, with new spaces along the Mekong recently implemented. Parking is identified as an issue as residents on the Peninsula are hesitant to leave their vehicles at remote lots for fear of theft/vandalism – thus parking is prevalent in small alleys, where vehicles are left for long durations. Sidewalk parking occurs in Luang Prabang, which not only block the walking path, potentially forcing pedestrians (and cyclists) into the roadway and traffic lanes, but also create dangerous conflicts when vehicles mount/depart the sidewalk areas. Space dedicated to roads and driving reduce that available to active mobility – where the street-level index results show that most sidewalks are under 1.8m wide (where provided), the minimum for two wheelchairs to pass.

This objective may be achieved with a multi-pronged approach including development of a parking strategy with on-street/off-street parking restrictions, payment systems, and enforcement, as well as a pilot parking management system in the Peninsula.

Strategy #	Strategy
2C1	Facilitate Effective Parking and Curbside Management Framework

Objective 2D: Raise Public Awareness Towards Green and Clean Mobility

Public awareness is essential to building green mobility sentiment and changing people's perspectives – and convincing them to use green modes. While walking is involved in every trip, most motorized trips are on motorbikes. Road designs promote vehicle

movement, instead of active mobility. People accept the norm – change may be unfamiliar/unwelcome, particularly if it affects a business or residence directly.

This objective may be achieved through both policy/incentive based measures, which could include complementary public transport or bike share for a specific day/period as well as bottom-up education and communications campaigns for the public (including car-free days such as in Jakarta or Tallinn, education campaigns at local universities, and interactive websites/apps to publicize green mobility).

Strategy #	Strategy
2D1	Encourage Greater Use of Green Mobility through Policies/Incentives
2D2	Inspire and Educate the Public to Build Sentiment

Objective 2E: Embed Resilience into Network and Infrastructure

Embedding resilience into the operation and design of green mobility systems is essential in the face of climate change, pandemics, and other unforeseen events. Cities have incorporated resilience elements directly into infrastructure to account for more severe flooding risks and weather events. Furthermore, ability to maintain operations and continuity equips cities to more effectively and safely maintain basic services for residents and visitors. This may take the form of network redundancy, as well as provision of alternate modes and backup operational plans to retain backbone mobility services.

This objective may be achieved by integrating resilience into green mobility design guidelines, as well as building this into the transport and mobility plans for the city.

Strategy #	Strategy
2E1	Integrate Resilience into Green Mobility Design
2E2	Integrate Resilience into Transport/ Mobility Plans for City

Goal#3: Heritage / Tourism

Key Message:

Preserving and respecting the living heritage of Luang Prabang, while accommodating future tourists more sustainably through green mobility

Description/Rationale:

The WHZ (focusing on the Peninsula and various heritage sites) has made Luang Prabang the world renown destination it is today. To retain its allure, the WHZ and sites must be preserved and respected. As a relatively small city with narrow streets and a small town feel, Luang Prabang and its WHZ are facing critical issues with city growth, its motorbike dominant travel patterns, growing tourist volumes (expected to increase significantly once the Lao-China Railway opens), and associated issues including congestion, emissions, and air quality. Within the WHZ, influxes of tourists in tuk-tuks and minivans converge on the WHZ and its key sites in the morning and evening - generating congestion and noise, disturbing the site and sanctity of the monuments, and denigrating the visitor experience. While the PSMV regulates how the build environment (including roads and sidewalks) can be modified and the types of vehicles that may operate within the PSMV (i.e., restricting buses with over 15 seats, etc.), this also affects the extent and scope of mobility improvements to increase capacity to handle more residents/tourists.

Leveraging green mobility to address some of these concerns is the main theme by stressing active mobility and green public transport to/from and within the WHZ. However, mobility strategies must be well tailored to align with restrictions put in place by the PSMV to protect the monuments. Accentuating heritage by combining tours / itineraries of varied sites with green mobility has also proven effective elsewhere as well (for instance themed cycle corridors/routes) to attract more tourists and diversify the current market to spread the peak and reduced peak loading impacts on the city and its streets and neighborhoods.

Recommended Objectives/Strategies to Achieve Goal

The goal is supported by four objectives and various underlying strategies.

Objective 3A: Respect Heritage and Improve Visitor Experience

Respecting and preserving the unique cultural and living heritage of the WHZ (and Peninsula) is an utmost priority. The WHZ is the reason why visitors come to Luang Prabang. Tourist influx and vehicles carrying them generate congestion, noise, emission, etc., particularly during the evening. Negative impressions of the sites and the visitor experience can discourage more visitors from coming to Luang Prabang and the WHZ. However, better accommodating tourist inflows (and residential needs) by widening sidewalks and physically reallocating roadspace to a new sidewalk is prohibited by the PSMV. Finally, unlike cities such as Melaka and Tallinn, there is no integrated heritage and mobility plan.

This objective may be achieved by tailoring green mobility solutions that respect heritage and align with protective PSMV restrictions (restricting noted sidewalk widening), integrating heritage and city mobility plans to create a seamless network within and outside the heritage aera, enhancing the mobility experience within the WHZ, and broadening the visitor experience by linking regional attractions with green mobility to reduce loading at popular sites.

Strategy #	Strategy
3A1	Tailor Green Mobility to Preserve and Respect Heritage and Protective Restrictions
3A2	Connect Outlying Tourism Attractions with Green Mobility to Broaden Appeal

Objective 3B: Intertwine Tourism and Mobility to Accentuate Luang Prabang and Broaden the Experience

Intertwining tourism and green mobility into a combined experience has created enriching, fulfilling, and attractive journeys in other locations. Cities such as Chinon and Jeju market/promote themed regional cycle networks linking heritage and historic sites. Melaka's riverwalk combines a shared use boardwalk with heritage/historic storytelling. Themed corridors are attractions themselves, accentuating heritage and broaden appeal.

This objective may be achieved by developing themed corridors or experiences that integrate mobility and heritage/tourism. Luang Prabang has great potential for this with planned bike infrastructure and new bike/walk trails along the Mekong and Nam Khan, combined with linkages to attractions further afield such as the Pak Ou Caves to the northeast and the Kuang Si Waterfall to the southwest for a day/multi-day experience.

Strategy #	Strategy
3B1	Leverage Green Mobility to Accentuate Regional / Heritage Appeal

Goal#4: Institutional

Key Message:

Creating an Enabling Institutional Framework to Encourage Green Mobility and Nurture Public Support

Description/Rationale:

Comprehensive institutional and policy frameworks, with clear legal delineation and responsibilities, linked visioning, goal setting, and prioritization, along with dedicated funding and financing schemes, are essential to successfully planning, designing, and implementing green mobility initiatives and achieving lofty green mobility ambitions. Integration of active mobility, public transport and universal access elements into road design is also essential at the implementation level to ensure facilities are people-centric and responsive to different groups.

However, at present in Luang Prabang, green mobility elements are not fully defined in the legal statutes governing transport in the city and across Lao PDR. Likewise, roles and responsibilities for cycling, public transport and e-mobility are not clearly defined to promote green mobility initiatives. Existing funding instruments are not sufficient to plan for the long-term investments. No funding is earmarked for public transport. At the strategic policy level, green mobility aspirations are defined, but an overall vision or discrete green mobility goals are lacking. Project prioritization lacks clear linkage to green mobility. At the local implementation level, green mobility and universal access are not integrated into design standards.

Recommended Objectives/Strategies to Achieve Goal

The goal is supported by three objectives and various underlying strategies.

Objective 4A: Integrate Green Mobility into Strategy, Planning, and Design and Leverage Technology to Improve Operations

Infusing green mobility into the strategy, planning, and design of transport facilities and services creates a facilitating and enabling framework for green mobility, in which priority is given to green mobility, and green mobility elements are integrated into the streets to make them safe, more secure, and more responsive to the needs to users. Other cities have also leveraged technology to generate green mobility innovations to more effectively operate and manage the city such as Melaka and Tallinn.

In Luang Prabang, the transport mobility plan is not directly tied to green mobility outcomes, nor are there clear green mobility goals. No monitoring system is in place to assess achievement of green mobility goals. Lastly, design standards for transport infrastructure have minimal inclusion of walking, and no mention of biking and public transport.

This objective may be achieved creating a participatory and people-centric planning and design framework linked directly to green mobility aspirations, as well as leveraging technology to create better green mobility networks, facilities, and outcomes (for instance leveraging the Cities Development Initiative for Asia (CDIA) plans for a CCTV monitoring system on the Peninsula with 48 poles for security). One potential mobility evolution may be a Sustainable Urban Mobility Plan (see **Box 2.1** below). **Box 2.2** also describes the inspirational example of rural road development in Tanzania and adopting a citizen-led and inclusive planning process and mobility outcome. Finally, technical

studies may further progress green mobility and integrate into the planning vision – including traffic management, motorbike policy, environmental and social safeguard studies, and heritage impact assessments.

Strategy #	Strategy
4A1	Create People-Centric Planning and Design Framework Directly Linked to Green Mobility Vision and Goals
4A2	Leverage Technology to Improve Green Mobility Operations and Outcomes

Box 2.1: Sustainable Urban Mobility Plan (SUMP)

A SUMP is a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practice and takes due consideration of integration, participation, and evaluation principles. Differently from a typical Transport Masterplan (TMP), a SUMP is based on defining target status (vision) with a participatory visioning, then defining alternatives to reach that vision for different tools and implementations. The SUMP approach requires definition of a future year (target) scenario and alternative scenarios to reach it (referred to as back-casting). Bologna (Italy)'s SUMP is illustrated here.

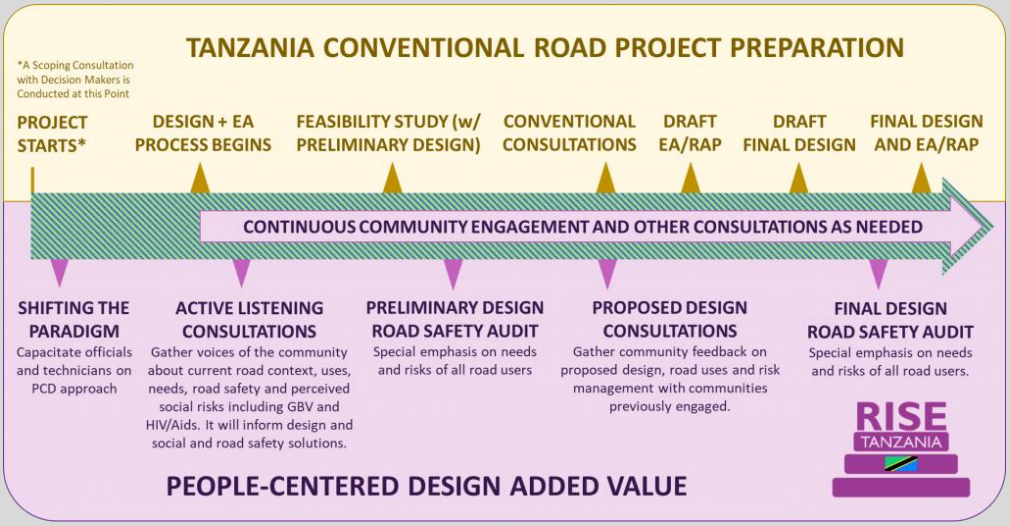
In comparison to SUMPs, Transport Masterplans (TMPs) are more transport-infrastructure focused, and have a much more loosely defined set of objectives that man not consider issues such as social inclusion, economic growth, or quality of life. Predict-and-provide modelling based approaches to transport planning (typically deployed for TMPs), produce certain outputs (such as large infrastructure projects) – but rarely do they include targets, monitoring, evaluation, public participation, or measures. Consideration of SUMPs could be one evolution from transport master plans to a more responsive/equitable mobility plan for the city.

Source: https://issuu.com/cittametropolitanabologna/docs/en-doc-sintesi-pumsbo

Box 2.2: People-Centered Design (PCD) in Tanzania

Success of green mobility initiatives is not solely due to improving infrastructure or services – but ensuring these are tailored to the local context and planned/developed with input from the locally affected groups and populace. A People-Centered Design (PCD) approach was developed by the World Bank and adopted for several projects in Tanzania. PCD actively engages, includes, and protects all beneficiaries. The objective of the PCD approach is to ensure enhancements "work" for everyone, placing a focus on social and safety risks. Vulnerable users are not just an afterthought but play a crucial role in the planning and design process. While this approach was applied to rural roads and transformation of urban spaces in Tanzania, it is also applicable to green mobility in ensuring responsive walk, cycle, road, and public transport networks.

A PCD approach includes multiple phases including: (i) engaging early with an active listening round of consultations; (ii) a second round of consultations focusing on design discussions; and (iii) people-centric safety audits (one at the preliminary design stage and one at the final design stage). The latter safety audits would be particularly relevant to the green mobility agenda for Luang Prabang to pinpoint key concerns to stakeholders and consultants/designers that may not recognize these issues if they have not experienced it themselves.



Source: https://blogs.worldbank.org/transport/building-roads-people-not-cars

Objective 4B: Strengthen Legal and Regulatory Framework to Create Conducive Conditions for Green Mobility

The legal and regulatory framework influences all stages of planning, designing, implementing and decision-making in delivering transport system and infrastructure. At present the legal framework in Luang Prabang mainly centers on the road sector, with minimal mention of cycling. Bus transport is mentioned but is geared for regional long-distance buses. E-mobility is not mentioned. Roles and responsibilities for cycling, public transport, and e-mobility are not clearly defined. The regulatory framework has minimal linkage to green mobility and wider aspirations – for instance in the investment prioritization process for potential projects. Staff capacity has primarily focused on roads and optimizing vehicle movement instead of green mobility.

This objective may be achieved with various measures to strengthen the overarching legal and regulatory framework to create a conducive and enabling framework for green

mobility including defining roles/responsibilities, clearly linking green mobility into the project prioritization framework, implementing targeted capacity building.

Strategy #	Strategy
4B1	Strengthen Legal and Regulatory Framework to Create Conducive Conditions for Green Mobility

Objective 4C: Leverage New Funding and Financing Mechanisms to Facilitate Green Mobility

Effective financing and funding mechanisms are essential to developing the green mobility network and maintaining and expanding it. Currently, committed financing is insufficient to meet the high demand for transport sector expenditures in Lao PDR (with Luang Prabang projects comprising a small portion of priority projects). There is a shortfall of identified financing of transport projects currently. No dedicated funding sources exist for green mobility. Funding instruments such as taxes, revenues, and land concession fees are not earmarked to urban transport projects, let alone active mobility in Luang Prabang or Lao PDR.

This objective may be achieved by adopting several approaches that seek to identify and leverage new funding sources and financing mechanisms.

Strategy #	**Strategy**
4C1	Explore New Revenue Sources and Develop Dedicated Funding Pool
4C2	Conduct Prioritization Exercise, then Mobilize More Development Partner Funding and Private Sector Capital

2.4 Linkage with Other Plans

The Green Mobility Vision defined in this Strategy has linkages and alignment with the five most relevant strategies/plans for Luang Prabang as defined below:

Table 2.2: Linkage of Green Mobility Vision to Major Relevant Strategies/Plans

#	Strategy / Plan	Linkage and Potential Synergy Opportunities with Green Mobility Vision & Goals
1	2012 Land Use Plan [A]	• Aligns with PSMV regulations restricting scope and extent of road and sidewalk works within the WHZ, by proposing tailored green mobility actions that facilitate active mobility and public transport within the most restricted areas. • Aligns with proposed growth areas towards and around the Airport with a new public transport system as well as improve active mobility infrastructure.
2	9th Five-Year National Socio-Economic Development Plan (NSEDP) [B]	• The 9th NSEDP was approved in March 2021 and the Near Draft Final Report was made available to the public in October 2021. (Source: https://laofab.org/document/download/4870) • Additional emphasis was placed on green mobility and environmentally friend transport including: (i) develop legislation/policies to promote the use of vehicles powered by clean energy including electric and biofuel vehicles; (ii) implement strategies such that 14% of all vehicles use clean energy; and (iii) build 20 charging stations / bio-fuel stations in the Northern Region (including Luang Prabang). • Specific to Luang Prabang, priority activities include: (i) improve and build infrastructure to connect to the Lao-China Railway; (ii) promote smart cities (no specific details provided); and (iii) construct a bridge crossing the Mekong River in Chompet District. These priorities align with the Green Mobility Vision.
3	7th Five-Year Socio-Economic	• Aligns with objective to develop economy to have continuous growth focusing on tourist services by accommodating new demand through a green public transport

#	Strategy / Plan	Linkage and Potential Synergy Opportunities with Green Mobility Vision & Goals
	Development Plan for City of Luang Prabang (2020-2025) [C]	system and active mobility that allows for more efficient movement of people in the Peninsula and more convenient linkage to attractions outside the main area. • Aligns with objective to improve transport infrastructure in city and outlying villages through targeted walk, cycle, and public transport improvements. • Aligns with objective to conserve ancient/nature tourism sites and develop a Master Plan that complies with WHZ regulations by integrating green mobility, universal accessibility, and heritage preservation into the transport and mobility plans. • Leverages proposed access road improvements on Route 13N and other major roads by improving walk infrastructure and experience by this Green Mobility Vision.
4	Chompet Development Across Mekong River [D]	• Broadly aligns with proposed Chompet development across the Mekong, by providing new public transport system with routes operating near the Airport in the Green Mobility Vision. As implementation timeline for development is unclear, routes can be easily extended across the New Mekong River Bridge in the future, hubbed out of the Sok Paserth Bus Terminal to the northeast of the Airport. • Proposals to plan/design development around green mobility can facilitate green sentiment and build support for more sustainable transport systems and behavior.
5	Lao-China Railway Development and Passenger Demand [E]	• The Lao-China Railway officially opened and started operations in December 2021. Feeder service between the new station and city center has begun and is funded by China. Opportunity exists to integrate this service or operators into the larger urban public transport system for Luang Prabang (and link to the Airport and wider area). • Proposals to plan/design the station and development around green mobility can facilitate green sentiment and support for sustainable transport systems/behavior.
6	ASEAN Smart City Action Plan (On-Going) [F]	• The Plan proposes construction of concrete alleyways and footpaths (including 44 paths within five years), as well as establishment of park & ride facilities to promote green mobility and walkability within the Peninsula. • Aligns with broad goals of upgrading walking paths as well as various updated to walking and pedestrianization to reduce vehicle use by adopting comprehensive green mobility strategies proposed in the Green Mobility Vision.
7	CDIA Lao Livable Cities Project [G] (On-Going)	• Aligns with broader CDIA plans to improve streets and walkways along major roads within the WHZ (including Wat Sene Road 3, Kanyong Road, Sisavangvong Road, Sakalin Road, Wat Seven Road, Wat Xiengthong Road, and Xiengthong Kili Road), by leveraging and incorporating these into the overall green mobility network with targeted active mobility enhancements from this Green Mobility Vision. • Aligns with other improvements such as riverside and bike lane improvements, as well as CCTV (and security scheme) and solar light poles on Peninsula as well as street enhancements (i.e., sidewalk paving, light, and tree installation).
8	JICA Luang Prabang Sustainable Urban Transport Master Plan [H] (Proposed)	• This JICA Study under DOT (draft scope provided in Fall 2021) is intended to formulate a 2045 smart plan that seeks to develop a long-term vision and strategy for sustainable urban transport including smart city planning, smart transport, green mobility, transit-oriented development (TOD) and non-motorized transport (NMT). • Aligns with objectives of a sustainable transport master plan to create environmentally sustainable transport, while preserving heritage of Luang Prabang. • Significant opportunity to align with the Green Mobility Vision and indicative investment priorities in terms of JICA funding of capacity building and institutional strengthening. Shortlist of Transport Master Plan initiatives should consider recommendations from this Green Mobility Vision.

[A] Source: http://www.luangprabang-heritage.org/what-we-do/regulation/buffer-zone/
[B] Source: 9th Five Year National Socio-Economic Development Plan (NSEDP), 2nd Draft, Ministry of Planning and Investment (MPI), 2020
[C] Source: 7th Five-Year Socio-Economic Development Plan for City of Luang Prabang (2020-2025), Department of Planning and Investment, 2020.
[D] Source: https://www.phousy.com/Files/Name2/CONTENT317992051339.pdf
[E] Source: http://www.china-railway.com.cn/english/businesses/railwayConstruction/202112/t20211206_118627.html
[F] Source: ASEAN Smart Cities Network, Smart City Actions Plans (as of July 8, 2018), 2018
[G] Source: Lao Livable Cities Project Preparation Study, Draft Interim Report (Revised), CDIA, May 2020.
[H] Source: https://www2.jica.go.jp/ja/announce/pdf/20220316_216175_1_01.pdf

3 Indicative Investment Priorities

3.1 Overview

This section presents the proposed responsibilities and roles of stakeholders vis-à-vis planning, implementation, operation and funding of green mobility initiatives (**Section 3.2**), indicative investment priorities for both Phase 1 (Year 1-7) and Phase 2 (Year 8-10) including indicative order-of-magnitude capital costs (based on local and international benchmarks), and primary stakeholders (**Section 3.3**), highlights of the Green Mobility Vision by mode/component (i.e., walk, bicycle, and public transport) (**Section 3.4**), two Priority Green Mobility Corridors for short-term implementation demonstrating transformation of key streets to facilitate green mobility (**Section 3.5**), and finally potential pilot projects to test new ideas and approaches to make the city more friendly to green mobility (**Section 3.6**).

3.2 Responsibilities and Roles of Stakeholders

Before identifying indicative green mobility investment priorities, it is important to identify which stakeholder(s) may play a key role in supporting and leading the initiatives. Based on a review of current roles and responsibilities, as well as feedback from stakeholders, the table below highlights the proposed entity responsible for planning, constructing, operating/ maintaining, and funding various green mobility initiatives (which is detailed in **Section 4.3**):

- **National / Provincial Road Improvements** – National / provincial roads are planned and constructed by MPWT, with DPWT responsible for maintenance of these roads outside the city center. MPWT funds these.
- **Local and Other Road Improvements** – Local roads are planned, constructed, operated, and funded by the DPWT. The USO is responsible for beautification works such as cleaning and tree pruning. Village road upkeep is the responsibility of the villagers.
- **Public Transport** – Introduction of public transport in Luang Prabang is proposed to be handled at the national level (i.e., MPWT) for planning, construction, and O&M of facilities such as bus lanes, bus stops/ shelters, terminals, and depots (with MPWT handling planning, construction, and financing, with DPWT overseeing maintenance). A public transport oversight body (under DPWT) would oversee operations (and maintenance of the infrastructure) to ensure regional integration – while plans for a long-term, separate public transport authority could be developed. Funding could come from the national level (with potential private sector involvement). Feasibility of public transport services should be further assessed.
- **Sidewalk Improvement** – Sidewalk improvements (including widening, creating new sidewalks, as well as installing trees and lights) would be handled by DPWT given its small-scale nature. For improvements included as part of a larger road improvement package, the responsible entity depends on the road type (i.e., national/provincial would be MPWT/DPWT, while a

local road would be the DPWT). Coordination in planning and O&M is important between jurisdictions to ensure connectivity as well as with DPL.

- **Cycle Improvement** – Cycle improvements (including new bike lanes, bike parking, and bike sharing programs) would be handled by DPWT. Collection of bike share fees and parking fees would be under USO. For improvements as part of a larger road improvement package, the responsible entity depends on the road type (i.e., national/provincial would be MPWT/DPWT, while a local road would be the DPWT). Coordination in planning and O&M is important between jurisdictions to ensure connectivity as well as with DPL. O&M and funding for bike share could be handled by the private sector.
- **Parking Improvement** – Construction of or enhancement of parking facilities in the city are relatively small-scale and would fall under the purview of DPWT. Operation and collection of fees would be under USO.

Table 3.1: Proposed Responsibility Matrix for Green Mobility Component

Component	Typical Enhancement	Activity [A]	MPWT [B]	DPWT	City of Luang Prabang (USO)	Traffic Police	Comment [C]
National / Provincial Road Improvements	• Road Widening • Pavement Resurfacing • New Zebra Crossing	Plan	✓				• Road improvement programs may also include packaged enhancements for sidewalks and crossings. • Coordination with the City of Luang Prabang and DPL is essential to ensure seamless network / design • USO responsible for cleaning and tree pruning • Village roads are the responsibility of villages.
		Construct	✓				
		O&M		✓			
		Funding	✓				
Local Road Improvements	• Road Widening • Pavement Resurfacing • New Zebra Crossing	Plan		✓			
		Construct		✓			
		O&M		✓	✓		
		Funding		✓			
Public Transport	• New Bus System • Bus Stops • Bus Lanes • Terminals/Depots • E-Bus Charging Facilities	Plan	✓				• A public transport oversight body is proposed under DPWT in lieu of the long-term creation of a separate public transport authority. • Potential exists for private sector involvement in operations and maintenance
		Construct	✓				
		Operation		✓ (see Comment)			
		Maintenance		✓			
		Funding	✓				
Sidewalk Improvements	• Sidewalk Widening • Sidewalk Resurfacing • New Sidewalk • New Trees / Lights • Street Furniture	Plan		✓			• If enhancement is part of wider road program, responsibilities fall under MPWT/DPWT if national or provincial road • USO responsible for cleaning and tree pruning • Coordination with the City and DPL is essential to ensure seamless network / design
		Construct		✓			
		O&M		✓	✓		
		Funding		✓			
Crossing Improvements	• New Signal • New Mid-Block Crossing • New Zebra Crossing • Traffic Calming	Plan		✓			
		Construct		✓			
		O&M		✓		✓	
		Funding		✓			
Cycle Improvements	• New Bike Lane • Bike Parking • Bike Share	Plan		✓			• Coordination with MPWT required for enhancements on national/provincial roads and DPL for facilities in WHZ • Potential exists for private sector involvement in bike share or parking • USO responsible for cleaning, tree pruning and fee collection
		Construct		✓			
		O&M		✓	✓		
		Funding		✓			
Bridge Improvement	• New Nam Khan Bridge (Proposed for Feasibility	Plan	✓				• Coordination with DPL is essential to alignment with WHZ zoning and UNESCO
		Construct	✓				

Component	Typical Enhancement	Activity [A]	MPWT [B]	DPWT	City of Luang Prabang (USO)	Traffic Police	Comment [C]
	Assessment under this Green Mobility Vision)	O&M		✓	✓ (Daily cleaning and crossing fee collection)		
		Funding	✓				
Parking Improvements	• New Off-Street Lot • Paid Parking & Meters • Sidewalk / Curbside Parking Modification	Plan		✓			• Potential exists for private sector involvement in parking • Enforcement handled by Traffic Police
		Construct		✓			
		O&M		✓	✓ (Cleaning, Tree Pruning & Fee Collection)		
		Funding		✓			

Notes:
[A] Funding pertains to the entity responsible for direct payments to implement the project.
[B] MPWT proposes a list of projects to MoF, who then approves the projects based on alignment with country development vision and available budget.
[C] All activities within the WHZ require coordination and integration with DPL (and possibly UNESCO for physical infrastructure changes).

3.3 Indicative Investment Priorities

The Green Mobility Vision, Goals, Objectives, and Strategies are then translated into discrete, actionable initiatives (comprising the "indicative investment priorities") that are time-based and divided into two phases: (i) Phase 1 (1-7 years); and (ii) Phase 2 (8-10 years). Indicative order-of-magnitude costs (if applicable) as well as responsible implementation parties are also identified. The latter is proposed based on best understanding of the current institutional framework (as noted in the previous section) and can be used a guide for discussion with the local stakeholders/partners to clarify lead roles and responsibilities. Key highlights of the indicative investment priorities are presented in **Section 3.4.**

The indicative investment priorities are summarized in a matrix format with columns indicating phasing, cost and assumed lead agency. Linkage to overarching Goal, Objective and Strategy is also included. Each action is meant to be self-explanatory – thus explanations are kept brief. Cost breakdowns are shown in **Table 3.2** – as are projects where private sector participation is more viable or suitable (and thus could facilitate faster implementation and lower risk to the government such as revenue generating initiatives such as vehicle and bike parking, public transport, etc.). **Table 3.3** presents the order-of-magnitude cost estimates by component.

Table 3.2: Green Mobility Indicative Investment Priorities (All Rounded Up to Nearest US$100,000)

Description								Implementation			
#	**Objective**	**#**	**Strategy**	**#**	**Action**	**Key Elements**	**Order-of-Magnitude Costs (US$)**	**Phase 1 (1-7 Years)**	**Phase 2 (8-10 Years)**	**Lead Party / Parties**	**More Viable for Private Sector Participation**
Goal 1 – People: Creating a People-Centric, Integrated Green Mobility System that Moves All People Safely, Securely, and Effectively											
1A	Continuous and Protected Active Mobility Network	1A1	Create Continuous and Protected Walk Network	1A1.1	Create/Improve 24.6 km of Paved Sidewalk with Segregated Curb	• Pavement resurfacing, sidewalk creation (including street furniture), curb installation, etc.	$5,700,000	X	X	DPWT	
				1A1.2	Create Pilot Pedestrianized Area in Peninsula	• Walk-only district centered around Sisavangvong Road and the Night Market, with vehicle prohibitions at certain times of the day • Access maintained with enhanced active mobility and public transport linkages.	$500,000	X		DPWT	
				1A1.3	Build Bridge over Nam Khan River (Only Includes Technical Studies under this Green Mobility Vision)	• A new concrete bridge over Nam Khan is envisioned in the future, however, multiple studies will be required to achieve this (study costs are included in Action 4A1.1) • Could replace existing Old Bridge or be situated closer to mouth of Mekong. Proposed to be 150m long and 10m wide. • Need to be respectful of heritage of the Bamboo Bridges. (See **Box 4.1 in Section 3.4**).	- See Action 4A1.1	X (Technical Study)	X (Further Investi-gation)	MPWT, DPL	
		1A2	Create Bike Priority Network	1A2.1	Create 62.8 km of Protected Bike Lanes, and 71.7 km of Sharrow	• Priority bike facilities on key corridors to capture medium-distance trips and complement public transport network (see **Section 3.4**).	$5,100,000	X	X	DPWT	
		1A3	Provide Walk/Bike Amenities to Complement Network	1A3.1	Provide Public Bike Parking (136 Bike Stations along 134.5 km Bike Lanes)	• Bike parking, bike share stations, and public toilets placed strategically along network to facilitate convenient access and comfort	$200,000	X	X	DPWT, City	✓
				1A3.2	Implement Bike Share Program in City		$2,700,000	X	X	DPWT, City	✓
				1A3.3	Install 40 Toilets along Key Walk Corridors		$200,000	X	X	City	
1B	Safe, Secure and Comfortable Experience for All	1B1	Make Crossings Safer	1B1.1	Implement Crossing Improvement Plan including 5 Signalized Junctions, Mid-Block Crossing Enhancements at 100 Locations, as well as Zebra Crossing Improvements at 190 Locations	• Various crossing treatments adopted based on junction and road type • Improvements include zebra crossings, traffic calming measures, rumble strips, pedestrian signals, and/or traffic signals	$2,400,000	X	X	DPWT	
				1B1.2	Conduct Citywide Crossing Improvement Study	• Conduct citywide study to understand crossing, traffic, and pedestrian crossing volumes for medium and long term	$200,000	X		DPWT	
		1B2	Bolster Sense of Security for Women and Disadvantaged Groups	1B2.1	Implement Pedestrian Scale Lighting on 24.6 km of Sidewalk (at 25m Intervals)	• Lighting improves safety and security for all users, but especially women particularly at night	$2,300,000	X	X	DPWT	
				1B2.2	Implement CCTV Monitoring System along 24.6 km of Sidewalk	• CCTV system installed at strategic streets and locations to improve safety/security for women and disadvantaged users	$200,000		X	DPWT	
				1B2.3	Integrate Crime Prevention Through Environmental Design (CEPTED) into Design Guidelines for Green Mobility Infrastructure	• CEPTED is an approach to redesign streets to create safer corridors and reduce harassment/ dangers (see https://www.cpted.net/) • See Action 4A1.4	-	X		MPWT	
		1B3	Integrate Universal Access into Streets	1B3.1	Implement Wheelchair Access Ramps at 295 Locations near Hospitals/Schools and Junctions	• Ramps provided at all retrofitted junctions to accommodate disabled, women and elderly.	$600,000	X	X	DPWT	
				1B3.2	Implement Tactile Pavement at 295 Junctions	• Tactile pavement provided along approaches to all retrofitted junctions for visually impaired	$300,000	X	X	DPWT	
				1B3.3	Integrate Universal Access into Design Guidelines for Green Mobility Infrastructure	• Universal access elements integrated into design guidelines (see Action 4A1.4)	-	X		MPWT	
		1B4	Create All-Weather / All-Year Network	1B4.1	Implement Tree Planting Program along 24.6 km of Sidewalk	• Trees provided every 10m for shading and protection.	$800,000	X	X	City	

