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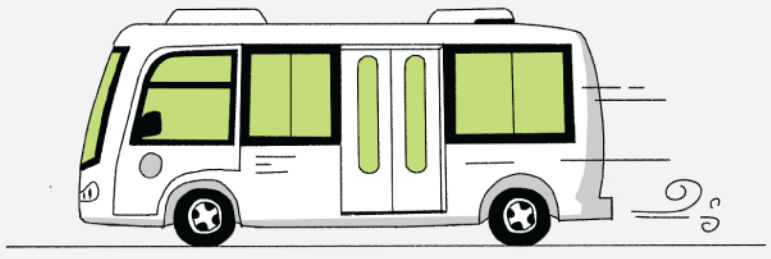
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Cambodia: Fostering Green Mobility in Siem Reap



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Vision, Strategies
& Financing

June 2022

World Bank

**Cambodia – Fostering Green
Mobility in Siem Reap**

Vision, Strategies, and Financing

Final Report | June 2022

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Contents

	Page
Context	I
Siem Reap City Profile	I
Increasing Mobility Challenges	V
Green Mobility Index	VII
Forward Look	X
Boundaries of the Study	XII
Structure of the Report	XII
1 Summary of Travel Patterns, Infrastructure Assessment and Key Gaps	1
1.1 Introduction	1
1.2 Key Generators and Activity Nodes	1
1.3 Travel Patterns	2
1.4 Perception Surveys	12
1.5 Mobility Gap Analysis	14
1.6 Institutional Issues	19
2 Green Mobility Vision	22
2.1 Introduction	22
2.2 Vision Statement	22
2.3 Goals and Objectives	22
2.4 Linkage with Other Plans	32
3 Indicative Investment Priorities	34
3.1 Overview	34
3.2 Responsibilities and Roles of Stakeholders	34
3.3 Indicative Investment Priorities	37
3.4 Green Mobility Network Spotlight	42
3.5 Priority Green Mobility Corridors	61
3.6 Pilot Projects	70
3.7 Priority Studies and Investigations	77
4 Institutional and Capacity Building	79
4.1 Introduction	79
4.2 Relevant Recent, On-Going, and Planned Institutional and Capacity Strengthening Efforts	79
4.3 Recommended Institutional and Capacity Building Enhancement Measures Recommended Institutional and Capacity Building Enhancement Measures	80
5 Financing Options	87
5.1 Overview and Costs for Indicative Investment Priorities – Phase 1	87

5.2	Potential Suitable Instruments	88
5.3	Exemplary Funding / Financing Schemes from Elsewhere and Application to Siem Reap	94
6	Key Success Factors Going Forward	96
6.1	Overall Success Factors	96
6.2	Institutional and Implementation Success Factors	98
7	Conclusion	100

Appendices

Appendix A

Public Investment Program 2022-2024

Appendix B

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

Appendix C

Potential Funding/Financing Instruments for Green Mobility and Case Studies

Appendix D

Motorbike Restrictions and Policies

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Abbreviations

Abbreviation	Definition
AAP	Angkor Archaeological Park
ADA	Agra Development Authority
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
APSARA	Authority for the Protection and Management of Angkor and the Region of Siem Reap
BAU	Business As Usual
BRT	Bus Rapid Transit
CCTV	Closed Circuit Television
CIF	Climate Investment Fund
CTF	Clean Technology Fund
DLMUPC	Department of Land Management Urban Planning and Construction
DPWT	Department of Public Works and Transport
DRD	Department of Rural Development
FCO	Foreign & Commonwealth Office
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GIS	Geographic Information System
GMI	Green Mobility Index
MLMUPC	Ministry of Land Management Urban Planning and Construction (MLMUPC)
MEF	Ministry of Economy and Finance
MOP	Ministry of Planning
MPWT	Ministry of Public Works and Transport
NMT	Non-Motorized Transport
NR	National Road
NSDP	National Strategic Development Plan
O&M	Operations and Maintenance
OUV	Outstanding Universal Value
PIP	Public Investment Plan
TTZ	Taj Trapezium Zone
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WHA	World Heritage Area

Context

Siem Reap City Profile

Siem Reap is a city in northwest Cambodia, with a population of around 245,000 (within an area of 442km²), and over 1.0 million residents in the province as of 2019 (within an area of 10,299km²).^{1,2} Siem Reap is the closest city to the UNESCO World Heritage Area (WHA) of Angkor, Cambodia’s main tourism hub. Since its 1992 UNESCO designation, the city has grown quickly over the last three decades, expanding past urban boundaries into the province of the same name, with growth area around the archaeological park, where available land exists. Siem Reap has rapidly urbanized (for instance from 2004-2017, the urbanized area grew by 160%), which is expected to continue. The 2035 Land Use Plan forecasts the population to grow by 50% or 2.5% annually to 440,000 with growth poles to the south and east/west (avoiding the WHA to the north).

Socio-Economic Context

Key socio-economic data are as follows:

- **Population Growth and Composition** – Siem Reap Province’s population has held relatively steady over the 2008-2019 period, with an average annual growth rate of 1.1%, versus the national average of 1.4%. The city itself has grown by a slower rate from 231,000 in 2008 to 245,000 in 2019 (or about 0.57% annual). Average household size in Siem Reap city is about 4.4 persons/household – on par with Phnom Penh Capital Municipality, but slightly lower than the national average of 4.6. The male-female ratio in the province in 2019 is 49.0% to 51.0%, which is slightly higher than the national average of 48.7% to 51.3%. Finally, the disabled population in the province comprises about 2.4% of the populace, compared to 0.8% in Phnom Penh and 2.0% nationally.
- **Poverty Conditions** – Compared to the province, Siem Reap City has a relatively lower poverty rate than the city, although this rate is still higher than that for Phnom Penh. Siem Reap Province ranked as the 8th poorest province in Cambodia out of 25 according to World Bank study (2017). Furthermore, this study notes that in 2014, 23.3% of the total population living below the national poverty line, significantly higher than the estimated national average of 18.8%.³

¹ The city of Siem Reap is synonymous with its official designation in the country as Siem Reap District or Krong Siem Reap (District Code 1710). Going forward, Siem Reap will refer to the city unless expressly noted or for clarity purposes.

² Source: General Population Census of the Kingdom of Cambodia 2019 – Final Census Results, National Institute of Statistics, Ministry of Planning (MOP), 2020.

³ Source: Cambodia Climbing Up the Manufacturing Value Chains, World Bank, October 2017 (Source: <http://documents1.worldbank.org/curated/en/628341511277852360/pdf/121519-WP-PUBLIC-NOV21-7PM-October-2017-Cambodia-Economic-Update-Final.pdf>).

- **Average per Capita Income^{4,5}** – The average disposable income per capita in Siem Reap is estimated at around 578,000 Riel (or around US\$140 from 2019 – but averaged among urban cities besides Phnom Penh). This is about 10% higher than the national average of 523,000 riel (or US\$125) per capita, but about 40% lower than that of Phnom Penh at 903,000 riel (or US\$220) per capita.

Tourism Context

Tourism is an important revenue generator for Cambodia’s national economy – in 2019, tourism was estimated to contribute more than 12% of national GDP, generate more than US\$4.9 billion in revenue and create 630,000 direct jobs. Siem Reap is the major tourism cog in the nation – generating some US\$1.2 billion revenue from tourism and creating some 248,000 jobs – with development in the city over the last two decades driven and shaped by tourism.⁶ There are 234 hotels and 310 guesthouses in the province as of 2019, with thousands of people employed by accommodation providers, as tour guides and as taxi and tuk-tuk drivers.⁷ The City is served by an international airport, which opened in 2006, transporting nearly 4.0 million travelers (two-way) in 2019, with direct flights to eight countries and domestic flights to Phnom Penh and Sihanoukville, with a new airport under construction due to open in 2023⁸. **Figure A** shows the composition of international arrivals to Cambodia and Siem Reap, with total visitors topping 6.5 million to Cambodia in 2019, with about one-third of these heading to Siem Reap.

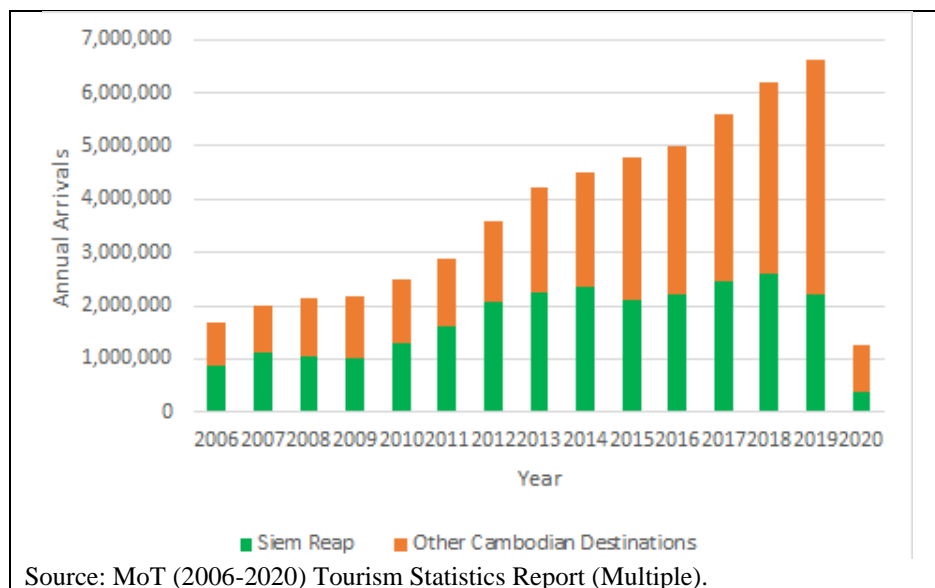


Figure A: International Visitors to Siem Reap Against Other Destinations in Cambodia

⁴ Source: https://www.nis.gov.kh/nis/CSSES/Final%20Report%20of%20Cambodia%20Socio-Economic%20Survey%202019-20_EN.pdf

⁵ Based on average of US\$1.00 = ~4,100 riel (as per end of December 2019 from <http://www.oanda.com>).

⁶ Source: <https://www.khmertimeskh.com/50955890/government-officially-launches-the-siem-reap-tourism-master-plan/>

⁷ Source: Statistical Yearbook of Cambodia 2021 (<https://www.nis.gov.kh/nis/yearbooks/StatisticalYearbookofCambodia2021.pdf>)

⁸ Source: VINCI Airport Annual Reports (<https://www.vinci-airports.com/>)

A large number of domestic tourists also visit Siem Reap, reflecting both the growth of leisure tourism in the country and the significance of Angkor for the people of Cambodia. **Figure B** shows the breakdown of international and domestic visitors to Siem Reap between 2010-2019, with international share about 40%-50% of the total depending on the year. In 2019, international visitors accounted for about 51.7% of the total.

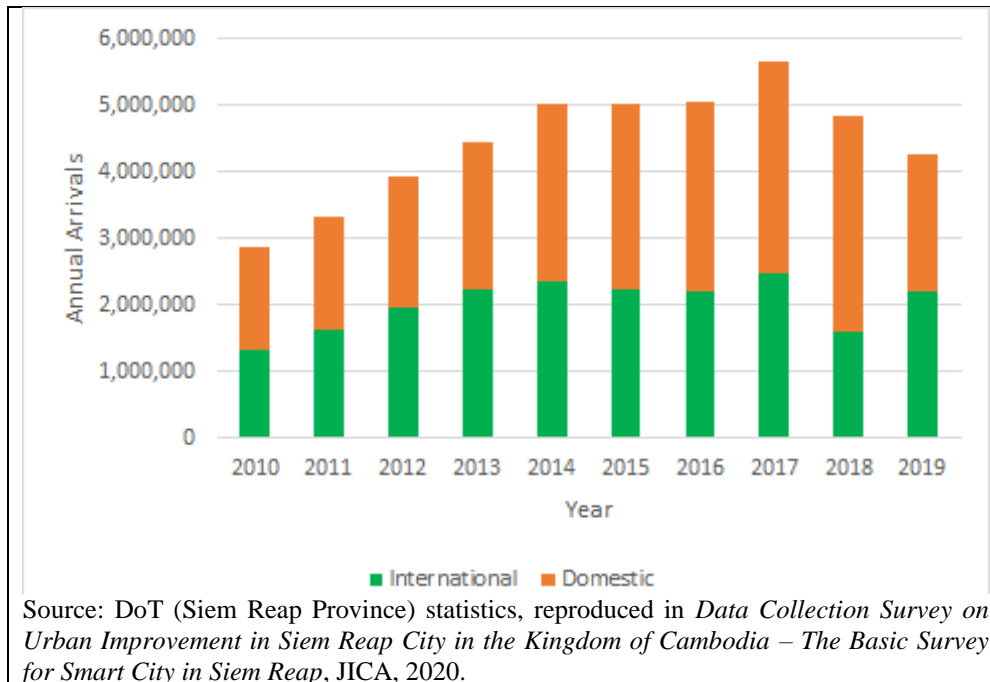


Figure B: Domestic and International Arrivals in Siem Reap

Angkor remains a popular international tourist destination with 2.2 million visitors in 2019, although this represents a decline of 15% from the 2.6 million visitors registered in 2018.⁹ The 2035 Tourism Development Master Plan envisions tourism visitors growing to 10.9 million domestic and 7.5 million international visitors to Siem Reap Province by 2035, creating 940,000 jobs (in 2019, 4.0 million domestic and international visitors were registered). A second airport and a new satellite city called Grand Siem Reap is being built around 50km to the east, elongating trip lengths.