Description								Implementation			
#	Objective	#	Strategy	#	Action	Key Elements	Order-of-Magnitude Costs (US$)	Phase 1 (1-7 Years)	Phase 2 (8-10 Years)	Lead Party / Parties	More Viable for Private Sector Participation
		1B5	Enhance Road Network and Safety	1B5.1	Improve 12.5km of Roads for Vehicles and Active Mobility	• Improve pavement, roadway, drainage, sidewalk, street furniture, and crossings on urban and rural roads to create all-weather network that is also amenable to green mobility	$29,900,000	X	X	MPWT, DPWT	
				1B5.2	Integrate Road Safety Elements into Road Design Standards	• Integrated international best practice and road safety elements into road and sidewalk design standards from MPWT/DPWT	-	X		MPWT	
				1B5.3	Conduct Road Safety Audits	• Identify key road safety improvements on network via periodic road safety audits	$900,000	X	X	DPWT	
				1B5.4	Create Road Safety Monitoring System / Database	• Create database / system for road safety monitoring and enhancement measures	$500,000	X		MPWT, DPWT	
1C	Integrated, Multimodal System, Emphasizing Efficient People Movement	1C1	Operate Green Public Transport Serving Key Attractions and Generators	1C1.1	Operate 124.4 km, 4 Line Bus System serving Luang Prabang and Surrounding Area	• System would serve city center, Airport, WHZ and Lao-China Railway Station (see **Section 3.4**). • Additional study to be undertaken to assess feasibility as well	$8,700,000	X	X	MPWT	✓
		IC2	Create Seamless and Integrated Interchange between Modes	1C2.1	Construct 2 Integrated Terminals for Multimodal Interchange	• Southern Bus Terminal (International) serves as major hub in south, while Northern Bus Terminal (Sok Paserth) serves as major hub to the north for the public bus system.	$4,500,000	X		MPWT	✓
Goal 2 – Environment: Reducing Emissions and Related Issues by Facilitating the Transition to Green Mobility by Building Sentiment and Changing Behavior, while Also Responding to Climate Change											
2A	Establish Green Mobility Foothold in New Areas	2A1	Plan New Development Areas Centered around Green Mobility	2A1.1	Integrate Green Mobility into Urban Planning and Future Master Plans	• Development of Chompet and Lao-China Railway station area around active mobility and public transport can fundamentally alter travel behavior	-	X	X	MPWT, DHUP	
2B	Accelerate Transition to Green Mobility and Minimize Adverse Environmental Effects of Transport	2B1	Accelerate E-mobility as Viable Mobility Option	2B1.1	Conduct Study to Develop E-Mobility Strategy	• Strategy identifies key roles and responsibilities, e-mobility partnerships, and policy implications	$200,000	X		DPWT	
				2B1.2	Pilot Low Emission Zone around Sisavangvong Road	• Creation of low emission zone by leveraging Sisavangvong Road slow zone, permitting only e-vehicles	$500,000	X		DPWT	
		2B2	Encourage Transition to Less Polluting Vehicles	2B2.1	Develop Policies to Tighten the Emission Limits for Vehicles	• Policy development/alignment with national-level strategies to reduce emissions from second-hand motorbikes and set engine standards.	-	X	X	MPWT	
2C	Enhance Curb Management and Transform Curb Use to Prioritize Green Mobility	2C1	Facilitate Effective Parking and Curbside Management	2C1.1	Conduct Further Study for Citywide Parking Strategy and Management Study	• Comprehensive parking management strategy to fully inventory parking patterns, illegal parking on the sidewalks, then identify city-wide parking restrictions, parking payment systems, areas for off-street lots, etc.	$200,000	X		DPWT	
				2C1.2	Pilot Parking Management Zone on the Peninsula	• Pilot scheme to manage parking and illegal sidewalk parking on the Peninsula.	$500,000	X		DPWT	✓
				2C1.3	Implement Parking Facilities to Provide Dedicated Off-Street Parking Spaces	• Development of off-street parking facilities to accommodate both vehicles and motorbikes to meet the need for parking space, while addressing illegal parking issues	$600,000	X	X	DPWT, City	✓
2D	Raise Public Awareness Towards Green and Clean Mobility	2D1	Encourage Greater Use of Green Mobility through Policies/Incentives	2D1.1	Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	• Pilot schemes provide discounted or free public transport and bike share on specific days can encourage greater green mobility use.	-	X		MPWT, City	
		2D2	Inspire and Educate the Public to Build Sentiment	2D2.1	Conduct Annual Walk/Car-Free Day Event	• Education and public participation mechanisms build green mobility sentiment and encourage its use	-	X	X	City	
				2D2.2	Conduct Education Campaigns at Local Universities		-	X	X	City	
				2D2.3	Conduct Communications Activities and Create Green Mobility Website & App to Educate and Provide Information		$600,000	X	X	City	✓

Description								Implementation			
#	Objective	#	Strategy	#	Action	Key Elements	Order-of-Magnitude Costs (US$)	Phase 1 (1-7 Years)	Phase 2 (8-10 Years)	Lead Party / Parties	More Viable for Private Sector Participation
2E	Embed Resilience into Network and Infrastructure	2E1	Integrate Resilience into Green Mobility Design	2E1.1	Integrate Resilience into Design Guidelines for Green Mobility Infrastructure	• Resilience elements adopted and integrated within design guidelines • See Action 4A1.4	-		X	MPWT	
		2E2	Integrate Resilience into Transport/ Mobility Plans for City	2E2.1	Conduct Further Study for Transport System Resilience	• Study for further development of transport resilience measures for operations/infrastructure	$200,000		X	DPWT	
Goal 3 – Heritage / Tourism: Preserving and Respecting the Living Heritage, while Accommodating Future Tourists More Sustainably through Green Mobility											
3A	Respect Heritage and Improve Visitor Experience	3A1	Tailor Green Mobility to Preserve and Respect Heritage and Protective Restrictions	3A1.1	Integrate Heritage Preservation and Mobility Plans	• Integrated heritage and mobility plans can ensure a seamless transport journey between historic areas and the larger urban transport networks to encourage active mobility and public transport.	-	X		MPWT, DPWT, DPL	
				3A1.2	Develop Policies to Regulate the Size / Type of Vehicles Permitted to Access the WHZ	• Creation of restrictive vehicle entry policies combined with electric buggy schemes to reduce visitor impacts and threats to the WHZ sites. • Entry restrictions for non-zero emission vehicles	-	X		MPWT, DPL, City	
				3A1.3	Operate Green Public Transport System to/within Heritage Sites	• Initiation of electric public transport services to the WHZ and improve loading as part of slow zone scheme around Sisavangvong Road.	$1,200,000	X		MPWT, DPL	
				3A1.4	Improve Loading/Unloading Areas at Key Locations within WHZ		-	X		DPWT, City, DPL	
		3A2	Connect Outlying Tourism Attractions with Green Mobility to Broaden Diversification	3A2.1	Connect Outlying Heritages Sites with Green Mobility to Diversify Tourism Products and Reduce Visitor Loads	• Buses serve Pak Ou Caves to the northeast and the Kuang Si Waterfall to the southwest directly to diversify tourists offering and reduce peak loading at popular sites (O&M Costs are included in 1C1.1)	-	X		MPWT	
3B	Intertwine Tourism and Mobility to Accentuate Luang Prabang and Broaden the Experience	3B1	Leverage Green Mobility to Accentuate Regional / Heritage Appeal	3B1.1	Create and Promote Luang Prabang and Nearby Sites as Overall Experience as Part of Tourism Package	• Other cities marketed regional cycling circuits to broaden appeal. • Luang Prabang has potential to combine riverfront experiences with more distant nature based sites including the Pak Ou Caves and/or the Kuang Si Waterfall as a multi-day cultural and heritage experience.	-	X		City, DPL	
				3B1.2	Create Committee to Develop Themed Experiences or Corridors	• Cross-cutting committee formed to develop regional heritage/tourism/mobility themed tours / circuits to broaden tourist appeal.	-	X		MPWT, City, DPL	
Goal 4 – Institutional: Creating an Enabling Institutional Framework to Encourage Green Mobility and Nurture Public Support											
4A	Integrate Green Mobility into Strategy, Planning, and Design and Leverage Technology to Improve Operations	4A1	Create People-Centric Planning and Design Framework Directly Linked to Green Mobility Vision and Goals	4A1.1	Develop Targeted Green Mobility Strategy including Clear Goals/Objectives and Undertake Green Mobility Policy / Technical Studies (for Traffic Management, Motorbike Policy, Nam Khan River Bridge, Environmental & Social Safeguards, and Heritage Impact Assessments)	• Identification of mode share goals provides clear messaging to justify investments and space reallocation to active mobility. • Technical studies include motorbike policy study, traffic management study, bridge feasibility study, safeguard study, and heritage study.	$2,900,000	X	X	MPWT, City	
				4A1.2	Create Cross-Cutting Committee to Develop Green Mobility Performance Monitoring Mechanisms	• Data-driven performance monitoring framework needed to assess achievement of green mobility plan	-	X		MPWT, City	
				4A1.3	Establish Participatory Mechanisms for Green Mobility Plans/Schemes	• Participatory processes improve buy-in and support for plans, making them people-centric.	-	X		MPWT	
				4A1.4	Integrate Green Mobility into Road Design Standards or in Standalone Standards (for Sidewalks, Crossings and Facilities)	• Integrating green mobility into design standards for roads (as well as sidewalks, crossing and other related facilities) ensures needs of such users included in development process to ensure better outcomes.	-	X		MPWT	

Description								Implementation			
#	Objective	#	Strategy	#	Action	Key Elements	Order-of-Magnitude Costs (US$)	Phase 1 (1-7 Years)	Phase 2 (8-10 Years)	Lead Party / Parties	More Viable for Private Sector Participation
		4A2	Leverage Technology to Improve Green Mobility Operations and Outcomes	4A2.1	Create Open-Data Sharing Platforms to Spur Innovation	• Open-data platforms have led to citizen-centric innovations and plans to create safer, more secure, and more accessible active mobility networks.	-	X		MPWT, City	
				4A2.2	Leverage Technology and Proposed CDIA CCTV Proposal to Enhance Enforcement	• Technology can be leveraged to improve enforcement and security on the streets (by leveraging the CDIA CCTV project)	-	X		MPWT	
4B	Strengthen Legal and Regulatory Framework to Create Conducive Conditions for Green Mobility	4B1	Strengthen Legal and Regulatory Framework to Create Conducive Conditions for Green Mobility	4B1.1	Create Cross-Cutting Committee to Integrate Green Mobility into the Legal Framework and Define Roles/ Responsibilities	• Legal framework lacks provisions for cycling, public transport, and e-mobility. • Committee to develop legal basis for green mobility – learning from Vientiane	-	X		MPWT	
				4B1.2	Create Regional Committee to Assess Potential for Transport Authority	• Public transport requires coordination and integration among various entities and jurisdictions. Establishment of overarching transport authority to manage roads, signals, sidewalks, cycling, and public transport may ensure integrated approach to planning/design	-	X		MPWT	
				4B1.3	Better Link Green Mobility into Project Prioritization Framework	• Better linkage can help to deliver better outcomes and effective projects, while also addressing financing shortfalls	-	X		MPWT	
				4B1.4	Implement Targeted Capacity Building to Sharpen Skills Needed for Green Mobility	• Skill development (including on funding and financing) essential for effective implementation and operation.	$200,000	X		MPWT, DPWT, City	
4C	Leverage New Funding and Financing Mechanisms to Facilitate Green Mobility	4C1	Explore New Revenue Sources and Develop Dedicated Funding Pool	4C1.1	Explore New Revenue Sources	• New revenue sources can make up for current shortfalls.	-	X		MPWT, City	
				4C1.2	Establish Dedicated Green Mobility Funding Pool	• Dedicated funding pools for active and green mobility with earmarked revenue can also help to overcome shortfalls.	-	X		MPWT, City	
		4C2	Conduct Prioritization Exercise, then Mobilize More Development Partner Funding and Private Sector Capital	4C2.1	Re-Prioritize Projects by Strengthening Linkage to Green Mobility (see Action 4B1.3)	• Re-prioritizing projects after linking green mobility into the framework ensures selected projects better align with green mobility goals, given shortfall in financing.	-	X		MPWT	
				4C2.2	Mobilize More Development Partner Financing	• Developer partner financing, or private sector participation in urban transport sector to increase access to financing for Lao PDR and Luang Prabang.	-	X		MoF	
				4C2.3	Mobilize Private Sector Capital and Increase Private Sector Participation (i.e., through PPP).		-	X		MoF	

The total plan cost is US$71.0 million, divided as follows: (i) Phase 1 – US$39.5 million; and (ii) Phase 2 – US$31.5 million. The biggest ticket item is the proposed road improvements, followed by the electric bus system, as well as other improvements such as sidewalk improvements (including lights and trees), and the extensive priority cycle network. Several different elements require further study and this is also included in the overall indicative investment priorities costs including a citywide parking study, an overarching e-mobility study, a resilient transport study, a traffic management study, a motorbike policy study, a new bridge feasibility study, environmental and social safeguard studies, as well as heritage impact assessment to prepare the city's transport systems for future unknowns.

Table 3.3: Proposed Costs for Indicative Investment Priorities – Phase 1 and Phase 2 (Rounded Up to Nearest US$100,000s)

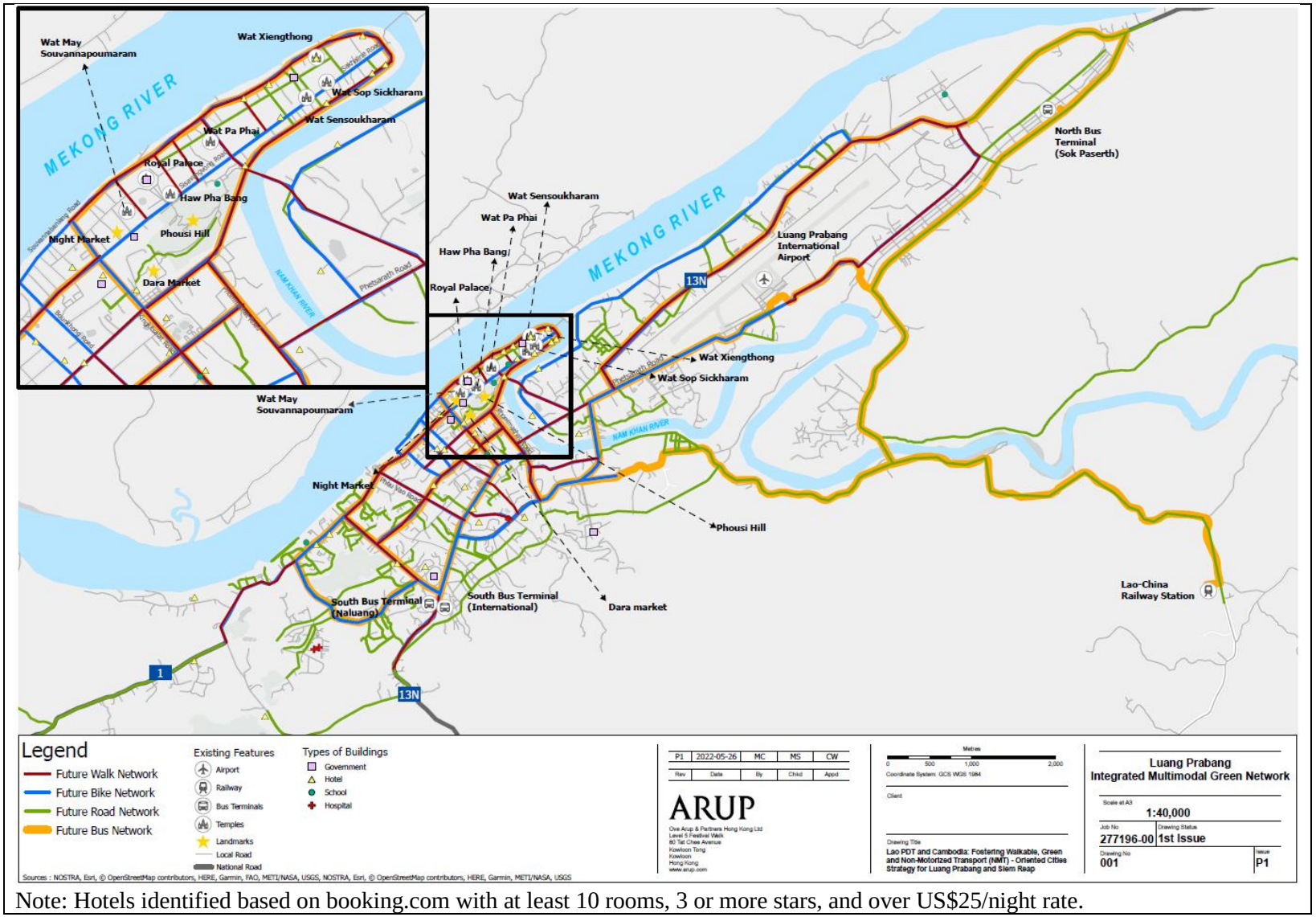
Component	Cost by Implementation Timeline (US$)		Total [A]
	Phase 1 (1-7 Years)	Phase 2 (8-10 Years)	
Road Improvement [B]	$14,000,000	$17,300,000	$31,300,000
Public Transport (Indicative – Requires Additional Study)	$12,700,000	$1,500,000	$14,200,000
Sidewalk Improvement	$5,100,000	$5,000,000	$10,100,000
Cycle Facilities	$2,300,000	$5,500,000	$7,800,000
Consulting Services [C]	$2,600,000	$1,000,000	$3,600,000
Crossing Improvement [D]	$1,500,000	$900,000	$2,400,000
Other Improvement [E]	$1,300,000	$300,000	$1,600,000
Total	$39,500,000	$31,500,000	$71,000,000

Note:
[A] Summations in this table by component may not match the totals from others due to rounding.
[B] Road improvements include paving and other sidewalk/crossing improvements as part of the overall road improvement.
[C] Consulting services include those for e-mobility, parking, traffic management, motorbike policy, feasibility study for a new bridge over the Nam Khan, environmental and social safeguards, heritage impact assessment, as well as capacity building and public outreach/communications.
[D] Crossing improvements (such as junction and mid-block improvements) are not included in the road improvement package and are solely for the benefit of pedestrians and exclude road paving.
[E] This category contains parking and pilot projects.

3.4 Green Mobility Network Spotlight

Overview of Network

The foundation of the Green Mobility Vision is an integrated, multimodal green mobility network with public transport as the principal medium-/long-distance mode, followed by cycling as a medium-distance alternative to motorbikes, and supported by an extensive/connected walk network with formal curbed sidewalks and shared streets. Road network enhancements may create an all-weather network and improve pavement/drainage, to facilitate active mobility and public transport. **Figure 3.1** shows the integrated multimodal network. These networks and other key green mobility elements of the Vision are described below.



Note: Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US$25/night rate.

Figure 3.1: Integrated Multimodal Green Network (Public Transport Network Indicative and Requires Further Study)

Road Network Enhancements

Road network enhancements are proposed as part of the Green Mobility Strategy. The foundational road network is essential to facilitate green mobility in terms of: (i) improving the active mobility environment for pedestrians and cyclists (in terms of improved sidewalks and road surfacing); (ii) creating conducive conditions for accessible, convenient, and effective public transport, which operates on the road network, and requires safe and convenient access to/from public transport facilities along the road; (iii) ensuring all-weather use of the road under any condition; and (iv) creating quality linkages to/from the city center, the WHZ, and new growth areas (including around the Airport and the new Railway Station).

Building on the CDIA and local road improvement projects proposed, a network of road enhancements (approximately 12.5km) are proposed to fill gaps and create a more expansive network with alternate vehicle paths. The upgrades would include pavement enhancements, drainage, and sidewalk and crossing improvements. These improvements would help lay the basis for and facilitate more accessible green mobility to encourage all-weather use of the network for active mobility and public transport. Phase 1 improvements focus on connecting to the Lao-China Railway Station. Phase 2 includes filling the road network gaps near the bus terminals and university near Pha O. This may improve air quality, improve passability during the rainy season, and create more amenable active mobility conditions through sidewalk/ crossing improvements as part of the umbrella project. All proposed road improvements are illustrated in **Figure 3.2**.

Table 3.4: Proposed Road Network Improvement by Timeframe

		Network Length (km)		
Timeframe	**Strategic Role**	**Urban**	**Rural**	**Total**
Phase 1 (1-7 Years)	Enhance surfacing and active mobility conditions on already paved roads as well as providing upgrades to the main road leading between the WHZ and the new Lao-China Railway Station.	5.3	0	5.3
Phase 2 (8-10 Years)	Creating paved and quality connections between major roads to create additional pathways – this includes filling the road network gaps near the bus terminals and along Route 13N.	7.2	0	7.2
	Total	**12.5**	**0**	**12.5**

Key Details:

- Target: Residents and Visitors
- Goals: Improve multimodal, all-weather conditions along the road network
- Scope of Enhancements: Repaving/upgrading roads/sidewalks, crossings, etc.
- Indicative Cost: ~ US$31.3 million (summary costs from **Table 3.3**, which may differ from table below due to rounding)

Benefits:

- All-weather network that benefits pedestrians, cyclists, and public transport
- Improves ride and safety for cyclists and public transport (and general traffic)

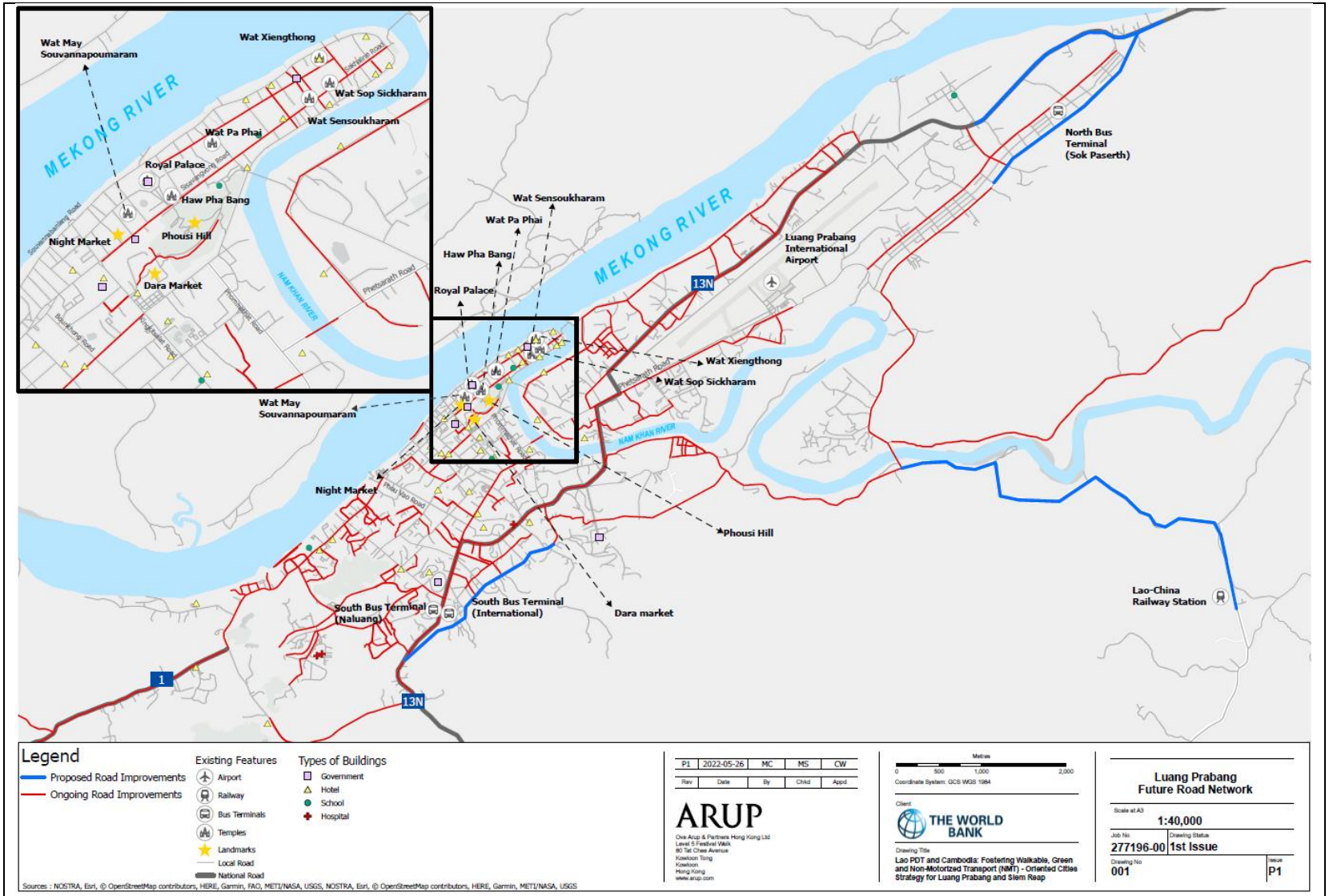
- Improves air quality from paved roads compared to currently unpaved / unmaintained roads
- Improves city's economic productivity with faster average travel times
- Improves travel times for all users (including public transport and vehicles) from newly paved and flat surfaces
- Creates direct linkages between the Railway Station, the Airport and the WHZ
- Enhances safety for all users and reduces accidents and vehicle-related injuries

Key Related Actions:

The proposed key actions for road network enhancements are summarized in the table below by timeline. The actions in Phase 1 comprise setting up of regulatory frameworks to guide the provision of safe road networks, besides building road networks. This includes integration of road safety elements into road design standards, establishment of road safety monitoring system, and undertaking of road safety audits. A road safety audit may be conducted at all phases of the indicative investment priorities to identify opportunities for improvement in road safety for all road users. The road network is to be designed to be climate resilient with multiple paths on various types of roads / streets to encourage the use of green mobility vehicles.

Table 3.5: Key Actions for Road Network Enhancement by Timeline

Time-frame	#	Action	Lead Party / Parties
Phase 1 (1-7 Years)	1B5.1	Improve 5.3 (Total 12.5) km of Road for Vehicle and Active Mobility	MPWT, DPWT
	1B5.2	Integrate Road Safety Elements into Road Design Standards	MPWT
	1B5.3	Conduct Road Safety Audits	DPWT
	1B5.4	Create Road Safety Monitoring System / Database	MPWT, DPWT
	4A1.4	Integrate Green Mobility into Road Design Standards or in Standalone Standards (for Sidewalks, Crossings and Facilities)	MPWT
Phase 2 (8-10 Years)	1B5.1	Improve 7.2 (Total 12.5) km of Road for Vehicle and Active Mobility	MPWT, DPWT
	1B5.3	Conduct Road Safety Audits	DPWT



Note: Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US$25/night rate.

Figure 3.2: Proposed Road Network

Electric Public Transport Network

Public transport is an important element of the overall Green Mobility Strategy to introduce a higher-capacity mode that will help to reduce the vehicle volumes on the Luang Prabang road network, thereby reducing congestion, emissions, and safety/health related issues from driving/riding motorcycles and automobiles. Public transport principally targets medium- to long-distance trips, by providing a cost competitive alternative and air-conditioned and more comfortable journey (with complementary walk and bike networks well integrated with the public transport system providing localized, short-distance mobility).

The public transport system is further intended to serve both local resident needs (i.e., serving key residential and employment nodes along major travel corridors), while also accommodate visitor demands (i.e., linking the Luang Prabang International Airport with the Lao-China Railway Station and the historic Peninsula, as well as key visitor attractions as indicated by the mobility data information. This initial service can build on the existing minibuses plying the route from the Peninsula to the Lao-China Railway and help to accommodate increasing tourist demand from the railway as well as the airport.

Electric bus (or e-bus) has support from local stakeholders and proponents (including the city) to provide a clean and non-polluting mode to move residents and visitors throughout the city and the monuments. E-bus may also be an attractive consideration due to expected reductions in O&M costs compared to diesel units (although initial capital outlay would likely be higher). Lastly, E-bus implementation represents a clear commitment by the city, DPL and others to sustainable and green mobility, which can also serve as a "selling point" to visitors and investors.

It is acknowledged that introduction of public transport (and especially e-bus) in Luang Prabang is ambitious in a city without formal public buses. Introduction will require enhanced knowledge and understanding of technical, financial, and institutional issues – thus additional studies are required to determine operating details and feasibility. Lessons learned from Vientiane as well as elsewhere for e-bus will be essential to ensure the system avoids mistakes and learns from best practice. Lastly, introduction of public buses must be well coordinated with other key elements of this Green Mobility Strategy – i.e., the walk and cycle improvement initiatives to ensure safe and convenient access to bus stops and road initiatives to align with pavement improvements for a more comfortable and faster ride.

Although details are specified here based on an assessment of mobile phone data and travel patterns, additional feasibility study is needed and proposed to determine exact routing, service network, and costs. Items specified in this section are for indicative purposes only to provide a general cost.

The proposed network may consist of four routes totaling some 124.4km in overall route length (in two phases). The public bus system is intended to serve medium-/longer-distance trips, providing a higher-capacity, air-conditioned, and clean journey into the heart of Luang Prabang and link to the Airport and the future Lao-China Railway. The routes are shown in **Figure 3.3**, with indicative operating details below:

Source: https://www.sustainable-bus.com/news/yutong-u12-electric-bus-on-a-test-in-tallin/

Figure 3.3: Electric Bus in Tallinn, Estonia

Table 3.6: Proposed Bus Routes

#	Route	Timeline	Vehicle Type	One-Way Distance (km)	Proposed Peak Headway (minutes)	Peak Vehicles Required including Spares [A,B]
1	North Terminal (Sok Paserth) - South Terminal (Naluang) (via Airport)	Phase 1	Small	33.4	30	5
2	North Terminal (Sok Paserth) - South Terminal (Naluang) (via University)	Phase 2	Small	35.4	30	5
3	South Terminal (Naluang) - Lao-China Railway Train Station	Phase 1	Small	34.1	30	5
4	North Terminal (Sok Paserth) - Lao-China Railway Train Station	Phase 1	Small	21.5	30	3

Note:
[A] Peak hour headways estimated from available information including: (i) tourist arrivals at the Airport; (ii) estimated peak arrivals at the Lao-China Railway Station; and (iii) magnitude of origin-destinations from mobile phone analysis.
[B] Peak vehicles estimated based on assumed in-vehicle travel time and layover time at terminal, peak headway, as well as 10% spare ratio to account for routine maintenance and unforeseen contingencies.

The bus system may be fully electric, operating a smaller vehicle with 14 or fewer seats to comply with PSMV restrictions on bus operations within the WHZ. Such a bus may be a 8-10m micro bus. Most routes are proposed to terminate at either the South Bus Terminal (Naluang) or the North Bus Terminal (Sok Paserth).

The fundamental operation of a public bus system requires that the underlying institutional and regulatory framework be established. While a public transport authority would be ideal to oversee and manage operations and regional coordination, this may not be practical in the immediate term – therefore a committee is proposed to develop a plan to establish an oversight body (in the interim term, with the long-term goal to establish an authority). This authority/body would be cross-cutting in terms of geography and sector – setting routes, fares, and performance metrics, as well as monitoring/evaluating service. The authority/body would collaborate with MPWT, DPWT and the City as well as other jurisdictions to ensure service, infrastructure, and operating arrangements are properly aligned.[27]

[27] In the case of Vientiane, the Vientiane Capital State Bus Enterprise operates buses in the capital region and formed a joint committee with MPWT and the City to manage its operation (Source: https://openjicareport.jica.go.jp/pdf/12235081_01.pdf).

There are several options to finance public transport system ranging from general public funding (i.e., subsidies, financial instruments, external funding, public-private partnership), direct benefit instruments (i.e., farebox revenue, fuel taxes, parking charges), to indirect sources (i.e., advertising, contributions from tourism income). Key actions proposed in this Green Mobility Strategy include identifying new revenue sources, establishing dedicated green mobility funding pool, and mobilizing private sector capital and development partner financing.

Key Details:

- Target: Residents (for daily commute trips) and Visitors (between the Airport, Railway Station, and Peninsula)
- Goals: Reduce vehicles, reduce emissions, and improve road safety
- Operating Hours: 5:00AM-11:00PM (7 days per week)
- Headway: ~30 minutes headway for convenient/attractive service (with more frequent service for the Lao-China Railway trains; for reference the Vientiane Airport Bus operates at 30 minutes headways)
- Peak Vehicles: 18 (including 10% spares based on 25 km/hour average speed)
- Indicative Cost~US$14.2 million (*indicative based on various assumptions, which is to be further investigated*)

Potential Benefits:

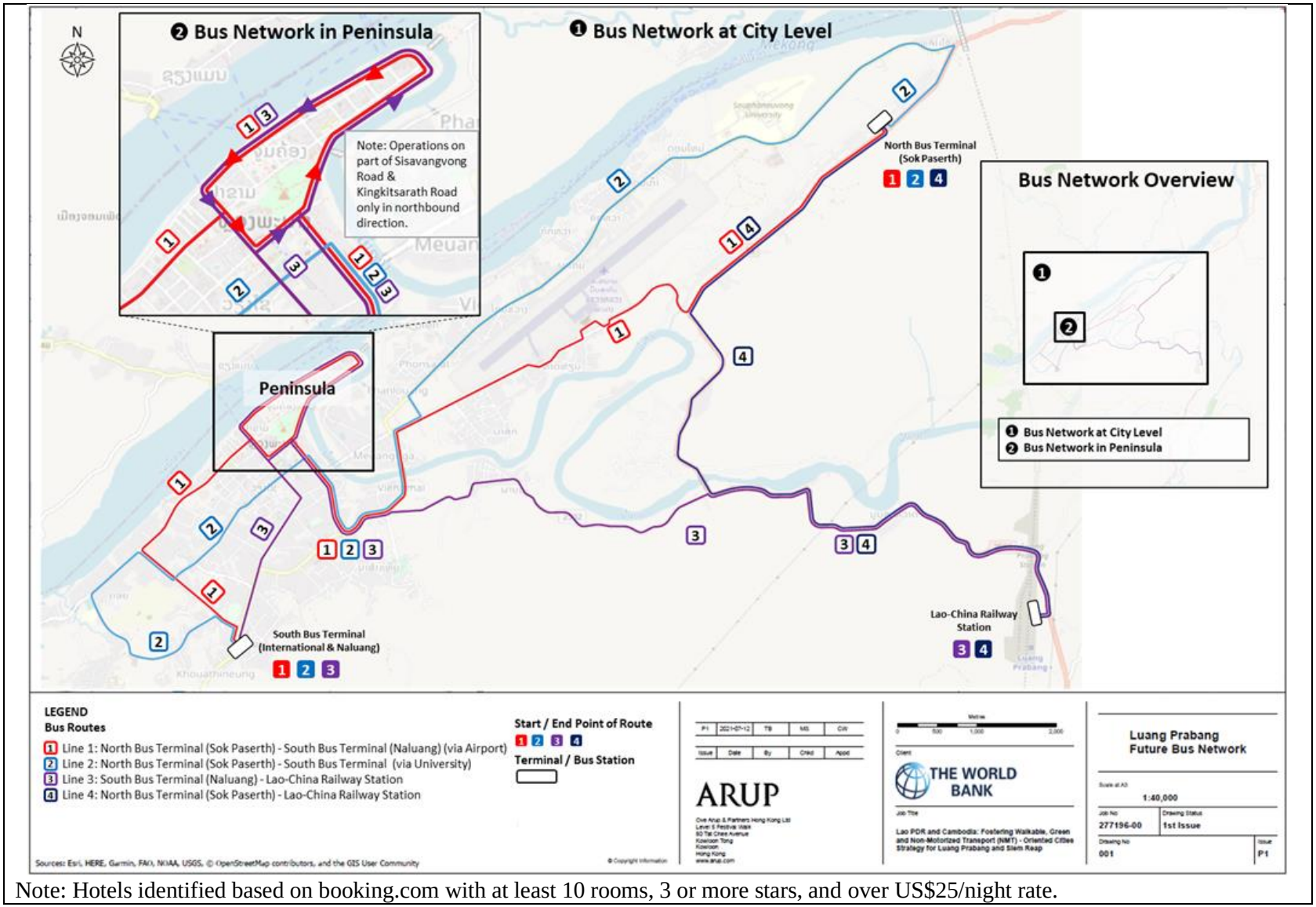
- Provides green, efficient, and reliable higher-capacity mode to serve residents and visitors to/from the Peninsula, the Airport, and the Railway Station
- Improves equal access and mobility for all users including disabled, women, and other groups, while providing enhanced mobility to/from key destinations
- Reduces O&M costs related to public transport if electric vehicles, potentially allowing improved financial viability of services
- Reduces number of vehicles on the road and can encourage shift away from single-occupancy vehicles and driving, to alleviate vehicle related issues including congestion and air pollution
- Improves city's economic productivity by removing vehicles from the road
- Improves air quality and reduces environmental impacts
- Small bus with 14 or fewer seats can replace ~10 motorbikes on the roads (assuming ~1 person per vehicle)

Key Related Actions:

The proposed key actions for public transport development are summarized in the table below by timeline. The actions in Phase 1 comprise institutional arrangements and development of business models. This includes a committee to establish a transport authority and setting up of fare schemes as part of the backbone of public transport services. In addition, service, infrastructure, and operating arrangements of buses may be determined in coordination with the transport authority. Civil works (i.e., bus lanes, terminals, depots, charging facilities if e-buses) may provide required infrastructure for operation of bus services. The public transport system may focus on transporting passengers to/from Peninsula, the Airport and Railway Station to ensure a seamless transport journey between historic areas and the larger urban transport networks to encourage active mobility and public transport.