The added local and visitor demand may place greater strains on the existing transport system and the environment, and potentially exacerbate the issues above.

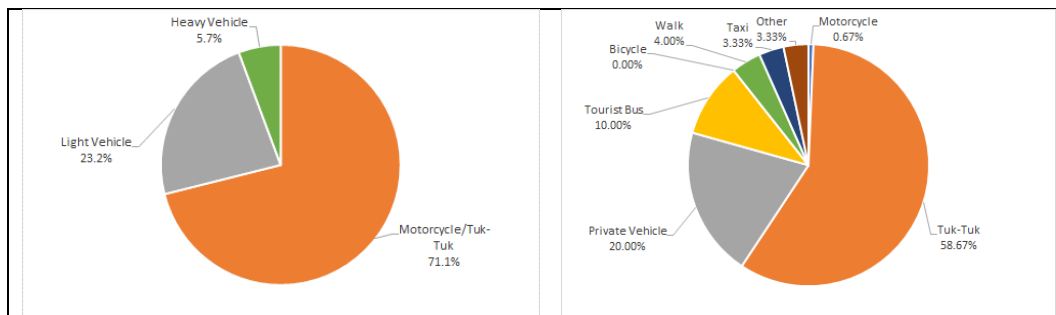
Transport Context

Various modes of transport are observed and used in Siem Reap. This ranges from walking, cycling, to motorized means such as motorbikes, tuk-tuks (with or without trailers – also known as remorques), taxis, sedans, minivans/minibuses, as well as tourist and long-distance buses, etc.

Key mode share findings are as follows:

⁹ Source: 2019 Statistics, Angkor Enterprises (<http://www.angkorenterprise.gov.kh/annual-news/2020/7/statistic>).

- A 2018 Korean green transport study estimated the 2016 mechanized mode share as 71.1% two-wheelers and tuk-tuks with the remainder being light vehicles (23.2%) and heavy vehicles (5.7%).^{10,11} In terms of split between two-wheelers and tuk-tuk, it is estimated that 79% of households in the country (as of 2017) own at least one motorbike – thus for local residents, it is presumed that motorbikes dominate over tuk-tuk for trip-making.¹²
- The same 2018 Korean Study surveyed 150 tourists on predominant mode used when in Siem Reap. Nearly 60% used tuk-tuks as the primary mode, followed by private vehicles (including sedans and rental cars). Walk was about 4%, while no tourists cited cycling as their primary travel mode.



Source: Green Urban Transport & Road Network Improvement Master Plan in Siem Reap, Cambodia – Volume I: Green Urban Transport & Road Network, Korea Ministry of Land, Infrastructure & Transport (MoLIT), 2018.

Note: Study did not specify what vehicles constitute “private vehicles” – but assumed to be sedans and rental cars. “Other” is also not specified.

Figure C: Estimated 2016 Mechanized Mode Share

Figure D: 2018 Tourist Mode Share Survey Results (n=150)

- A 2020 journal article on Angkor visitors found that in 2018, more than 75% of the 292 respondents used a tuk-tuk as their primary transportation mode. Some 28% of visitors used a car, taxi, or van during their stay, while 10% used tourist coaches (with 45 seats) and 8% used minibuses with 24 seats, respectively. Motorbike and bicycle were the least used mode at 5.2% and 5.5%.¹³

Two and three-wheel motorized vehicles (i.e., motorbikes or tuk-tuks) represent the predominant travel mode in Siem Reap. Motorbikes dominate for local resident trip-making, while tuk-tuks dominate for tourist travel, followed by tourist coaches and minivans. Two- and three-wheel vehicles, contribute to congestion, emission, and road safety issues in Siem Reap and the WHA.

¹⁰ Source: Green Urban Transport & Road Network Improvement Master Plan in Siem Reap, Cambodia – Volume I: Green Urban Transport & Road Network, Korea Ministry of Land, Infrastructure & Transport (MoLIT), 2018.

¹¹ The study did not detail the specific types of vehicles included as a “light vehicle” or a “heavy vehicle”.

¹² Source: Cambodia Socio-Economic Survey, National Institute of Statistics, Ministry of Planning, 2018 (<https://www.nis.gov.kh/nis/CSES/Final%20Report%20CSES%202017.pdf>).

¹³ Source: Green CG, Gonzales E, Sawyer D, Smith EB, Cypriano A, Rivera MU (2020) Understanding the Visitor Experience: A Focus on Angkor Temples of Cambodia. J Tourism Hospitality 9:439. doi: 10.35248/2167-0269.20.9.439

Increasing Mobility Challenges

Against this backdrop, Siem Reap 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, Siem Reap must preserve its unique and intrinsic heritage that attracts visitors and is the lifeblood for Siem Reap – its UNESCO World Heritage Area (WHA) sites.

Critical challenges for Siem Reap include:

- **Current Infrastructure Less Friendly for Green Mobility** - Every trip includes walking. While there has been significant improvement on walkability recently in the central parts of the city, more work needs to be done at the network level. The walk environment is perceived as insufficient, unsafe, and uncomfortable due to limited provision of paved and segregated sidewalks, as well as discontinuities in the walk network.
- **Limited Mobility Options Encourages Motorbikes and Driving** – Motorbikes are the principal means of travel for most residents in Siem Reap, where it comprises over 70% of motorized trips.¹⁴ Siem Reap lacks alternate mobility options, which encourages motorbikes and driving. New bike lanes have been built or planned, but do not form an extensive network. No public transport operates in the city.
- **Limited Access-for-All Amenities** –About 2.4% of the population is considered disabled (i.e., visually, hearing, or mobility impaired) based on a 2013 census.¹⁵ Many sidewalks have obstructions including trees and parked vehicles that create difficulties for disabled. Some 13 junctions have installed accessibility ramps to facilitate crossings for disabled and other disadvantaged groups, while the same number of junctions have traffic signals. No tactile pavement is installed. The lack of safe access-for-all amenities makes crossing the street and walking in Siem Reap more difficult, inconvenient, and dangerous for all types of users.
- **Emissions and Air Quality Issues from Transport** – The WHA is located outside of Siem Reap, but emissions and air quality issues generated by transport do not respect these boundaries. Local authorities cite acid rain as a threat to the WHA. Poor air quality can impact the tourist experience.
- **Mobility and Congestion Issues around Key Locations and Heritage Sites Threaten Attractiveness of Siem Reap** - Congestion is a key issue along NR6, the main east-west corridor through the city, at the tourist area around Pub Street, and at the WHA sites themselves. Illegal parking on

¹⁴ Source: Green Urban Transport & Road Network Improvement Master Plan in Siem Reap, Cambodia – Volume I: Green Urban Transport & Road Network, Korea Ministry of Land, Infrastructure & Transport (MoLIT), 2018.

¹⁵ Source: Cambodia Inter-Censal Population Survey 2013, Analysis of CIPS Results Report 5 – Disability, National Institute of Statistics, Ministry of Planning, 2013 (source: <https://www.stat.go.jp/info/meetings/cambodia/pdf/c13ana05.pdf>).

sidewalks and streets is a key issue. These issues can also reduce productivity, safety, and the visitor experience.

- **Significant Population and Tourism Growth Expected, Translating into Higher Demand for Travel and Strains on the Transport System** – Current mobility issues may be magnified due to planned growth and development if business as usual (BAU) travel patterns persist. A significant increase in population and jobs is forecast. A new airport and city are planned to the east. Declines in tourism experienced in 2018-2019 are forecast to be reserved, with significant increases in tourism forecast due to targeted tourism/infrastructure development.

As tourism is the lifeblood of Siem Reap and important contributor to the economy, addressing these mobility issues is paramount to allowing Siem Reap 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 Siem Reap, 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 Siem Reap:

- **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 and builds popular support for these initiatives.
- **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 strategies common to green mobility friendly cities.

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. Siem Reap scores a 29 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). Siem Reap 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.

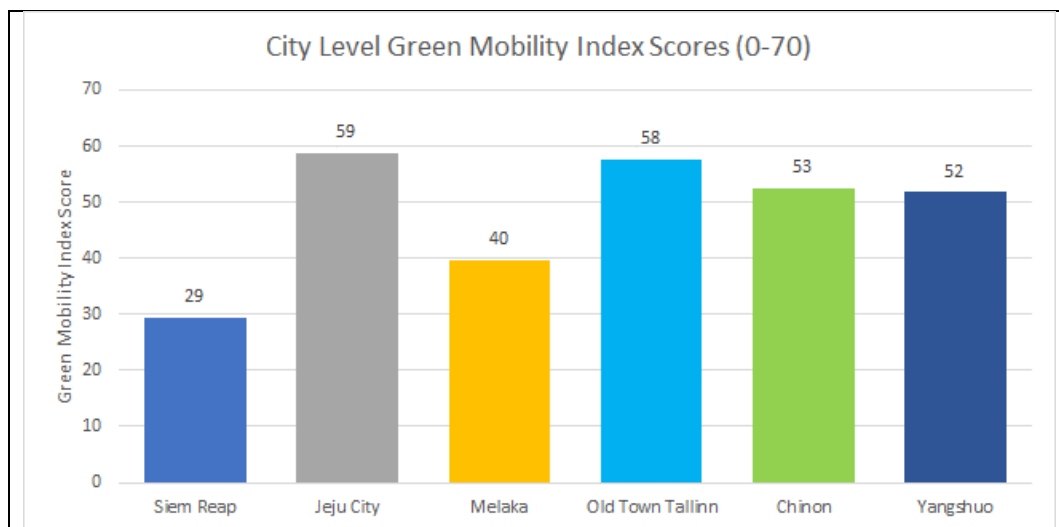


Figure E: City Level Green Mobility Index Scores

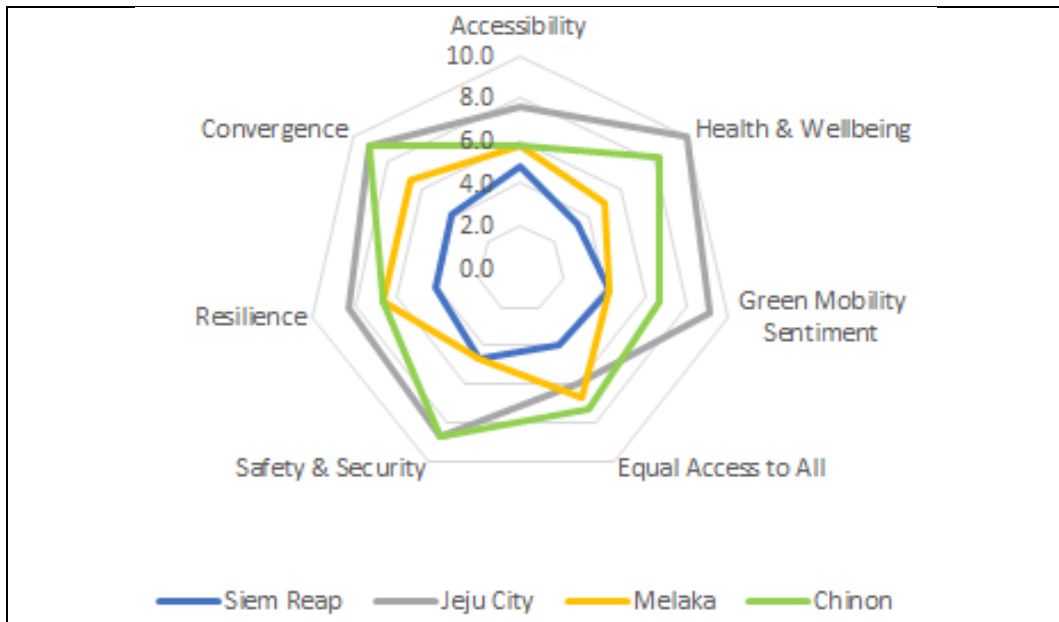


Figure F: Overall City Level Scores by City

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 G: 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 Siem Reap are for green mobility (with dark green representing the most conducive segments, while red represents the least conducive segments). As the maps show, the **city center around Pub Street and the tourist area is most conducive to green mobility (yellow and green)**, whereas clear gaps exist outside of this area evident by the predominate orange shading.

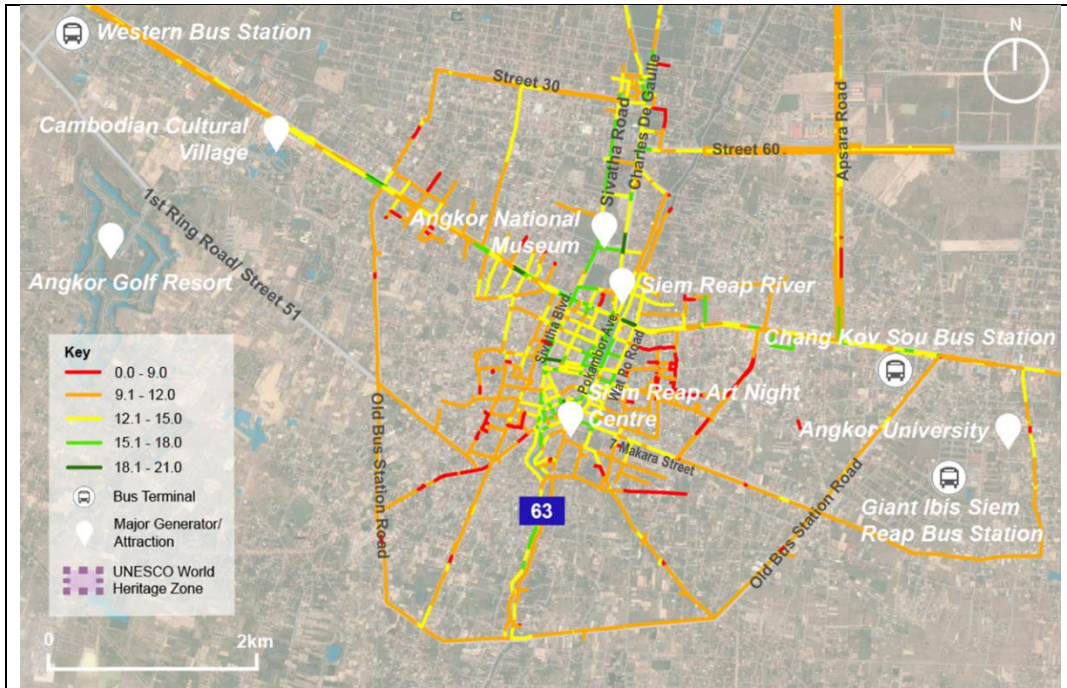


Figure H: Composite Street-Level Index Score (City Center)

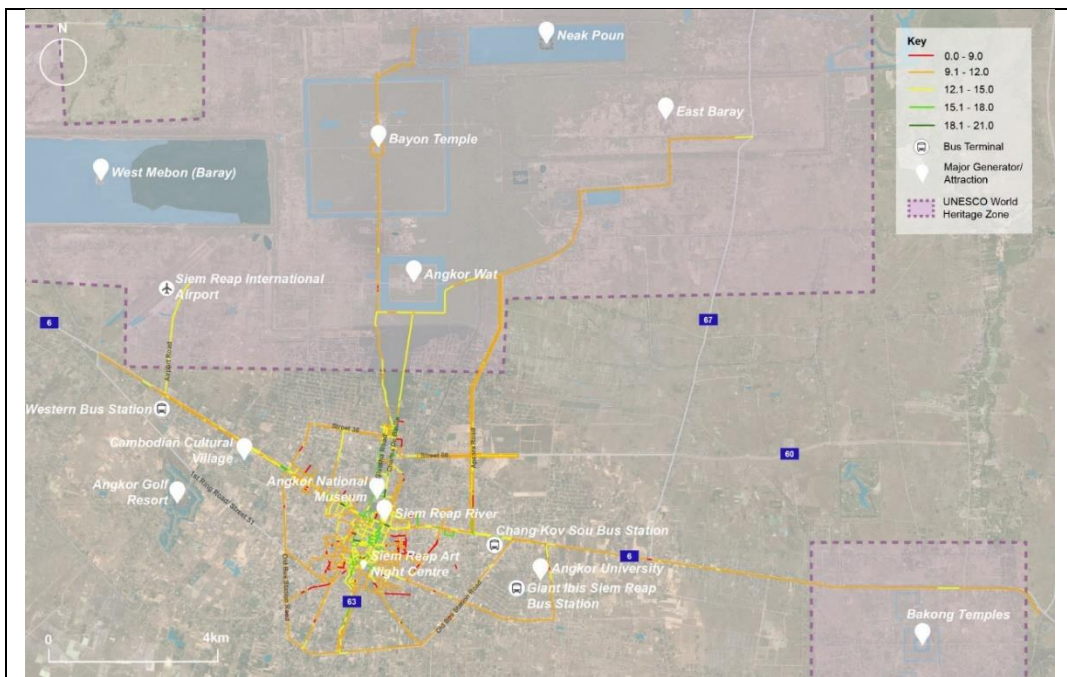


Figure I: Composite Street-Level Index Score (Study Area)

Forward Look

Siem Reap 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 green mobility including active mobility and public transport.

The proposed Green Mobility vision and plan builds upon these efforts by laying the strategy, vision, and actions that may help shepherd Siem Reap towards achieving a more green and sustainable transport system. Key conclusions of this study include the following:

- **Green Mobility Vision Built on “Integration”** – Integration of modes as well as integration horizontally and vertically in terms of multiple inter-linked strategies/ objectives helps to move green mobility forward instead of separate actions.
- **Indicative Investment Priorities Consist of Approximately US\$220.3 Million of Activities over the Next Ten Years** – The Indicative Investment Priorities are delineated into two phases: (i) Phase 1 (1-7 years) at US\$123.4 million; and (ii) Phase 2 (8-10 years) at US\$96.9 million.
- **New Electric Public Transport System to Be Showcase** – The 8-route electric bus system may be a showcase and provide higher capacity service with a comfortable, clean mode within the city and to/from WHA.
- **Extensive Cycle and Walk Networks Leverage On-Going Road and River Improvement Projects** - The US\$150 million, 38-road improvement project and the Siem Reap River Rehabilitation Project are on-going and financed by Government. It would be remiss if these projects were not leveraged in the greater active mobility system. Thus, active mobility links directly to these corridors to create a more extensive network. Of note, the proposed interventions are within the existing rights of way, thus expected impact is minimal on land acquisition.
- **Road Enhancements Further Improve All-Weather Network and Facilities Green Mobility** – Some 65.0km of improvements are proposed beyond the ongoing US\$150.0 million 38-road improvement project. These roads focus on filling the gaps and creating an all-weather network.
- **Two Priority Green Mobility Corridors Highlighted to Serve as Foundations for this Transformation** – The NR6 and the Sivutha Blvd. corridors are identified as priority corridors for green mobility. These transformations include wider sidewalks with pleasant trees/lighting and street furniture, crossing enhancements include signalized junctions and new mid-block crossings, as well as bike lanes (dedicated and shared), bike parking and bike share, and finally public transport amenities. The total

expected magnitude costs of these (US\$17.0 million for NR6 and US\$1.8 million for Sivutha Blvd.) align with the 2022-2024 PIP.

- Four Pilot Projects Identified and Can Be Steppingstone for Wider Implementation** – A pilot scheme is proposed to fully pedestrianize Pub Street at certain times of the day (i.e., banning vehicles completely), then adopting a “slow zone” around the area and on Wat Bo Road as a means of “slowing traffic”. Adoption of a parking management zone would allow for innovative schemes to reduce sidewalk parking and improve enforcement and parking management – while off-street parking facilities can create a more orderly parking environment in the city center. Another pilot scheme is proposed focusing on remote parking and buggy system for Angkor Wat to reduce vehicle and visitor pressures on the sites.
- Suite of Institutional Strengthening and Financing/Funding Initiatives Identified to Create Enabling Environment for Green Mobility** – A variety of institutional and capacity building activities are proposed 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 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 for green mobility, as well as creating an encouraging environment for private sector involvement.

The risks of doing nothing and continuing the status quo are considerable and threaten the livelihoods of residents of Siem Reap 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 Siem Reap. 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 Siem Reap 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 Siem Reap, 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 Siem Reap 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 Siem Reap, focusing principally on the city center. The Siem Reap River bisects the city in the north-south direction, while National Road 6 (NR6) bisects it in the east-west direction.

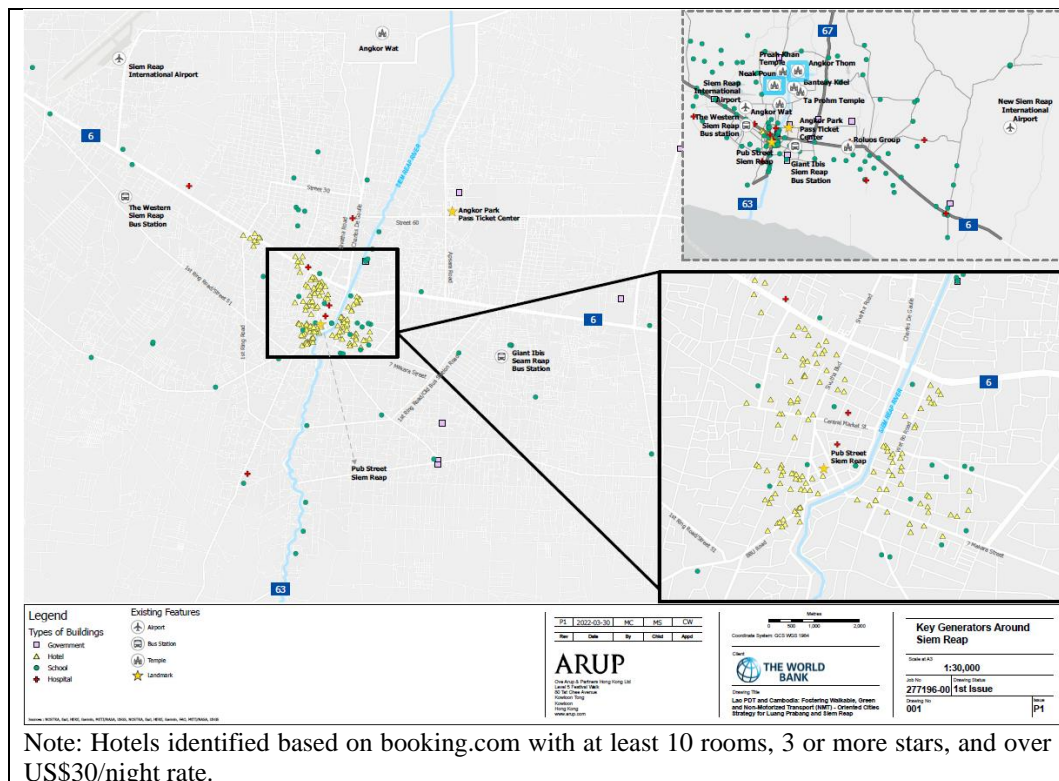


Figure 1.1: Key Generators Around Siem Reap

Key generators include the following:

- The city center includes clusters of hotels surrounding the principal tourist area (i.e., Pub Street Area), which is bounded by NR6 to the north, the Siem Reap River to the east, and Sivutha Blvd. on the west.
- Historic monuments, hotels, schools, and government buildings are also concentrated in this area.

- The Angkor Archaeological Park is located directly north of the city including Angkor Wat and Angkor Thom – this is the major tourism attraction in the region.
- Schools and hospitals are dispersed across the city, while key government buildings (i.e., Siem Reap Provincial Hall) are located along Street 60 and Apsara Road.
- In terms of transport hubs, long-distance bus terminals are located on the outskirts of the city near NR6. The city is currently served by a single airport, Siem Reap International Airport located in the west. A second airport for Siem Reap, Siem Reap Angkor International Airport, is currently under construction about 50km 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 Siem Reap. For instance, inbound air arrivals declined by 84% from 2019 to 2020.¹⁶ Angkor visitors declined from 2.2 million in 2019 to 400,000 in 2020 (a decline of over 80%). Lastly, Google COVID-19 Community Mobility Reports for Cambodia show declines in all types of trip-making in the country. Cambodia has officially reopened the border (including Siem Reap) for vaccinated tourists to safely promote its tourism sector in March 2022.¹⁷

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. Two sets of data were reviewed for Siem Reap to assess mobility and travel patterns:

- **Mobile Device Location Data** – Anonymized geo-location data from mobile devices was obtained for Siem Reap from January to April 2019, a four-month period including the Lunar New Year and visitor high season.¹⁸ 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

¹⁶ Source: VINCI Airport Annual Reports (<https://www.vinci-airports.com/>).

¹⁷ Source: Announcement “Cambodia is a Safe and Warm Tourism Destination”, Royal Government of Cambodia, 2022 (<https://www.mfaic.gov.kh/covid-19>)

¹⁸ The data set contains around 115,000 unique IDs for Siem Reap, including surrounding areas (equating to about 8-10% of the entire provincial population of over 1.0 million), as well as over 15,000 “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 2% of all international air arrivals over this period, about 750,000). 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.

country code, which can be used to differentiate between local residents (i.e., those living in Siem Reap) and those visiting Siem Reap 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 the highest density of pings is centered on Siem Reap, including the city center, Angkor Wat to the north, and Airport to the west.