Table 3.7: Key Actions for Public Transport Development by Timeline (Costs Are Indicative and Also Include Additional Study for Public Transport to Ascertain Feasibility)

Timeframe	#	Action	Lead Party / Parties
Phase 1 (1-7 Years)	1C1.1	Operate 89.0 (out of 124.4) km, 3 Line Bus System serving Luang Prabang and Surrounding Area	MPWT
	1C2.1	Construct 2 Integrated Terminals for Multimodal Interchange	MPWT
	2D1.1	Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	MPWT, City
	3A1.3	Operate Green Public Transport System to/within Heritage Sites	MPWT, DPL
	4B1.2	Create Regional Committee to Assess Potential for Transport Authority	MPWT
Phase 2 (8-10 Years)	1C1.1	Operate Additional 35.4 (out of 124.4) km Bus Route Serving Luang Prabang and Surrounding Area	MPWT



Note: Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US$25/night rate.

Figure 3.4: Proposed Electric Bus Network (Bus Network Indicative and Subject to Further Investigation/Study)

Bike Network

In other cities around the world such as Amsterdam, Copenhagen, etc. cycling is a vital cog in the overall transport mobility scheme. At present, there are no dedicated bike lanes in the city either on-street or off-street or government-operated cycle sharing facilities, although the city plans to implement bike lanes along linear parks along the Mekong River (including improved pedestrian trails). No public bike share program exists. No public bicycle parking is provided in the city. Provision of dedicated facilities can encourage cycling, reduce driving, and motor vehicle use for short-/medium-distance trips and promote a healthier and more active lifestyle.

A 62.7km priority bike network is proposed in Luang Prabang (with additional markings for shared paths or sharrows on another 71.7km of roads). The bike network is meant to provide priority cyclists to a more amenable environment for cycling (i.e., slower traffic, segregation from other vehicles, etc.). The bike network complements the higher-capacity public transport network and capture medium-distance trips currently taken on motorbike or tuk-tuk. The bike network may tie into proposed bike lanes along linear parks along the Mekong River. Dedicated bike facilities also include bike racks (assumed to be every 1km), and an extensive bike share program with up to 600 bicycles (200 in Phase 1 and 400 in Phase 2).

Table 3.8: Examples of Bike Priority Facilities Proposed in Luang Prabang

Facility	Example
Type 1: Protected Bike Lanes – Bike lanes are located within the road right-of-way and delineated with a combination of raised curbs, bollards, colored pavement, and/or signage. For Luang Prabang, protected bike lanes are around the Peninsula on Khem Khong Street, as well as along Sisavangvong Road south to Luang Prabang Technical College. Bike lanes are also provided along Route 13N to the north of the Airport and south of the Airport.	 *Near San Francisco, USA*
Type 2: Shared Bike Lanes or Sharrows – These are shared facilities, in which cyclists and drivers must co-exist in the same lane. Sharrows are delineated by a bike/arrow pavement marking. These are typically on less traveled streets that are considered safe and comfortable for cyclists off the main route. Sharrows are proposed along Sisavangvong Road north of Bounkhong Road	 *Portland, USA*
Other Facilities:	
Bike Parking – Bike racks are necessary to allow users to safely secure their bikes for parking. Racks may be placed at key bus stops or terminals to allow interchange with the public transport system, but also at key trip generators and attractions such as schools, civic buildings, etc. to encourage cycling use. Placed of racks should also be along the priority cycling facilities.	 ***Washington D.C., USA***

Facility	Example
Bike Share – Bike share allow public rental of bicycles using pre-paid cards or via apps. Once registered, the bike is released – payment systems vary, but may include time-based charges, with some cities offering free use for the first 30 minutes to encourage short-distance travel by bike. Placement of stations at key trip generators and transport interchanges/ stops can encourage biking.	 *Montreal, Canada*

Source: (i) https://oddviser.com/netherlands/amsterdam/bicycle-ride; (ii) https://iteucdavis.weebly.com/; (iii) https://mobilitylab.org/2016/02/08/bike-parking-gets-people-riding/, and (iv) https://www.flickr.com/photos/afagen/4869430761

The table below highlights the breakdown of proposed cycle enhancements:

Table 3.9: Proposed Cycle Network Enhancements

#	Type of Cycle Enhancement	Strategic Role in Network	Cycle Enhancement by Timeframe (km)		
			Phase 1	Phase 2	Total
1	Protected Bike Lane	Located in the Peninsula to connect busy streets such as Khem Khong Street and Sisavangvong Road based on assessment from mobile phone data of short-/medium-distance trips	17.0	45.8	62.8
2	Shared Street	Local roads that provide alternate corridors that are slower with less vehicles for less experienced users	24.2	47.5	71.7
		Total	41.2	93.3	134.5

Key Details:

- Target: Residents and Visitors
- Goals: Reduce driving / motor vehicle use for short/medium-distance trips
- Bike Parking Stations: 136
- Bike Share: 600 bicycles
- Indicative Cost: ~US$7.8 million (summary costs from **Table 3.3**, which may differ from table below due to rounding)

Benefits:

- Create more expansive bicycle network to encourage wider use of cycling
- Create memorable and sustainable cycling experience through the city and to/from the Peninsula for visitors and residents
- Improve air quality by reducing driving, vehicle use and carbon emissions
- Reduces necessity of driving or using motorbikes for shorter-distance trips
- Improves city's economic productivity by removing vehicles from the road
- Promote a healthier and more active lifestyle

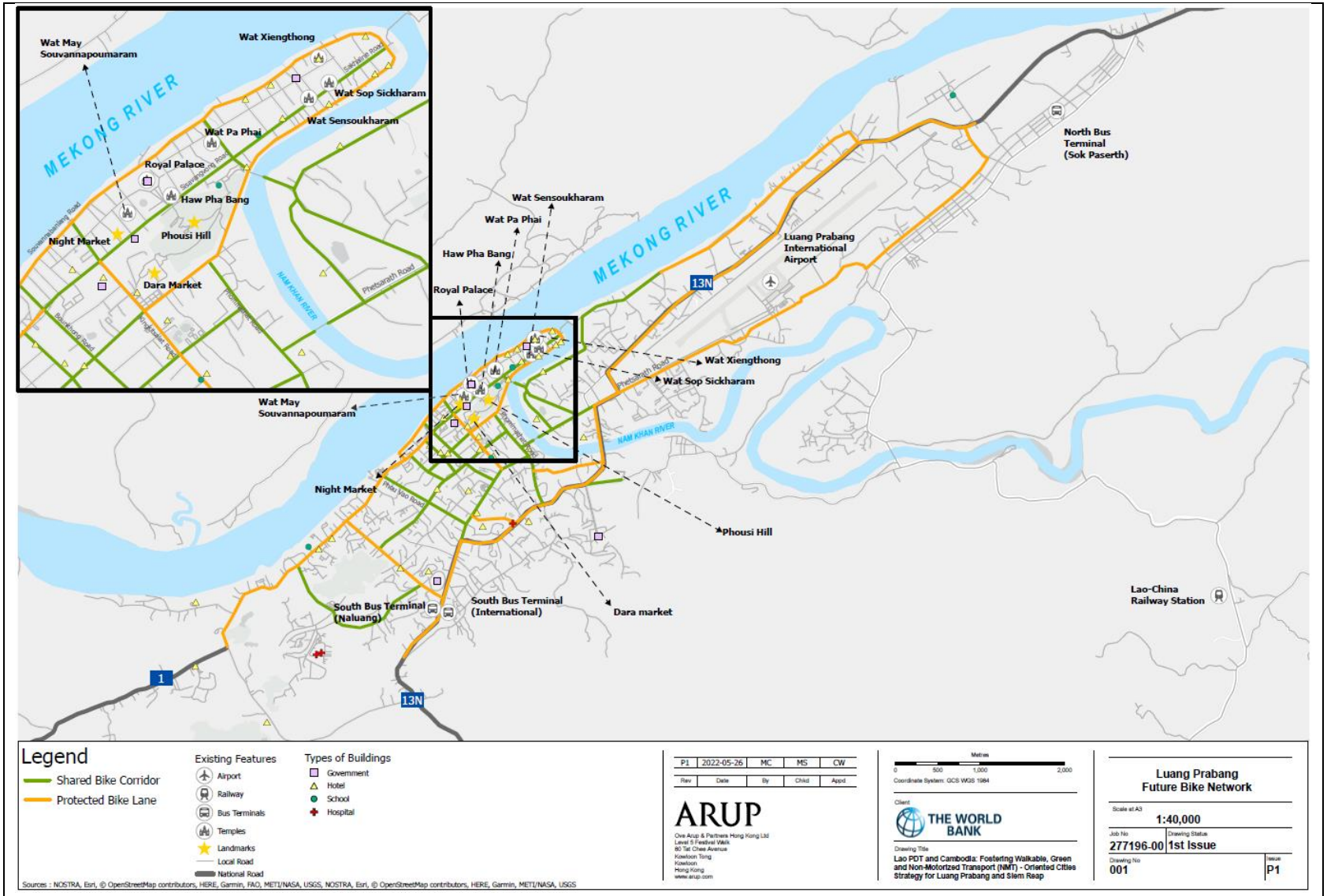
Key Related Actions:

The proposed key actions for bike network development are summarized in the table below by timeline. The actions in Phase 1 focus on introduction of bikes to the city by expanding the dedicated/priority network, installing bike parking racks,

initiating bike share programs, and providing ancillary facilities to create a comfortable, bike-friendly environment. In Phase 2 the bike network may be further extended to cover the wider populace and geographic areas connecting key trip generators and attractions. As noted above, wider range of activities such as institutional enhancement may supplement these efforts to provide a bike-friendly environment and encourage greater use of active mobility.

Table 3.10: Key Actions for Bike Network Enhancement by Timeline

Time-frame	#	Action	Lead Party / Parties
Phase 1 (1-7 Years)	1A2.1	Create 17.0 (Total 62.8) km of Protected Bike Lanes, and 24.2 (Total 71.7) km of Sharrow	DPWT
	1A3.1	Provide Public Bike Parking - 42 (Total 136) Bike Stations along 17.0 km Bike Lanes	DPWT, City
	1A3.2	Implement Bike Share Program in City	DPWT, City
	1A3.3	Install 20 (Total 40) Toilets along Key Walk Corridors	City
	2D1.1	Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	MPWT, City
Phase 2 (8-10 Years)	1A2.1	Create 45.8 (Total 62.8) km of Protected Bike Lanes, and 47.5 (Total 71.7) km of Sharrow	DPWT
	1A3.1	Provide Public Bike Parking - 94 (Total 136) Bike Stations along 45.8 km Bike Lanes	DPWT, City
	1A3.2	Implement Bike Share Program in City	DPWT, City
	1A3.3	Install 20 (Total 40) Toilets along Key Walk Corridors	City



Note: Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US$25/night rate.

Figure 3.5: Proposed Bike Network

Walk Network

Every trip begins and ends with a walk trip, regardless of primary mode used. However, perception surveys found that the walk experience is considered dangerous and the existing facilities are inadequate – particularly the continuity of the network and crossing amenities. In addition, the street-level index also found other instances of poor quality or non-existent sidewalks, etc. Therefore, enhancement of the walk environment is of utmost priority in the Green Mobility Strategy. An enhanced walk experience can also improve access and convenience of public transport trips, thereby making these more attractive to those originally driving and helping to drive more sustainable and green transport choices.

Based on the public transport and cycle networks, the fundamental walk network providing first/last mile connectivity has been identified. Given scale of the street network, target corridors have been selected as part of the priority walk network for investment, with a clear focus on the Peninsula and roads radiating from this. Several of these corridors have been earmarked for improvement as part of the CDIA Study, therefore the walk component of the Green Mobility Vision seeks to fill remaining gaps and ensure that the walk network is resilient with multiple paths on various types of street to encourage its use instead of motorbikes for short trip.

Table 3.11: Proposed Walk Network Improvements by Timeframe

		Network Length (km)		
Timeframe	**Strategic Role**	**2.0m**	**3.0m**	**Total**
Phase 1 (1-7 Years)	Enhance the sidewalk network in align with public transport and bike networks to provide connected, seamless journeys between modes – this includes improving the sidewalk along Route13N.	11.6	0	11.6
Phase 2 (8-10 Years)	Creating paved and quality connections between major roads to create additional pathways – this includes Khem Khong and Kingkitsalat Road.	13.0	0	13.0
	Total	**24.6**	**0**	**24.6**

Figure 3.6 presents the proposed walk improvements on various streets - the blue lines represent the proposed walk network, while the red lines represent those already being upgraded by the CDIA Study. Street improvements under the Green Mobility Vision include sidewalk widening to 2m (with 3m being ideal), as well as provision of street trees (every 10m) and pedestrian scale lighting (every 25m), based on international standards identified in the previous Technical Report – Luang Prabang Green Urban Mobility.[28] Street furniture such as streetlights, benches, trees, also constitutes a key element of sidewalk improvements. **Figure 3.7** presents the proposed crossing improvements including new traffic signals, mid-block crossings, as well as zebra crossing improvements throughout the city.

One potential enhancement as part of the walk strategy is a new bridge over the Nam Khan River to provide an active mobility corridor across the river to near the Airport. Movements across the Nam Khan River are visible thru the mobile data

[28] The vision is to provide a 3m wide sidewalk – however, this may not be feasible in all locations and further local studies may be necessary to resolve limitations in these sections.

analysis – currently these are handled by the temporary bamboo bridges at the tip of the Peninsula as well as the Old Bridge. During the rainy season, the bamboo bridges may be removed or washed away, creating relatively long and inconvenient walk trips between the right bank of the Nam Khan and the left bank – encouraging driving and motorized trips between these two areas. Provision of an alternate all-weather crossing would improve linkages between both banks of the Nam Khan as well as provide vistas of the Peninsula and Nam Khan/Mekong rivers.

Given timeline and bridge cost, a feasibility study is proposed for the new bridge as part of the Green Mobility Vision (with engineering design and construction as part of another study/program). Potential for a new bridge is explored below.

Box 3.1: Potential New Nam Khan River Bridge

One potential walk improvements is the construction of a new bridge over the Nam Khan River. Further study would be required; however, one possibility would be to replace the existing Old Bridge. A second possibility would be to provide a new bridge further to towards the confluence with the Mekong, close to the two Bamboo Bridges.

Replacement of one of these bridges and/or construction of a new foot/cycle bridge must be assessed carefully and respectfully with heritage and preservation in mind. The heritage assessment finds that the World Heritage Site description, does not specifically mention the bridges as heritage features, thus there may be some potential leeway for improvement. However, the bridges crossing the Nam Khan are recognized as a cultural heritage feature, as they have traditionally been used for river crossings. Despite being washed away in the rainy season, the process of construction and materials used are a continuation of a cultural tradition. The bridges are recognised as a feature to visit and cross in the city (and are considered a photogenic structure).

Thus, any potential bridge to improve connectivity would first and foremost need to respect this heritage. One possibility would be to integrate various cultural and heritage touches to the bridge, while also allowing locals to be closely involved in planning, design, and operation. Retaining one of the Bamboo Bridges and holding knowledge and cultural classes could supplement this concept. A bridge would also benefit local residents with all-year/all-weather crossing point at the tip of the Peninsula (given identified movements from the mobile data analysis). Lastly, there is opportunity with a sensitive, yet iconic landmark bridge, near a famous winding river in Asia could become the next landmark for Luang Prabang. This would create a fantastic vista point to view the historic Peninsula, the confluence of the Nam Khan and Mekong rivers, as well as the traditional bamboo bridges crossing the Nam Khan. Discussions with DPL and the authorities will be necessary to understand the feasibility of this and potential landing locations on the Peninsula (and alignment with the PSMV).

Photo References:
Top (Luang Prabang): https://live.staticflickr.com/4373/35987856070_15168257e7_b.jpg
Middle (Vltava, Czech Republic): https://files.structurae.net/files/photos/3299/img_3042.jpg
Bottom (River Segre)
https://images.adsttc.com/media/images/5018/793e/28ba/0d33/a800/0f32/newsletter/stringio.jpg?1414294400

Key Details:

- Target: Residents and Visitors
- Goals: Improve walk conditions to encourage alternatives to driving
- Extent of Improvements (distinct from those including in road improvements):
    - 24.6km of 2m sidewalk improvement
    - 5 new traffic signals
    - 100 mid-block crossings
    - 190 zebra crossing improvements
    - Access-for-all enhancements at all improved crossings
- Indicative Cost: ~US$12.5 million [29] (Sidewalk – US$10.1 million and Crossings at US$2.4 million) (summary costs from **Table 3.3**, which may differ from table below due to rounding)

Benefits:

- Enhanced and continuous walk environment encourages more walking and reduces driving for short-distance trips
- Create more conducive conditions for public transport by improving first-/last-mile connectivity to/from public transport stops and stations
- Promote a healthier and more active lifestyle
- Reduce necessity of driving or using motorbikes for shorter-distance trips and can help to improve economic productivity
- Reduce accidents by creating a safe walk environment where people are prioritized over vehicles

Key Related Actions:

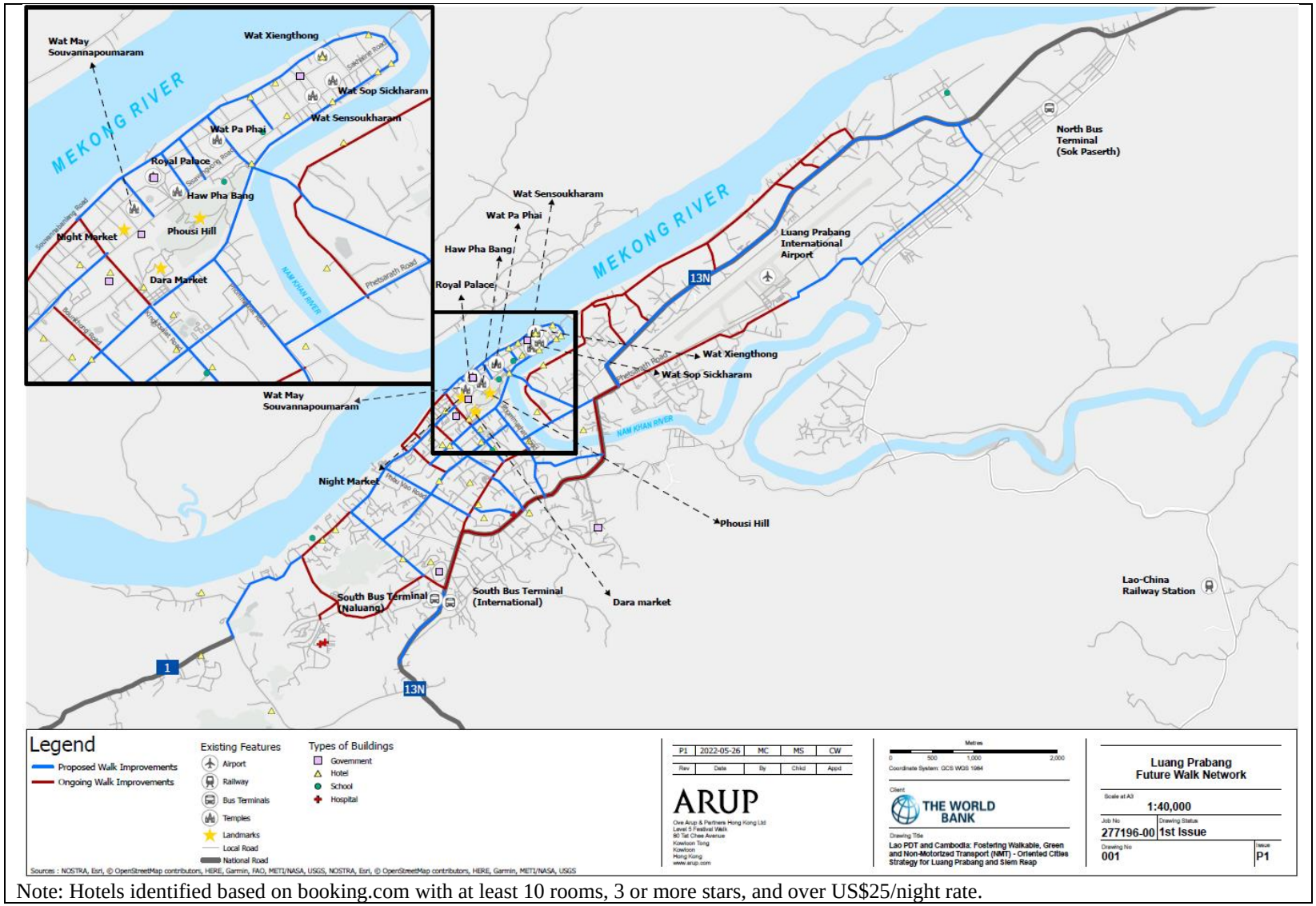
The proposed key actions for walk network development are summarized in the table below by timeline. The actions in Phase 1 consist of a wide range of activities to build green mobility "sentiment" and encourage walking. These include: (i) the formulation of design guidelines (i.e., universal access, crime prevention); (ii) a crossing improvement study; (iii) public engagement activities (i.e., car-free day), and (iv) pilot pedestrian zone. The walk network may be built in phases. In Phase 1 street enhancements (i.e., light, tree, wheelchair access ramps) may follow the alignment of public transport and bike networks, while improvements in Phase 2 seek to fill remaining gaps to ensure the walk network is connected and seamless.

Table 3.12: Key Actions for Walk Network Enhancement by Timeline

Time-frame	#	Action	Lead Party / Parties
Phase 1 (1-7 Years)	1A1.1	Create/Improve 11.6 (Total 24.6) km of Paved Sidewalk with Segregated Curb	DPWT
	1A1.2	Create Pilot Pedestrianized Area in Peninsula	DPWT
	1A1.3	Build Bridge Over Nam Khan River (Technical Study)	MPWT, DPL
	1B1.1	Implement Crossing Improvement Plan including 5 Signalized Junctions, Mid-Block Crossing Enhancements at 50 Locations, as well as Zebra Crossing Improvements at 100 Locations	DPWT
	1B1.2	Conduct Citywide Crossing Improvement Study	DPWT

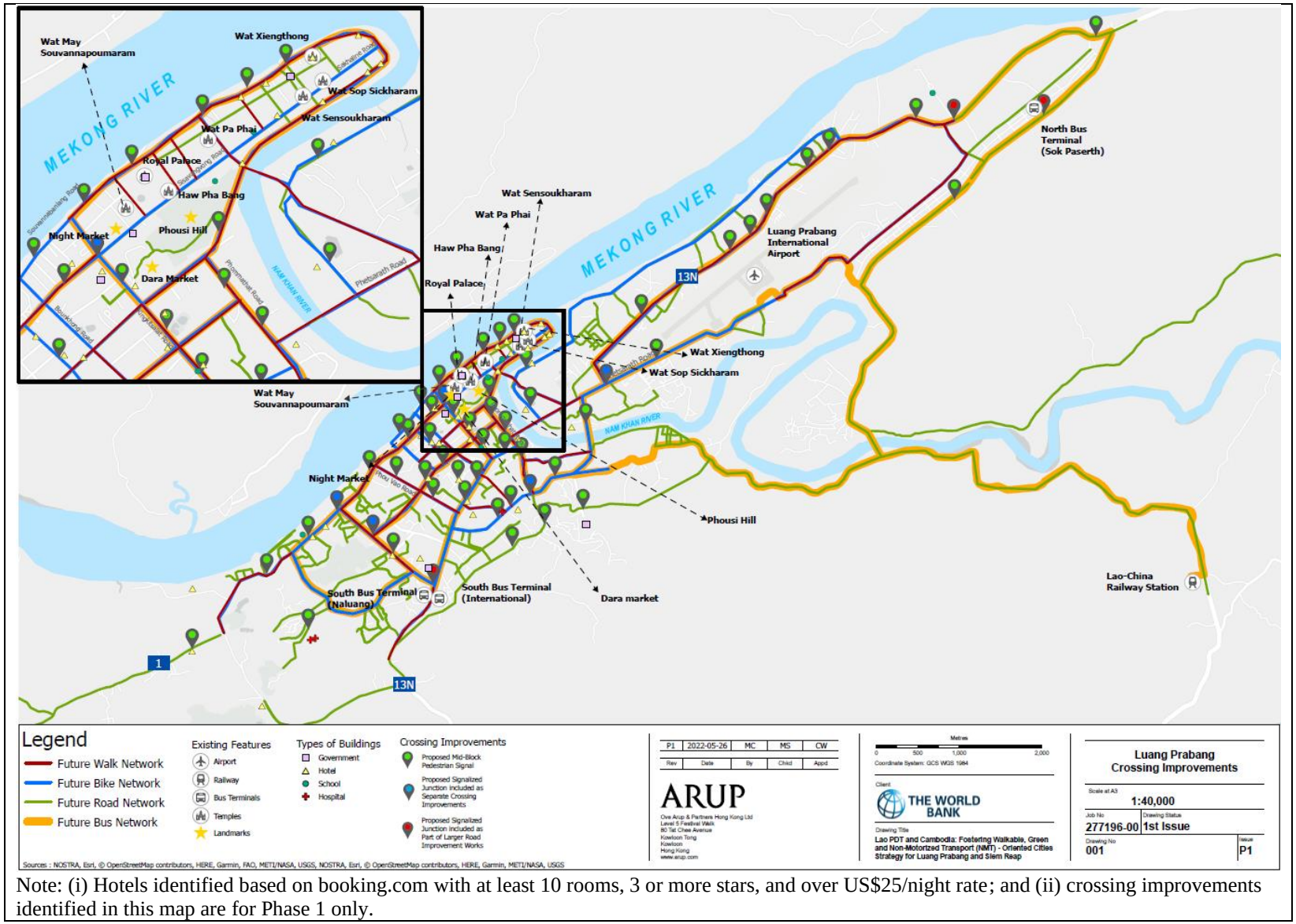
[29] Costs to study or implement a new Nam Khan River bridge is not included in this indicative cost. The cost for the feasibility study is included as part of Consulting Services (**Table 3.3**).

Time-frame	#	Action	Lead Party / Parties
	1B2.1	Implement Pedestrian Scale Lighting on 11.6 (Total 24.6) km of Sidewalk (at 25m intervals)	DPWT
	1B2.3	Integrate Crime Prevention Through Environmental Design (CEPTED) into Design Guidelines for Green Mobility Infrastructure	MPWT
	1B3.1	Implement Wheelchair Access Ramps at 155 (Total 295) Junctions	DPWT
	1B3.2	Implement Tactile Pavement at 155 (Total 295) Junctions	DPWT
	1B3.3	Integrate Universal Access into Design Guidelines for Green Mobility Infrastructure	MPWT
	1B4.1	Implement Tree Planting Program along 11.6 (Total 24.6) km of Sidewalk	City
	2D2.1	Conduct Annual Walk/Car-Free Day Event	City
	4A1.4	Integrate Green Mobility into Road Design Standards or in Standalone Standards (for Sidewalks, Crossings and Facilities)	MPWT
Phase 2 (8-10 Years)	1A1.1	Create/Improve 13.0 (Total 24.6) km of Paved Sidewalk with Segregated Curb	DPWT
	1A1.3	Build Bridge Over Nam Khan River (Further Investigation)	MPWT, DPL
	1B1.1	Implement Crossing Improvement Plan including Mid-Block Crossing Enhancements at 50 Locations as well as Zebra Crossing Improvements at 90 Locations	DPWT
	1B2.1	Implement Pedestrian Scale Lighting on 13.0 (Total 24.6) km of Sidewalk (at 25m intervals)	DPWT
	1B2.2	Implement CCTV Monitoring System along 13.0 (Total 24.6) km of Sidewalk	DPWT
	1B3.1	Implement Wheelchair Access Ramps at 140 (Total 295) Junctions	DPWT
	1B3.2	Implement Tactile Pavement at 140 (Total 295) Junctions	DPWT
	1B4.1	Implement Tree Planting Program along 13.0 (Total 24.6) km of Sidewalk	City
	2D2.1	Conduct Annual Walk/Car-Free Day Event	City



Note: Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US$25/night rate.

Figure 3.6: Proposed Walk Network and Improvements



Note: (i) Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US$25/night rate; and (ii) crossing improvements identified in this map are for Phase 1 only.

Figure 3.7: Proposed Crossing Improvements (Phase 1 Only)

3.5 Priority Green Mobility Corridors

Background and Selection of Priority Green Mobility Corridors

The Green Mobility Vision and the indicative investment priorities set the stage to facilitate green mobility within the entirety of Luang Prabang and surrounding areas. This section identifies two priority green mobility corridors – proposed for implementation within the 2-3 years pending planning and design concurrence. Concepts and cost estimates are developed for each corridor – this may allow Luang Prabang and stakeholders to better visualize transformations, understand relative cost implications, and kickstart implementation of the enhancement package (including planning and design, identifying funding sources, conducting community engagement, etc.).

Priority Green Mobility Corridor#1: Sisavangvong / Sakhaline Road

Background of Corridor

Sisavangvong Road and Sakhaline Road collectively represent the major thoroughfare on the WHZ's Peninsula, stretching from Kingkitsalat Road in the south to the tip of the Peninsula and Khem Khong in the north. The road has two lanes (one in each direction) with parking on one side of the road at a time (for most sections), with segregated brick sidewalks on both sides.

Figure 3.8: Extent of Priority Green Corridor along Sisavangvong / Sakhaline Road

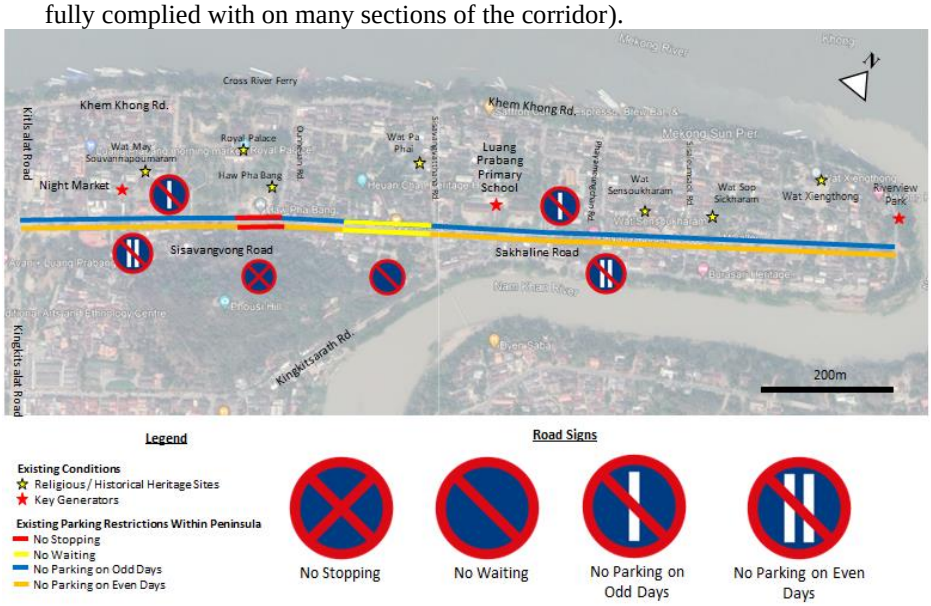
The corridor is the primary heritage stretch in the WHZ lined with key historic and religious sites including the Royal Palac, Wat Mai Monastery, Wat May Souvannapoumaram, Haw Pha Bang, Wat Sensoukharam, Wat Sene, and Wat Sop Sicharam (as well as Wat Nong Sikhoumuang and Wat Xiengthong located just off the corridor), as well as Mount Phousi and the Riverview Park overlooking the Nam Khan River. Most of these historic sites lie on the north side of the road (except for Mount Phousi). From Kingkitsalat eastward, the road is closed every night to vehicles from 5:00PM to 11:00PM on weekdays and from 9:00AM to 9:00PM on weekends for the Night Market. The Night Market occupies approximately 450m of Sisavangvong Road up until Ounheun Road.

The priority green mobility corridor encompasses the entire stretch of the corridor, starting from Kingkitsalat in the south to Sisavangvatthana, where the corridor switches names from Sisavangvong Road to Sakhaline Road. From this point, the corridor continues north to the tip of the Peninsula. The corridor is 1.5km in total length, with 700m on Sisavangvong Road and 800m on Sakhaline Road.

Key Green Mobility Issues on Corridor

Key mobility issues along this corridor are as follows:

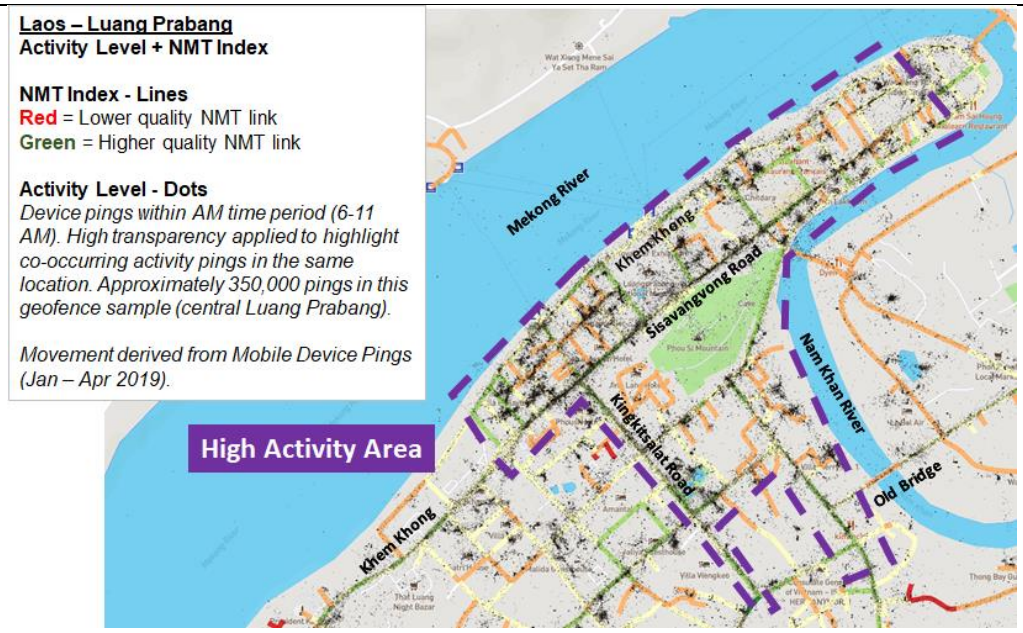
Table 3.13: Key Issues Observed on Selected Corridors

#	Key Issues	Description / Details
1	WHZ Protection Zone Limits Physical Improvements	• The WHZ's *Plan de Sauvegarde et de Mise en Valuer* (PSMV) prohibits sidewalk widening or roadspace reallocation to sidewalks. Therefore, any improvements would need to have minimal impact on physical infrastructure – but could include operational measures (for instance creating more pedestrian or cycle walk space by prohibiting vehicles or parking in specific areas). • Some lighting improvements have been implemented by other projects, therefore coordination with DPL and UNESCO is necessary for any such improvements to ensure alignment with the PSMV.
2	Limited Dedicated Bike Facilities	• Review of videos and GoogleStreetView show a good number of bicyclists and parked bicycles along the corridor, particularly in front of wats and other heritage locations. • No dedicated bike lanes or bike parking facilities are provided on the corridor. • Bicycle rental shops exist along the corridor but are primarily for tourists.
3	Potentially Unclear Parking Regulations and Illegal Parking	• Various sections of the corridor have different posted parking regulations, with the north curb allowing parking on "even" days (i.e., such as the 2nd, 4th, etc. of the month) and the south curb allowing parking on "odd" days (i.e., such as the 1st, 3rd, etc. of the month). Some areas also have no parking / waiting restrictions. • From video and GoogleStreetView analysis, parking regulations by day are not fully complied with on many sections of the corridor). 
4	Corridor Already Major Pedestrian Zone Especially for Market on Weekday Nights and Weekends	• The noted Night Market, with nightly closures on weekdays and full day closures on weekends, is a major tourist draw. Sisavangvong Road is closed to vehicular traffic in this section. Numerous stakeholders have identified pedestrianization as a possible initiative instead of just a slow zone. • The level of pedestrian activity in the corridor is relatively high compared to other areas from **Figure 1.9** below, which shows the "ping" detections for mobile phone activities. for residents and visitors along Sisavangvong Road (with the Night Market activity obvious from the 6:00-11:00PM map).[30] This demonstrates that any

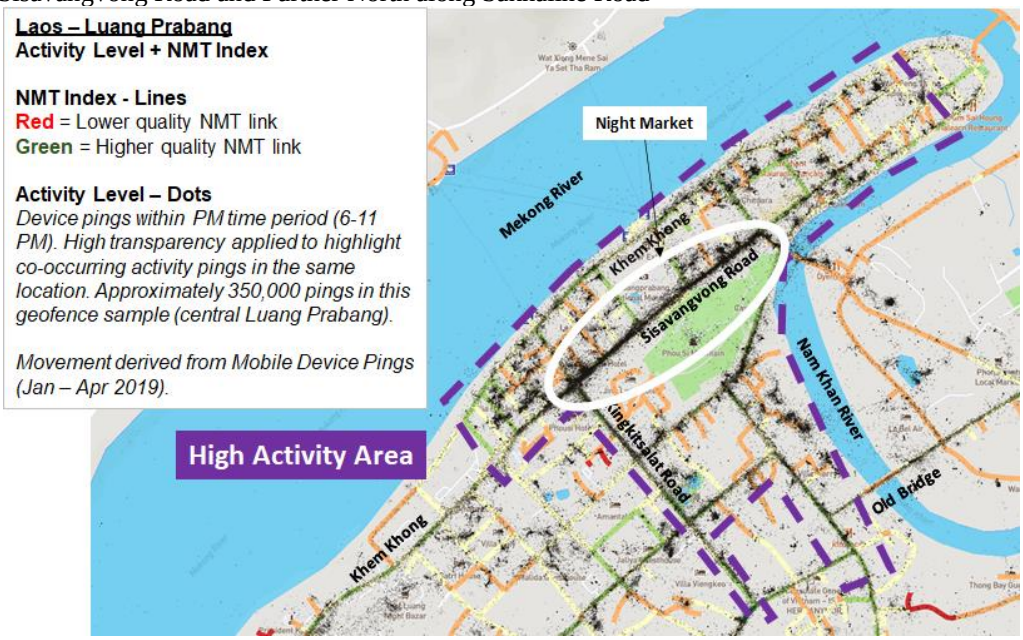
[30] "Ping" data from mobile phones represents unique, anonymized, and aggregated detection of mobile phone devices. Denser ping detections represents areas of higher activity and likely higher volumes of visitors or residents in the area. "Ping" data is geo-located meaning time, location, and

#	Key Issues	Description / Details
		pedestrian effort in this corridor would benefit a relatively high volume of users compared to other areas of the city.
5	Sidewalk Obstructions along the Corridor	• Sidewalk obstructions are observed along the corridor. This includes billboards, merchandise, and other obstructions. Given the relatively narrow sidewalk in these locations, clearing of the obstructions would facilitate more walking as well as more convenient passage for wheelchair and other mobility disadvantaged users.
6	Limited Crossing and Access-for-All Facilities	• While the corridor is relatively narrow, there is limited provision of zebra crossings across the road and some of these are faded. While provision of lighting is good, more visible crossings could improve safety. • No wheelchair access ramps or tactile paving are observed along the corridor.
7	Major Loading / Unloading Node at Junction with Kingkitsalat	• The southern end of the corridor at the junction with Kingkitsalat is the major loading/unloading point for tuk-tuk, taxis, vehicles, etc. to visit the Night Market. Therefore, there is a need to better organize this area with more tourists expected in the area. Any extension of vehicle prohibition hours would also increase the volume of such loading/unloading activities at this location.
8	Limited Weather Protected Paths	• Sections of Sisavangvong Road located south of the Royal Palace have limited tree shading, which may impact walk comfort and attractiveness.
9	Limited Lighting Provision	• Some portions of Sisavangvong Road possess minimal street lighting, which may impact the willingness of pedestrian to use this corridor at night for safety/security.
10	No Operating Public Transport	• As no public transport system operates in Luang Prabang, no facilities are provided on this corridor.

trajectory is collected directly from the device via apps requiring geo-location data (for instance any mapping apps, weather app, etc.), allowing for granularity in terms of exact locations. Each phone/device has a unique identification (ID) number, allowing it to be tracked over spatial or temporal contexts. Individual devices also have other information attached included the native country code, which can be used to differentiate between residents (i.e., those living in Luang Prabang) and those visiting Luang Prabang for a short period. This data was analyzed to provide the basis for walk and public transport improvements as part of the initial indicative green mobility investment priorities list.



Top: Activity on Peninsula from 6:00-11:00AM Showing Comparatively Heavy Activity along Sisavangvong Road and Further North along Sakhaline Road



Bottom: Activity on Peninsula from 6:00-11:00PM Showing Extremely Heavy Activity along Sisavangvong Road for the Night Market Compared to Other Areas with Lower Activity North of Sisavangvatthana, Where Sakhaline Road Starts
Source: WB study team.

Figure 3.9: "Ping Detections" along Sisavangvong / Sakhaline Road (6:00-11:00AM on Top / 6:00-11:00PM on Bottom)

Proposed Green Mobility Initiatives and Costs

At present, planned improvements on the corridor are from the CDIA Study, which proposed road enhancements along Kingkitsalat as well as Sakhaline Road (as per the latest November 2020 update, these included repaving the entire stretch with 5cm thick asphalt pavement). The Study also proposed placing communication and electrical cables underground, with a new light pole (high-mast CCTV and solar pole) along Sisavangvong Road to complement existing light poles.

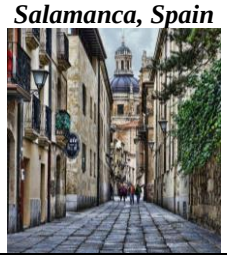
The proposed Green Mobility Vision and indicative investment priorities complement these efforts and seeks to:

- Further transform the corridor to facilitate green and multimodal mobility focusing on people-centric design and access-for-all;
- Create a pedestrian-only zone to coincide with the Night Market area including enhanced crossings at the start of the Night Market (at Kingkitsalat) with a new signalized junction and additional zebra crossing improvements further north towards the Nam Khan (as noted below – vehicles would not be permitted in except emergency vehicles at all times, with service/delivery vehicles permitted at night or early morning);
- Improving the walk experience with a focus on trees, lighting, access-for-all facilities, and street furniture (as sidewalk widening may be prohibited by the PSMV and DPL/UNESCO) where space allows;
- Addressing illegal on-street parking by dedicating one side of Sakhaline Road for parking;
- Facilitating bike use with shared bike lanes, as well as bike parking and bike share stations along the corridor (although bikes must be pushed through the pedestrian-only zone); and
- Creating convenient linkages to the public transport system at the endpoints of the corridor and on parallel corridors in intermediate areas.

In addition, global best practice for pedestrianized areas can be leveraged including improving vibrancy and street activities, creating urban focal points, permitting specific vehicle types (for instance deliveries and emergency vehicles), as well as restricting vehicular activities. Some proposed best practices for Sisavangvong Road include the following:

Table 3.14: Best Practices for Pedestrianized Zones Applicable to Sisavangvong / Sakhaline Road Context

Best Practice	Example	Benefit/Purpose
Restrictive Measures / Policies		
Removable Bollards and Signage	***Coventry, United Kingdom*** 	• Bollards are metallic cylinders that are often deployed to demarcate pedestrian from vehicular areas as shown in the example in Coventry in the United Kingdom. • Bollards may be retractable to allow in specific vehicles (for instance emergency vehicles in the day, or service/delivery vehicles at night) • Bollards should be placed close enough to deter banned motor vehicles (including motorbikes) • Installation of bollards would require coordination with DPL to ensure alignment with PSMV
Vehicle Restrictions (including Bicycles, Motorbikes, Emergency Vehicles, Service Vehicles, and Deliveries)	***Salzburg, Austria (Allows Delivery Vehicles and Select Residents / Taxis Controlled Access into Pedestrian Zone)*** 	• Pedestrianized zones often allow specific types of vehicles into the designated pedestrian area, with bollards providing the segregation • Bicycles would be allowed into the pedestrian zone – but must be pushed and riders must dismount. Bicycles can be north of the Night Market area (within this zone, they may push their bikes) • Motorbikes would be banned in the Night Market area but allowed north of here. Ample bike parking is provided at key locations leading into the Night Market. • Emergency vehicles would be allowed access at all times • Service vehicles and smaller delivery vehicles would be allowed in at night after the conclusion of the Night Market.

Best Practice	Example	Benefit/Purpose
		• If the pedestrian zone is expanded further north, inspiration may be drawn from Salzburg, Austria – in which delivery vehicles are allowed only in the early morning (as bollards are retracted), but also residents and taxis have their own devices to control the bollards and allow entrance.
Pickup/ Dropoff Zones	***Melaka, Malaysia*** 	• As vehicles such as motorbikes, taxis, and buses would not be allowed entry to the Night Market section, a dedicated zone is proposed west of the junction of Sisavangvong Road and Kingkitsalat Road on the southbound curb. • This would be similar to the setup for Melaka where these activities occur in designated areas just outside the restricted pedestrian zone.
Amenities to Enhance Pedestrian and Street Activities		
Wayfinding and Signage	***Toronto, Canada*** 	• Wayfinding signs can help tourists navigate through the Peninsula and identify optimal means to travel to the desired destination. • Also, branded wayfinding (including scannable QR codes) can enhance the tourism experience and expand interest in unique offerings and attractions in Luang Prabang.
Plazas and Outdoor Café Areas	***Barcelona, Spain*** 	• In Europe especially, plazas and outdoor cafes breed street activity and vibrancy at all hours of the day and night, providing a focal point for visitors and residents alike. Barcelona has numerous examples of this includes along Las Ramblas and other plazas around the city. • Plazas could be focused around street arts, statues, fountains, etc. but as noted – they may need to be removable to comply with DPL.
Parklets	***Vienna, Austria*** 	• Parklets are sidewalk extension that provides more space and amenities for people using the street. As the sidewalks cannot be physically extended as per the DPL and PSMV restrictions, parklets can be created using wooden pallets to extend the curb and created sitting, dining, garden, public or attraction space). • Vienna demonstrates examples of creating pleasant public spaces using sustainable materials involving citizen-led design.
Seamless Interface between Zones	***Tallinn, Estonia*** 	• As shown by the Tallinn example, the pedestrianized zone meshes well with the adjacent vehicular zone. This seamless interface is aesthetically pleasing and at the same time is beneficial to achieve access-for-all to allow users of all abilities to load/unload from vehicles and directly enter the pedestrian zone.
Distinctive Pavement / Surfacing	***Salamanca, Spain*** 	• Many pedestrianized areas have special pavement or distinctive surfacing. While this may be historic (due to use of pavers or stones), nonetheless a more aesthetically pleasing treatment may make the walk and leisure environment more inviting and picturesque (see Salamanca, Spain example). • Any such pavement surfacing must align with the DPL and PSMV. Temporary surfacing may first be deployed to pilot public opinion.
City Art / Festivals	***Melaka, Malaysia*** 	• Already, Sisavangvong Road already hosts the Night Market on a daily basis – and the morning alms. • Other festivals, etc. could attract more visitors to capitalize on this unique opportunity to bring people and visitors together in this unique and inviting pedestrian environment. Melaka holds numerous festivals and night-events drawing resident and tourist alike.

Source: (i) https://macs-bollards.com/case-studies/automatic-rising-bollards-coventry-city-council/; (ii) https://faac.biz/stories-of-success-10-years-of-bollards-in-salzburg/; (iii) https://www.viator.com/tours/Kuala-Lumpur/Malacca-Day-Trip-from-Kuala-Lumpur/d335-38355P3; (iv) https://www.cbc.ca/news/canada/toronto/toronto-wayfinding-project-1.4804231; (v) https://www.dailymail.co.uk/travel/article-2516379/Holidays-SpainYoull-love-Ramblabuzzy- Barcelona.html; (vi) https://urbinat.eu/articles/blogpost-finding-inspiration-from-an-austrian-initiative-to-co-develop-parklets/; (vii) https://www.dreamstime.com/tallinn-estonia-august-view-historicalbuildings-located-pedestrian-zone-city-center-view-historical-buildings-located-image193378475; (viii) https://www.pinterest.com/pin/976718856 42270213/; (ix) https://www.cktravels.com/jonker-street-night-market-melaka-malacca/

Table 3.15 summarizes these improvements along the priority green mobility corridor, including approximate costs and associated initiative from the indicative investment priorities. Total cost of the enhancements on this corridor is US$1.1 million or roughly US$730,000 per km.

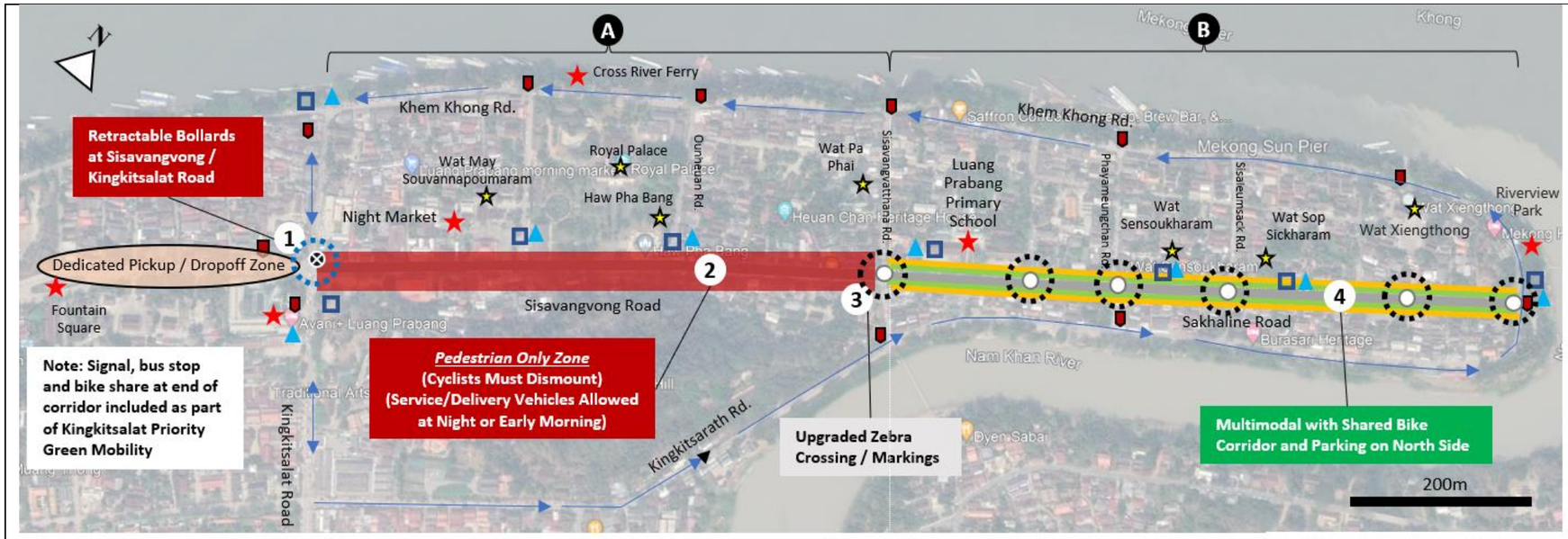
Table 3.15: Enhancements/Costs for Priority Green Mobility Corridor – Sisavangvong / Sakhaline Road

#	Type	Proposed Initiative in Indicative Investment Priorities	Notes / Assumptions	Costs (US$)
1	Public Transport	• One bus stop implemented at north end of corridor at tip of Peninsula • Other bus stops located off corridor on Khem Khong are shown for reference to illustrate connectivity (but costs are not allocated to this corridor) • Bus stops to south of Sisavangvong and Kingkitsalat are allocated to the Kingkitsalat corridor	• Bus infrastructure may need to be removable depending on PSMV restrictions • Costs for procuring buses, operating service, and depot/terminal costs excluded from estimate	$25,000
2	Road	• Resurfacing / pavement improvements planned in 700m pedestrianized/cycle zone from Kingkitsalat to Sisavangvatthana Road (with vehicles prohibited from entering) • Other pavement improvements are proposed by the CDIA study, but focus on asphalt improvements for vehicles (see next column)	• Road improvement works undertaken by CDIA project include a new 5cm thick asphalt layer and placement of electric and communication lines underground and drainage • Proposed improvements for Green Mobility Vision focus on specialized treatment in pedestrian only zone (i.e., pavers to beautify the area), which need to align with PSMV and DPL/UNESCO guidelines • Cost assumed to be borne as part of the indicative investment priorities, however, CDIA funding could be redirected from asphalt work to the noted specialized treatment.	$650,000
3	Sidewalk	• 1.5km of sidewalk improvements including trees, lights, wheelchair ramps tactile pavement, and select street furniture in each direction • No sidewalk widening is proposed as per PSMV restrictions	• Sidewalk improvements must align with PSMV and DPL/UNESCO guidelines • Assumed that trees and light improvements comprise 40% of the sidewalk enhancement unit price (and assumed to cover tactile paving and wheelchair ramps) • Street furniture would create a more friendly walk environment, but must align with the DPL/UNESCO guidelines (thus a parklet or temporary amenities may be preferred) • Tactile paving may improve access and safety for vision-impaired pedestrians	$300,000
4	Crossing	• One new signalized junction at Kingkitsalat proposed (and included in the Kingkitsalat corridor cost) • Six upgraded zebra crossings (including more visible pavement markings, raised crossings, and signage)	• Combined package of crossing improvements and traffic calming to reduce vehicular speeds and facilitate safer crossings • Crosswalk improvements must align with PSMV and DPL/UNESCO guidelines • Wheelchair ramps to improve access and safety for all types of users	$50,000
5	Cycle	• 1.5km of shared bike lane (sharrow) each way	• Combined strategy of shared bike lane, parking and cycle share beneficial for residents and tourists	$50,000

#	Type	Proposed Initiative in Indicative Investment Priorities	Notes / Assumptions	Costs (US$)
		(including 700m in the pedestrian zone, in which cyclists are allowed) • Six bike parking facilities (~75 spaces) • Six bike share facilities (~120 bikes)	• Bike facilities to tie directly into the public transport network and walk improvements • Bike parking and bike share stations must align with PSMV and DPL/UNESCO guidelines	
6	Parking	• On-street curb on north side of Sakhaline Road dedicated for parking • No off-street facilities proposed due to lack of available land in congested Peninsula	• Current on-street arrangement is confusing as north side permits parking on even days of the month, while south side permits parking on odd days of the month (with illegal parking observed) • On-street parking modifications assumed in road costs (mainly consisting of updated signage) (with proposed paid parking) • Fixed arrangement may allow for smoother traffic flow and facilitate transition to a shared road for bicycles and vehicles	Included in Road Cost
			Total	$1.1 million

Figure 3.10 presents the concept for the Sisavangvong Road priority green mobility corridor, including cross-sections at different locations where the road has significantly different profiles, as well as location of the other proposed walk, cycle, and crossing improvements. General location for parking facilities is also indicated (i.e., with the lot preferred within a 400m walk of this location).

To facilitate the transition to full pedestrianization, the following is required: (i) convenient detour route (this is shown by the blue directional arrows in **Figure 3.10** along Kingkitsarath to the east and Khem Khong to the west), with traffic circulating in a clockwise direction – this is already used as the main detour route during night-time and weekend closures; and (ii) an effective signage program and communications and outreach plan to make residents, businessowners, and visitors fully aware of the new closure and available detour routes to minimize disruption to daily lives. At the onset, Traffic Police or other city staff may be deployed to the field to help pedestrians, cyclists, and drivers to navigate the area.



Legend

Existing Conditions
- Religious / Historical Heritage Sites
- Key Generators
- Existing Crossing Without Signal
- Existing Junction Without Zebra Crossing
- Direction of Traffic Flow (Also Detour Route around Pedestrian Zone)

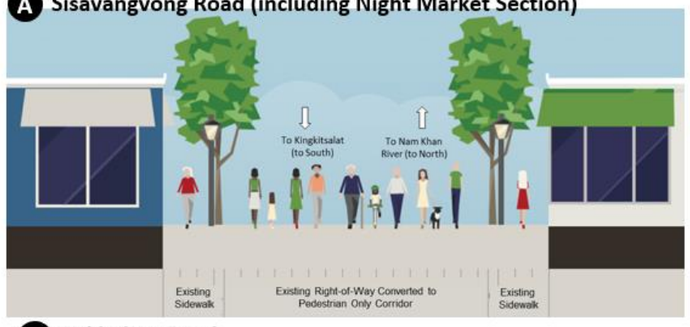
Streetscape Improvements
- Bus Stop (Note: Stops Outside of Corridor Not Included in Costs for This Corridor)
- Shared Bike Corridor (Sharrow)
- Bike Rack / Parking
- Shared Bike Station
- Pedestrian Only Zone (Small Service/Delivery Vehicles Permitted At Night)
- Walk / Access Enhancement (Wheelchair Ramp, Tactile Pavement, Trees, Streetlights & Street Furniture as Allowed by DPL/UNESCO in WHZ – See Sidewalk Note Below)

Crossing Improvements
- Signalized Crossing (Scramble Junction)
- Upgraded Zebra Crossing / Markings

Note: Potential streetscape modifications subject to PSMV and UNESCO/DPL concurrence. Furthermore, no sidewalk widening proposed due to PSMV restrictions on such actions.

Total Length of Corridor = 1.500m
- Sisavangvong Road = 700m
- Sakkaline Road = 800m

Typical Cross Section (Note: Profile may vary somewhat within section)



Examples of Street Furniture

Parklet

Bollard

Public Art & Focal Point

Designated Pickup/Dropoff Zone

Sample of Green Mobility Transformation (All Views Looking To North To Nam Khan River)

1 Rectractable Bollards at Sisavangvong / Kingkitsalat Road

Note: Small service vehicles can enter prohibited area at night

2 Pedestrian-Only Zone / Specialized Street Treatment

3 Upgraded Zebra Crossing / Markings at North End of Pedestrianized Zone

4 Streetscape – Multimodal with Shared Bike Corridor & Parking on North Side

Figure 3.10: Conceptual Design of Priority Green Mobility Corridor – Sisavangvong / Sakhaline Road

Priority Green Mobility Corridor#2: Kingkitsalat / Kitsalat Road

Background of Corridor

Figure 3.11: Extent of Priority Green Corridor along Kingkitsalat / Kitsalat Road

The Kingkitsalat Road and Kitsalat Road corridor is a major east-west road from the Mekong to the east, providing access to/from the Peninsula. The corridor allows two-way traffic throughout, with one lane in each direction and parking allowed on one or both sides of the street. Kitsalat Road starts at the Mekong and runs for one block to the Sisavangvong Road junction, whereby the name of the street changes to Kingkitsalat Road and heads east to its junction with Naviengkham Road. The street is lined with both residential and commercial uses. The junction with Sisavangvong Road is important as this marks the south end of the Night Market and is an area with significant pickup/dropoff activities, while Dara Market one block to the east.

The priority green mobility corridor along Kingkitsalat / Kitsalat Road encompasses the entire stretch from the Mekong to Naviengkham Road, a distance of about 1.0km.

Key Green Mobility Issues

Key mobility issues along this stretch of Kingkitsalat / Kitsalat Road are as follows:

Table 3.16: Key Issues Observed on Kingkitsalat / Kitsalat Road

#	Key Issues	Description / Details
1	Important Mobility Corridor	• This corridor is a major east-west corridor into/out of the WHZ and links to the south end of the Sisavangvong Road and the Night Market. As shown in **Figure 1.9**, the corridor has a moderate density of pings (detections) akin to moderate activity on the corridor. If the Sisavangvong Road Corridor is fully pedestrianized, Kingkitsalat / Kitsalat may become an even more important link as most pickup/dropoff activities occur at the south end of the Night Market.

#	Key Issues	Description / Details
2	Parking on Both Sides of a Narrow Road Creating Dangerous Driving Conditions	• Videos and GoogleStreetView imagery from Fall 2021 show curbside parking on both side of Kingkitsalat. While in some segments the road is wide enough, closer to Naviengkham in the east, parking on both sides of the street causes vehicles to enter the opposing traffic lane. This is also dangerous for those bikes operating on this corridor. Examples of parking on both curbs is shown in the figure to the right (heading eastbound towards Naviengkham). As noted, the car in front must operate in the lane of the opposing traffic, creating a potentially hazardous situation. 
3	Widen and Unsafe Crossing at Naviengkham	• The eastern end of the corridor intersects with the north-south Naviengkham Road. The junction has a channelized right turn lane onto southbound Naviengkham. To cross Kingkitsalat, pedestrians must cross from the southwest corner (where the blue pedestrian crossing sign is, stop in the yellow marked refuge area (without a segregated curb), then crossing the left-turn lane to northbound Naviengkham, and then proceed across the westbound Kingkitsalat lane. This crossing has low visibility at night and the channelized right-turn encourages fast turns with minimal stopping time / warning for crossing pedestrians. Safety enhancements at this corner could be beneficial to pedestrians and disabled users. 
4	Narrow Sidewalk and Obstructions along the Corridor	• From Technical Report – Luang Prabang Green Urban Mobility, most of the corridor has a sidewalk width of less than 1.8m, which makes two-way passage difficult, especially for disabled. • Sidewalk obstructions exist especially on the eastern part of Kingkitsalat. This includes billboards, merchandise, and other obstructions. A wider sidewalk where feasible could improve the walk experience (in addition to clearing of these obstacles).
5	Limited Crossing and Access-for-All Facilities	• In some cases, road width is over 10m. However, zebra crossings exist at major junctions, although they could be more visible to drivers, especially at night. • No signalized junctions or flashing pedestrian beacons provided on the corridor. • Two wheelchair ramps are observed as junctions along the corridor. • Tactile paving is not provided along the corridor for visually impaired users.
6	Major Loading / Unloading Node at Junction with Kingkitsalat	• The southern end of the corridor at the junction with Sisavangvong is the major loading/unloading point for tuk-tuk, taxis, vehicles, etc. to visit the Night Market. Therefore, there is a need to better organize this area with more tourists expected in the area. Any extension of vehicle prohibition hours would also increase the volume of such loading/unloading activities at this location.
7	Limited Weather Protected Paths	• The Technical Report – Luang Prabang Green Urban Mobility surveys find the eastern part of the corridor has relatively poor weather protection in the form of shade trees or overhead canopies, which may influence the decision to walk due to sunshine or wet conditions.

#	Key Issues	Description / Details
8	Limited Lighting Provision	• Some portions of the corridor possess minimal street lighting, which may impact the willingness of pedestrian to use this corridor at night for safety/security.
9	Limited Cycle Facilities in the City	• No bike lanes, bike share facilities, or bike parking exists along the corridor
10	No Operating Public Transport	• As no public transport system operates in Luang Prabang, no facilities are provided on this corridor.

Proposed Green Mobility Initiatives and Costs

The proposed Green Mobility Vision and indicative investment priorities focus on:

- Transforming Kingkitsalat Road to be more amenable to green modes including walking, cycling and public transport, and all users at all times of the day and night;
- Enhancing the walk and crossing experience with sidewalk improvements (including widening, trees/lighting, and other street furniture) as well as targeted crossing enhancements (including a new signal at Sisavangvong and various pavement and signage improvements to make crossing more visible and safer);
- Better organizing parking and cycle use along Kingkitsalat by allocated the south curb for on-street parking and providing a dual bike lane on the north side to separate bikes and vehicles; and
- Creating a more pedestrian-friendly junction of Kingkitsalat and Naviengkham by removing the dedicated right turn heading eastbound and extending the curb to provide a pedestrian refuge with bike parking, a bike share station, and a bus stop.

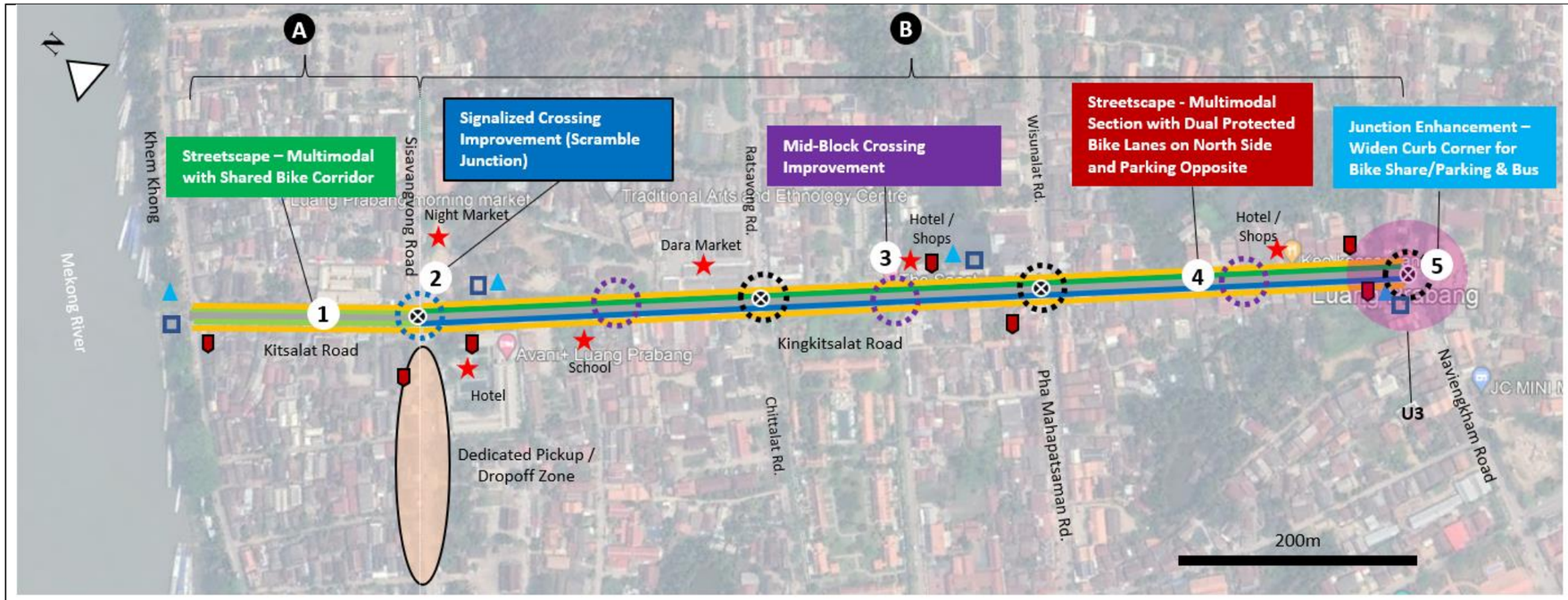
Table 3.17 summarizes these improvements along the priority green mobility corridor, including approximate costs and associated initiative item from the indicative investment priorities. **Total cost of the enhancements on Kingkitsalat Road is US$800,000 or roughly US$800,000 per km.**

Table 3.17: Enhancements/Costs for Priority Green Mobility Corridor – Kingkitsalat / Kitsalat Road

#	Type	Proposed Enhancement	Notes	Costs (US$)
1	Public Transport	• Bus stops every ~250-350m (7 stops), some with bulbout configuration due to constrained sidewalk • Primary loading zone south of Kingkitsalat and Sisavangvong junction at the south end of Night Market	• Bus infrastructure may need to be removable depending on PSMV restrictions • Costs for procuring buses, operating service, and depot/terminal costs excluded from estimate	$25,000
2	Road	• None (improvements handled by others – see next column)	• Road improvement works being undertaken by CDIA include putting communications and electric lines benefit the surface • CDIA also proposes four new high-mast CCTV poles with solar lights	-

#	Type	Proposed Enhancement	Notes	Costs (US$)
			• No improvement costs are attributed to the investment priorities in this segment	
3	Sidewalk	• 1.0km of sidewalk widening and paving (to 1.8m), as well as new trees and streetlights (each direction) and street furniture • Tactile paving and wheelchair ramps at select junctions	• Street furniture where space allows can improve the walk experience • Tactile paving to improve access and safety for vision-impaired pedestrians	$300,000
4	Crossing	• One new signalized junction • Three mid-block crossings (including crosswalk, speed humps, median, etc.) • Three upgraded crossings with enhanced zebra crossings and speed humps • Traffic calming elements	• Combined package of crossing improvements and traffic calming to reduce vehicular speeds and facilitate safer crossings • Wheelchair ramps to improve access and safety for all types of users • Crossing improvements included Naviengkham curb extensions. • Traffic calming elements introduced to reduce speed on approaches	$200,000
5	Cycle	• 200m of shared bike lane (sharrow) each way (on Kitsalat) • 800m of protected bike lane (dual lanes on north side of street on Kingkitsalat) • Four bike parking facilities (~40 spaces) • Four bike share facilities (~80 bikes)	• Combined strategy of dual protected bike lane, shared bike lane (sharrow), parking and bike share beneficial for residents and tourists • Bike facilities to tie directly into the public transport network and walk improvements	$175,000
6	Parking	• On-street parking along south side of Kingkitsalat • One off-street lot within 400m walk of the corridor (Lot U3 – see **Figure 3.16**)	• Current on-street parking occupies both sides of the road on Kingkitsalat. The proposed on-street parking may be exclusively on the south side of Kingkitsalat. • Off-street parking to be in key locations near key generators and where significant illegal sidewalk parking observed • On-street parking costs considered to be minimal and focus on signage • Paid parking could help offset O&M costs, with special price/space priority given to electric vehicles or high-occupancy vehicles	$50,000
			Total	$800,000

Figure 3.12 presents the concept for the Kingkitsalat / Kitsalat Road priority green mobility corridor, including cross-sections at different locations where the road has significantly different profiles, as well as location of the other proposed walk, cycle, and public transport improvements. General location for parking facilities is also indicated (i.e., with the lot preferred within a 400m walk of this location).