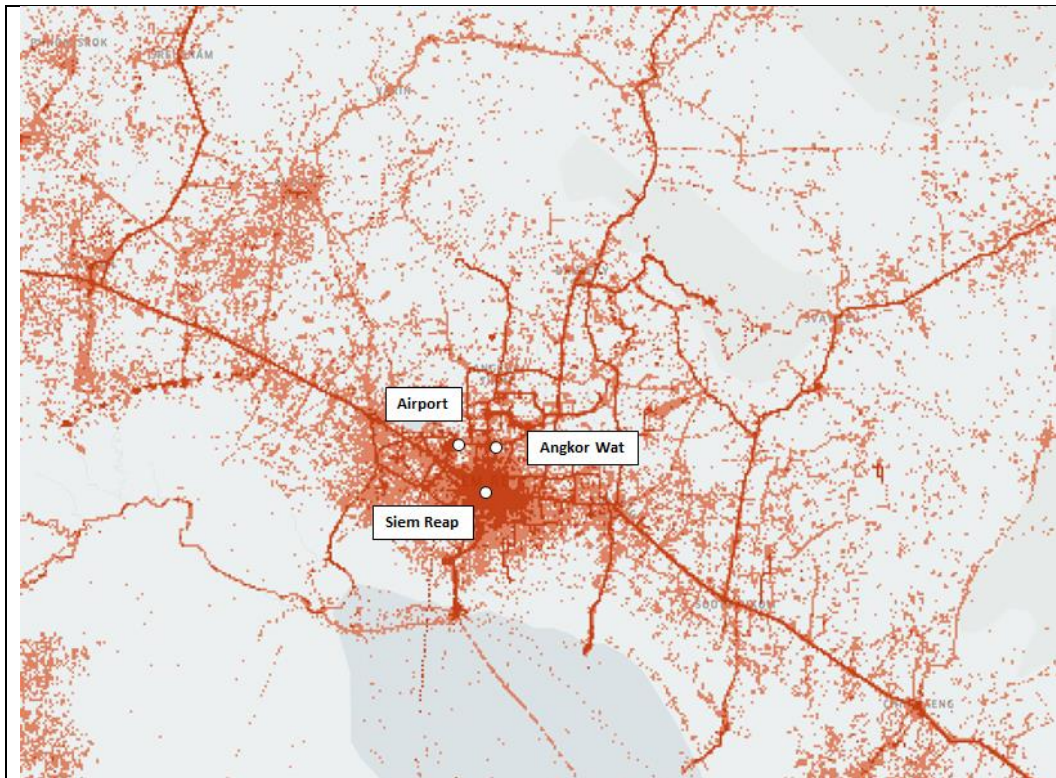


Figure 1.2: Snapshot of Cumulative Detections around Siem Reap Showing High Activity around the City Center, Angkor Wat and Airport (January-April 2019)

- On-Demand Vehicle Data** – Anonymized on-demand vehicle data for hired/shared taxis were obtained for the entire 2019 year. This data set provides more certainty on the mode (i.e., vehicle) and origin/destination, than that from the mobile devices, but is less granular as location data is provided within 1km hexagons (instead of specific location). Total trips taken were not provided due to confidentiality, however, general findings can be made based on relative or proportional volumes.

Key insights from the two sets of data are as follows:

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 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 1.68km, while average is 3.99km. For those trips over 1km, the average length is 6.23km.

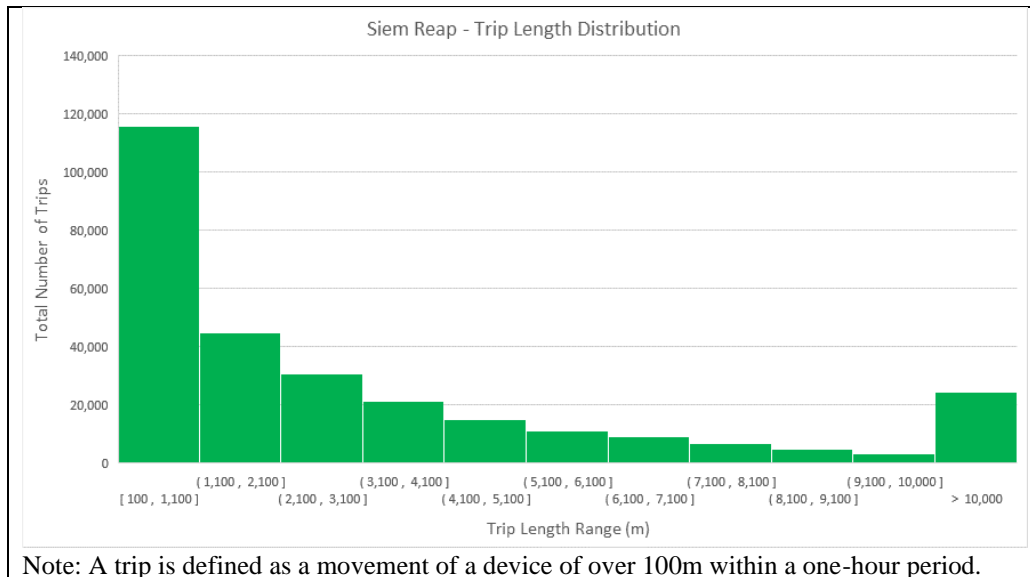


Figure 1.3: Trip Length Distribution (by Meters)

Origin/Destination and Trip Chaining Insight

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.

Short-Distance Trips (under 1.0km)

Most short-distance trips (1.0km or under) are observed in the city center (this is further discussed in the district analysis below).

However, the shared taxi origin/destination data in **Figure 1.4** shows that the majority of short-distance trips are concentrated within the city center and Pub Street area. Given that these trips are only 1.0km or less, walking, and active mobility could potentially capture these trips - if the network is enhanced and made more continuous, comfortable, safe, and secure.



Figure 1.4: Short-Distance Trips (under 1km) on Shared Taxi

Medium-Distance Trips (1.0-5.0km)

Figure 1.5 shows medium-distance trips (1-5km) to/from the city center (these trips were chosen due to high density of pings as shown in **Figure 1.5**). These trips are not assigned to the road network but represent the origin-destination of trips. Trips are evident east-west along NR6, as well as surrounding areas to the Pub Street / city center area. Trips along some key arterials such as BBU Street and 7 Makara, as well as Sivatha Blvd. and Charles de Gaulle are visible.

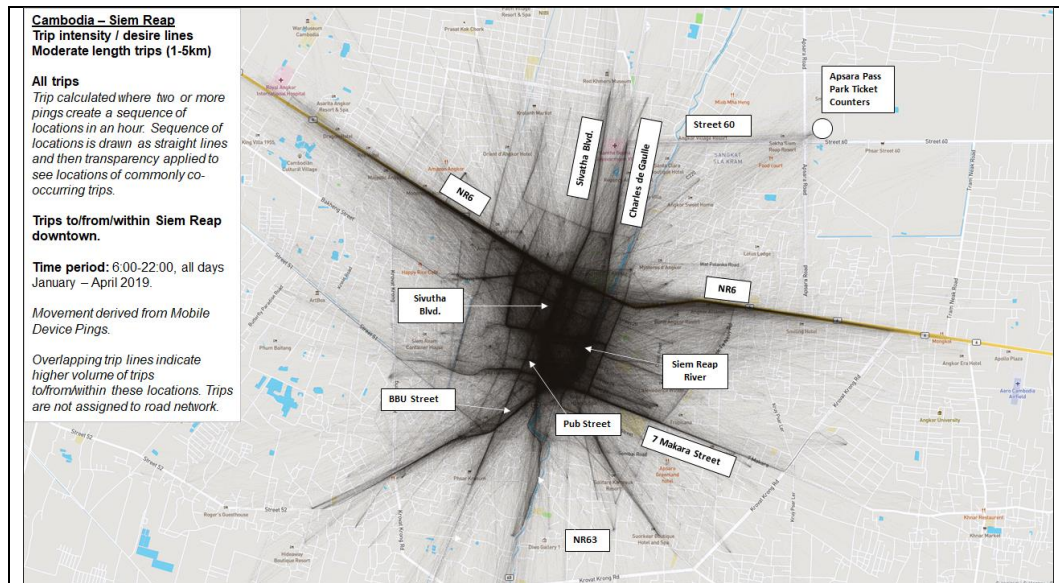


Figure 1.5: Trip Intensity for Medium-Distance Trips (to/from the City Center)

Shared taxi demand data in **Figure 1.6** show that medium-distance trips are concentrated around the city center, which aligns with the mobile phone travel data. 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.

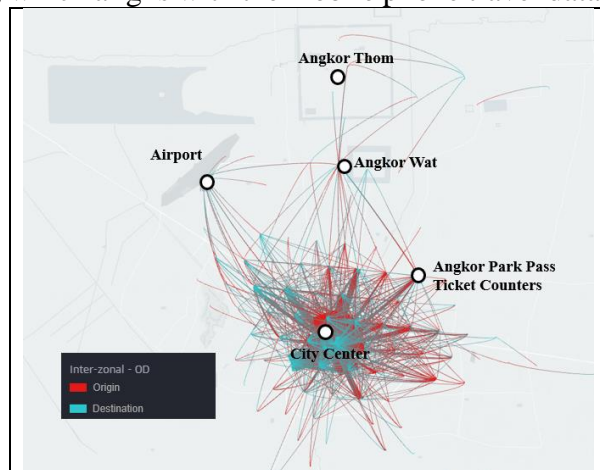


Figure 1.6: Medium-Distance Trips (1-5km) on Shared Taxi

All Trips (Regardless of Distance)

Figure 1.7 and **Figure 1.8** show all trips detected to/from specific locations around the city center and WHA. The red lines represent trips to/from the Airport, orange represents those to/from Angkor Wat, black represents those to/from the city center (and Pub Street), and blue represents those to/from the Roluos Group. Desire lines are not assigned to the road network. Key findings include:

- **Trips to/from Airport** - A strong desire line is apparent between the Airport and the city center shown by the heavy red, which coincides with visitor accommodations in this area.
- **City Center** - Shorter-distance desire lines are apparent into/out of the city center on key radials away from the Pub Street area include
- **Trips to/from Angkor Wat** – Desire lines show the linkage between the city center (where many tourists reside), the Angkor Park Pass Ticket Center

at the corner of Street 60 and Apsara Road, and Angkor Wat (the main entrance to the west). From Angkor Wat, most visitors then chain their visit to Angkor Thom as well, with a lower volume heading to Banteay Koei. Another key north-south corridor is Sivatha Blvd., which parallels Charles de Gaulle to the east.

- **Trips to/from the Roluos Group** – Trips to/from the Roluos Group and the city center are less intense than the other movements, which makes sense as this is a less visited attraction.

Results suggest that:

- Longer-distance origin/destination patterns could be potential routes for a public transport system (i.e., to/from the Airport and city center, city center and the WHA sites, etc.) and the target corridors (along key roads such as NR6, Charles de Gaulle, and key roads in the city center).
- Radials with heavy medium-distance travel may be attractive for public transport as well as cycle priority corridors (as noted, Charles de Gaulle and the Siem Reap River are implementing cycle and shared path improvements), which is also shown by the medium-distance trip intensity.

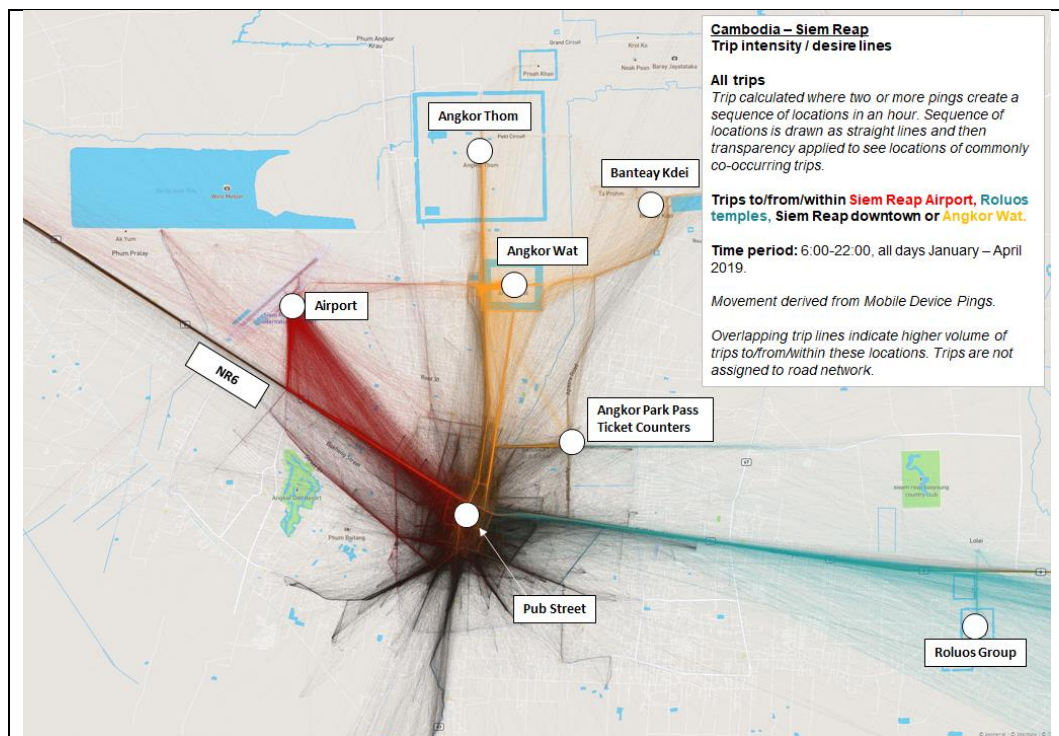


Figure 1.7: Major Origins/Destinations – All Trips (Study Area)

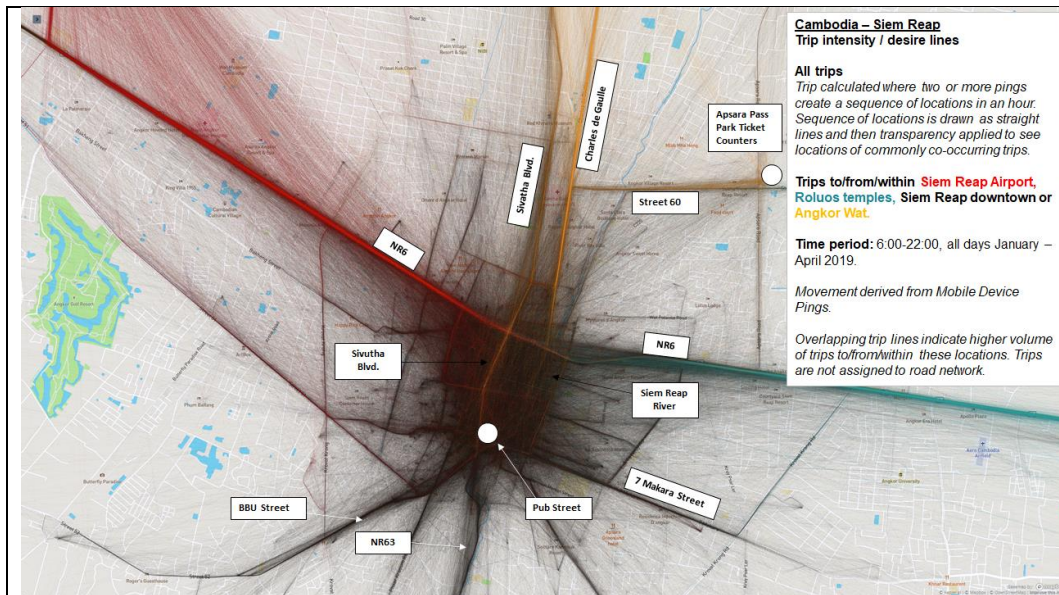


Figure 1.8: Major Origins/Destinations – All Trips (City Center)

The figure below shows all trips to/from the city center by visitors (left) and residents (right). The visitor trips show higher demand along Sivutha Blvd. and around Pub Street. The resident trips show more intense and extended demand along key arterials such as BBU Street to the southwest, NR63 to the south, and 7 Makara Street to the east. Additionally, these trips are slight longer – thus bike or public transport networks must reach beyond the tourism area to serve the local residents.