Legend

Existing Conditions
- Key Generators
- Existing Crossing Without Signal

Streetscape Improvements
- Bus Lane / Select Transit Signal Priority
- Bus Stop
- Bikeway (on Frontage Road)
- Protected Bike Lane
- Shared Bike Corridor (Sharrow)
- Bike Rack / Parking
- Shared Bike Station
- Walk / Access Enhancement (~2-3m Paved Sidewalk, Segregated Curb, Wheelchair Ramp, Tactile Pavement, Trees, & Streetlights, Street Furniture)

Crossing Improvements
- Signalized Crossing (Scramble Junction)
- Mid-Block Crossing (With Traffic Calming)
- Upgraded Zebra Crossing / Markings

Parking Improvements
- General Location of Off-Street Parking Facility along Kingkitsalat / Oupalathxiengkong Road (Within 400m Radius)

Total Length of Corridor = 1,020m
- **Kitsalat Road = 190m**
- **Kingkitsalat Road = 830m**

Typical Cross Section (Note: Profile may vary somewhat within section)

Examples of Street Furniture

Parklets

Bollards

Wayfinding Signage

Sample of Green Mobility Transformation

Figure 3.12: Conceptual Design of Priority Green Mobility Corridor – Kingkitsalat / Kitsalat Road

3.6 Pilot Projects

Pilot#1: Designate Local Streets as Slow Zone

The local streets are the foundation of the pedestrian network and would be the predominate street type in the peninsula. Within the local streets, certain sections are designated as pedestrian priority street and slow zone with enhanced treatments.

Slow Zone

They are designated for traveling on pedestrian speeds with a maximum of 15-20 km per hour. Vehicles maintaining low speed and bicycles can travel on those streets to provide local access and to meet the needs for people with limited mobility. Vehicles must yield to pedestrians. This type of streets is also commonly known as "Shared Street" or "Living Street". A Slow Zone would complement efforts to develop the Sisavangvong Road corridor as a pedestrian-only zone as proposed in **Section 3.5**.

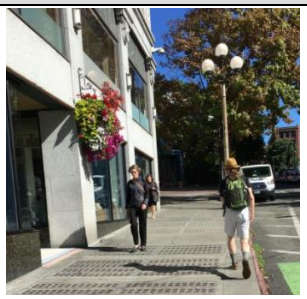
Source: Google Maps, 2021.

Figure 3.13 Shared Streets in Chinon, France

Figure 3.14 Streets within Heritage Zone in Peninsula are Primary Candidates to Create Slow Zone

Street Block Treatment

Treated Surface with paint (near term) and pavement (long term)



Pedestrian Scale Lighting

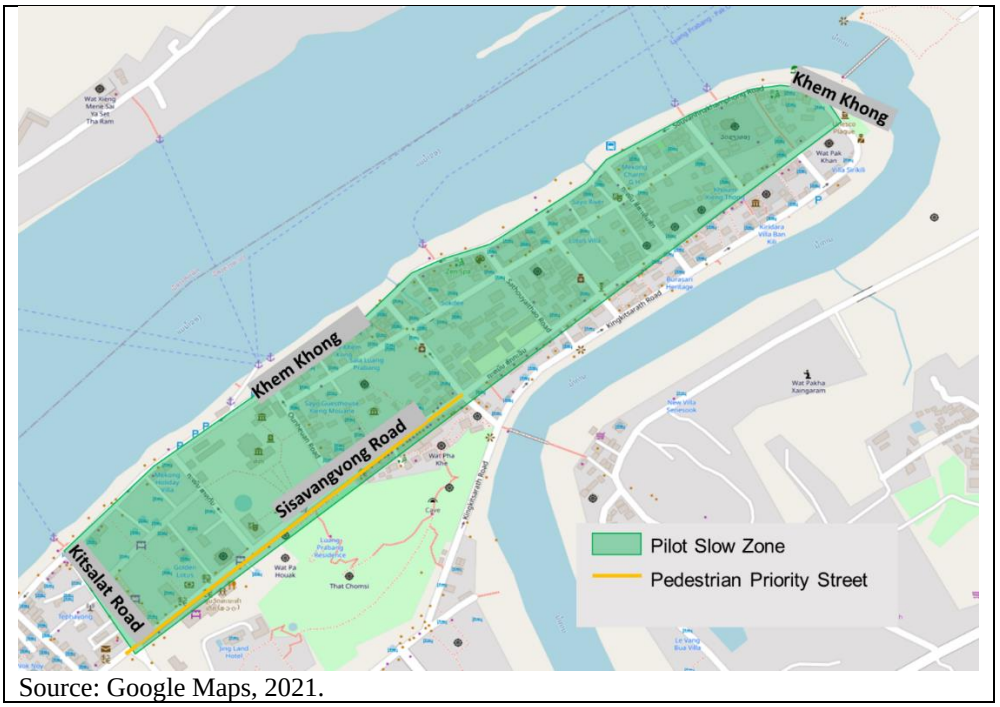
Planters and Street Furnitures (*source: Arup, New York Shared Street pilot)*

Key Actions For Luang Prabang:

- Create slow zone within the Peninsula, bounded by Kitsalat Road, Khem Khong and Sisavangvong Road. Within the slow zone, vehicle still have

access with a maximum speed of 20 km/hour. Motorists must yield to pedestrians.

- Capacity building with the City, Traffic Police and DPWT for enforcement.
- Complementary signage and restrictions to align with the proposed pedestrian-only zone on Sisavangvong Road and the modified parking and cycling corridor along Sakhaline Road to the tip of the Peninsula.



Source: Google Maps, 2021.

Figure 3.15: Pilot Slow Zone and Pedestrian Only Priority Street in Luang Prabang

Benefits:

- Proper allocation of street space to the dominant user – pedestrians while accommodating slow-moving vehicles.
- Improved public realm and comfortable walking experience
- Safety benefits - the slow zone reduces vehicle speed to below 15 km/hour, closer to average pedestrian walking speed. This decreased the risk of pedestrian injury and fatality.
- Creation of a destination of its own with boosted economic benefits (i.e., increased retail and tourism revenue)

Pilot#2: Parking Management Zone

Development of a parking strategy as part of Strategy 2C1 (Facilitate Effective Parking and Curbside Management) is an important activity given observed illegal sidewalk parking and focus group priorities on alleviating this issue for safety reasons. The parking strategy would likely include establishing norms that regulate and influence parking behavior and could start with a pilot in the designated slow zone and the WHZ and focus on three areas:

Table 3.18: Key Focus Areas for Pilot Parking Management Zone

Element	Potential Actions/Strategies
Supply	**Phase 1:** • Designate on-street parking with meters and create on-street parking duration limits • Establish loading zones that encourages late evening or early morning activities. • Create secured off street parking areas – with reduced parking fee to encourage residents to park off street. • Designate parking area for tourist buses in the heritage area and requires them to switch off engines when parked. • Establish mobility hubs at key locations for shared vehicles, loading and drop off etc. • Create integrated data platform with wayfinding and parking availability information.
Regulation	**Phase 1:** • Pilot standardized street parking and regulations using curb colors and signage. • Issue residential parking permits that restrict parking location. • Issue business parking permits and restrict time and location. • Study and monitor parking usage to identify the needs of additional off-street parking and explore shared parking strategies.
Enforcement	**Phase 1:** • Establish clear enforcement strategies, roles, and responsibilities in enforcement-tie to institutional capacity • Prohibit parking on sidewalk outside designated area. Leverage parking management system proposed in the ASEAN smart city action plan • Establish a system to increase fines for repeated violators - tie to institutional capacity

Key Actions for Luang Prabang:

- Understand where the key issues are and what is the root cause
- Seek integrated "push-pull" strategies/policies to provide options if parking strategy adopted (i.e., better public transport and active mobility)
- Create cross-cutting committee with City, DPWT, and Traffic Police to discuss enforcement and parking regulations
- Leverage technology to institute and manage parking regulations (for instance the CDIA Study)
- Leverage proposed slow zone to demonstrate new parking regulations and operations for larger roll-out

Benefits:

- Improve parking and roads to be better managed, less chaotic, and safer
- Curbspace freed up for public realm and enhanced walk environment
- Opportunity to extend this initiative to reclaim more roadspace for active mobility and shared use
- Set precedent for city to respect parking laws and encourage other modes

Pilot#3: Off-Street Parking

Illegal parking on sidewalks and streets in the city center, and the need for park-and-ride lots that intercept vehicles from driving into the city center and thereby reducing congestion and emissions from vehicles are identified as key issues. Although a parking plan was developed as part of the initial indicative investment

priorities, further elaboration was requested by stakeholders to include approximate and sizing of new parking facilities.

Types of Lots Proposed

Two types of off-street parking facilities have been added to the plan as per stakeholder comments and review of existing parking conditions: (i) urban lots, whose aim is to reduce on-street parking and illegal sidewalk parking in more urbanized and populated areas; and (ii) periphery lots, whose aim is to serve as quasi park-and-ride facilities along the outskirts of the city along major roads including Route 13N served by public transport to serve as intercepts for vehicles entering the city. On-street parking improvements are proposed as part of the parking management pilot in the WHZ around Sisavangvong Road.

Table 3.19: Description of Proposed Off-Street Parking Facilities

Type of Lot	Purpose	Target User(s)	Key Locational Considerations
Urban	• Provide off-street parking in central area • Reduce on-street and illegal sidewalk parking	• Residents, commercial users, and tourists	• Near areas with significant illegal sidewalk parking • Near areas identified as lacking sufficient capacity • Close to key commercial districts in the city center and/or tourist/heritage areas • Convenient linkage/access to walk/ cycle network and facilities • Located in open public lots (to minimize impact on existing buildings)
Periphery Lot (Park & Ride)	• Provide periphery parking • Intercept vehicles before entering city to reduce congestion and emissions • Encourage public transport to access city center	• Regional / long-distance users	• Along major highways on city outskirts • At or near planned public transport terminals / stations on the outskirts • Located in open public lots (to minimize impact on existing buildings)

General Location of Parking Facility and Approximate Sizing

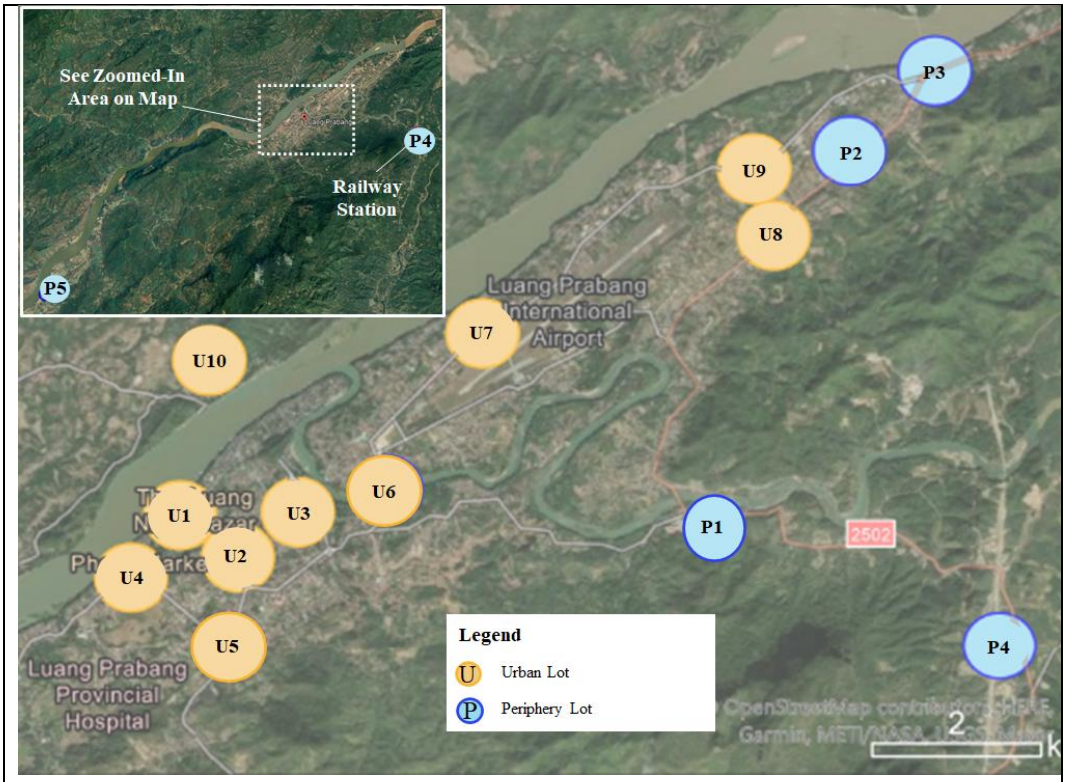
The figure and table below present the proposed number of parking spaces by general location. A total of 10 lots are proposed in the urbanized area, with a capacity of 325 spaces, with an additional five periphery lots with a capacity of 300 spaces. Overall capacity of proposed off-street facilities is 625 spaces (assuming around 30m^2 per space including circulation and maneuver area, the total area for the parking would be above 19,000m^2 – this could also be flexibly used to accommodate motorbikes and tuk-tuks while decreasing full-size vehicle spaces). The figure below depicts the parking locations throughout the city.

Total cost is about US$600,000 with each space costing approximately US$600 with additional costs for parking barriers, lighting, and CCTV.

Key Actions For Luang Prabang:

- Identify potential off-street parking locations
- Collaborate with local districts to ensure convenient walk access to the facilities
- Ensure strict enforcement of illegal parking to encourage off-street parking

- Ensure public transport and other first/last-mile connectivity modes conveniently located to serve the parking facilities
- Identify private sector opportunities for implementation and O&M
- Identify mechanisms to allow surplus revenues for green mobility O&M



Notes:
[A] Circles represent general location (i.e., within a 400m walk). Specific location is subject to additional DPWT or City investigation to identify public and/or available land to minimize land acquisition, resettlement, compensation, and environmental issues.

Figure 3.16: Map of Potential Off-Street Parking Facilities

Benefits:

- Better organize and manage parking in specific locations
- Reduce curbside and sidewalk parking, which may improve the sidewalk environment and create a safer active mobility environment
- Reduce the number of vehicles driving into the city center
- Encourage use of public transport for more sustainable travel behavior
- Use revenues to offset O&M costs for other green mobility initiatives

3.7 Priority Studies and Investigations

This Green Mobility Strategy identifies a longlist of indicative investment priorities. To underpin these priorities, additional foundational studies will be required to better understand feasibility, operating details, and implementation processes, as well as to establish facilitating environments and frameworks to expedite delivery and success of these investment priorities.

A series of priority investigations and studies have been proposed in **Section 3.3** to advance investment preparation – these include the following (with additional details/insights on key components of the studies):

Table 3.20: Priority Studies to Advance Investment Preparation

Element	Action #	Action / Study	Key Components and Additional Details for Priority Studies
Public Transport	1C	Public Transport Studies	• Undertake a more detailed feasibility analysis of the public transport system including e-bus operations and key energy requirements and infrastructure implications • Explore private sector participation in public transport system • Undertaken investigations on creating a public transport oversight entity (or authority) and developing plan to establish such an entity • Identify training and capacity building needs related to public transport management and operations (learning from Vientiane) • Investigate social implications from new public transport system on sector drivers and employees and develop plan to address these impacts
Walk	1B1.2	Citywide Crossing Improvement Study	• Undertaken pedestrian crossing inventory to undertake dangerous locations and current condition of crossing facilities • Identify crossing locations for enhancement and develop city-wide crossing improvement study • Quantify safety benefits to pedestrians and persons with disabilities • Identify training and capacity building needs related to signals and crossing safety/design
	4A1.1	Nam Khan River Bridge Study	• Undertaken feasibility assessment of new Nam Khan River Bridge • Identify crossing location and feasible connections to existing/planned walk and cycle network • Estimate demand and sizing for the bridge • Assess feasibility of private sector involvement • Assess social impacts on nearby communities and business • Assess environmental impacts and heritage impact from new bridge
Road	1B5.3	Road Safety Audits	• Create road safety audit program and identify key locations to assess • Conduct road safety audits and develop plans for e-database to store and share information and allow for visualization • Establish framework to leverage results of audits and integrated into plans and designs for local road/walk/cycle enhancement
	4A1.1	Traffic Management Study	• Review traffic flows and congestion currently and forecast in the future, especially related to Chompet and the new Lao-China Railway Station and increase in population and visitors • Identify problematic locations (including junctions and corridors) • Develop city-wide traffic improvement/management measures including integrated signal systems, etc. • Conduct financial and economic assessment of introducing various traffic management measures to improve future traffic performance and impacts on the public transport system • Identify training and capacity building needs related to traffic management and operation
Parking	2C1.1	Citywide Parking Strategy and Management Study	• Undertake comprehensive parking-related surveys to inventory parking patterns and behavior, illegal sidewalk parking, and key focus areas outside of city center • Conduct best practice review for parking regulations, enforcement systems, payment systems, and institutional setup for parking • Identify optimal locations for on/off-street parking facilities

Element	Action #	Action / Study	Key Components and Additional Details for Priority Studies
			• Conduct financial assessment of introducing parking management and facilities (including surplus of revenue to reallocate for other green mobility initiatives) • Identify opportunities for private sector participation • Identify training and capacity building needs related to parking design and operation/management
Other Policy / Overarching Studies	2B1.1	E-Mobility Study	• Identify key roles and responsibilities, e-mobility partnerships, and policy implications • Identify potential scope of e-mobility in the city and key infrastructure requirements • Identify potential pilot projects including implementation and costing issues to prepare the groundwork for more intensive adoption of e-mobility • Identify training and capacity building needs related to e-mobility planning and operations
	2E2.1	Transport System Resilience Study	• Identify future climate and resilience related risks / trends in city • Identify specific locations / infrastructure at risk / threat • Conduct overarching best practice review of transport system resilience policies overseas and identify relevant ones for city • Identify key stakeholders that will lead the city in ensuring resilience and frameworks/guidelines for incorporating system resilience into the transport network and systems • Develop overarching cost estimates to understand magnitude of measures required to improve resilience
	4A1.1	Environmental & Social Safeguards Study	• Conduct environmental and social safeguard studies for all related green mobility initiatives
	4A1.1	Heritage Impact Assessment	• Assess impact of new green mobility elements on heritage on the Peninsula and other major heritage areas in the city
	4A1.1	Motorbike Policy Study	• Quantify impact of motorbikes on congestion and demand in city • Identify best practice in motorbike regulations, restrictions, and enforcement adopted in other cities (and likewise complementary policies/measures to compensate for reduction in accessibility) • Develop proposed motorbike measures to restrict or better control use and develop engagement program with stakeholders and public to assess feasibility

Note: Studies identified in this table have been presented in **Table 3.2** with additional elaboration on key focus areas and assessment components.

4 Institutional and Capacity Building

4.1 Introduction

An enabling institutional framework, organizational set-up, and appropriately upskilled local staff are requisite to allow the indicative green mobility investment priorities to be planned, adopted, and sustainably managed and allow the city to achieve the Green Mobility Vision established in this document. The sections below highlight recent, on-going, and planned institutional and capacity strengthening efforts by other donors and stakeholders in the country and Luang Prabang. Then, based on the institutional and capacity gaps from **Table 1.6** as well as discussions and workshops with stakeholders, a series of institutional and capacity strengthening initiatives are proposed to create an enabling green mobility environment. Opportunities for synergies with the other parallel efforts are also identified to leverage these efforts and reduce duplication of effort.

4.2 Relevant Recent, On-Going, and Planned Institutional and Capacity Strengthening Efforts

Prior to developing the list of recommendations, it is important to identify previous, on-going, or planned initiatives targeting institutional strengthening and/or capacity building to avoid duplication and identify potential synergies. Relevant activities by the Asian Development Bank (ADB), Cities Development Initiative for Asia (CDIA), and Japan International Cooperation Agency (JICA) in Luang Prabang as well as Vientiane are follows:

- **JICA Project to Enhance the Capacity of Vientiane Capital State Bus Enterprise (VCSBE)** – A capacity building effort to strengthen the bus operator in Vientiane, there are parallels to potential public bus services in Luang Prabang that can leverage prior materials developed (for operations, planning, maintenance, branding, etc.).
- **JICA Project for Capacity Enhancement for Sustainable World Heritage Management and Preservation in Luang Prabang (or JICA Capacity Enhancement Study)** – A strengthening study focused on institutions involved in heritage preservation. The study suggests modification to the WHZ's strict infrastructure restrictions, which this study could piggyback upon to enact minor modification to suit green mobility.
- **ADB Capacity Building for Vientiane Sustainable Urban Transport Project (or the VSUTP) (CS-1 Consulting Services for Capacity Building)** – A comprehensive capacity building effort for a sustainable urban transport project in Vientiane, establishing a local public transport oversight body within DPWT and extensive capacity building focused on public transport, parking, branding, and more project management. On-going activities align well with the needs of Luang Prabang for enhanced expertise in green mobility and urban transport.
- **CDIA Lao Livable Cities Project Preparation Study for Luang Prabang (or the CDIA Study) –** This study seeks to create a livable city in

Luang Prabang including various urban transport components including road, sidewalk, and cycle improvements. From a capacity building perspective, this study seeks to improve project management and financial management capabilities, which could be leveraged by Luang Prabang to improve project formulation and management of green mobility initiatives.

- **JICA Luang Prabang Sustainable Urban Transport Master Plan (or JICA Transport Master Plan**) – A new proposed plan including capacity building on urban transport policymaking, green mobility, smart transport, etc., which aligns with this Strategy.

4.3 Recommended Institutional and Capacity Building Enhancement Measures Recommended Institutional and Capacity Building Enhancement Measures

This section highlights the key recommendations to address key institutional and capacity building gaps vis-à-vis urban transport and green mobility (specifically related to implementing this Green Mobility Vision and indicative investment priorities). The recommendations are organized by specific element using the same framework adopted for Section 1.6 - that is: (i) Legal, Regulatory, and Policy; (ii) Decision-Making, Organizational, Engagement, and Funding/Financing; and (iii) Training and Capacity Building. The table also highlights entities involved, expected benefits and implementation considerations, synergy opportunities with other projects/programs, reference examples as applicable, and timeline (i.e., Phase 1 (Year 1-7) or Phase 2 (Year 8-10).

First though, major recommendations by element are summarized as follows:

- **Legal, Regulatory, and Policy**
    - ***Developing a more targeted strategy*** with clear numerical goals for green mobility to ensure that the city's plan is more responsible towards the transition to green mobility and sustainable travel and more fundamentally a clear policy statement from the Government on urban green mobility (including Luang Prabang);
    - More clearly ***defining the definition and operation of green mobility within the current legal/regulatory framework*** – starting with intermediate steps to enshrine this locally, then in the long-term seek stepwise change at the national level (this also encompasses incorporation into prevailing road and infrastructure design standards, as well as formulation of a framework for financing mechanisms for green mobility – covered in the funding recommendations below);
    - ***Creating enabling conditions to improve parking enforcement*** to minimize illegal sidewalk parking and restore sidewalks for their intended purpose – including a pilot parking zone, additional training for the Traffic Police, and public education on parking etiquette – all supported by strong mayoral advocacy (similar to what occurred in

Vientiane, which now has an on-street parking regime generating a surplus that subsidizes the public bus system); and

- ***Formulating a performance monitoring mechanism and body*** to allow the city to assess its achievement of overarching urban mobility and green mobility goals.

- **Decision-Making, Organizational, Engagement, and Funding/ Financing**
  - Initiating the ***process to create an oversight body responsible for green mobility in the city***, serving as a strong advocate for green mobility and integrating systems and designs across various geographies (this process starts with a regional committee that includes all relevant transport and policy-making bodies in the city and neighboring areas (at a minimum this would include MPWT, DPWT and the City and could be led by the MPWT) to develop the scope/breadth of this body – then identifying the optimal organizational arrangement, potentially giving responsibility to an existing department in DPWT);
  - Initiating a ***similar process for a public transport oversight and management body*** – taking a cue from Vientiane's VSUTP – this body could be appended to an existing division in DPWT to quicken the timeline (with long-term aspirations for a separate public transport authority – which would be part of the responsibility of the committee formed to resolve this issue);
  - Ensuring that ***cross-cutting frameworks and mechanisms are in place*** (either via existing bodies such as the Local Heritage Committee or another new Steering Committee) such that planning, transport, design and heritage are intertwined in decision making and consensus building – while also aligning among different geographies;
  - Improving the ***linkage for green mobility within the project prioritization framework*** (with MPWT developing a framework integrating green mobility, then DPWT adopting this at the local level) to ensure that selected projects more closely align with envisioned green mobility agenda (it is noted that full alignment of the MOF national level prioritization would be much more gradual and require full support from all national level parties);
  - ***Establishing and encouraging greater and diversified civic participation*** in the green mobility and urban transport planning and design process;
  - ***Initiating public education and awareness campaigns to educate the public*** on the benefits of green mobility and initiate a shift in "sentiment" towards green mobility to build momentum for this transition (and at the same time, ensuring proper engagement of impacted residents to create win-win situations for instance if a new public transport system is implemented, those employed in the informal transport sector may be impacted);

- ***Identifying alternate revenue and funding sources (see Box 3-1)*** such as PPP, earmarking of other funding instruments (including tourism levies, parking charges, etc.) to increase the ability of the city to implement more extensive green mobility initiatives as well as develop sustainable and recurring O&M sources to cross-subsidize operations of other initiatives where needed (for instance in Vientiane, on-street parking revenues subsidize public transport operations); and
- ***Overcoming financial constraints through various government and city actions*** including: (i) reprioritizing projects once the linkage with green mobility is establish in the decision-making framework; (ii) leveraging private sector financing; (iii) exploring potential revenue sources for green mobility and urban transport; (iv) gradually increasing public expenditures allocated to green mobility and urban transport; and (v) developing an appropriate financing mechanism and framework to support sustainable green mobility initiative implementation and operation.

- **Training and Capacity Building**
  - ***Formulating a localized training and capacity building agenda for Luang Prabang***, as the national MPWT agenda may not fully incorporate green mobility needs of the city (as MPWT typically sets the training agenda, which cascades down to the local level); and
  - ***Developing targeted technical and programmatic capacity building*** for relevant stakeholders to enable them to plan, design, implement and operate green mobility initiative, but also to formulate, seek funding and apply for international cooperation programs, initiate and assess bids and tenders, and oversee finances and project management (this includes ***leveraging on-going and planned capacity building efforts by ADB in Vientiane, as well as CDIA and JICA in Luang Prabang to avoid duplication and expand the breadth of training).***

Key priority strategic recommendations to form the initial foundation for green mobility are highlighted in the right-most column.

Table 4.1: Recommendations on Institutional Development and Capacity Building

Category	Proposed Enhancement / Recommendation	Green Mobility Gap Enhancement/ Recommendation Seeks to Address (refer to Table 1.2)	Entities Involved	Expected Benefits & Implementation Considerations	Synergy Opportunities (If Any)	Timeline (Phase 1 = Year 1-7) Phase 2 = Year 8-10)	Priority Strategic Recommendations to Lay Foundation for Green Mobility
Legal, Regulatory, and Policy Issues							
Visions, Goals, and Strategies/ Plans	• **Develop Targeted Green Mobility Strategy, including Clear Goals/Objectives into Transport Plans and City Strategy**	• Lack of Overall Green Mobility Vision or Discrete Targets/Goals included in Overarching Transport Plans	Province, City, DPWT, DPL	• As shown by other cities such as Chinon and Tallinn, developing a clear green mobility vision and goals provide the impetus for impactful actions to facilitate green mobility. • Clearly identifying mode share goals may allow also provide clear messaging to citizen on the intention and rationale for transport investments and space reallocation to active mobility and provide a means to measure achievement against the stated city's green mobility vision and agenda. • Also though, more fundamentally a clear policy statement from the government on urban green mobility (including Luang Prabang) is needed to drive this effort and ensuing refinements to various frameworks.	-	Phase 1	✓ **(Represents the essential foundational element to set city's agenda and inform decision-making)**
Laws / Regulations	• **Identify Innovative Practices to Facilitate Green Mobility and Align with PSMV Limitations (but Also Seek Gradual Change to Specific PSMV Clauses)**	• PSMV Places Limitations on Green Mobility Planning and Operations	DPL, DPWT	• The PSMV dictates allowable physical changes in the WHZ (precluding roadway reallocation to sidewalks) as well as vehicle operating and stopping/parking restrictions (i.e., buses with 15 or more seats are prohibited). • Given these restrictions, innovative strategies learning from global best practice can help to deliver desired green mobility benefits, without violating the prohibition on physical changes to the sidewalk and road mandated by the PSMV – for instance, adopting pop-up walk and bike facilities (inspired from COVID-19 trials, with movable elements) to create wider walk and cycle paths in the Peninsula would benefit residents and visitors alike. • In addition, operation of smaller electric buses for public transport adhering to the seat limitations could also be adopted. • Regardless, all plans proposed in the WHZ would need to be approved by the Local Heritage Committee (which includes the City and DPL). • Long-term change to the PSMV, as posited by the JICA Capacity Enhancement Study may face challenges as these would need to be approved by the city, DPL, and UNESCO.	JICA Capacity Enhance-ment Study	Phase 1 (Immediate Measures); Phase 2 (Change to PSMV)	
	• **Create Cross-Cutting Committee to Investigate Green Mobility (in Particular Cycling, Public Transport and E-Mobility) into the Legal Framework**	• Green Mobility Not Well Defined in Legal Framework (including Financing Mechanisms)	MPWT	• Currently, the legal framework lacks explicit provisions for cycling, public transport, and e-mobility as well as that for financing for green mobility. • Formation of a committee is proposed to assess how to address and resolve the legal basis for green mobility – learning from best practice worldwide and experience in Vientiane. The committee would likely include national, provincial, and local authorities. At this time, it is not clear if a stand-alone act is needed (i.e., Singapore's Active Mobility Act), but green mobility should be enshrined in the legal framework to provide guidance for rules of the road, as well as a basis for expropriation for such infrastructure. • Given likely challenges to quickly modify long-standing transport legal framework, it is suggested to explore leveraging a Mayoral Decree to formally enshrine active mobility and public transport in the operating manuals/regulations of the city. Eventually, there may be a national push to modify the legal framework and design guidelines (see below for design guideline discussion) to include these modes and be more responsible to designs friendly to green mobility. Support from MPWT is essential.	-	Phase 1 (Mayoral Decree); Phase 2 (Change to Legal Framework)	✓ **(Sets the stage to prioritize green mobility in the national agenda and laws, which can trickle down to planning and design throughout the country)**
		• Bus Transport Provisions in Legal Framework More Appropriate for Long-Distance, Provincial Buses	MPWT	• Urban bus systems operate significantly differently than regional or provincial bus types. However, the legal framework for public transport in Lao PDR appears to be more tailored to long-distance, provincial buses. • Creating a more tailored framework and regulatory environment for an urban public bus system is needed to guide stop distances, services, passenger amenities, etc. • Realizing that modification to the legal framework to establish operating regulations for urban buses may be challenging, it is proposed that these details be specified by Mayoral Decree and adopted by the local DPWT – similar to Vientiane. Eventually MPWT can then support modifications to this framework. Support from MPWT is essential to achieve this as well.	-	Phase 1 (Mayoral Decree); Phase 2 (Change to Legal Framework)	
Design, Operational Norms, and Guidelines	• **Integrate Green Mobility into Infrastructure Design Guidelines or Manuals**	• Limited Consideration of Active Mobility and Green Mobility in Road Design Standards	MPWT, DPWT	• Integrating these elements into local design standards can ensure that needs of such users are included throughout the development process. • This recommendation would have multiple steps include: (i) forming a committee to assess global best design practice, in collaboration with authorities at local and the national level; (ii) selecting appropriate standards for access-for-all, active mobility and public transport; and (iii) deciding if these are integrated into the current Design Manual (such as Chinon or Melaka), or created as a stand-alone active mobility or green mobility design guideline (such as Singapore). The framework should be flexible and allow for updates easily. • Given difficult to modify long-standing national road design standards, it is suggested to explore leveraging a Mayoral Decree to dictate integration of these elements into the local DPWT street and road designs. Designs within WHZ should also integrated priorities of DPL as well. Support from MPWT is essential to achieve this as well.	--	Phase 1 (Mayoral Decree); Phase 2 (Change to National Guidelines)	
Enforcement	• **Develop Parking and Enforcement Plan and Improve Training** • **Establish Parking Pilot Zone to Test Enforcement Procedures and Demonstrate Public Benefits**	• Enforcement of Illegal Parking Is Weak and Penalties Not Clearly Defined	DPWT, City, Traffic Police	• Removal of illegal curbside/sidewalk parking may improve the active mobility environment and accessibility to/from street-fronting properties. Currently, sidewalk parking is prohibited, but this is not uniformly enforced. • Therefore, a stepwise process is recommended including a Parking Study to identify potential parking regulations and strategies to adopt – including rationalizing some of the parking rules (for instance some streets allow curbside parking on different sides of the street on different days). Also parking signage differs by area – sometimes using signs or painted curbs. • This Parking Study should also recommend enforcement techniques and training for the Traffic Police, and public education on parking etiquette. • In addition, a pilot parking zone (with paid parking and enhanced enforcement) was proposed as part of the green mobility indicative investment priorities. This can be a demonstration area to test different enforcement regulations and techniques to learn lessons to apply to a wider parking management zone.	-	Phase 1	✓ **(Essential action to ensure sidewalks are "returned" to pedestrians and access-for-all enhanced.**
	• **Leverage Technology and Proposed CDIA CCTV Program to Enhance Enforcement**		DPWT, City, Traffic Police	• Enforcement using digital means has been adopted in other cities and is being planned for roll out by the CDIA Study. • Expanding this to other blackspot areas and tying this to a system that can issue fines may improve safety and moderate road/parking behavior. • Public reporting of parking violations has been adopted elsewhere, which would need to be maintained by the Traffic Police.	CDIA Study		
Monitoring / Evaluation	• **Formulate Green Mobility Performance Monitoring Mechanism and Framework**	• No Monitoring System in Place to Track Green Mobility Achievement	DPWT, City	• Achievement of the Green Mobility Vision requires a systematic data-driven approach to track results. Data, however, should not only focus on transport, but other relevant sectors including economic, energy, health, safety, environment, planning, and heritage. • A cross-cutting committee would start by developing the umbrella framework including metrics, data collection role, and review/reporting process. • This could leverage the CDIA proposed CCTV scheme and data gathering mechanisms for road maintenance under DPWT. Furthermore, there is a Statistics Division under DPWT that could be strengthened and take ownership of this activity.	CDIA Study	Phase 1	✓ **(The city requires a system to monitor attainment of goals to achieve the green mobility vision)**