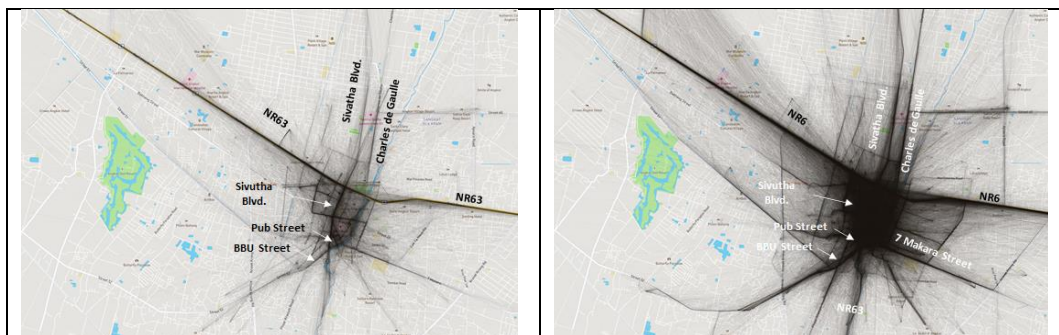


Figure 1.9: All Trips to/from City Center (Visitor (Left) vs. Resident (Right))

Long-distance shared taxi trips (6km or longer) are also shown in the graphics below for the 6:00AM-9:00AM and the 5:00-8:00PM periods (with thicker lines representing a larger magnitude of trips, and colors representing average speed in km/hour with green showing faster trips). The figures reinforce the strong linkage between the Airport and city center. They also illustrate relatively slower travel conditions within the city center, as shown by the orange and red colors. Similar to the mobile data patterns, Angkor Wat appears as a strong trip origin/destination as well especially in the morning, as does the Angkor Park Pass Ticket Center. Trip speeds are slowest on the eastern approaches to the city center and in the city center area, as exhibited by the yellow and orange areas to the east.



Figure 1.10: Long-Distance Trips (5+km) on Shared Taxi by Speed (6:00AM-9:00AM on Left & 5:00PM-8:00PM on Right)

Strong linkage between the Airport and city center, as well as the city center and Angkor Wat (with linkage to Angkor Thom and Banteay Koei) could be potential routes for public transport. Also, slower travel speeds in the city center and the eastern approach (likely on NR6) may suggest potential sections for public transport priority (as well as priority for active modes).

District Activity Insights

Resident & Visitor Detections

The mobile data analyses and previous studies identified the city center, focused on Pub Street as a hub of activity in the day, but also at night when the Pub Street is closed and pedestrianized. This area has been proposed for pedestrianization by other studies.

The following graphics show the device pings detected within the AM (6:00AM-11:00AM) and the PM (6:00PM-11:00PM), overlaid on top of the street-level index maps from TR1A, 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 higher activity along NR6 between Wat Bo Road and west of Sivutha Blvd., as well as on Sivutha Blvd., south of NR6. Pockets of activity are also visible in east-west streets perpendicular to Sivutha Blvd., which include tourist accommodations. The dashed purple zone delineates the highest activity area in the map. Denser detections are evident on poorly performing streets such as west of Sivutha Blvd. (north of Achamean Street), Sok San Road, west of the Angkor Night Market Street, and on BBU Street. NR6 also has relatively dense detections along its east-west alignment.

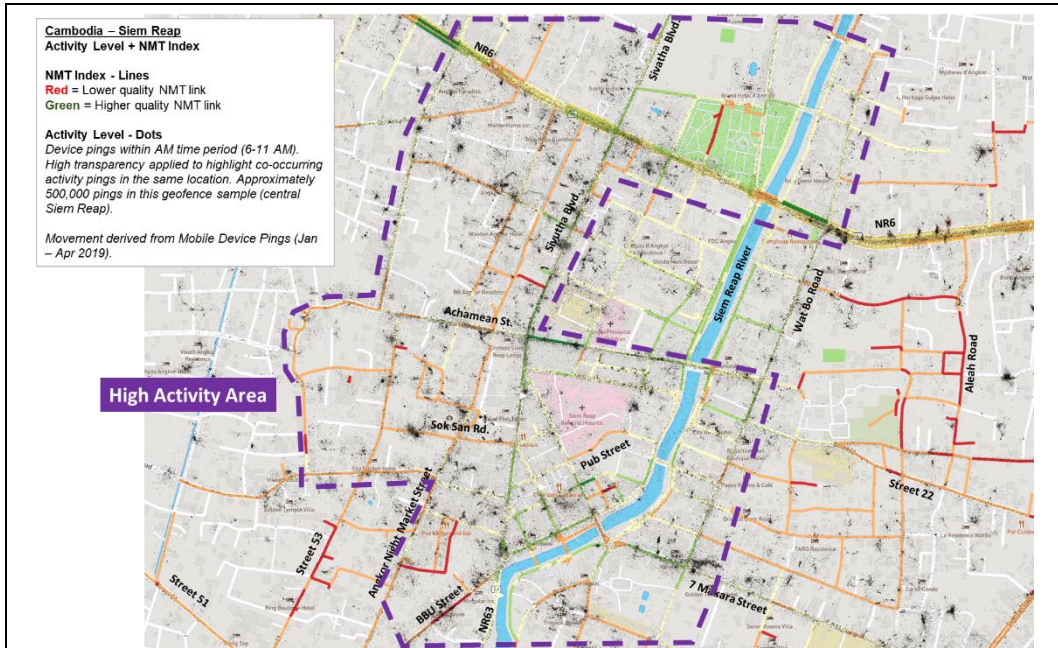


Figure 1.11: District Activity vs. Street-Level Index (City Center – 6:00-11:00AM)

The PM period ping detections show much denser activity throughout the dashed purple zone, with significantly higher detections on streets paralleling Sivutha Blvd. and Pub Street (at this time closed to vehicular traffic with busy restaurants and entertainment establishments). Similar to the AM period, denser detections are evident on several streets/areas with relatively poor street-level performance including west of Sivutha Blvd. (such as Achamean St. and Sok San Road). More dense detections are also evident east of the Siem Reap River, bounded by Wat Bo Road to the east.

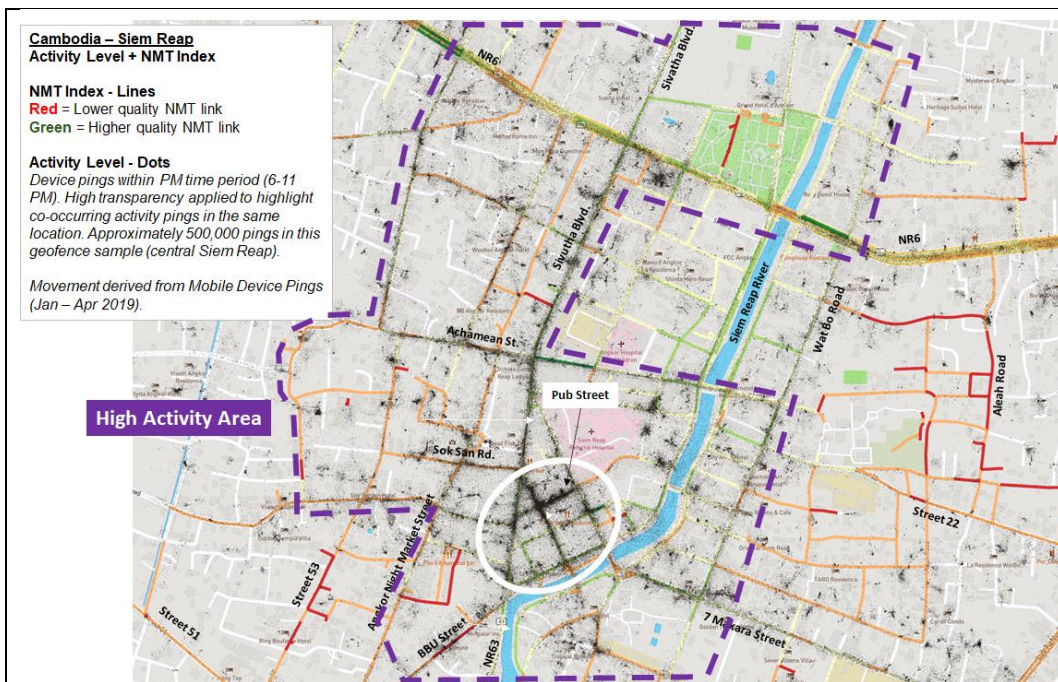


Figure 1.12: District Activity vs. Street-Level Index (City Center – 6:00-11:00PM)

Visitor Detections

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 1.13** show that the prevalent patterns shown in **Figure 1.12** also occur for visitors, with concentrations along Pub Street the most dense, followed by relatively dense detections along Sivutha Blvd., as well as some of the alleys/roads radiating from Sivutha Blvd. (scoring poorly in the street-level index as indicated by orange shading, representing low-moderate performance).

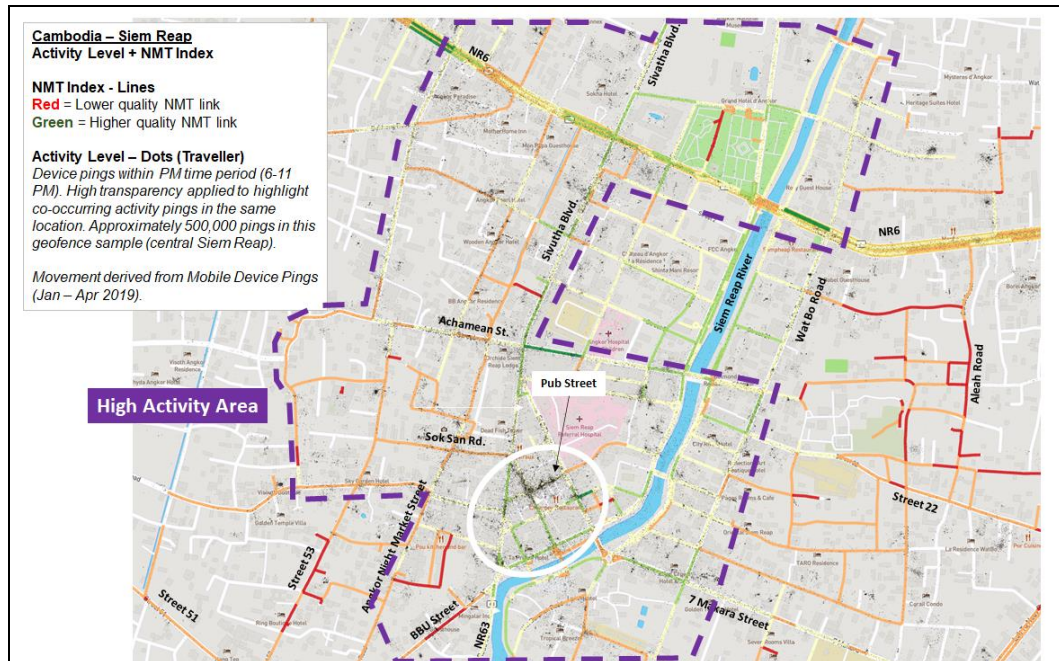


Figure 1.13: District Activity for Visitors Only vs. Street-Level Index (City Center – 6:00PM-11:00PM)

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 may suggest that 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 Pub Street area on Sivutha Blvd. (including Sok San Road) suggest targeting this area for improvement measures to better manage/regulate loading/unloading for the Pub Street.

Temporal Insights

Figure 1.14 shows detections by arrival hour at sites around the city and WHA (both visitors and local residents). Angkor Wat is visited early in the morning – with 5:00-7:00AM representing the peak. Angkor Thom, likely the second destination on trips to the WHA after Angkor Wat, follows with a peak at around 9:00-11:00AM, with a slightly lower magnitude of trips. Banteay Srei and Roluos Group exhibit similar magnitudes in overall detections, but different arrival patterns, with the former have a peak at 9:00-11:00AM, with the latter having an afternoon peak 3:00PM, but more sustained detections during throughout the day. Pub Street has relatively sustained detections in the mid-day, but experiences a rapid increase starting at 6:00PM lasting until 11:00PM, coinciding with the closure of the street to vehicles. The airport has relatively sustained demand throughout the day starting at around 7:00AM until 10PM, with peaks in the evening.