Category	Proposed Enhancement / Recommendation	Green Mobility Gap Enhancement/ Recommendation Seeks to Address (refer to Table 1.2)	Entities Involved	Expected Benefits & Implementation Considerations	Synergy Opportunities (If Any)	Timeline (Phase 1 = Year 1-7) Phase 2 = Year 8-10)	Priority Strategic Recommendations to Lay Foundation for Green Mobility
Decision-Making, Organizational, Engagement, and Funding/Financing Issues							
Clear and Discrete Responsibilities and Roles for Green Mobility Activities & Overarching Transport Authority / Cross-Cutting Coordination Mechanism (Note: these elements are combined given their linkages)	• **Create Regional Committee to Assess Potential & Role of Green Mobility Oversight Entity and Determine Optimal Organizational Framework**	• No Clearcut Agency Responsible for Green Mobility	MPWT, DPWT, City	• An overarching entity responsible for green mobility would help to advocate for green mobility in the city and DPWT, and moreover created an integrated approach to green mobility to create a cohesive network of different green modes. Such an entity would also be responsible for ensuring designs adhering to green mobility best practice, as well as ensure seamless linkages and designs even across different geographic jurisdictions. This body would also be responsive to the public needs regarding green mobility. • Creation of this body, however, cannot be done overnight. Therefore, it is suggested that a regional committee be formed to assess which entity (new or existing) is best placed to oversee and manage green mobility. This arrangement could be similar to the proposed public transport oversight entity created in Vientiane under an existing DPWT division (via a Mayoral Decree) • Involvement and support from MPWT is essential to achieve this as well.	-	Phase 1	✓ **(Foundational step to establish a dedicated body to oversee green mobility and ensure consideration of green mobility in city decisions)**
	• **Create Regional Committee to Assess Role of Public Transport Oversight Entity and Determine Optimal Organizational Framework**	• No Dedicated Body for Public Transport Oversight	MPWT, DPWT, City	• A public transport oversight entity is important in Luang Prabang as no public transport currently operates in the city. The entity would need to coordinate routing, service, operations, as well as infrastructure provision among various jurisdictions. The entity would also need manage the operator and review and assess service performance and suggest corrective actions. • It is suggested that a committee be formed to assess roles/ responsibilities of the public transport operator, then determine optimal means to achieve this. Multiple jurisdictions and provinces may require involvement of MPWT for coordination and integration. • Taking a lesson learned from the VSUTP in Vientiane, a public transport oversight entity is proposed to be established within an existing DPWT unit instead of a creating an outright new public transport authority given timeline and institutional challenges to establish this.	**VSUPT**	Phase 1 (Oversight Body) Phase 2 (Authority)	
	• **Develop Steering Committee to Address Cross-Cutting Issues**	• Cross-Cutting Committee Exists for WHZ Projects but Lacks Direct Transport Input	Province, City, DPL, DPWT	• The Local Heritage Committee, comprised of the Vice Governor, the Provincial Government, the City, and DPL) advises on projects planned in the WHZ. However, no transport entity is included in this Committee. • Two options exist here to either include DPWT in the Local Heritage Committee (possibly via Mayoral Decree) – although this action would only create a cross-cutting committee for WHZ related projects. • To address and build consensus at the regional level (including areas of Luang Prabang outside the WHZ), formation of a Steering Committee is suggested – possibly including the same parties as the Local Heritage Committee. This may facilitate decision-making and consensus building, while also ensuring that urban and green mobility concerns are addressed in proposed plans and developments, resulting in outcomes better tailored to these needs of green mobility users. • This could be adopted via a Mayoral Decree enshrining DPWT on the Committee.	-	Phase 1	
	• **Allocate Road Maintenance under DPWT and then Beautification Works to USO**	• Overlapping Responsibilities for Road and Parking Operations and Maintenance	MPWT, DPWT, City, USO	• MPWT is responsible for national roads (and allocation of funding for O&M from the Road Fund), while DPWT is responsible for provincial and district road construction and O&M. At the same time, the USO is responsible for small-scale road improvement works, as well as cleaning and beautiful of roads. Villages are responsible for upkeep of their own village roads. Lastly, parking spaces are developed by DPWT, with USO collecting fees and cleaning them. • Allocating road maintenance and repair to DPWT and beautification and cleaning works to USO may help to clarify responsibilities and create more efficient urban services. This may also ensure that a similar level of upkeep and repair may be maintained along the road network, regardless of jurisdiction. • A similar arrangement was proposed by the CDIA Study, in addition to this occurring in Vientiane via Mayoral Decree. Support from MPWT is essential to achieve this. • Parking facilities could also be handled in a similar way, with maintenance left to DPWT and collection of fees to USO.	CDIA Study	Phase 1	
Project Formulation and Prioritization / Decision-Making	• **Better Link Green Mobility into Project Prioritization Framework**	• Limited Inclusion of Green Mobility in Local Prioritization Framework	MPWT, DPWT, City	• Integrating green mobility priorities into the project prioritization framework provides transparent justification for selection of green mobility initiatives for national and local funding. • This effort can start at the national level, whereby MPWT can develop a prioritization framework (integrating green mobility), passing this down to the DPWT to undertakes a prioritization exercise locally. This shortlist is passed to MPWT and ultimately the Ministry of Finance (MOF), then integration of green mobility into the evaluation framework should occur at the local level first as this is most practical. This could be achieved through a Mayoral Decree identifying relevant metrics for incorporation. • However, modification of the overall national level prioritization process (used by MOF) may require a long-term approach given embedded processes and resistance to change. However, MPWT can take a key role in advocating for green mobility and its inclusion in the national agenda and prioritization framework as a means for Lao PDR to achieve its Nationally Determined Contributions (NDDs) to reduce national emissions.	-	Phase 1	✓ **(Incorporating green mobility goals into investment decision-making can ensure green mobility considerations are integrated into forthcoming projects)**
		• National Level Prioritization Framework Lacks Green Mobility Focus	MPWT, Ministry of Finance (MOF)		-	Phase 2	
Civic/ Community Participation	• **Establish Participatory Mechanisms for Green Mobility Plans/Schemes –**	• Limited Citizen Engagement / Participation in Development of Transport Plans	DPWT, City	• Creating citizen-centric designs generate and promote buy-in for green mobility. • It is proposed to expand participatory processes for current mobility plans and include digital, online as well as in-person means to provide this input. • Cities such as Tallinn developed their transport plans based on extensive feedback from citizens including digital and in-person means.	-	Phase 1	✓ **(Inclusive mobility plans integrated opinions and feedback from those benefitting, including disadvantaged users; this can help to make plans and designs more inclusive and beneficial)**
	• **Create Open-Data Sharing Platforms to Spur Innovation**		DPWT, City	• Open data can be leveraged by planners and citizens to develop useful apps to facilitate green mobility or just to track and visualize data for the public.	-	Phase 1	
Public Outreach and Education	• **Develop Education/ Awareness Program to Promote Green Mobility**	• Limited Public Outreach and Green Mobility Education Campaigns	DPWT, City	• Increasing public awareness of green mobility may help to popularize its use and build support for more extensive measures and elicit a shift in behavior. • Car-Free or Walk-Days have proven a popular way to bring attention to green mobility as shown in Tallinn, Jeju and other locations. • A comprehensive education program should include public campaigns, but also technical training for local students to improve their data analysis skills relative to green mobility. • Specific focus areas should be on walk, driving etiquette, as well as parking. • Opportunity exists to leverage public awareness days as promoted by the JICA Capacity Enhancement Study.	**JICA Capacity Enhance-ment Study**	Phase 1	✓ **(Communications plans with the public are needed to educate them about green mobility and build groundswell support at the start)**
	• **Ensure Participation Mechanism in Place Prior to Developing Public Transport System**	• Engagement of Existing Public Transport Operators / Drivers Key to Successful Transition to Modern Bus System	DPWT	• Developing a mechanism to achieve this engagement (including feedback and possibly direct involvement or opportunity for involvement with the future public transport system) may be important to build support and consensus locally among key stakeholders and help any public transport initiative flourish. • Participatory mechanisms may also include integration of some services into the new public transport services (either as main operator or more likely feeder, but also employees of the new public transport system).	-	Phase 1	

Category	Proposed Enhancement / Recommendation	Green Mobility Gap Enhancement/ Recommendation Seeks to Address (refer to Table 1.2)	Entities Involved	Expected Benefits & Implementation Considerations	Synergy Oppor-tunities (If Any)	Timeline (Phase 1 = Year 1-7) Phase 2 = Year 8-10)	Priority Strategic Recommendations to Lay Foundation for Green Mobility
Private Sector Involvement	• **Consider PPP for Larger Prioritized Investments (i.e., Public Transport & Road Improvements)** • **Initiate Pilot PPP Scheme to Build Experience**	• PPP Potentially Promising for Large-Scale Green Mobility Initiatives, But Limited Experience in the Country	MPWT	• Exploring PPP for larger projects could increase access to private sector financing and capabilities in the transport sector in Luang Prabang. • PPP would be most suitable for large-scale green mobility initiatives including public transport and roads. • A pilot scheme would help Luang Prabang and relevant agencies to learn from - any issues and problems encountered during the implementation of the pilot scheme could provide information and learning to develop and / or refine policy and enhance the process for future PPP projects. • Market sounding needs to be conducted to ensure capability and appetite exists in the local context, while commercial arrangements may need to be structured appropriately. • Government plays a key role in addressing PPP regulatory gaps, provides commitment to PPP projects to provide an effective and transparent environment to encourage private sector participants. • Staff specifically trained in these submissions can guide the private sector entities through this process and ease this requirement (note this issue could also be considered a training and capacity building issue, but is left here as it specifically relates to private sector involvement).	-	Phase 1	
Dedicated Funding for Green Mobility	• **Earmark Funding Instruments such as Property Taxes, Tourism Levy (if Implemented at City-Level), Vehicle Taxation and Parking Charges for Green Mobility**	• No Dedicated Funding for Urban Transport or Green Mobility	MPWT, MOF, DPWT	• Having a dedicated funding for urban transport or green mobility increases funding pool available to prioritized green mobility and urban transport projects. • Green mobility initiatives such as public transport, cycling, walking, roads, and parking, which have a property element or may help drive footfall to nearby businesses, may be able to justify earmarking a proportion of property taxes for funding. • Policy and / or process setting to earmarking non-fare funding instruments requires.	-	Phase 1	✓ **(Given budgetary constraints, identification of alternate funding instruments is essential, for instance adoption of parking charges and utilization of revenues for green mobility and/or public transport)**
	• **Collect Parking Charges and Public Transport Fares (for Bus Service) and Allocate Surplus to Other Green Mobility Systems** • **Explore Potential New Non-Transport Revenue Sources (such as a Tourism Levy at the City Level) to Provide Subsidies for O&M of Green Mobility Systems** • **Allocate Public Transport Subsidies for O&M**	• Entities Unable to Fulfil Responsibilities due to Limited Operations & Maintenance (O&M) Budget	DPWT, Province, City	• Sufficient O&M funding is key to ensure long-term sustainability and uptake of green mobility and urban transport system. • Use of tourist taxes has been implemented elsewhere, which has potential in Luang Prabang given the higher volume of visitors. • A key lesson learned is from Vientiane, where on-street parking revenues are used to offset operating deficits of the urban bus system. • Defining adequate subsidy levels require coordination among various agencies and overall health of both national/provincial government budgets. • A detailed analysis of their economic and social impacts needs to be conducted when considering potential new revenue sources. • A solid communication plan to the public is required when introducing charges as potential new revenue sources to manage public expectations and demonstrate public benefits from increased funding from new sources.	-	Phase 1	
Financing Schemes for Green Mobility	**Phase 1 (Year 1-7)** • **Reprioritize Projects after Linkage to Green Mobility** • **Leverage Private Sector Financing** • **Explore Potential Revenue Sources for Green Mobility and Urban Transport (and Develop Financing Mechanism for Green Mobility)** **Phase 2 (Year 8-10)** • **Gradually Increase Public Expenditures for Green Mobility and Urban Transport**	• Green Mobility Not Well Defined in Legal Framework (including Financing Mechanisms) • Constrained Fiscal Space in Lao PDR Has Resulted in Insufficient Financing to Meet the Needs for Public Works and Transport Sector Expenditure	MPWT MOF DPWT	• Reprioritizing projects helps to re-allocate available resources in the short term to immediate prioritized investments. • Exploring PPP options for larger projects enable access to private sector financing that may help to address constrained. • Introducing new and sustainable revenue sources may help in narrowing gaps in fiscal capacity. • Detailed assessment needs to be carried out to determine the ability of national government to allocate budget to green mobility and urban transport. • Introduction of new revenue sources requires the consideration of social and economic impacts, and proper management of inflationary expectations of the public. • Development of an appropriate financing mechanism and framework is key to supporting implementation and operation of various green mobility initiatives.	-	Phase 1 & Phase 2	
Training and Capacity Building							
Training and Capacity Building	• **Formulate Localized Training Needs and Ensure More Widespread Staff Development Locally**	• Capacity Building Agenda Set at National Level	MPWT, DPWT, DPL	• Formal training is identified by the MPWT and cascaded to the local level. • As noted below, enhancing technical and programmatic expertise is considered a priority. However, ensuring that courses are tailored to the localized needs of Luang Prabang and its green mobility agenda is important. • While most capacity building initiatives may originate from international donors at the moment, targeting local recipients, nonetheless it is important that DPWT continually seek to identify relevant training at the local level (including online courses or other parallel efforts with other studies) and ensure more widespread training of local staff (thus augmenting the MPWT national level requirements for training). Support from MPWT is essential to achieve this as well.	CDIA Study JICA Transport Master Plan	Phase 1	✓ **(All training and capacity building programs / initiatives are considered strategic and high priority to build staff understanding and expertise in green mobility. This will facilitate faster and more effective "pickup" of green mobility plans and projects. The training should focus on technical and soft aspects to ensure that funding and programming also are developed appropriately.**
	• **Develop Targeted Technical Capacity Building Program on Green Mobility and Urban Transport**	• Limited Technical Expertise on Green Mobility and Urban Transport • WHZ Requirement for Environment / Heritage Impact Assessments for Projects within WHZ May Discourage Private Sector Involvement	MPWT, DPWT, DPL, City	• Current knowledge on green mobility and urban transport is relatively limited within DPWT, the city and other key stakeholders. Thus, targeted training may upskill key staff and enable them to be fluent in green mobility and facilitate the planning and designs, while also serving as beacons for the public during engagement to demonstrate benefits of shifting to green mobility. • Training programs should focus on identified areas of need including: (i) general green mobility planning and design; (ii) data collection using innovative techniques; (iii) road design and right-of-way allocation; (iv) public transport planning, operations, and maintenance (particularly for electric buses); and (v) traffic signals and timing. • In addition, it is noted that any green mobility initiative in the WHZ requires an Environment & Heritage Impact Assessments, thus staff adequately trained in the documentation and requirements and assessments are needed to help guide private sector entities seeking involvement.	CDIA Study ADB VSUTP Study JICA Transport Master Plan	Phase 1	
	• **Develop Soft-Skill Capacity Building Program Focused on Project Formulation, Funding, Procurement and Delivery**	• Limited Staff Capacity to Develop Projects and Proposals to Obtain Funding	MPWT, DPWT	• While technical skills are important, equally important is formulating the green mobility initiative at the outset, including developing the goals and objectives, rationale, funding plan and finances, requirement documentation for donor or funding application, bid/tender selection, project management, fund disbursement, and project monitoring. • This core set of skills, including English fluency, may be important to implement various green mobility initiatives and seek funding from international donors if needed.	CDIA Study ADB VSUTP Study	Phase 1	

5 Financing Options

5.1 Overview and Costs for Indicative Investment Priorities – Phase 1

This section identifies potential funding / financing mechanisms and tools for the Phase 1 (Year 1-7) indicative investment priorities from **Table 3.2** – ***as these are the immediate priorities for implementation (and thus for funding procurement).*** As part of this analysis, the capital and annual O&M costs are estimated at the national and sub-national levels.[31] This allocation is assumed based on the responsibility matrix in **Table 3.1**, whereby large-scale projects such as public transport and road would be handled by MPWT (although possibly implemented in the field by DPWT), while smaller-scale initiatives including walk, cycling and parking would be handled by the sub-national authorities – either the Province, the City or DPWT for instance.

Table 5.1 presents this breakdown, with total capital cost amounting to US$39.5 million, with US$26.1 million attributed to the national level and US$13.4 million to the sub-national level. Annual O&M costs are estimated at US$2.3 million, with US$1.9 million attributed to the national level and US$0.4 million to the sub-national level. **Appendix A** presents the list of initiatives prioritized for Phase 1.

Table 5.1: Green Mobility Indicative Investment Priorities – Phase 1 (by Component, Rounded Up to Nearest US$100,000)

Component	Capital Costs (US$)		Annual O&M Costs (US$)	
	National Level	Sub-National Level	National Level	Sub-National Level
Road	13,400,000	600,000	300,000	-
Public Transport (Indicative – Requires Additional Study)	12,700,000	-	1,600,000	-
Walk	-	5,100,000	-	100,000
Cycle	-	2,300,000	-	100,000
Crossing	-	1,500,000	-	100,000
Other-Parking	-	300,000	-	100,000
Other-Pilot	-	1,000,000	-	-
Other-Technical Study [A]	-	2,200,000	-	-
Other-Capacity Building	-	400,000	-	-
Other-Institutional/Regulatory/Legal	-	-	-	-
Sub-Total	26,100,000	13,400,000	1,900,000	400,000
Total	39,500,000		2,300,000	

Note:
[A] The cost of a technical study for bridge improvement is included in "Other Technical Study" to conduct feasibility assessment, environmental investigations, and detailed design.

[31] Annual O&M costs are estimated by applying a percentage of the initial capital outlay – with 10% assumed for bike share, and paid parking facilities (to account for daily operations and management staff) and 2% for infrastructure projects (including road improvements, bike lanes, sidewalk improvements, etc. to account for cleaning and routine maintenance). That for buses is based on the localized/escalated unit costs per revenue hour proposed for bus rapid transit (BRT) system in Vientiane, refined to account for electric bus operations.

5.2 Potential Suitable Instruments

Based on the indicative green mobility investment priorities listed above and associated capital and annual O&M costs, an analysis of potential funding and financing instruments was conducted. Financing refers to money required to meet upfront capital investment, typically raised through debt and equity instruments from the public and / or private sector. Funding refers to the source of money that will ultimately pay for the Project over time. The costs of green mobility initiatives, including costs of financing, operations, and maintenance costs, will have to be covered by payments from either the government budget (national and / or local) or users. For example, for a public bus system in Luang Prabang, funding instruments could include availability payments from government for the public transport project company, or revenues from direct users (i.e., fare payments from tourists or local passengers). The difference between financing and funding is that financing must be repaid and/or generate a return for investors.

A longlist of potential instruments was formulated form the World Bank's "Who Benefits Pays" Principle, focusing on general benefit instruments, direct benefit instruments, and indirect benefit instruments. This longlist was then further refined to identify a shortlist of potentially relevant options base on four factors:

- Level of **income** stream (i.e., the amount of the "benefit" that can be captured by the instrument);
- **Stability** of the income stream (i.e., whether or not the "benefit" is susceptible to fluctuation or cyclicality);
- **Public acceptance**; and
- **Ease of implementation** in Lao PDR and/or Luang Prabang.

Potentially suitable shortlist instruments are summarized below:

Table 5.2: Shortlist of Potentially Suitable Funding / Financing Instruments

Financing / Funding Instrument	Definition / Notes	Level of Income Stream	Upfront	Recurrent
Financing				
National and International Grants and Loans	• Loans/grants provided by national/international organizations, private organizations, or foreign sources (i.e., governments of other countries, bilateral or multilateral agencies such as the World Bank and Asian Development Bank (ADB))	High	✓	✓
Climate-Related Financial Instruments	• Typically used to finance incremental costs associated with mitigation of environmental impact financed • Global Environment Facility (GEF), Clean Technology Fund (CTF), Clean Development Mechanism (CDM), and Green Climate Fund (GCF) are climate-related financing instruments commonly used for transport projects	Low	✓	✓
Public-Private Partnerships (PPP)	• PPP is a contractual agreement between public and private sectors in which the public sector obtains resources from the private sector, and pays the private sector for resources/services • A financing mechanism that secures funding for the overall lifecycle of the project (from construction to O&M)	High	✓	✓

Financing / Funding Instrument	Definition / Notes	Level of Income Stream	Upfront	Recurrent
Funding				
Public Transport Subsidies	• Money from the national or local government generally derived from the budget • It can be used to fund supply-side funding gap (to cover operators' required rate of return) or demand side funding gap (to ensure affordability of the transport system to users)	Low		✓
Property Taxes	• A form of revenue based on taxes on value of properties collected by government that can be used to fund general infrastructure development or urban transport	High		✓
Tourism Levy	• Charges imposed on tourists typically used to combat over-tourism or as a revenue-generating measure to fund O&M of tourist sites and facilities, protecting natural resources and in certain cities or countries, fund transportation projects	Low		✓
Parking Charges	• Fees collected from users of parking spaces, which can include on/off-street parking areas • Revenue can be earmarked for urban transport	Low		✓
Fuel Taxes and Surcharges	• Excise tax charged to users based on volume of fuel consumed (generally an indicator for road usage and distance travelled) • Typically used for road maintenance, although revenue can be earmarked for urban transport	High		✓
Vehicle Taxation	• Charges that represent a permit to use the road, generally paid annually by users of vehicles • Vehicle taxation rates can vary by engine size, or actual impact on road infrastructure (i.e., weight of vehicles) • Revenue can be earmarked for urban transport	High		✓
Farebox Revenue	• Fares charged to users of public transport, typically to cover O&M of public transport system • Revenue collected varies by patronage and fare level • Fare level often requires a compromise between the ability to cover the O&M cost of the public transport system and making the transport system accessible to the entire population	Medium		✓
Advertising	• Revenue generated from advertising on infrastructure (i.e., terminals, stations) or assets (i.e., fleet)	Low		✓

This shortlist of instruments was then further vetted based on local context and precedent, as well as a review of international best practice (see **Appendix B, which** focuses on adoption of these instruments in similar emerging market context as Luang Prabang and Lao PDR where possibly) to generate a tailored suite of potentially suitable funding and financing instruments. Key findings related to the shortlist instruments and most applicable green mobility component are as follows:

- **National and International Loans/Grants Suitable for All Green Mobility Investments** – These loans and grants are suitable for all green mobility investment types given they are often structured as subsidies or grants and in this case do not require repayment or returns to be generated.
- **Larger Projects Have Potential for PPP** – Larger projects proposed for Luang Prabang, such as the public transport scheme and road improvements, could utilize PPP as a financing mode, subject to commercial arrangements being structured appropriately and market sounding to ensure capability and appetite exists in the local context.

- **Projects Improving Emissions Outcomes Suitable for Climate-Related Financing Instruments** – Projects that improve emissions outcomes including public transport, cycling, and walk schemes may also be suitable for climate-related financing instruments.
- **Potential for Earmarking Property Taxes for Green Mobility Funding** – Green mobility initiatives such as public transport, cycling, walking, roads, and parking, which have a property element or may help drive footfall to nearby businesses, may be able to justify earmarking a proportion of property taxes for funding.
- **Tourist Levies Also Have Potential as Alternate Source** – Tourism levies could be appropriate for Luang Prabang given the large volume of tourists and potentially appropriate to fund assets that enhance Luang Prabang's appeal as a tourism destination and improve green mobility for locals.
- **Fuel and Vehicle Taxes More Applicable to Road Improvement Funding** – Funding for road improvements aligns well with fuel and vehicle taxes given direct use by motorists.
- **User Chargers More Applicable to Fund Initiatives with Physical Assets (i.e., Public Transport, Cycling and Parking)** – User charges including those for parking, bike share or bike parking, and public transport can be used to offset O&M costs for these green mobility investments, where the user pays for a defined service or use of a physical asset.
- **Initiatives Not Linked to Physical Assets More Suited to Funding through National/International Grants/Loans –** Initiatives not directly linked to physical assets, such as capacity building, technical studies and institutional, regulatory, or legal enhancement, are generally more suited to being funded through national/international grants/loans (although advertising (or a portion of the advertising revenues generated by the city's transport network) is useful to fund such activities).

Table 5.3 summarizes the indicative investment priorities by component (i.e., road, public transport, etc.) indicating general types of improvements, estimated capital costs (capex) and O&M costs (opex) at the national and sub-national levels, as well as amount of committed financing by component - only two plans identified committed funding – the 7th Five-Year Socio-Economic Development Plan for City of Luang Prabang (2020-2025) or SEDP and the CDIA Study). Finally, potential financing and funding instruments for Luang Prabang to consider are presented. Note all costs estimated here are at the component-level to the nearest US$10,000.

Based on this table, there is a large gap in funding for all components, even though the SEDP and CDIA have committed funding to specific components, including public transport in Luang Prabang. Broaching these gaps would thus be a combination of the various elements noted in this chapter (for instance a mixture of both applicable financing and funding instruments).

Table 5.3: Summary of Green Mobility Indicative Investment Priorities (Phase 1) – Costs & Committed Financing by Component

Component	Example Green Mobility Initiatives	National		Sub-National		Amount of Committed Financing (US$ '000)[A]	Potential Financing & Funding Instruments
		Capex (US$ '000)	Annual Opex (US$ '000)	Capex (US$ '000)	Annual Opex (US$ '000)		
Road Improvement	• 5.3km of multimodal road improvements • Updated road safety & design standards	13,400	300	600	-	See Note [B]	• National/international loans and grants • PPP; Property taxes • Fuel taxes and surcharges; Vehicle taxation
Public Transport	• New transport authority • Electric bus system (serving major visitor and residential areas – requires further feasibility assessment)	12,700	1,600	-	-	-	• National/international loans and grants • Climate-related financing instruments; PPP • Public transport subsidies; Property taxes • Tourism levy; Fuel taxes and surcharges • Farebox revenue; Advertising
Walk / Crossing Improvement	• 11.6km of paved sidewalk with segregated curb, street lighting, trees, and street furniture • 5 new signalized junctions • 50 new mid-block junction improvements • 100 enhanced junctions (with improved zebra crossings, etc.) • Wheelchair access ramps and tactile pavement at 155 locations • Pilot pedestrianization on Sisavangvong and Sakhaline Corridor	-	-	6,600	200	See Note [C]	• National/international loans and grants • Climate-related financial instruments • Property taxes • Advertising
Cycle Facility	• 17.0km of protected bike lanes & 24.2km of sharrow (shared bike/vehicle lanes) • Parking for ~500 bikes • Bike share (~200 bikes)	-	-	2,300	100	See Note [D]	• National/international loans and grants • Climate-related financial instruments; PPP • Public transport subsidies • Property taxes; Tourism levy • Parking charges; Farebox revenue; Advertising
Other - Parking	• 8 off-street lots (including 6 in the urban area and 2 in the periphery) • Designated curbside parking in some streets (costs included in road improvement)	-	-	300	100	See Note [E]	• National/international loans and grants • Property taxes • Parking charges • Advertising
Other - Pilot Studies	• Pilot low emission zone in Peninsula • Pilot parking management zone in Peninsula	-	-	1,000	-	-	• National/international loans and grants • PPP • Property taxes

Component	Example Green Mobility Initiatives	National		Sub-National		Amount of Committed Financing (US$ '000)[A]	Potential Financing & Funding Instruments
		Capex (US$ '000)	Annual Opex (US$ '000)	Capex (US$ '000)	Annual Opex (US$ '000)		
							• Parking charges • Advertising
Other - Technical Study	• E-mobility strategy • Citywide parking & management strategy • Transport system resilience study • Traffic Management • Motorbike Policy • New bridge feasibility study • Environment and Social Safeguard • Heritage Impact Assessment	-	-	2,200	-	-	• National/international loans and grants • Property taxes
Other - Capacity Building	• Education and communication campaigns • Green mobility website/app for education • Targeted capacity building	-	-	400	-	-	• National/international loans and grants • Property taxes
Other - Institutional/ Regulatory/ Legal	• Integrated heritage and mobility plan • Better link green mobility to project prioritization • Policy development to tighten emission limits for vehicles • Cross-cutting committee to develop green mobility performance monitoring mechanisms • Mobilization of private sector capital / development partner financing	-	-	-	-	-	• National/international loans and grants • Property taxes
	Total	26,100	1,900	13,400	400	See Note [A]	

Notes:

[A] The SEDP and CDIA Study contains several potentially relevant projects with linkage to green mobility with committed funding. However, the specific location for these improvements may differ from specific locations proposed in these indicative green mobility investment priorities list. It is possible that funding appropriated for one project could be reallocated to one of the green mobility initiatives – however, further discussions should be initiated to understand potential eligibility of Luang Prabang Green Mobility initiatives for these funds.

[B] The 7th Five-Year Socio-Economic Development Plan (SEDP) for City of Luang Prabang (2020-2025) (SEDP) allocates some Lak625.635 billion or US$55.0 million based on xe.com in January 2022) for road improvements throughout the province. Reallocation of some of this funding to road enhancement works as part of these indicative investment priorities may be possible, with discussion potentially warranted.

[C] The 7th Five-Year Socio-Economic Development Plan (SEDP) for City of Luang Prabang (2020-2025) (SEDP) and CDIA Study have earmarked funding for sidewalk improvement. For the SEDP, this includes: (i) #44 construction of sidewalks along the side of the road (at Department of Public Works and Transport – 4 intersections at the temple) – Lak1,638 million (about US$145,000 based on xe.com in January 2022). For the CDIA Study, this includes: (i) E2: Install pedestrian walkway, drainage, and linear park along existing road – US$3.3 million; (ii) E5 – construction of 48 high mast CCTV and solar lighting poles throughout the city (26 in the historic core and 22 outside the core; and (iii) E8 - street light improvement – US$600,000.

[D] The CDIA Study includes the following funding for cycle projects in the city: (i) E1: develop complementary riverside and bike lane improvements with street furniture (benches and tables), signage, rubbish bins and drinking fountains, etc. along linear parks and riverside routes and create pedestrian and bike lanes along newly improved linear park systems and link these with park systems along Mekong River – US$850,000 (combined); and (ii) E4 - construction of 6 public toilets – US$480,000.

[E] The 7th Five-Year Socio-Economic Development Plan (SEDP) for City of Luang Prabang (2020-2025) (SEDP) has earmarked funding for parking. For the SEDP, this includes: #51: parking on the side of the back of the Provincial Administrative Office – – Lak1,595 million (about US$140,000 based on xe.com in January 2022)

5.3 Exemplary Funding / Financing Schemes from Elsewhere and Application to Luang Prabang

The boxes in this section highlight key case studies related to leveraging tourism taxes for green mobility funding, as well as other potential financial mechanisms for green mobility initiatives and operations for the city to learn from.

Box 5.1: Tourism Taxes for Green Mobility Funding

Definition:
A tourism levy could be a potential funding source for Luang Prabang's local government given the significant role of tourism in the city. Collected tourism levies could be earmarked for dedicated green mobility fund in Luang Prabang to fund proposed prior**itized** initiatives. There are various ways to generate tourism revenue for Luang Prabang, which will require further assessment.

Examples Elsewhere:

- **Tourist Tax, Barcelona, Spain** - Being first introduced in 2012, the municipal tourist tax in Barcelona is applicable for non-residents who stay in tourist accommodations. The rate varies by accommodation type, currently between €0.75 and €2.50 (an average of around US$1.80) per person per night. There is on-going consideration to increase the tourist tax from €0.75 to €1.25 in 2024. In 2019, €4.2 million of tourist tax was collected and used for funding public transport, promoting culture, and improving public space. Of that amount, €1.3 million was to be allocated under Barcelona's Bus Offers Summer Improvement Plan to increase summer bus service. Only two bus routes in the Barcelona Metropolitan Area are financially profitable. The revenue from these two routes (i.e., one between the city and airport and another being a city tour bus) are used to offset deficits for the other routes.

- **Tourist Tax, Switzerland** - Switzerland charges a tourist tax for non-residents who stay overnight**.** The rate varies by town and accommodation type, between CHF3 and CHF7 with an average of CHF3.75 (US$4.00) per person per night, which is determined by local authorities. The tourist tax is billed separately on the invoice by hotels, tourist agencies or landlords of holiday homes – it is used to pay for tourist infrastructure such as transport, information services, cultural performances, etc.

- **Tourist Tax, Bali, Indonesia -** The Indonesian Government is proposing a new tourist tax of around US$10.00 per person on all foreign visitors to Bali. The proceedings would be used to fund programs to preserve the environment and Balinese culture. The tax collection mechanism is still under consideration (i.e., included in airplane ticket fees or collected at the airport).

Potential Applicability to Luang Prabang:
Around 860,000 visitors came to Luang Prabang in 2019. A potential tourist tax could be a daily rate per tourist per night (i.e., average tourist tax of US$4.00 per person per night in Switzerland) or a flat rate per tourist (i.e., the new tourist tax of US$10.00 in Bali). Average stay by tourists in Luang Prabang is around 3.5 days. Assuming a daily rate of US$2.60 (being a simple average of tourist taxes in Switzerland and Barcelona), tourist tax on foreign visitors in Luang Prabang in 2019 would amount to US$7.8 million. Under a policy of a flat rate of US$10 per tourist, the amount would be US$8.6 million. The tax could be collected by: (i) including it in the airline ticket; (ii) charging this at special arrival or departure counters at the airport; or (iii) indirect billing by tourist agencies. It may also be collected via accommodation invoices.