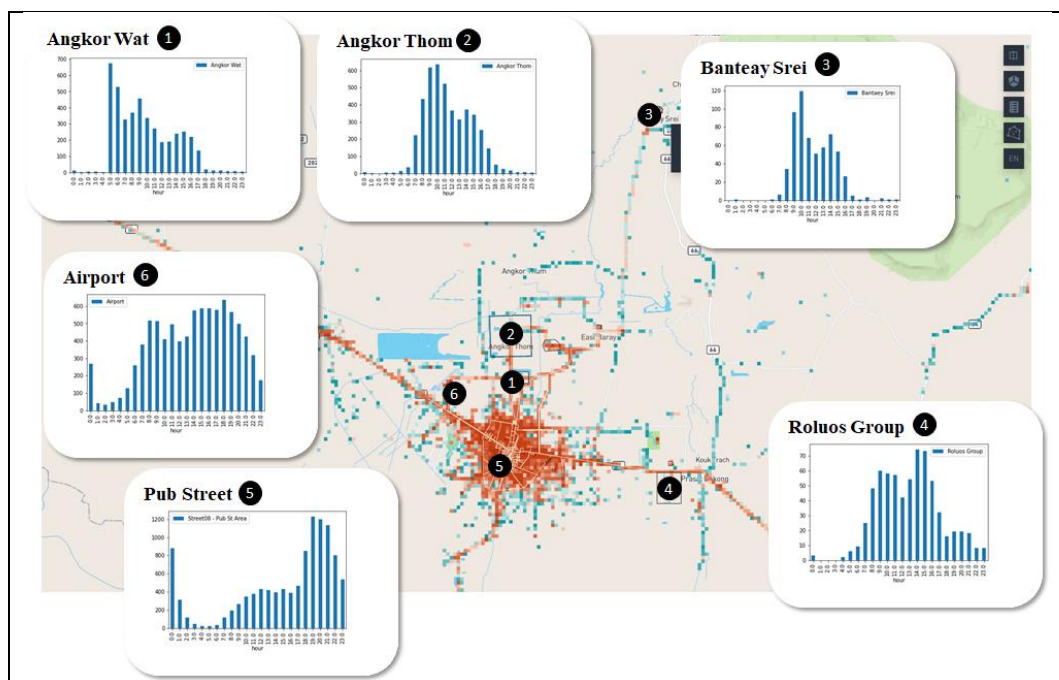


Figure 1.14: Volume of Detections by Arrival Times at Various Locations

Figure 1.15 shows relative share of shared taxi trips throughout the day – with a significant peak at 4:00AM-6:00AM, when visitors request service to Angkor Wat to experience the sunrise. These arrival pattern snapshots provide insight on potential operations for a public transport system, including service span (i.e., operating hours) and peak vehicles.

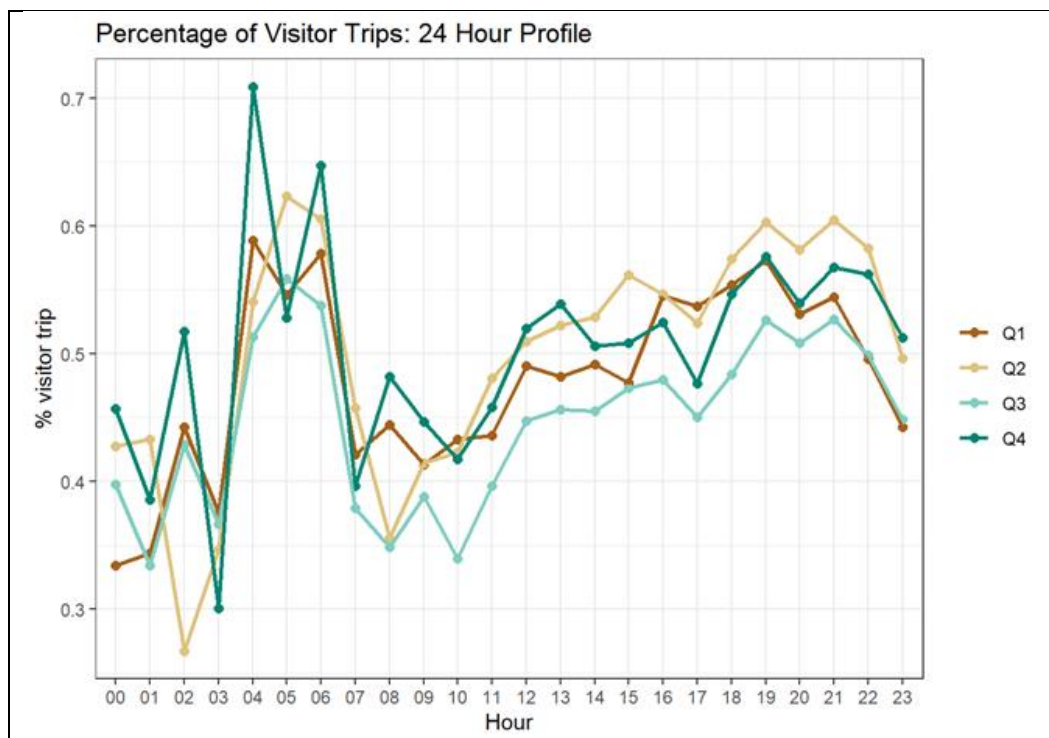


Figure 1.15: % of Visitor Trips on Shared Taxi

1.4 Perception Surveys

Key Gaps and Issues Identified

A 2018 Korean green transport study conducted perception surveys with a group of 150 visitors (i.e., the Visitor Panel), 150 pedestrians (including both local residents and visitors, i.e., the Pedestrian Panel), and tuk-tuk drivers (i.e., the Tuk-Tuk Panel). Key findings are summarized below:

Table 1.1: Summary of 2018 Green Transport Perception Surveys

Project	Description
Major Inconveniences	<ul style="list-style-type: none"> Visitor Panel: 25% cite poor walk conditions as the major inconvenience when moving, followed by congestion, traffic safety, and air quality/emissions. Pedestrian Panel: 60% cite sidewalks as inconvenient. Of those considering the sidewalk as inconvenient, 40% cite congestion as the major inconvenience when moving, followed by sidewalk parking (16%), lack of sidewalks (16%), and poor pavement (13%), respectively.
Mobility Safety / Security	<ul style="list-style-type: none"> Visitor Panel: 10% consider walking in the day as either unsafe or very unsafe, with this rising to 15% at night. Pedestrian Panel: 30% consider walking in the day as unsafe or very unsafe, with this rising to 40% at night. 35% consider vehicles/drivers as inconsiderate or very inconsiderate of pedestrians. NR6 is considered the most dangerous road followed by Sivatha Blvd., due to high volume of vehicles and insufficient traffic safety facilities. 20% experienced a traffic accident when walking.

Project	Description
Sidewalk Provision	<ul style="list-style-type: none"> • Visitor Panel: Over 50% indicate sidewalk provision is insufficient or very insufficient, while 75% find sidewalks are inconvenient (due to illegal parking, poor pavement surfacing and discontinuities). • Pedestrian Panel: Over 75% find sidewalk provision is insufficient or very insufficient, while 60% find sidewalks are inconvenient (due to illegal parking and discontinuous sidewalks/obstacles).
Crossing Facilities	<ul style="list-style-type: none"> • Visitor Panel: 32% find crossing the road dangerous or very dangerous.
Congestion	<ul style="list-style-type: none"> • Tuk-Tuk Panel: The most congested areas were identified as Pub Street (45% of respondents), followed by Phsar Leu Thom Thmey Market (21%), Sivatha Road (17%), and Phsar Chas Market (16%).

Source: Green Urban Transport & Road Network Improvement Master Plan in Siem Reap, Cambodia – Volume I: Green Urban Transport & Road Network, Korea Ministry of Land, Infrastructure & Transport (MoLIT), 2018.

The figure below shows congested and dangerous areas as identified by the Tuk-Tuk and Pedestrian panels.

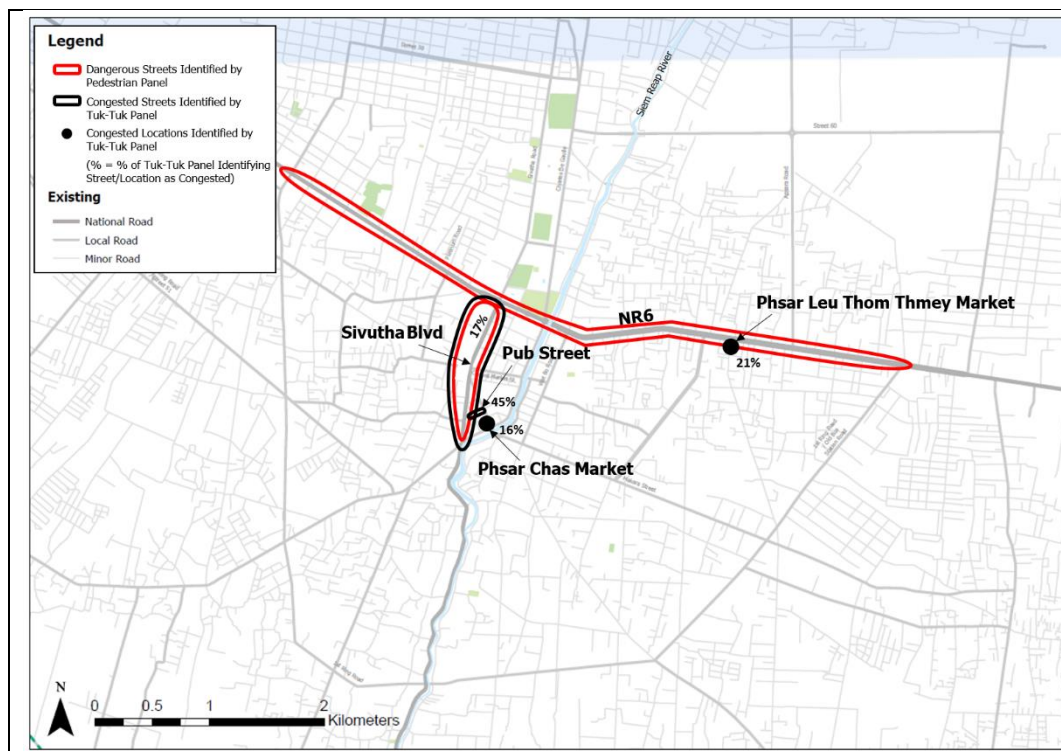


Figure 1.16: Key Dangerous and Congested Areas Identified in 2018 Korean Green Transport Study

Priority Improvements

The Visitor Panel (n=149) was queried on the top priorities for improving transport in Siem Reap. The highest priority initiative was to improve the walk environment (44%), followed by installing more streetlights (15%), and introducing public transport (13%). The Pedestrian Panel (n=150) was asked a similar question but focusing on the walk environment. The highest priority initiative was to restrict

vehicles from mounting/occupying the curb (37%), followed by improving the sidewalk pavement quality (16%), installing new sidewalks (15%), and installing more streetlights (10%). When queried on creating a 24-hour pedestrianized zone around Pub Street, over 90% of the tourist survey group supported such an idea.

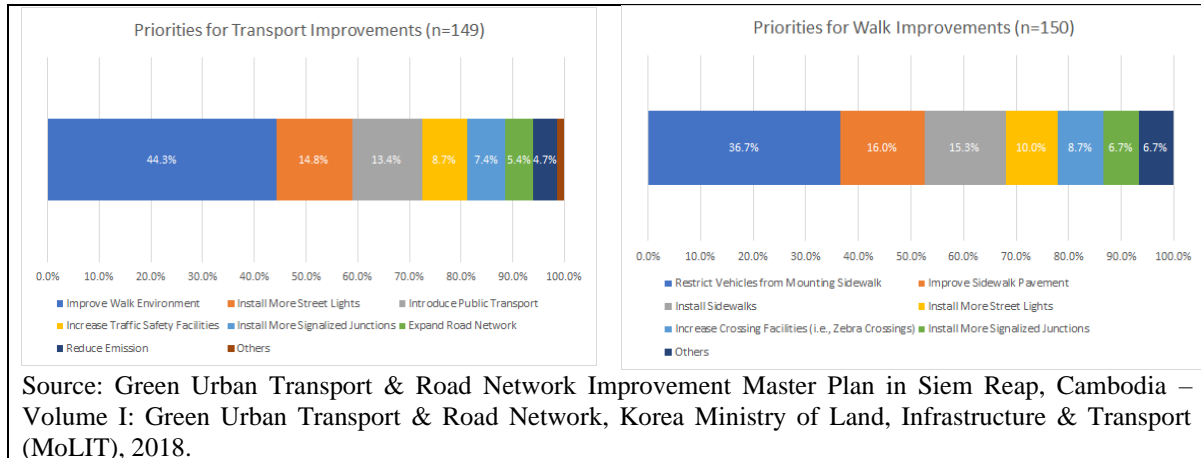


Figure 1.17: Priorities for Transport Improvements (Left) and for Walk Improvements (Right)

1.5 Mobility Gap Analysis

Key mobility issues were identified in the existing conditions review in Technical Report - Siem Reap 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 Encourages Motorbikes and Driving** – Motorbikes are the principal means of travel for most residents in Siem Reap, where it comprises over 70% of motorized trips.¹⁹ Siem Reap lacks alternate mobility options, which encourages motorbikes and driving. The City is quickly trying to solve this – a new 23km bike lane has been built around Angkor Wat and opened in 2020 (the Angkor Bike Lane), with plans for additional lanes on Charles de Gaulle. However, prior to this, no bike lane, bike parking or bike share program existed. The city also has no public transport system. Tourists flying into the airport to the west of the city use tuk-tuks to enter the city and for circulation. Furthermore, lack of 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.