Box 5.2: Financing Mechanisms from Elsewhere to Support O&M

Background:

Other cities have adopted various financing mechanisms to support mobility investments and operations – particularly public transport. Some examples globally are shown below with brief comment on potential lessons learned / applicability to Luang Prabang:

Case Study#1: Melaka, Malaysia - Free Bus Service

Melaka is a core historic tourism destination in Malaysia, being on the list of UNESCO World Heritage Sites since 2008. A free bus service using a fleet powered by natural gas, was launched in August 2018 by Panorama Melaka, which is the main public transport operator, owned by the state Government of Malacca. The target was to annually assist the livelihoods of some 290,000 local residents by improving their well-being and to encourage their use of public transport.

The estimated cost of providing this free bus service was around MYR1.4 million (or around US$0.3 million), which was sourced from various governmental agencies and private firms through the Melaka State Government Public Transport Fund. The fund is authorized by the Federal Government and is channeled through the Malaysian Land Public Transport Agency to the Melaka State Government for the purpose of improving quality of local bus services. Financing support from national or provincial level through dedicated funds should be considered as a potential source to cover costs from O&M activities for Luang Prabang, especially, when the proposed green mobility projects can be integrated with other initiatives under the same topic on improving local public transportation through sustainable solutions.

Case Study#2: London, United Kingdom – Cable Car Naming Rights

Value could be captured directly from the beneficiary as illustrated by the case of the London Cable Car over the River Thames. The cable car was built as part of the infrastructure linkages developed for the 2012 London Summer Olympics. Transport for London (TfL) and Emirates Airlines agreed on a Naming Rights arrangement whereby the system would be known as the Emirates Air Line and would feature as such on the Tube Map. The exposure and name recognition resulting from this agreement represented substantial commercial value for Emirates Airlines which agreed to a 10 year contract with TfL receiving sums over £36 million (or around US$47.0 million) per annum. Corporate naming and sponsorship could be a potential revenue generator to sustain O&M for Luang Prabang, for instance naming of stations, bus services, and/or bicycle share or parking facilities.

Case Study#3: Various Cities, United States – Sales Tax District

Sales Tax Districts are found in the United States as districts within which retail and commercial enterprises are subject to a special sales tax whose use is earmarked for the funding of the public transport operations. Examples include in Seattle, Washington where a Transportation Benefit District was established in April 2021, whereby sales and use tax increased by 0.15% and will be earmarked for transport purposes. In San Antonio, Texas, a 1/8th cent sales tax will be used by 2026 for public transit programs including increasing services for the urban bus operator and planning for rapid transit systems. Adoption of similar sales tax measures earmarked for transport could be considered in the city, however, significant coordination would be required to implement this (not only at the city, provincial and national levels – but also with the public).

6 Key Success Factors Going Forward

6.1 Overall Success Factors

The indicative investment priorities, institutional and capacity strengthening programs, and funding/financing schemes are a first step in putting Luang Prabang in position to enhance its green mobility systems and services, build green mobility sentiment to elicit public support for and eventual shift of residents and visitors to more sustainable transport modes in the future, as well as to meet long-term goals to more effectively service resident/visitor mobility needs and preserve monuments, sites and heritage that are synonymous with the city and surrounding areas. At the same time, implementation of "hard" infrastructure and services may not directly lead to achievement of the green mobility vision. Infrastructure and services must be combined with a variety of elements to ensure success. Key success factors from other experiences include the following:

- **Harmonize Green Mobility Vision and Indicative Investment Priorities with Underlying Supportive Policies and a Holistic Approach** – The various indicative green mobility investment priorities cannot be implemented in silos – they must be supported by policies and a holistic approach. For instance, to support walking and cycling, not only should the infrastructure and supportive services be in place, but government and city policies to reallocate land from vehicles to green modes, and encourage reduced driving or vehicle should be use be considered (this may include parking policies and pricing, motor vehicle restrictions (on use or purchase), etc.).

- **Create Integrated Land Use and Transport Master Plan** – Separate land use and transport plans can lead to disjointed development, excessive urban sprawl, as well as development areas marred by congestion if the transport infrastructure provided is insufficient to meet demands. An integrated land use and transport master plan, ensuring development and growth needs in line with transport capacity and infrastructure expansion can facilitate more sustainable outcomes (with green mobility as a priority). For instance, developing new areas with public transport, cycling, and walking in mind may help to tailor these areas to prioritize green mobility, instead of being built around vehicles. More accessible areas with mixed use development can also reduce trip distances and the necessity of driving or vehicular trips. A new land use master plan is proposed as part of the CDIA package of improvements, and this should be integrated with the future transport plan to create an integrated and unified plan to promote green mobility and reduce urban sprawl and development in Luang Prabang.

- **Integrate Green Mobility Strategy into Wider, Long-Range Transport Master Plan** – As noted, the Green Mobility Strategy constitutes a relatively short-range (up to 10 years into the future) green mobility plan, which seeks to complement national/local green mobility visions/objectives, address shortcomings currently and in the future identified by this Study Team, and complement on-going efforts/programs

funded by other international donors. This Green Mobility Strategy can serve as inspiration for and constitute one part of a larger longer-term Transport Master Plan (or even SUMP as defined in **Box 2.1**), which is lacking. The long-range transport master plan, besides aligning with the land use development and growth plans, can also serve as a vehicle to identify funding needs in advance, allowing for more innovative sources to be procured, enabling timely implementation of infrastructure and facilities.

- **Prioritize Foundational and Institutional Refinements First to Set the Stage for Public-Facing Actions** – Foundational/fundamental structures and frameworks are needed to ensure green mobility initiatives are ultimately "successful". For instance, key challenges must be resolved prior to a public transport system is initiated – including decision on the operator (government or private), level of subsidies and government support if any, bus stop and facility maintenance and responsibility, regional jurisdiction over routing and service, etc. As such, prioritized actions for the stakeholders in the roadmap focus on foundational actions first, then more public-facing actions in both Phase 1 and Phase 2, once frameworks are established. Foundational actions may also include integrating green mobility priorities into design guidelines and road standards to ensure baseline designs are amenable to green modes and capacity building.

- **Leverage Pilot Projects (as Part of the COVID-19 Recovery) to Build Green Mobility Sentiment and Demonstrate Potential Success** – Schemes such as the pedestrian slow zones, crossing enhancements, parking enforcement schemes, and trial bus services could be implemented as pilot programs as part of the COVID-19 recovery/ revitalization, given reduced trip demand and visitor volumes at this time. This would allow the city to test and trial these interventions and gauge public support (with the ultimate aim to increase green mobility sentiment within the government and public) and demonstrate benefits for wider deployment. The pilots also offer a chance for experimentation – for instance how do residents react to different parking regulatory schemes to reduce illegal sidewalk parking, which can then be disseminated throughout the city once "perfected".

- **Leverage Symbiotic Benefits of Packages of Actions** – The roadmap identifies the priority actions under each "mode" package. Effectiveness of actions depends on the implementation of commensurate actions – for instance, an effective public transport system also relies on smooth running of the buses during operations (i.e., installation of bus lanes and/or transit signal priority), access bus stops (i.e., with nearby and safe pedestrian street crossings, as well as amenable first/last-mile walk connections along a continuous sidewalk that is well shaded and protected from vehicles). Thus, packaging may be most effective at eliciting mode shift and building sentiment.

- **Continue Technical Studies to Understand and Address Mobility Issues –** Further technical studies are needed - focusing on e-mobility, citywide parking management, transport resilience, traffic management, motorbike policy, environmental and social safeguards, and heritage impact assessment. Understanding the potential ramifications of reallocating

roadspace to green mobility, closure of some stretches to vehicles, as well as implementation of modified traffic timings (to provide more priority to active mobility) may be key targets for any future traffic study. Likewise understanding implications of changes to motorbike policy (restrictions on use/parking in specific areas, purchase/registration by model and emissions rating, etc.) may be a key focus of a motorbike study – as this could be a key element in encouraging residents to forsake motorbikes for green mobility. These priorities also include targeted capacity building efforts (including communication and engagement activities) for local staff and the public – to build knowledge and expertise in green mobility and proper "operation" and "etiquette" in the field (for drivers and green mobility users alike).

- **Consider Various Motorbike Management Measures to Expedite Green Mobility Transition** – Reality is that motorbikes and two-wheel vehicles still dominate in the city. This may continue to be the case going forward in the immediate term, prior to the development of a more robust and extensive green mobility network and wider green mobility sentiment. Measures to better manage motorbike use, operation, and ownership combined with the Green Mobility Strategy have been implemented elsewhere in an effort to spur modal shift and reduce implications of significant motorbike use on congestion, safety, and the environment. Some of these measures including motorbike ownership and operating limitations, parking management and pricing schemes, and electric motorbike transition schemes - all of which would be considered and assessed in the proposed motorbike policy study as part of the green mobility initiatives (examples from and potential applicability to the city are presented in **Appendix C**).

6.2 Institutional and Implementation Success Factors

Finally, based on experience of relevant mobility projects (i.e., the VSUTP in Vientiane given relevance in pivoting towards more efficient and effective urban transport, public transport, and), several key factors for success have been identified related to institutional setup and capacity building in Luang Prabang. They include:

- **Identify Strong Advocates at National and Sub-National Levels to Carry Green Mobility Agenda Forward** – Strong advocates are needed to push the Green Mobility Vision forward– at the national and sub-national levels. Fundamentally, a clear policy statement from the national government on urban green mobility (including Luang Prabang) is needed to drive this effort and ensuing refinements to various frameworks. A strong and supportive Provincial Governor can mobilize and galvanize agencies and resources to advocate for green mobility. At the local level, a similarly strong and supportive Mayor can issue formal decrees to support green mobility to compel DPWT and others to prioritize green mobility. Lastly, the process may not be quick – finding younger advocates is important when they rise in the ranks and replace current management and leaders.

- **Create a Project Management Unit (PMU) to Support Institutions with Limited Technical Expertise –** A PMU under the project sponsor (either

MPWT or DPWT) can support implementation, particularly if the implementation agency lacks expertise. Typically, this PMU consists of a team of international consultants, however, given unique conditions in the Lao PDR and the governance structure, local experts fluent in English are recommended to facilitate full knowledge and understanding of local context and support collaboration between the PMU and local authorities.

- **Focus on Local Improvements as National Level Improvements May Be More Challenging** - Institutional and organizational changes at the national (or ministry) level are difficult and may require substantial time and review to enact any meaningful changes for green mobility. However, changes at the local level are often achieved via Mayoral decree. This has been proposed several times in the institutional strengthening recommendations to enact change locally first. At the same time, the groundwork can be built to consensus to understand how to enact change at the national levels. ***This being said, it is essential national level support is obtained on any institutional changes to guide the change from the top.***

- **Create Steering Committee to Facilitate Consensus Building and Integrated Decision Making** – A Steering Committee was formulated for the VSUTP whereby MPWT, DPWT, and the Mayor collaborated to oversee / endorse projects. Such a committee can help to ensure green mobility projects are aligned with national priorities and local needs and identify potential risks to achieve intended project outcomes. This cross-cutting framework is essential to efficient decision-making and is also proposed in the institutional strengthening mechanisms.

- **Leverage Capacity Building Programs in Vientiane to Accelerate Green Mobility Training in Luang Prabang –** Technical assistance to enhance skills and knowledge in the urban transport sector in Vientiane can serve as a reference to identify areas of improvement and formulate training programs for those in Luang Prabang. Programs include operation/ management of public transport, PPP schemes for public transport, traffic management policies, parking management system. Moreover, materials can be used for training for Luang Prabang stakeholders, while upcoming sessions in Vientiane could also be attended by Luang Prabang stakeholders.

- **Educate the Public on Green Mobility Benefits All Steps of the Way –** Public engagement and education is a key to achieving the Green Mobility Vision and enacting a sustainable change on residents and visitors. Green mobility is in its incipient stages– although people understand walking and cycling, clearly demonstrating on a personal level that green mobility is beneficial to them as individuals and the larger society and earth is important as well. Education programs may help build support such as car-free days, etc. Also important is developing a direct engagement framework to allow citizens input on the transport plan and mobility schemes themselves – to create more buy-in and sentiment supporting green mobility. Public engagement is a key element of the institutional strengthening.

7 Conclusion

Luang Prabang is growing and developing quickly – tourism is the lifeblood of the city and also a key revenue generator. Luang Prabang is facing several key mobility issues, principally due to its road-based transport system. Thus, Luang Prabang has an important choice whether to keep developing and encouraging a vehicle-based growth strategy or to adopt another approach. ***Green mobility – focusing on sustainable modes that minimize impact on the environment including human-powered modes as well as more efficient public transport and e-mobility - offers a chance to reduce transport related emissions and associated air quality issues. It also offers a chance, if properly planned, designed, and implemented to shift the tide and build green mobility "sentiment" to encourage greater use of active mobility and public transport. For Luang Prabang, this is vital – to allow the city to minimize impacts on heritage/historic monuments, while more sustainably handling growth in tourist volumes and overall travel demand.*** The COVID-19 pandemic also provides a transformative opportunity while travel demand has been repressed and visitors have yet to return. Already, Luang Prabang is in the midst of physical transformation across the Peninsula. The CDIA Study plans to improve streets, walkways, and landscapes within the WHZ. This Green Mobility Strategy builds upon these efforts by laying the strategy, vision, and actions that may steer the city towards achieving a greener transport system. Key elements of the Strategy include:

- **Green Mobility Vision Built on Four Key Pillars -** The Green Mobility Vision for Luang Prabang – to achieve an ***Accessible, Comfortable, Inclusive, and Resilient Green Mobility System, Focusing on People Movement, Enhancing the Environment, and Accentuating Heritage, Supported by an Enabling Framework,*** is based on four key goals focusing on People (i.e., creating a responsive and people-centric system that places the user experience first for all users), Environment (i.e., reducing emissions and leading the charge to transition to green mobility), Heritage & Tourism (i.e., preserving and accentuating heritage, to broad tourist appeal, but doing it sensitively), and Institutional (creating the enabling framework and regulations to encourage and effectively manage green mobility).

- **Green Mobility Vision Built on "Integration"** – One key theme through the vision and the underlying goals, objectives and action is the need for integration. Integration of modes (i.e., intermeshed public transport network with the active mobility network) as well as integration horizontally and vertically in terms of multiple inter-linked strategies/objectives helping to move green mobility forward instead of separate, individual actions. Second, integration is important in the institutional aspects in terms of embedding green mobility fully into design and planning guidelines, project prioritization, and regulatory frameworks, and in terms of regional and cross-cutting coordination.

- **Indicative Investment Priorities Consist of Approximately US$71.0 Million of Activities over the Next Ten Years** – The indicative investment priorities are delineated into: (i) Phase 1 (1-7 years); and (ii) Phase 2 (8-10

years). Total cost is as follows: (i) Phase 1 – US$39.5 million; and (ii) Phase 2 – US$31.5 million. The biggest ticket item is the road improvements, followed by the proposed electric bus system, sidewalk improvements (including lights, trees, and street furniture), and the extensive priority cycle network among others. The bridge and bus proposals require further additional study.

- **Extensive Cycle and Walk Networks Leverage On-Going Road and River Improvement Projects -** The CDIA Study is improving roads, burying overhead cables, improving streetscapes, etc. It would be remiss if these projects were not leveraged in the greater active mobility system. Thus, active mobility linkages directly to these corridors create a more extensive and wide-reaching network. In addition, walk improvements along Route 13N may include pedestrian beacons to allow safer crossings of this road, especially at night north of the Airport.

- **Road Enhancements Further Improve All-Weather Network and Facilities Green Mobility** – Building on the CDIA and local road improvement projects proposed, a network of road enhancements (approximately 12.5km) are proposed to fill gaps and create a more expansive network with alternate vehicle paths. The upgrades would include pavement enhancements, drainage, and select sidewalk and crossing improvements.

- **Indicative Investment Priorities Align with 9th Five-Year National Socio-Economic Development Plan** – The proposed indicative investment priorities align with the five-year National Socio-Economic Development Plan (NSEDP) (2021-2026) to reflect the priorities and needs of Luang Prabang City towards achieving green mobility. The NSEDP proposals include (i) delivering efficient and climate-resilient investments and environmentally friendly transport including electric public transport; (ii) improving utilized infrastructure and inclusive accessibility to reduce infrastructure and service access gaps; and (iii) enhancing gender equality and opportunities.

- **Several Initiatives Potentially Viable for Private Sector Involvement –** Revenue generating schemes including bike parking and bike share, vehicular parking (including off-street lots and on-street meters) and the public bus system represent potential opportunities for private sector involvement that could be further investigated in the next stage.

- **Two Priority Green Mobility Corridors Highlighted to Serve as Foundations for this Transformation** – The Sisavangvong / Sakhaline Road & Kingkitsalat / Kitsalat Road corridors are identified as priority corridors for green mobility – plans have been formulated to transform these corridors into people-centric ones safe, convenient, and amenable to all types of green mobility – including walking, cycling, public transport, etc. – and for all users regardless of mobility capability. The Sisavangvong / Sakhaline Corridor may be converted to a pedestrian-only zone where the Night Market is held each night, while Sakhaline Road north of this section may include new shared bike lanes and more regulated curbside parking. In

addition, a more pleasant walking ambience may be created by adding street furniture, parklets, lighting/trees, and street art that align with the PSMV and DPL requirements (which prohibits major road and sidewalk modifications). The Kingkitsalat/Kitsalat Road corridor may likewise be upgraded for green mobility with wider and more pleasant sidewalks, additional crossing amenities, as well as a dedicated bike lane on the north side of Kingkitsalat. Total expected magnitude costs of these are US$1.1 million for Sisavangvong / Sakhaline Corridor and US$800,000 for Kingkitsalat Road.

- **Pilot Projects Focusing on Parking and Slow Zones Proposed Across Peninsula Can Be Steppingstone for Wider Implementation** – A pilot project can demonstrate and prove feasibility of an approach. Given issues such as safety, increasing visitors, and lack of pedestrian-friendly environment, a pilot scheme is proposed to adopt a "slow zone" to accommodate active modes, centered around the pedestrian zone along Sisavangvong / Sakhaline Road. A parking management zone is proposed in the same area, complemented by a series of off-street parking lots within the city center (to relieve on-street parking issues) and along major roads entering the city (to serve as intercepts whereby drivers may then use connecting public transport into the city).

- **Suite of Institutional Strengthening and Financing/Funding Initiatives Identified to Create Enabling Environment for Green Mobility –** Last but not least, foundational institutional and financing/funding elements are proposed to create an environment that can sustain green mobility initiatives from planning, to funding, to implementation, and to operation. This includes a variety of institutional and capacity building efforts seeking to reinforce green mobility more strongly as a key goal in developing regional and city transport plans and budget allocation, training, and capacity building of staff in green mobility and the funding procurement process, as well as outreach and communications with the public to build green mobility sentiment. Finally, as no dedicated green mobility funding is currently available, a variety of innovative sources for implementation and O&M funding is proposed based on global best practice – this may include leveraging the region's role as the premier tourist locale in the country and adopting a tourism tax to be used for green mobility (similar to cities in Indonesia, Spain and Switzerland), as well as creating an encouraging environment for private sector involvement – particularly for larger scale ventures such as roads, public transport and possibly parking.

Finally, adopting this Green Mobility Vision and proposed indicative investment priorities has the opportunity to transform the city and allow it to more sustainably handle current and expected travel and tourism demand. We encourage the city to utilize this Strategy and accompanying background reports as a toolkit to plot their own path forward, informed by successes elsewhere, but also responding to the local context and the mobility requirements of local residents as well as visitors.

The risks of doing nothing and continuing the status quo are considerable and threaten the livelihoods of residents of Luang Prabang and the economic growth– green mobility offers the opportunity to begin a transition to clean,

sustainable mobility enabling the city to meet future growth and handle more tourists, while retaining and preserving its unique heritage and cultural patrimony.

The ultimate effectiveness of green mobility cannot be viewed in a silo. Green mobility is just one part of an integrated framework to facilitate cleaner and more sustainable mobility in Luang Prabang. Green mobility must be integrated into the wider context of urban planning, tourism development planning, and integrated/ synchronized institutions. The way the city and tourist development is planned must align with the transport infrastructure initiatives to enable compact development that decreases the inclination and necessity to drive and encourages short-distance travel on alternate modes and, where needed, provides competitive alternatives for longer distance travel. From a tourism perspective, this integration is needed to protect and retain the vital cultural and tourism patrimony in the city but still provide efficient movement for visitors.

At the institutional level, coordination is needed for all elements including between transport departments (vertically between national and sub-national levels), in addition to horizontally between different departments (i.e., Transport, Urban Planning, Finance, etc.) to ensure plans and budgets align and do not conflict with one another. A clear mandate and agenda from the city government and key agency leaders to build momentum and align all relevant stakeholders (i.e., Traffic Police, etc.) with the same green mobility vision and an effective and inclusive communications plan will drive initiatives and build support and sentiment for the green mobility transition. Robust municipal financing and/or development of intrinsic revenue systems for green mobility is necessary to ensure financial sustainability and long-term continuation of these efforts.

Appendix A

Indicative Investment Priorities - Phase 1 (Detailed List, Costs, and Synergy Opportunities)

A1 Details for Indicative Investment Priorities – Phase 1 (by Green Mobility Initiative)

Initiative #	Component	Initiative	Plan & Design [A]	Implement / Construct [A]	Operate & Maintain [A]	Capital Cost (US$) [B,C]	Annual O&M Cost (US$) [C,D]	Potential Synergy Opportunity with On-Going Plans / Projects					For Priority Implement-ation
								NSEDP	SEDP	ASEAN Smart City Action Plan	CDIA Study	JICA Transport Master Plan	
4A1.4	Road Improvements	Integrate Green Mobility into Road Design Standards or in Standalone Standards (for Sidewalks, Crossings and Facilities)	MPWT	MPWT	-	-	-						
1B5.2		Integrate Road Safety Elements into Road Design Standards	MPWT	MPWT	-	-	-						
1B5.3		Conduct Road Safety Audits	DPWT	DPWT	-	600,000	-						
1B5.1		Improve 5.3 (Total 12.5) km of Road for Vehicle and Active Mobility (includes Paving/Surfacing, Sidewalk, Drainage, Traffic/Pedestrian Signal, Trees, Lighting, CCTV and Access-for-All Enhancements) [E]	MPWT (See Note) [F]	MPWT/ DPWT (See Note) [F]	DPWT (See Note) [F]	12,900,000	260,000		ü		ü		
1B5.4		Create Road Safety Monitoring System / Database	MPWT	MPWT	DPWT	500,000	10,000						
4B1.2	Public Transport	Create Regional Committee to Assess Potential for Transport Authority	MPWT / City	MPWT / City	-	-	-						
2D1.1		Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	MPWT	MPWT	-	-	-						
1C1.1		Operate 89.0 (Total 124.4) km, 3 (Total 4) Line Bus System serving Luang Prabang and Surrounding Area [G]	MPWT	MPWT	DPWT	8,400,000	1,500,000	ü					ü
1C2.1		Construct 2 Integrated Terminals for Multimodal Interchange	MPWT	MPWT	DPWT	4,500,000	90,000						
1B1.2	Walk / Sidewalk / Crossing Improvements	Conduct Citywide Crossing Improvement Study	DPWT	DPWT	-	200,000	-						
2D2.1		Conduct Annual Walk/Car-Free Day Event	City	City	-	-	-						
4A1.4		Integrate Green Mobility into Road Design Standards or in Standalone Standards (for Sidewalks, Crossings and Facilities)	MPWT	MPWT	-	-	-						
1B3.3		Integrate Universal Access into Design Guidelines for Green Mobility Infrastructure	MPWT	MPWT	-	-	-						
1B2.3		Integrate Crime Prevention Through Environmental Design (CEPTED) into Design Guidelines for Green Mobility Infrastructure	MPWT	MPWT	-	-	-						
1A1.1		Create/Improve 11.6 (Total 24.6) km of Paved Sidewalk with Segregated Curb (including Street Furniture)	DPWT	DPWT	DPWT	2,700,000	60,000		ü	ü	ü		
1A1.2		Create Pilot Pedestrianized Area in Peninsula	DPWT	DPWT	DPWT	500,000	-						ü
1B3.1		Implement Wheelchair Access Ramps at 155 (Total 295) Junctions	DPWT	DPWT	DPWT	300,000	10,000						ü

Initiative #	Component	Initiative	Plan & Design [A]	Implement / Construct [A]	Operate & Maintain [A]	Capital Cost (US$) [B,C]	Annual O&M Cost (US$) [C,D]	Potential Synergy Opportunity with On-Going Plans / Projects					For Priority Implement-ation
								NSEDP	SEDP	ASEAN Smart City Action Plan	CDIA Study	JICA Transport Master Plan	
1B2.1		Implement Pedestrian Scale Lighting on 11.6 (Total 24.6) km of Sidewalk (at 25m intervals)	DPWT	DPWT	DPWT	1,100,000	30,000				ü		ü
1B3.2		Implement Tactile Pavement at 155 (Total 295) Junctions	DPWT	DPWT	DPWT	200,000	10,000						ü
1B4.1		Implement Tree Planting Program along 11.6 (Total 24.6) km of Sidewalk	City	City	City	400,000	10,000				ü		ü
1B1.1		Implement Crossing Improvement Plan including Zebra Crossing Improvement (at 50 Junctions) and Traffic Calming [H]	DPWT	DPWT	DPWT	1,500,000	30,000				ü		ü
2D1.1	Cycle Improvements	Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	MPWT / City	MPWT / City	-	-	-						
1A2.1		Create 17.0 (Total 62.8) km of Protected Bike Lanes, and 24.2 (Total 71.7) km of Sharrow	DPWT	DPWT	DPWT	1,400,000	30,000				ü		ü
1A3.1		Provide Public Bike Parking - 42 (Total 136) Bike Stations along 17.0 km Bike Lanes (~500 Spaces)	DPWT	DPWT	DPWT / City [I]	100,000	10,000						ü
1A3.2		Implement Bike Share Program in City (~200 Bicycles)	DPWT	DPWT	DPWT / City [I]	900,000	20,000						ü
1A3.3		Install 20 (Total 40) Toilets along Key Walk Corridors	City	City	City	100,000	10,000				ü		ü
1A1.3	Other-Bridge	Build Bridge over Nam Khan River (Cost for Technical Study is Included in 4A1.1)	MPWT, DPL	MPWT	DPWT / City [J]	-	-						
2C1.3	Other-Parking	Implement Parking Facilities to Provide Dedicated Off-Street Parking Spaces	DPWT	DPWT	DPWT / City [J]	300,000	30,000		ü	ü			ü
2B1.2	Other-Pilot [K]	Pilot Low Emission Zone in Peninsula	DPWT	DPWT	-	500,000	-						
2C1.2		Pilot Parking Management Zone in Peninsula	DPWT	DPWT	-	500,000	-						ü
2B1.1	Other-Technical Study [L]	Develop E-Mobility Strategy	DPWT	DPWT	-	200,000	-	ü					
2C1.1		Develop Parking Strategy for City	DPWT	DPWT	-	200,000	-						ü
4A1.1		Develop Targeted Green Mobility Strategy, including Clear Goals/Objectives (including for Traffic Management, Motorbike Policy, New Nam Khan River Bridge Feasibility Study, Environmental and Social Safeguards, as well as Heritage Impact Assessments)	MPWT / City	MPWT / City	-	1,900,000	-	ü				ü	ü
2D2.2	Other-Capacity Building [M]	Conduct Education Campaigns at Local Universities	City	City	-	-	-						
2D2.3		Conduct Communication Activities and Create Green Mobility Website and App to Educate and Provide Information	City	City	-	300,000	-			ü			ü
4B1.4		Implement Targeted Capacity Building to Sharpen Skills Needed for Green Mobility	MPWT/ DPWT/City	MPWT/ DPWT/City	-	200,000	-					ü	ü
3B1.1		Create and Promote Luang Prabang and Nearby Sites as Overall Experience as Part of Tourism Package	City / DPL	City / DPL	-	-	-						

Initiative #	Component	Initiative	Plan & Design [A]	Implement / Construct [A]	Operate & Maintain [A]	Capital Cost (US$) [B,C]	Annual O&M Cost (US$) [C,D]	Potential Synergy Opportunity with On-Going Plans / Projects					For Priority Implement-ation
								NSEDP	SEDP	ASEAN Smart City Action Plan	CDIA Study	JICA Transport Master Plan	
3A1.1	Other-Institutional/ Regulatory/ Legal [N]	Integrate Heritage Preservation and Mobility Plans	MPWT/ DPWT/ DPWL	MPWT/ DPWT/ DPWL	-	-	-			ü		ü	
4A1.3		Establish Participatory Mechanisms for Green Mobility Plans/Schemes	DPWT	DPWT	-	-	-						
4B1.3		Better Link Green Mobility into Project Prioritization Framework	MPWT	MPWT	-	-	-						
4C2.1		Re-Prioritize Projects by Strengthening Linkage to Green Mobility (see Action 4B1.3)	MPWT	MPWT	-	-	-						
4A1.2		Create Cross-Cutting Committee to Develop Green Mobility Performance Monitoring Mechanisms	MPWT / City	MPWT / City	-	-	-						
4C1.1		Explore New Revenue Sources	MPWT / City	MPWT / City	-	-	-						
4C1.2		Establish Dedicated Green Mobility Funding Pool	MPWT / City	MPWT / City	-	-	-						
4C2.2		Mobilize More Development Partner Financing	MoF	MoF	-	-	-						
4C2.3		Mobilize Private Sector Capital and Increase Private Sector Participation (i.e., through PPP).	MoF	MoF	-	-	-						
2A1.1		Integrate Green Mobility into Urban Planning and Future Master Plans	MPWT/ DHUP	MPWT/ DHUP	-	-	-			ü		ü	ü
4B1.1		Create Cross-Cutting Committee to Integrate Green Mobility into the Legal Framework and Define Roles/ Responsibilities	MPWT	MPWT	-	-	-						ü
3B1.2		Create Committee to Develop Themed Experiences or Corridors	MPWT/ City/DPL	MPWT/ City/DPL	-	-	-						
2B2.1		Develop Policies to Tighten the Emission Limits for Vehicles	MPWT	MPWT	-	-	-						
3A1.2		Develop Policies to Regulate the Size / Type of Vehicles Permitted to Access the WHZ	MPWT/ City/DPL	MPWT/ City/DPL	-	-	-						
3A1.4		Improve Loading/Unloading Areas at Key Locations within WHZ	DPWT/ City/DPL	DPWT/ City/DPL	City	-	-						
3A2.1		Connect Outlying Heritages Sites with Green Mobility to Diversify Tourism Products and Reduce Visitor Loads	MPWT	MPWT	-	-	-						
4A2.1		Create Open-Data Sharing Platforms to Spur Innovation	MPWT/ City	MPWT/ City	-	-	-						
4A2.2		Leverage Technology and Proposed CDIA CCTV Proposal to Enhance Enforcement	MPWT	MPWT	-	-	-						

Notes:
[A] It is assumed that for initiatives led by the DPWT, appropriate coordination with the City will also be required as warranted. USO is responsible for beautification and cleaning for city infrastructure (and management of other facilities).
[B] Total costs for initiatives by component may differ from previous tables due to rounding. No specific costs are included for policy, regulatory, or institutional initiatives, except if a study is proposed.
[C] Capital costs rounded up to the nearest US$100,000 and O&M costs to the nearest US$10,000 for approximation.
[D] Studies, pilots and other one-time initiatives may have associated capital costs, but not an O&M one. For these cases, O&M costs are assumed to be embedded in the initial capital cost already. This will be noted expressly by initiative.