¹⁹ Source: Green Urban Transport & Road Network Improvement Master Plan in Siem Reap, Cambodia – Volume I: Green Urban Transport & Road Network, Korea Ministry of Land, Infrastructure & Transport (MoLIT), 2018.

- **Congestion** - Congestion has been identified as an issue on several major roads, particularly on NR6 in city area (which serves as the major east-west route and the major freight route through the province) and the tourist streets around the Old Market and Pub Street areas in other studies. Congestion results in longer travel times and delays, lost productivity, as well as additional emissions. Peak loads at the WHA sites place stresses on handling facilities – mobility data shows peaks occur at different times. Currently, this is served by motor vehicles, which can degrade the visitor experience. Site management is a key concern expressed by APSARA.
- **Emissions and Air Quality**^{20,21} – Transport-related emissions and poor air quality impact health of residents, active mobility comfort, the tourist experience, as well as the WHA sites. APSARA identifies acid rain as a prime threat to the WHA sites due to motor vehicles. The 2018 Korean study found that air quality was one of the major inconveniences experienced when traveling. In the country and in Siem Reap, motor vehicle use is a prime contributor, particularly the dominance of two- and three-wheel vehicles, and growing vehicle trip demand.
- **Road Safety**^{22,23} – Road safety issues impact vehicular traffic and active mobility, including pedestrians walking and crossing streets. The 2018 Korean study identified traffic safety as a key issue, with 20% of respondents having been directly involved in an accident when walking. Cambodia has one of the highest road fatality rates in the International Transport Forum’s Road Safety Annual Report 2020.
- **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. The 2035 Land Use Plan forecasts population to grow by 50% or 2.5% annually to 440,000 – with growth occurring in outer areas to the south and east. Declines in tourism experienced in 2018-2019 are forecast to be reversed - some 10.9 million domestic and 7.5 million international visitors to Siem Reap Province are expected by 2035, creating 940,000 jobs (in 2019, 4.0 million domestic and international visitors were registered). A new airport and satellite city, Gran Siem Reap, are being built around 50km to the east. 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.

²⁰ Source: Partnership Ready Cambodia: Sustainable Mobility, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2020 (https://www.giz.de/en/downloads/GBN_Sector%20Brief_Kambodscha_Construction_E_WEB.pdf).

²¹ Source: Promoting Green Mobility Through Electric Motorbikes in Cambodia, Global Green Growth Institute, 2021.

²² Source: Traffic Safety in Cambodia, Ministry of Public Works and Transport, 2021 (https://www.jasic.org/meeting_docs_admin/contents/uploads/doc/meeting2/1-2%20Presentation%20for%20JASIC_%202021%20final.pdf).

²³ Source: https://www.itf-oecd.org/sites/default/files/docs/irtad-road-safety-annual-report-2020_0.pdf

Key overarching mobility issues thus are summarized as follows:

Table 1.2: Summary of Overarching Mobility Issues in Siem Reap

Issue	Key Details
Limited Mobility Options Encourages Motorcycles and Driving	<ul style="list-style-type: none"> Motorcycles are dominant mode representing over 70% of motorized trips Most tourist use tuk-tuk as their primary mode on their visit to Siem Reap Alternate mobility options such as public transport and bike are lacking, with limited dedicated infrastructure for green mobility
Congestion	<ul style="list-style-type: none"> The vehicle fleet especially motorcycles is growing at up to 15% annually Significant congestion on NR6 and around Pub Street
Emissions and Air Quality	<ul style="list-style-type: none"> Vehicle emission and poor air quality impact health of residents, active mobility comfort and attractiveness of the city Acid rain is a primary threat to the WHA sites due to motor vehicle use and emissions
Road Safety	<ul style="list-style-type: none"> Sidewalk and crossing safety is a major issue in the city, with 20% of respondents to a road safety survey indicating they have been directly involved in such an incident when walking Safety issues discourage the use of green modes throughout the city Cambodia has one of the highest road fatality rates in the International Transport Forum’s Road Safety Annual Report 2020
Urban Expansion and Future Travel Demand	<ul style="list-style-type: none"> Significant growth is forecast, which has the potential to increase road traffic and congestion, and worsen emissions and health issues, if current mobility patterns persist in the future. The 2035 Land Use Plan forecasts population to grow by 50% or 2.5% annually to 440,000 – with growth occurring in areas to the south and east Some 10.9 million domestic and 7.5 million international visitors to Siem Reap Province are expected by 2035, creating 940,000 jobs

Green Mobility Issues

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

- Limited Provision of Paved and Formal Sidewalk Outside of City Center** – Outside of the city center, Pub Street, and a few of the major arterials, formal paved sidewalks segregated from the carriageway are limited. Of 250km of roadsides surveyed in this Study:

- Paved Sidewalks** – Around 16% are paved and well-maintained, while 70% 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 70% of roadsides have no curb, while about 15% have a curb of 150mm or higher.

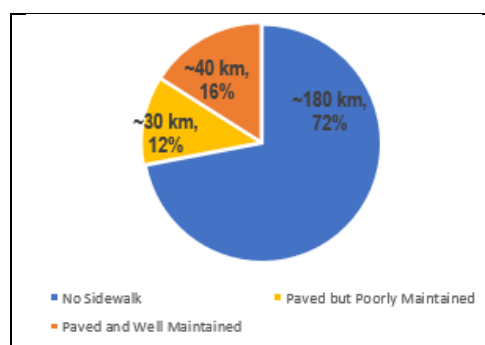


Figure 1.18: Sidewalk Pavement Condition along Surveyed Sides of the Road (250km)

- **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 5% of the surveyed sidewalks are 1.8m or wider, allowing two wheelchair users to pass.

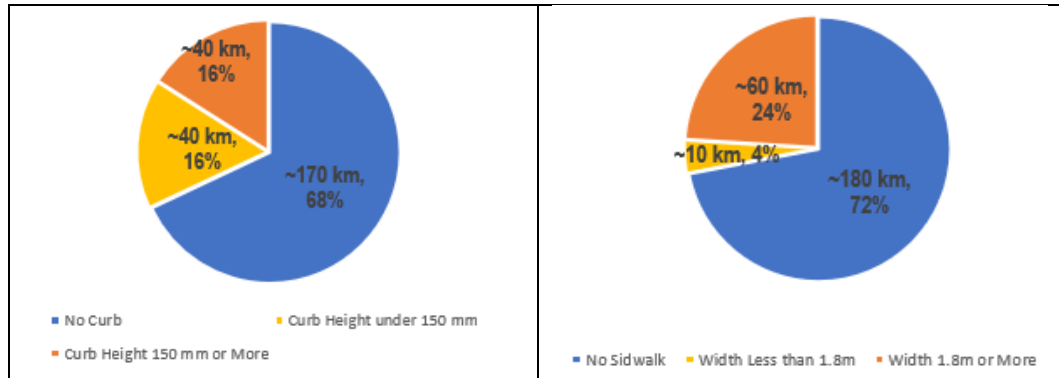


Figure 1.19: Curb Height along Surveyed Sides of the Road (250km)

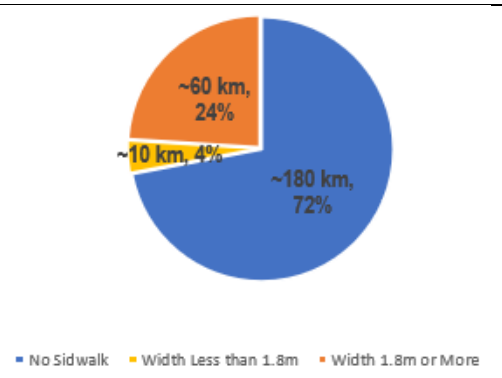


Figure 1.20: Sidewalk Width along Surveyed Sides of the Road (250km)

- **Limited Crossing Facilities** – The inventory of the City identified 13 signalized junctions. Only two of the signalized junctions have pedestrian countdown signals and none of them have pedestrian actuated buttons.

- **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.

- **NR6, the Major East-West Corridor, Lacks Continuous Stretches Conducive to Green Mobility** – Many stretches perform poorly due to lack of curb, sidewalk obstructions due to parking, as well as lack of trees and weather protected sections. In addition, vehicles mount the curb to park, which is dangerous for pedestrians and cyclists, in addition to blocking the sidewalk.

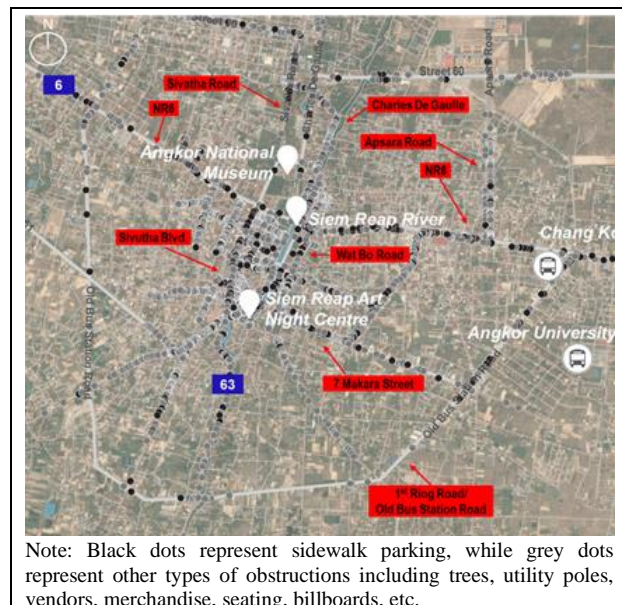


Figure 1.21: Extent of Sidewalk Parking and Obstructions in Central Siem Reap (Top) and Example on Sivutha Blvd. (Bottom)

- **Sidewalk Obstructions a Significant Safety Issue (see Figure 1.21)** – Sidewalk obstructions are prevalent in the city and are especially severe in commercial areas. Obstructions include parked vehicles, but other obstructions including utility poles, trees, and sidewalk activities of vendors and residents. This forces pedestrians to walk around them and sometimes

into the street – with most of these being parked vehicles. Also, vehicles mounting the sidewalk degrade safe walking experiences.

- **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.
- **Poor Lighting Provision on Local Roads and Throughout WHA** – Street lighting is limited on most streets in the City, with the densest provision in the tourist areas around Pub Street. This impacts safety and security for pedestrians and cyclists, particularly for women, and influences mode choice and corridor selection.
- **Lack of Cycle Facilities** – The field surveys find a lack of cycle facilities in the City besides the Angkor Bike Trail (which is mainly used by visitors) and the planned improvements on Charles de Gaulle and the Siem Reap River. No other dedicated bike lanes are provided, forcing cyclists to operate in lanes with motor vehicles. This lack of dedicated facilities, maybe more importantly, 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 continue to rely on tuk-tuks to travel to/from the WHA and the city center, while residents mainly use motorbikes for all types of trips, regardless of whether for short- or long-distance travel. Proliferation of two- and three-wheeled vehicles contributes to congestion, emissions, and safety issues on the road network. This is particularly critical in peak periods when visitors travel to/from the WHA and during the daily commute peak period. Properly planned and accessible public transport can serve as 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 associated emissions, as well as subsequent issues identified at the WHA including acid rain degradation and congestion/ overcrowding issues at the WHA and reception facilities.

Specific green mobility issues thus are summarized as follows:

Table 1.3: Summary of Specific Green Mobility Issues in Siem Reap

Issue	Key Details
Limited Provision of Paved Sidewalks Outside of City Center	<ul style="list-style-type: none"> • Of 250km of roadsides surveyed in this Study, 70% lack paved sidewalks • The same survey identified that nearly 70% of roadsides have no curb, while about 15% have a curb of 150mm or higher • Only 5% of surveyed sidewalks are 1.8m or wider
Limited Crossing Facilities	<ul style="list-style-type: none"> • 13 signalized junctions operate in the city • Only two of these have pedestrian countdown signals and none of them have pedestrian actuated buttons
Limited Access-for-All Amenities	<ul style="list-style-type: none"> • No overarching policy to plan or design for women, elderly, disabled, and other disadvantaged groups within the street realm exist including the sidewalk
Sidewalk Obstructions a	<ul style="list-style-type: none"> • Sidewalk obstructions are prevalent in the city, especially near commercial areas.

Issue	Key Details
Significant Safety Issue	<ul style="list-style-type: none"> • Obstructions include parked vehicles, utility poles, trees, and vending activities on sidewalk. • Pedestrians are often forced to walk on the carriageway to avoid them • Vehicles mounting the sidewalk create unsafe walking environments as well
Weather Protected Paths Limited	<ul style="list-style-type: none"> • 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
Poor Lighting Provision on Local Roads and Throughout WHA	<ul style="list-style-type: none"> • Street lighting is limited on most streets in the City, with the densest provision in the tourist areas around Pub Street, impacting safety and security, as well as the willingness to walk at night
Lack of Cycle Facilities	<ul style="list-style-type: none"> • Limited cycle facilities exist in the city other than the Angkor Bike Trail and the planned improvements on Charles de Gaulle and the Siem Reap River. • No other dedicated bike lanes are provided, forcing cyclists to operate in lanes with motor vehicles or to choose other modes of travel
No Public Transport Service/Facilities	<ul style="list-style-type: none"> • 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, as well as acid rain degradation and congestion/overcrowding issues at the WHA

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 September 2021 to gather feedback and insights on the Vision and indicative investment priorities and related institutional and capacity issues (including MPWT, Department of Public Works and Transport (DPWT), Department of Land Management Urban Planning and Construction (DLMUPC), Authority for the Protection of the Site and Management of the Region of Angkor (APSARA), Siem Reap Province, and Siem Reap City); and (iii) targeted follow-up meetings with key stakeholders prior to and after this September 2021 workshop.