Initiative #	Component	Initiative	Plan & Design [A]	Implement / Construct [A]	Operate & Maintain [A]	Capital Cost (US$) [B,C]	Annual O&M Cost (US$) [C,D]	Potential Synergy Opportunity with On-Going Plans / Projects					For Priority Implement-ation
								NSEDP	SEDP	ASEAN Smart City Action Plan	CDIA Study	JICA Transport Master Plan	

[E] Additional walk and crossing improvements are also proposed under the separate Walk/Sidewalk and Crossing improvements components, which are not associated with road improvements.
[F] DPWT plans and implements local roads, as well as overseeing maintenance on national and local roads. USO is responsible for local road cleaning and beautification. Villages are responsible for upkeep of village roads.
[G] The cost for buses operating in the WHZ were previously estimated separately under 3A1.3 but are now combined into 1C1.1.
[H] New signalized junctions including pedestrian countdown signals and zebra crossings are included as part of the 1B5.1 Multimodal Road Improvements.
[I] The City (via the USO) would be responsible for collection of fees associated with use of the bike parking or bike share systems.
[I] The City (via the USO) would be responsible for collection of bridge usage fees (if any) and parking fees from use of paid parking facilities.
[K] Pilot studies are assumed to be one-time activities (possibly subject to further extension). This initial "capital cost" represents all related costs to establish the pilot and manage it. Thus, no O&M costs are defined for this activity.
[L] Technical studies are one-time activities with "capital costs" representing all related costs to conduct the studies. Thus, no O&M costs are defined for this activity.
[M] Capacity building efforts are one-time activities with "capital costs" representing all related costs to establish and conduct the activities. Thus, no O&M costs are defined for this activity.
[N] Institutional / regulatory items (i.e., design, standards, guidelines) are assumed to be under the responsibility of national entities, while studies, capacity building and pilot projects are assumed to be conducted by sub-national entities

Appendix B

Potential Funding/Financing Instruments for Green Mobility and Case Studies

B1 Financing Instruments for Indicative Investment Priority List

Financing & Funding Instruments	Opportunities in Luang Prabang / Comments	Applicable Component [A]		Selected Case Studies / Precedents
National and International Loans and Grants	• National and international loans and grants are key financing sources for transport infrastructure investment in Lao PDR • Based on planned expenditures for 2020, over 47% of the capital expenditures in Lao PDR were foreign capital from development partners including World Bank and ADB. [B] • One example is a special ADB fund loan of US$35.0 million for the Vientiane Sustainable Urban Transport Project, which seek to improve urban transport and capacity in Vientiane. An estimated US$99.7 million will be funded by ADB, other financers (including European Investment Bank and OPEC Fund), private sector and Lao Government, contributing 35%, 44%, 6% and 15% respectively.[C] • Existing shortfalls in financing for transport from national/international loans/grants, demonstrates need to re-prioritize projects to strengthen linkage between green mobility and prioritization framework. • Financing from multilateral agencies typically provides added credibility to a project, thus helping to attract other financing sources (i.e., private sector participation, subject to feasibility and/or contractual arrangement of the project). • National and international loans and grants can be used to finance all modes of transport given their broad use and stability. • Given the amount of effort needed in arranging national/international loans and grants, projects of a smaller-scale like sidewalk and crossings might be still appliable through bundling under large-scale projects • National and international loans and grants may continue to be major sources for upfront capital investment for prioritized investment	Roads	✓	• **Bus Operations, Phnom Penh, Cambodia [D] –** A City Bus Authority was established in 2014, overseeing 57 vehicles on three routes. Operations have not been profitable, thus government subsidizes US$50,000/month. • **Cycling Scheme, France [E] -** The Government announced a plan in 2020 to allocate €300 million into bike lanes on nine segregated corridors, linking 30 districts of Paris. The €300 million investment will cover about 60% of construction costs, with the remainder covered by local councils and the National Bicycle Fund.
		Public Transport	✓	
		Cycling	✓	
		Sidewalk / Crossings	✓	
		Parking & Pilot	✓	
		Bridge	✓	
		Others	✓	
Climate-Related Financial	• Transportation is one of the strategic priorities identified by the National Strategy on Climate Change (NSCC), but no specialized national funds have been set up to support transport activities.	Roads	✓	• **CTF in Philippines [H] -** Philippines has US$250 million in CTF concessional financing to finance low carbon public transport and encourage PPP in industrial energy efficiency and renewable energy. Investments include:
		Public Transport	✓	
		Cycling	✓	

Financing & Funding Instruments	Opportunities in Luang Prabang / Comments	Applicable Component [A]		Selected Case Studies / Precedents
Instruments [F]	• Under the Vientiane Sustainable Urban Transport Project, a US$1.84 million grant from GEF forms part of financing, in addition to a US$35 million ADB concessional loan, US$20 million credit from the European Investment Bank, US$15 million loan from OPEC Fund, and US$6.4 million from private sector. Government's contribution is US$14.55 million. The GEF grant will finance civil works and equipment to facilitate NMT, and this will be administered by ADB.[G] • There are further opportunities to explore financing from climate funds, given the alignment of the focal areas with the infrastructure development plan in Lao PDR and / or Luang Prabang. • Based on precedent and how climate funds support urban transport projects, this instrument would be suitable for public transport, bike schemes, walk, and road in Luang Prabang. • However, the amount of financing provided by climate funds is relatively low and is not meant to be the sole source of financing for a project. Co-financing from other sources, typically from multilateral agencies and / or the government is needed.	Sidewalk / Crossings	✓	○ **Cebu BRT -** US$25 million CTF approved in 2014 for a maturity of 20 years. The CTF investment leverage ratio is 1:8, leveraging co-financing of US$204 million from IBRD and ADB. CTF is supports emission reduction for Cebu's transport sector (generating 24%-41% reduction after completion). Funded investments include bus stations, system marketing / management, area traffic control and project outcome monitoring. ○ **Metro Manila BRT Line 1 -** Received US$24 million CTF for total project costing US$110 million. CTF was allocated to support GHG reduction from the transport sector in Metro Manila, and together with Cebu BRT, deliver long-term climate benefits in the Philippines. ○ **Electric Tricycles in Cebu and Manila -** Deployment of 100,000 energy efficient electric tricycles in Cebu City and Manila, CTF provides initial financing for rooftop solar charging stations for vehicles. • **Karachi BRT, Pakistan [I] -** GFC funding accounts for ~8% (US$49 million) of total cost for the zero-emission BRT system. • **Semarang BRT, Indonesia [J] -** GFC funding of US$0.788 million was approved through the Project Preparation Facility to prepare a feasibility study, accounting for about 63% of total cost of project preparation activities.
		Parking & Pilot		
		Bridge	✓	
		Others		
PPP	• There is potential to explore PPPs and private sector involvement to unlock private sector financing in the transport sector in Lao PDR and Luang Prabang. • However, there are limited PPP precedents in the transport sector in Lao PDR in particular for smaller cities like Luang Prabang. • Examples of PPPs in the transport sector include the National Road 13 PPP, and the proposed Southern Laos Railway 345km PPP. • The government plays a key role in supporting PPPs in the country through addressing institutional and regulatory gaps to provide an effective and transparent environment to encourage private sector participation in Lao PDR and Luang Prabang. • The government is in the process of developing an effective system for PPPs in the country, which is a key step towards PPP development in the country. The Lao PDR's PPP Law was passed in December 2020 as an important step in this process.[K]	Roads	✓	• **BRT Lite, Yangon, Myanmar [L] –** BRT Lite was initiated in 2016 via a pilot PPP scheme for two routes with 45 buses (scaled down from the original plan). System cost (~US$19.2 million) was fully financed by Yangon Bus Public Company (YBPC) – with 40% financed by government and 60% by private companies and public shareholders. Drivers are paid a fixed wage to eliminate encourage safe driving and competition for passengers. • **Public Bus Service, Yangon, Myanmar [M] -** Following success of BRT Lite, the Yangon Bus Service (YBS), under the supervision of the Yangon Region Transport Authority (YRTA), was launched to reduce over 300 privately-owned bus lines to 50, and consolidate over 100 companies to 8 private companies under a PPP model. Bus drivers and conductors are paid regular monthly salaries (some with additional revenue share, food, and housing benefits – varying by operator). Additional financial support from the Government was provided to private operators includes new bus purchase to replace old buses (to be eligible to participate in the new scheme), and licenses to operate petrol stations and distribute fuel as subsidiary businesses.
		Public Transport	✓	
		Cycling	✓	
		Sidewalk / Crossings		
		Parking & Pilot	✓	
		Bridge	✓	
		Others		

Financing & Funding Instruments	Opportunities in Luang Prabang / Comments	Applicable Component [A]		Selected Case Studies / Precedents
	• PPPs could be considered for public transport (e-bus) and road improvements in Luang Prabang as these projects are of a larger scale and have potential to attract private sector participation, subject to deal structure and viability of the project. • PPPs could be considered for bike share, based on Hoi An. This could also be applied to Parking & Pilot schemes. Despite their small scale, the private sector could still profit from supplying facilities and O&M. • Given relatively limited experience in PPPs in transport, private sector may be uncertain on government commitment and financial viability. • Market sounding is key to gauge private sector appetite and concerns.			• **Bike Share Scheme, Hoi An, Vietnam [N] –** Launched in 2019 to encourage cycling under a PPP modality in its UNESCO World Heritage Site, this scheme was organized by the Hoi An Authority, HealthBridge Canada and GIZ. GIZ provided US$200,000 (part used to improve a 3-5 km road with a bike lane). Land for parking was contributed by the Hoi An People's Committee, with 225 bikes and 275 QR locks from TUMI, 100 assisted-pedal bike and O&M costs from QIQ (a Singapore-based green mobility company), and 50 bikes from the Hoi An Hotel. This scheme was extended to Hue in May 2021, Ho Chi Minh in December 2021, with plans to extend to Hanoi, Ba Ria-Vung Tau and Da Nang.

Notes:
[A] The "Others" component includes capacity building, technical studies, as well as institutional / regulatory / legal initiatives.
[B] Source: Ministry of Finance, State Budget Plan for the Fiscal Year 2019 and 2020.
[C] Source: https://www.adb.org/sites/default/files/project-documents/45041/45041-002-apfs-en_0.pdf
[D] Source: https://www2.jica.go.jp/en/evaluation/pdf/2017_1000212_4_f.pdf
[E] Source: (i) https://www.forbes.com/sites/carltonreid/2020/04/22/paris-to-create-650-kilometers-of-pop-up-corona-cycleways-for-post-lockdown-travel/?sh=60943eb54d40; (ii) https://www.forbes.com/sites/carltonreid/2020/04/22/paris-to-create-650-kilometers-of-pop-up-corona-cycleways-for-post-lockdown-travel/?sh=60943eb54d40
[F] Source: (i) https://www.giz.de/de/downloads/First-steps-for-Making-Climate-Finance-Work-in-Lao-PDR-2013-1.pdf; (ii) https://www.vientianetimes.org.la/freeContent/FreeConten_European.php; (iii) https://www.thegef.org/projects-operations/projects/9146; (iv) https://www.greenclimate.fund/countries/lao-pdr; and (v) https://www.greenclimate.fund/news/gcf-and-gef-join-forces-with-lao-pdr-to-advance-climate-action
[G] Source: (i) https://greatermekong.org/lao-pdr-setting-vientiane-road-sustainable-transport; (ii) Resource: ADB Global Environmental Facility 2021 Project Implementation Report for Vientiane Sustainable Urban Transport Project; (iii) https://www.adb.org/sites/default/files/project-document/155510/45041-002-pam.pdf
[H] Source: (i) https://pubdocs.worldbank.org/en/637331531492550417/1758-XCTFPH062A-Philippines-Project-Document.pdf; (ii) https://www.climateinvestmentfunds.org/projects/cebu-bus-rapid-transit-project; and (iii) https://www.climateinvestmentfunds.org/country/philippines
[I] Source: https://www.greenclimate.fund/project/fp085
[J] Source: https://www.greenclimate.fund/sites/default/files/document/ppf-application-integrated-sustainable-bus-rapid-transit-development-semarang.pdf
[K] Source: Source: https://www.vientianetimes.org.la/freeContent/FreeConten_Govt_16.php
[L] Source: https://www.mmtimes.com/national-news/yangon/18990-bus-upgrade-offers-commuters-a-reprieve.html
[M] Source: (i) https://www.unescap.org/sites/default/files/SUTI%20Final%20Report%20Submission_ED.pdf; (ii) https://www.mmtimes.com/business/23485-yangon-transport-autority-2.html; and (iii) https://www.mmtimes.com/business/21621-govt-to-offer-financial-support-for-yangon-ppp-bus-lines.html
[N] Source: (i) https://e.vnexpress.net/news/travel/places/hoi-an-s-first-bicycle-sharing-scheme-hits-the-streets-3932468.html; (ii) https://e.vnexpress.net/news/travel/places/hoi-an-s-first-bicycle-sharing-scheme-hits-the-streets-3932468.html; (iii) https://smmr.asia/wp-content/uploads/2020/01/Trang_Bike_Hoi_An.pdf; (iv) https://en.vietnamplus.vn/hue-to-pilot-public-bikesharing-scheme/200913.vnp; (v) https://en.vietnamplus.vn/hcm-city-pilots-bicyclesharing-service-in-central-area/218285.vnp; and (vi) https://vietnamnet.vn/en/society/bicycle-sharing-scheme-to-be-extended-to-hanoi-ba-ria-vung-tau-danang-803577.html

B2 Funding Instruments for Indicative Investment Priority List

Financing & Funding Instruments	Opportunities in Luang Prabang / Comments	Applicable Mode [A]		Selected Case Studies / Precedents
Public Transport Subsidies	• Public transport subsidy is a key funding source for public transport, and/or bike share in Luang Prabang if farebox revenue or bike share fees are insufficient to cover operating costs/ • Subsidies can be for capital or O&M costs (i.e., in-kind contributions (land, fleet)) or annual payments to private sector operators (if applicable) to cover O&M of the e-bus and/or bike share scheme. • Defining adequate subsidy levels require coordination among various agencies and overall health of national/provincial government budgets. • Public transport subsidies may be required to ensure fares remain affordable to lower-income residents in Luang Prabang or to compensate for initial low demand for the public transport and/or bike share scheme. • Detailed assessment will need to be carried out at the feasibility stage to determine the quantum of subsidies required, and the ability of the national government to allocate subsidies to the prioritized investments.	Roads		• **Public Transport Subsidies, Yangon, Myanmar [B]** - Only one or two large private operators can recover O&M costs and fleet upgrades through farebox revenue. Most smaller operators have weak financial performance, with farebox revenue sufficient to cover O&M costs, but not financing costs for fleet upgrades. The Government made in-kind investments, including fleet purchase for YBS, which is treated as an equity injection by Government to private operators. • **Public Transport Subsidies, Ho Chi Minh City, Vietnam –** The city provides subsidies of over US$43 million annually to the 12 public bus operating companies • **Public Transport Subsidies, Bogota, Colombia [C]** - A pro-poor public transport subsidy was introduced by the local government in 2014 to provide subsidies to potential beneficiaries. Qualified households received discounted fares (up to 60% off) leading to a 56% increase in trips by such groups. • **Cycling Scheme, France [D]** - The French government offered €20 million in 2020 under a scheme covering all citizens to make them eligible for bike repairs of up to €50 at registered mechanics to promote cycling. The funding scheme will also help to pay for cycle training and bike racks/parking. • **Fare-Free Public Transport, Tallinn, Estonia [E]** – Bus, tram and trolleybus have been free since 2013. To enjoy this benefit, passengers must be registered as residents, enabling Tallinn to collect €1,000 per person on average per year (approximately €11 million per year) from income tax allocations. The income tax collected covers the costs of the fare-free public transport.
		Public Transport	✓	
		Cycling	✓	
		Sidewalk / Crossings		
		Parking & Pilot		
		Bridge		
		Others		
Property Taxes	• The tax rate on land and property in Lao PDR varies depending on the location and type of land.[F] • The land tax collection mechanism has been enhanced through modernization to further regulate payment of land taxes.[G] • Lao PDR could consider potential use of property tax as a funding source to support urban transport development (i.e., by earmarking a portion of	Roads	✓	• **Property Taxes for Transit Infrastructure in Minnesota, United States [H]** - A property tax is levied by the Metropolitan Council to pay for the debt service on transit bonds used to cover costs of maintaining the existing system. A second property tax, imposed by the County Regional Railroad Authorities, to develop regional transitways typically funds 10% of construction costs.
		Public Transport	✓	
		Cycling	✓	

Financing & Funding Instruments	Opportunities in Luang Prabang / Comments	Applicable Mode [A]		Selected Case Studies / Precedents
	property taxes to a dedicated green mobility fund). This would require an efficient system to collect and transfer the fund to the responsible local authorities in Luang Prabang for the proposed green mobility initiative. • The fund is a potential source that can be used to fund all types of modes of transport.	Sidewalk / Crossings	✓	• **Property Tax, Toronto, Canada [I] -** A special dedicated property tax levy has been imposed since 2017 for the City Building Fund, which was established for priority transit and housing infrastructure, including construction of SmartTrack stations within the city and expansion of Yonge-Bloor Station for greater passenger capacity. • **Funding of Project Connect, Austin, United States [J]** - Approved by voters in 2020, the permanent increase of property tax of approximately 4% was dedicated to the Austin Transit Partnership to fund Project Connect – a US$7.1 billion mass transit system, which includes the city's first light rail lines
		Parking & Pilot	✓	
		Bridge	✓	
		Others	✓	
Tourism Levy (Included in **Box 3-1**)	• A tourism levy could be a potential funding source for Luang Prabang's local government given the significant role of tourism in the city. • Luang Prabang could consider additional ways of implementing tourism levies on tourists, and earmarking revenues to a dedicated green mobility fund in Luang Prabang to fund the proposed prioritized investments. • There are various ways to generate tourism revenue for Luang Prabang, which will require further assessment. Examples from select case studies that could be tailored to the local context include: o Charging higher airport, public transport, and bike share fares for tourists to cross-subsidize other transport development in the cities (i.e., parking and roads), similar to Barcelona o Charging taxes for staying in Luang Prabang, similar to Switzerland and Indonesia • Around 860,000 visitors came to Luang Prabang in 2019. A potential tourist tax could be a daily rate per tourist per night (i.e., average tourist tax of US$4.00 per person per night in Switzerland) or a flat rate per tourist (i.e., the new tourist tax of US$10.00 in Bali). Average stay by tourists in Luang Prabang is around 3.5 days. Assuming a daily rate of US$2.60 (being a simple average of tourist taxes in Switzerland and Barcelona), tourist tax on foreign visitors in Luang Prabang in 2019 would amount to US$7.8 million. Under a policy of a flat rate of US$10 per tourist, the amount would be US$8.6 million. • There are several options to collect the tourist tax: (i) including it in the airline ticket; (ii) charging this at special arrival or departure counters at the airport; or (iii) indirect billing by tourist agencies. In case of adopting	Roads		• **Tourist Tax, Barcelona, Spain [K] -** In 2019, €4.2 million of tourist tax was collected and used for funding public transport, promoting culture, and improving public space. Of that amount, €1.3 million was to be allocated under Barcelona's Bus Offers Summer Improvement Plan to increase summer bus service. The revenue from two profitable bus routes (i.e., one between the city and airport and another being a city tour bus) are used to offset deficits for the other routes. • **Tourist Tax, Switzerland & Indonesia [L]** - Switzerland charges a tourist tax for non-residents who stay overnight. The tourist tax is billed separately on the invoice by hotels, tourist agencies or landlords of holiday homes – it is used to pay for tourist infrastructure such as transport, information services, cultural performances, etc. The Indonesian Government is proposing a new tourist tax of around US$10.00 per person on all foreign visitors to Bali. The proceedings would be used to fund programs to preserve the environment and Balinese culture.
		Public Transport	✓	
		Cycling	✓	
		Sidewalk / Crossings		
		Parking & Pilot		
		Bridge		
		Others		

Financing & Funding Instruments	Opportunities in Luang Prabang / Comments	Applicable Mode [A]		Selected Case Studies / Precedents
	a daily rate per tourist per night, an additional option could be through accommodation invoices (i.e., hotels, holiday apartments, etc.).			
Parking Charges	• Parking charges are levied on public spaces along the Mekong in Luang Prabang. • Parking charges and or fines for violations of parking regulations could be introduced in Luang Prabang as a funding source for O&M for off-street parking and bike parking scheme. • However, assessment on the structure of parking charges will need to be performed to encourage use of these off-street vehicle and bike parking facilities to discourage illegal or disorganized parking on sidewalks and roadways to ensure safe and unblocked paths.	Roads		• **Parking Revenue Allocation in Milton Keynes, United Kingdom [M] -** By legislation, use of parking revenue is restricted to service or transport related purposes (commonly including improvement, extension and maintenance of the existing parking schemes, car parks and infrastructure, etc). • **Mobility Fund, Amsterdam, Netherlands [N] -** Funds have been established to collate parking income, which can be allocated to transport (i.e., bike, road safety, and public transport including new routes and bus stops), etc. • **Mass Transit Improvement Fund, Mexico City, Mexico [O] –** The construction code was revised in 2017 to ensure financial viability of residential projects (with parking facilities). Developers are charged parking development fees, which are directed to a fund to improve mass transit.
		Public Transport		
		Cycling	✓	
		Sidewalk / Crossings		
		Parking & Pilot	✓	
		Bridge		
		Others		
Fuel Taxes and Surcharges	• Fuel taxes and surcharges are a stable funding instrument with relatively low administration costs. Apart from additional revenues, they have potential to encourage a switch to low emissions modes. • To collect additional revenue to meet set targets, an upward revision was implemented by the Government in 2018 on taxes on goods and services, including gasoline and diesel.[P] The Lao Government has also established since 2002 an earmarking system for the fuel levy to a special fund (Road Fund) allocated to road maintenance.[Q] The revenue collected in 2002 was only US$2.0 million. Currently, it has reached almost US$100.0 million per year. • Lao PDR could consider potential use of fuel taxes and surcharges as a funding source to support urban transport development. The dedicated green mobility fund can then be allocated to Luang Prabang's proposed public transport and road enhancements. However, this must be considered carefully given potential local opposition. • A step-by-step approach should be taken by the national government, with a solid communication plan to the public to manage inflationary expectations and demonstrate public benefits from the increased funding sources from fuel taxes and surcharges.	Roads	✓	• **Fuel Taxes for BRT Investment, Bogota, Colombia [R] -** Fuel taxes in Bogota are earmarked with 50% of fuel tax revenues allocated to capital investments for BRT corridors, 40% to capital and maintenance works for road networks, and 10% to local councils for maintenance of the road network. • **Fuel Taxes, Germany -** Fuel taxes are managed at the federal level in Germany. In Bavaria, fuel taxes are used to subsidize 40% of the O&M cost for suburban rail services.
		Public Transport	✓	
		Cycling		
		Sidewalk / Crossings		
		Parking & Pilot		
		Bridge		
		Others		
		Roads	✓	

Financing & Funding Instruments	Opportunities in Luang Prabang / Comments	Applicable Mode [A]		Selected Case Studies / Precedents
Vehicle Taxation	• Lao PDR imposes vehicle taxation (road tax) on owners of private vehicles. Vehicle tax rate varies by the make and model of the vehicle.[S] • Like the cases cited in the United States and London, Lao PDR could consider establishing mechanisms to allocate vehicle taxes for urban transport development (i.e., earmarking a portion of vehicle taxes for road development). Earmarking of this resource requires an effective allocation scheme to be planned out.	Public Transport		• **Vehicle Taxes, Wisconsin, United States [T] -** In Wisconsin, vehicle taxes can only be spent on transport projects by regulation. • **Road Taxes, London, United Kingdom [T] -** 90% of the road tax has been used for road network projects in 2018.
		Cycling		
		Sidewalk / Crossings		
		Parking & Pilot		
		Bridge		
		Others		
Farebox Revenue	• Farebox revenue is a key funding source for operating the proposed public transport and bike schemes, however it may be insufficient to cover all O&M costs (including debt repayment if any) in the context of Luang Prabang. • Fare pricing requires careful assessment to encourage use of the public transport and bike services, and still ensure affordability. • From the Tallinn case study, public transport is free for locals, but visitors and tourists must still pay for fares. • In Luang Prabang, pricing differences between tourists and locals could be key to ensuring equitable access to public transport and bike services for residents.	Roads		• **Bus Farebox Revenue, Yangon, Myanmar [U] -** Fares are priced by route type and distance. Farebox recovery is relatively high (with one operator achieving a ratio of 1.2). The 20% surplus is allocated to debt service and investor return. • **Cost-plus Formula, Thailand [V] -** Farebox revenue covers most O&M costs. Fares are regulated by the Department of Land Transport based on a "cost-plus formula", which considers O&M costs under three categories – variable, semi-variable and fixed. A reasonable margin of between 10% and 14% is then added to provide profitability for operators. • **Farebox Revenue, Ho Chi Minh City, Vietnam [W] –** Public transport fares are relatively low compared to income (4.4% of annual income). Low fares reduce farebox recovery (~46% in 2017), and require government subsidies. • **Free Public Transport, Tallinn, Estonia [X] -** Public transport has been free in Tallinn since 2013 for tax-paying residents. Visitors from outside Tallinn and tourists still must pay to ride the public transport network.
		Public Transport	✓	
		Cycling	✓	
		Sidewalk / Crossings		
		Parking & Pilot		
		Bridge		
		Others		
Advertising	• Advertising is a key non-fare revenue to cover O&M costs of public transport, bike, and parking schemes in addition to farebox revenue or parking charges.	Roads		• **Bus Advertising, Yangon, Myanmar [Y] -** The Yangon City Development Committee (YCDC) owns bus advertising rights. At launch, the Government intended to generate revenue by selling advertisements at bus stops, to upgrade stops without using State budget (if YCDC relinquished rights to advertising). In June 2018, YCDC awarded FMIDecaux Co. an exclusive 20-year contract for advertising at shelters, for building 500 new shelters with digital panels totaling US$13.0 million to replace existing stops. The project is financed by advertising, based on a JCDecaux business model, at no cost to the city.
		Public Transport	✓	
		Cycling	✓	
		Sidewalk / Crossings	✓	
		Parking & Pilot	✓	
		Bridge		

Financing & Funding Instruments	Opportunities in Luang Prabang / Comments	Applicable Mode [A]		Selected Case Studies / Precedents
		Others		• **Electric Vehicle Financing, Bogota, Columbia** [Z] – This municipal government scheme promoted electric vehicle investment. Owners of electric buses (not diesel buses) are able to collect revenue from bus advertising space. • **Bus Contracting Model, Singapore** [^] **-** Since implementation of the Model in 2016, operators must adhere to new guidelines on commercial bus advertising and retain advertising revenue from buses and bus interchanges.

[A] The "Others" component includes capacity building, technical studies, as well as institutional / regulatory / legal initiatives.
[B] Source: https://openknowledge.worldbank.org/bitstream/handle/10986/33890/Urban-Transport-in-Yangon-and-Mandalay-Review-of-Sector-Institutions-Expenditures-and-Funding.pdf?sequence=1
[C] Source: (i) https://publications.iadb.org/publications/english/document/How_Affordable_is_Transportation_in_Latin_America_and_the_Caribbean.pdf; and (ii) https://publications.iadb.org/publications/english/document/Operating-Subsidies-in-Urban-Public-Transit-in-Latin-America-A-Quick-View.pdf
[D] Source: https://www.bbc.com/news/world-europe-52483684
[E] Note: (i) Fares are free for residents in Tallinn but still costs for tourists and visitors; and (ii) approximately 42% of residents were previously un-registered for taxes before introduction of fare-free public transport. Source: (i) https://www.itfglobal.org/sites/default/files/node/page/files/031119%20PUBLIC%20FINANCING.pdf; and (ii) https://ruralsharedmobility.eu/wp-content/uploads/2019/08/SMARTA-GP-Fare-free-Public-Transport-in-Tallinn.pdf
[F] Source: https://www.austchamlao.org/wp-content/uploads/2020/03/DFDL-Lao-PDR-Tax-Pocket-Guide-2020.pdf
[G] Source: https://elevenmyanmar.com/news/lao-govt-to-enhance-land-tax-collection-iasia-news-network
[H] Source: https://www.transportationalliance.com/sites/ta/files/uploads/inline/docs/FinalFundingOptions.pdf
[I] Source: https://www.toronto.ca/legdocs/mmis/2019/ex/bgrd/backgroundfile-140989.pdf
[J] Source: (i) https://www.capmetro.org/funding; and (ii) https://www.statesman.com/story/news/local/2020/10/10/prop-a-what-voters-would-get-for-71-billion-transit-plan/114256246/
[K] Source: (i) http://www.ub.edu/gim/wp-content/uploads/2013/10/Tourism-and-urban-public-transport.pdf; (ii) https://www.barcelona.cat/infobarcelona/en/tema/enterprise/the-tourist-tax-is-funding-improvements-in-the-city_874558.html; (iii) https://www.barcelona.cat/infobarcelona/en/tema/enterprise/the-tourist-tax-is-funding-improvements-in-the-city_874558.html
[L] Source: (i) https://www.myswissalps.com/accommodation/touristtax; and (ii) https://www.straitstimes.com/asia/se-asia/bali-set-to-impose-us10-levy-on-foreign-tourists
[M] Source: https://www.miltonkeynes.co.uk/news/traffic-and-travel/council-pockets-ps12-million-annual-profit-parking-charges-and-fines-milton-keynes-1271094
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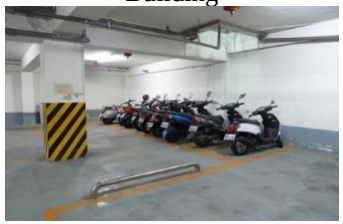
Appendix C

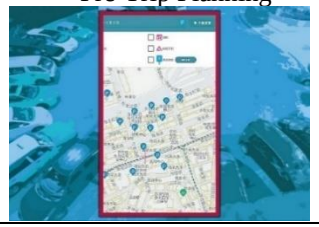
Motorbike Restrictions and Policies

C1 Potentially Relevant Motorbike Management Measures Adopted Elsewhere

#	Category	Policy Measures	Cities	Description	Potential Benefits / Results	Potential Applicability to City
1	Motorbike Ownership Restrictions	Vehicle Quota System 	• Singapore • Hanoi	• Singapore - Sets cap on number of permitted vehicles that can operate in the city by using uniform-price auctions to allocate Certificates of Entitlement or registration rights. This aims to limit the growth/number of all private vehicles and two wheelers. • Hanoi - Plans to limit registration of new motorbikes in the downtown area from 2020 to reduce traffic jams, starting with some districts and expanding to others by 2025.	• Singapore - The annual growth rate was capped to 3% per year in 2012/13, and subsequently reduced to 0.25% in 2018. This contributed to a net reduction in total number of motorbikes (thus less congestion, CO2 emissions, etc.)	• Two-wheelers are the primary means of transport in the city. A drastic policy change such as this requires that alternative and affordable options are already in place instead of motorbikes. • Therefore, the success of policies to limit the motorbike vehicle fleet depends on the presence of a convenient, accessible, and affordable walk and cycle network (and bike share program) for short-/medium-distance trips and integrated public transport network for longer distance trips.
2	Motorbike Parking Management	Parking Pricing 	• Taipei	• Minimum motorbike parking fees are mandated by the Parking Law and based on cost relative to local resident incomes and zone, time of day, and type of parking (off-street and on-street)	• Higher parking charges mandated by law can help to discourage motorbike use and encourage use of alternate and less expensive modes • Higher parking fees can also lead to higher turnover rate and alternate modes for longer duration trips	• Specific legal framework needed to standardize motorbike parking fees and operating regulations. Parking fees collected by the city can also be used to improve current parking facilities and build new facilities. • Viable alternate transport modes needed including walk, cycling and public transport to complement these pricing measures.
3		Parking Supply	• Taipei	• Regulate motorbike parking on sidewalks by	• Dedicated motorbike spaces reduce the sidewalk areas used for parking, thereby freeing the sidewalk, and	• Enforcement is a key issue. Without proper enforcement, continued

#	Category	Policy Measures	Cities	Description	Potential Benefits / Results	Potential Applicability to City
				creating dedicated motorbike spaces	making the walk environment safer, more enjoyable, and continuous • This can also reduce dangerous interactions between pedestrians and motorbikes when mounting or leaving the curb	parking on sidewalks in an unmanaged fashion may occur. • Although parking fines are enshrined in relevant legal statutes, limited enforcement reduces the deterrence factor. • A comprehensive signage program would also be needed on the sidewalks and on the roads for both pedestrian and the motorcyclists.
4		Parking Enforcement 	• Taipei	• Establish parking violations to exceed the mandated daily charge to discourage illegal parking (i.e., both in non-designated locations and for exceeding time limits)	• Higher parking fines would ideally discourage motorbikes parking outside of designated zones as well as those overstaying maximum time limits.	• Higher parking fines would ideally discourage motorbikes parking outside of designated zones as well as those overstaying maximum time limits.
5		Parking Requirements in Building 	• Taipei	• Establish maximum motorbike parking requirements are established for different types of building by the Building Code	• Setting maximum parking requirements for buildings places a cap on the total number of parking spaces created at the building and thus can help to reduce overall use of motorbikes in the city • This can also reduce motorbike parking on the sidewalks and create a safer and more inclusive walk environment	• Integrating parking requirements into the Building Code can help to reduce on-street and sidewalk parking • At the same time, however, maximum parking limits may be useful to constrain the size of building parking, to discourage driving and vehicle use
6	Motorbike Operating Restrictions	Motorbike Use Restrictions 	• Taipei, • Hanoi, • Guangzhou • Beijing • Shanghai	• Prohibit motorbikes from operating within or entering certain areas of the city during the peak period or other particular periods (i.e., Friday night and during weekends)	• This can discourage driving and encourage alternate transport means during the busiest periods of travel in the city • This can also benefit the city through reduced emissions and also reduced congestion along the roads	• Establishing a restricted cordon around the city is necessary to achieve desired results, including a monitoring and enforcement system • Manual enforcement at checkpoints may also be considered, although this would be manually intensive

#	Category	Policy Measures	Cities	Description	Potential Benefits / Results	Potential Applicability to City
7		Congestion Charge and Prohibitions 	• Vienna • Singapore • Melbourne	• Introduce congestion charges and motorbike bans to reduce congestion and air pollution	• Similar to motorbike restrictions, congestion charging and bans on motorbikes could also discourage driving and encourage alternate transport modes during the peak period or permanently • Cities have implemented restrictions based on the type of motorbike (based on Euro emission standard) with varying implementation hours and pricing schemes	• Convenient and accessible alternate transport options are necessary to compensate for the loss of access in these central areas
8	Motorbikes as Part of Multimodal Mobility System	Integrated Mobility Planning 	• Taipei	• Create motorbike parking (park and ride facilities) near public transport stations/stops to encourage motorcyclists to use public transport for longer distance trips	• This can encourage shift from motorbikes to public transport for long haul trips, while still retaining the convenience of motorbikes for first-/last-mile connectivity • Policies implemented in Taipei help to reduce motorbike use, while boosting public transport demand	• Establishing linked parking facilities at public transport stops and stations should be coupled with design guidelines that encourage multi-modal interchange • Creating mobility hubs with convenient first-/last-mile options (including bike share, carshare, etc.) could also help to green the final trip linkage instead of exclusive use of motorbikes
9	Promotion of Clean & Electric Motorbikes	Electric Motorbike Share 	• Taipei, • Portland, USA	• Introduce e-motorbike sharing schemes	• This can encourage more sustainable and clear transport for those using motorbikes • These shared facilities could be co-located at key public transport hubs and stops to encourage use of public transport and convenient first/last-mile connections	• Framework to govern and facilitate e-mobility adoption and implementation required • Previous e-mobility efforts from the government side have proven unsustainable, therefore operating model must consider sustainability and linkage to public transport network for viability
10		Emission Standards	• Singapore, London,	• Restrict/ban vehicles exceeding emissions thresholds	• In London, motorbikes failing to meet a minimum Euro 3 emission standards are prohibited from operating within London's Ultra Low Emissions Zone	• Establishing a restricted cordon around the city is necessary to achieve desired results, including a monitoring and enforcement system

#	Category	Policy Measures	Cities	Description	Potential Benefits / Results	Potential Applicability to City
					• This effort led to a 65% reduction in the number of older, more polluting (non-compliant) vehicles driving in the zone	• Manual enforcement at checkpoints may also be considered, although this would be manually intensive • Convenient and accessible alternate transport options are necessary to compensate for the loss of access in these central areas
11		Vehicle Renewal (Economic Incentive) 	• Bangalore • Taipei	• Provide economic incentives (government subsidies) to replace diesel models with new low-emission or electric motorbikes	• This policy can help drive towards cleaner vehicles, but not necessarily modal shift to public transport • For Bangalore, economic incentives were substantially higher than the 15-year resale value to encourage vehicle renewal	• Price incentives would require government funding mechanisms for cleaner vehicles • This can be combined free park-and-ride services at public transport hubs to encourage public transport
12	Digital Tools to Improve Motorbike Operations	Pre-Trip Planning 	• Hong Kong	• Information on-street parking spaces can be searched through "HKeMobility" app to facilitate motorcyclists' pre-trip planning and transfer to public transport	• Guides people to find on-street parking spaces before departure and shift to public transport	• This could leverage real-time parking management/monitoring systems to provide information directly to user apps • This can also be provided via open data repositories for public use and assessment

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