Issues and gaps are categorized under three constituent elements:

- **Legal, Regulatory and Policy** – The review focused on identifying gaps in the legal, policy, and regulatory framework governing green mobility.
- **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.

Key issues thus include the following (categorized into three elements):

Table 1.4: Summary of Institutional Gaps and Capacity Building Needs

Category	Broad Issue
Legal, Regulatory, and Policy Elements	
Visions, Goals and Strategic Plans	<ul style="list-style-type: none"> • Lack of Overall Green Mobility Vision or Discrete Targets/Goals in Overarching Transport Plans – The planning framework includes green mobility aspirations such as electric public transport. These are not, however, linked directly tied to an overarching green mobility vision or clear/discrete goals to inform concrete actions, nor is there a national policy directive. • Spatial Plans at Multiple Levels Requires Special Coordination for Green Mobility - Bike lanes and bus infrastructure may span different jurisdictions. Coordination of spatial plans at several levels is essential to create seamless/integrate networks. • APSARA Has Its Own List of Priority Mobility Projects, thus Coordination Needed to Align APSARA with Green Mobility Goals – APSARA has its own master plan of transport improvements for the WHA – thus inclusion of green mobility and tie-in to the external regional network is important to ensure connectivity and facilitate green mobility. • National Plans Prioritize Resilience Tied to Flooding, but Not for Mobility – The NSDP highlights resilience as a key goal, but this is not reflected in local plans or in planning/design of green mobility systems or infrastructure.
Laws / Regulations	<ul style="list-style-type: none"> • Legal Statutes Governing Transport Focus on Roads, with Limited Regulations for Green Mobility - The current legal statutes governing transport (i.e., Road Law and Road Traffic Law) focus on roads and vehicles. No specific and detailed statutes govern green mobility. No safe access-for-all provisos are included. Legal/regulatory frameworks for financing mechanisms are lacking. • Green Mobility Plans and Initiatives Potentially Constrained by 1994 Royal Decree – The 1994 Royal Decree governs allowable uses and facilities in the WHA including restricting vehicle type, driving speeds, and parking. Thus, the Decree may limit the scope / extent of green mobility initiatives (i.e., size of public transport vehicles and location of bus stops in the WHA). • Green Mobility Initiatives within WHA Must Align with “Outstanding Universal Value” (OUV) - Any project within the WHA, including green mobility initiatives, must adhere to the OUV, which defines criteria to meet UNESCO requirements. • Green Mobility Infrastructure Not Specifically Categorized under Law on Expropriation – Sidewalk improvements/ expansion that require expropriation come under the purview of road expansion. Cycling, public transport, and e-mobility are not mentioned.
Design, Operational Norms and Guidelines	<ul style="list-style-type: none"> • Limited Consideration of Active Mobility and Green Mobility in Road Design Standards – The current Road Design Standards (developed by AusAID) provide a comprehensive guide for planning and designing roads. The standards seek to enhance the flow of vehicles, but there is minimal consideration of other road users – namely pedestrians, cyclists, public transport, etc.
Enforcement	<ul style="list-style-type: none"> • Weak Enforcement Impacts Green Mobility Attractiveness and Effectiveness - Parking on sidewalks is illegal. However, inconsistent parking enforcement has resulted in significant illegal parking on the sidewalks. No clear fines are dictated by law.
Monitoring and Evaluation	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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. • No Clear Entity Responsible for Public Transport Operations – There is no clear institutional arrangement for public transport. Establishing the public transport authority at the metropolitan level is a viable option to ensure coordination with neighboring cities. • Overlapping Responsibilities for Road – MPWT is responsible for national roads, while DPWT is responsible for provincial and district road construction and O&M. APSARA is responsible for construction and maintenance of roads within its jurisdiction. Department of Rural Development manages rural roads falling outside national, provincial or APSARA roads.
Project Formulation and Prioritization /	<ul style="list-style-type: none"> • 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 Agendas May Not Reflect Local Needs for Green Mobility – The MPWT and Ministry of Economy and Finance (MEF) Committee may lack understanding of local needs and thus

Category	Broad Issue
Decision-Making	shortlist projects based on national interests. Thus, selected projects may have minimal linkage to green mobility.
Overarching Transport Authority / Cross-Cutting Coordination Mechanism	<ul style="list-style-type: none"> • Coordinating Authority for Transport Needed – APSARA oversees transport projects within the WHA. The DPWT and Province are responsible for transport projects outside this jurisdiction. There is a need to identify a body with overarching transport management and oversight responsibilities – regardless of geography/jurisdiction.
Civic/Community Participation	<ul style="list-style-type: none"> • Limited Citizen Engagement / Participation in Development of Transport Plans – Transport plans in Siem Reap 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	<ul style="list-style-type: none"> • 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). • Public Engagement of Existing Operators Essential in Introducing New Bus System – Engagement of tuk-tuk operators is essential in introducing a new bus system to ensure a balance between the two systems and to gain support locally.
Private Sector Involvement	<ul style="list-style-type: none"> • Public-Private Partnerships (PPP) Potentially Promising for Large-Scale Green Mobility Initiatives, But Limited Experience in the Country - There is limited experience in developing and formulating PPPs.
Dedicated Funding for Green Mobility	<ul style="list-style-type: none"> • No Dedicated Funding for Urban Transport or Green Mobility - There is no dedicated funding exclusively for urban transport or green mobility at present. • Limited Budget for Green Mobility – Local government lacks budget for smaller-scale green mobility initiatives. Past shuttle system within the WHA faced funding issues. Alternate revenue sources may be necessary to sustain such operations.
Financing Schemes for Green Mobility	<ul style="list-style-type: none"> • Constrained Fiscal Space in Cambodia Has Resulted in Insufficient Financing to Meet the Needs for Public Works and Transport Sector Expenditure - There is limited planned projects in Siem Reap for urban transport or green mobility.
Capacity Building Elements	
Training and Capacity Building	<ul style="list-style-type: none"> • 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. • Separate Capacity Building Efforts between APSARA and Sub-National Levels – APSARA has its own training center with its own curricula including that related to mobility. DPWT (via MPWT) has its own set of capacity building activities. • Limited Technical Expertise on Green Mobility and Urban Transport – Current knowledge gaps include: (i) general green mobility planning, design, and management; (ii) road safety and traffic signage; (iii) public transport planning, operations, and maintenance; (v) traffic calming and trip reduction measures; and (vi) municipal infrastructure management. • Limited Staff Capacity to Develop Projects and Proposals to Obtain Funding – There is limited local government expertise on developing green mobility initiatives and seeking funding for these.

2 Green Mobility Vision

2.1 Introduction

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 Siem Reap. Essentially, how will Siem Reap 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 Siem Reap, which is currently lacking.

2.2 Vision Statement

In the future, Siem Reap will have an:

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

2.3 Goals and Objectives

Four Key Goals

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 heritage, while accentuating heritage and broadening tourism 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 and explained below.

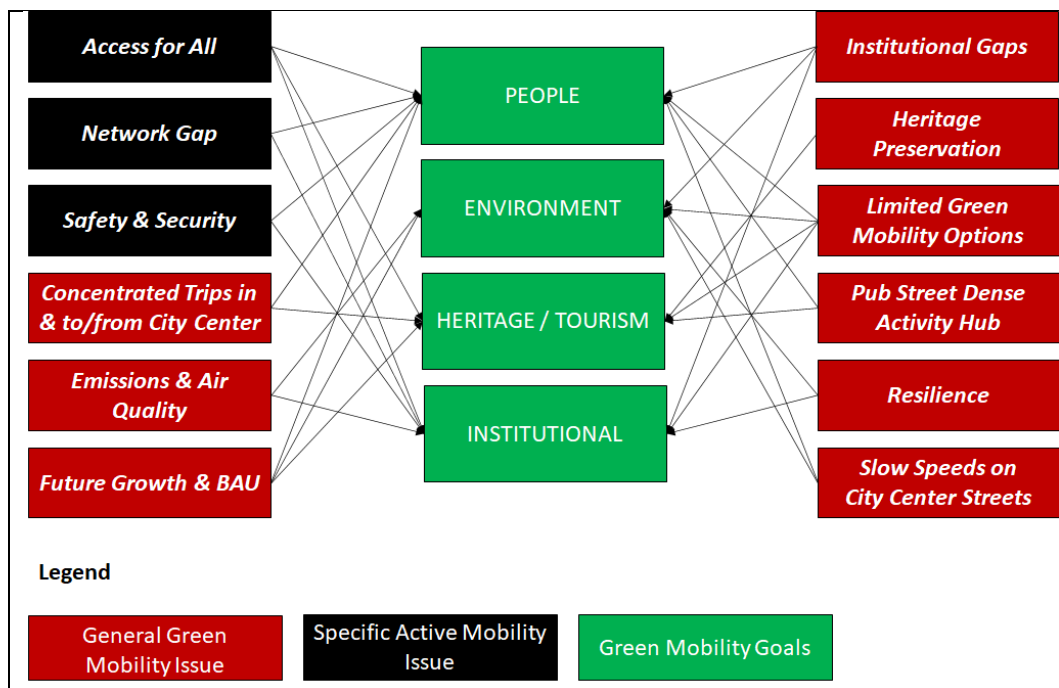


Figure 2.1: Linkage between Green Mobility Goals and Key Issues

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, catering to both residents and visitors.

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 the Angkor Bike Trail and the planned Charles de Gaulle facility and the Siem Reap River shared path). In addition, a large portion of streets in Siem Reap are unpaved – making cycling difficult due to rough surfaces. During the rainy season, unpaved roads often have large accumulations of water, making walking and 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. Walk/bike amenities may be provided to complement the network including toilets, bike parking and bike share. Linkage to key civic destinations may benefit residents (including government buildings, schools, and hospitals), while those to tourist destinations and 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. Cambodia has one of the highest fatality rates in the International Transport Forum’s Road Safety Annual Report 2020. In addition, the street level index and perception surveys find that crossing safety is a key issue – 13 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. Creating a safe and secure environment free from danger and harassment is 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 Siem Reap’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 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 develop 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 will 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 serves 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 already congested roads such as NR6. Perception surveys indicate that public transport is a desired potential improvement. APSARA has specifically requested “clean” and green public transport to/from the WHA sites to reduce impacts of vehicles (including congestion and emissions). Mobile device and shared taxi data suggest that strong linkages exist between the city center and the Airport, currently served by tuk-tuks principally for tourists (and minivans), and the city center to Angkor Wat. Lower speeds are observed on the eastern approach to the city and the city center. In the future, longer distance trips may be generated to/from the new airport and Grand Siem in the east that would create additional 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 city center, Airport, WHA and areas further afield), ensuring seamless connections and interchange between modes, and implementing public transport priority corridors with tailored treatments to minimize delay and reduce travel times through congested areas. The system may benefit residents

commuting to work or traveling in their daily lives, as well as visitors traveling to/from the Airport and the WHA.

Strategy #	Strategy
1C1	Operate Green Public Transport Serving Key Attractions and Generators
1C2	Create Seamless and Integrated Interchange between Modes
1C3	Create Public Transport Priority Corridors (with Bus Lanes and Priority Elements)

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 creating efficient and effective systems is a start. Advocating and supporting transition of current modes to electric ones (or E-mobility) and less polluting models is an important lever a city (and governments) can deploy. Restrictive policies and measures on vehicle use and parking can also be effective – so long as they are accompanied by options that include attractive and convenient modal options. 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 Siem Reap.

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, the urbanized area of Siem Reap is not well equipped for green mobility as found by the street-level index, with areas outside of the center impacted by connectivity gaps, lack of sidewalks, limited crossings, etc. Developing growth areas in Siem Reap (including Grand Siem Reap) 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 Grand Siem Reap 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 vehicle use can reduce 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 flexibility and convenience).

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 such as the Global Green Growth Institute (GGGI)'s e-motorbike and e-bus initiatives will 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 further 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 Siem Reap, but is not well regulated and parking is not charged. Sidewalk parking is observed by the street-level index. Sidewalk parking blocks the walking path, potentially forcing pedestrians (and cyclists) into the traffic lanes, and 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 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 that includes 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 Pub Street.

Strategy #	Strategy
2C1	Facilitate Effective Parking and Curbside Management

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. Roads and street designs promote vehicle movement, instead of active mobility. People accept the norm – change may be unfamiliar and 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 green mobility is essential to face climate change, pandemics, and 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/continuity equips cities to effectively and safely maintain basic services for residents/visitors. This may take the form of network redundancy, 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 Plans for City

Goal#3: Heritage / Tourism

Key Message:

Preserving and respecting heritage, while accentuating heritage and broadening tourism through green mobility

Description/Rationale:

The WHA and constituent sites are what has made Siem Reap the world renown destination it is today. The sites are faced with critical issues brought about by both the large volume of tourists visiting annually as well as the growth of Siem Reap itself. Large influxes of visitors can overwhelm sites, generating congestion and noise, disturbing the site and sanctity of the monuments, and denigrating the visitor experience. APSARA also identified acid rain from emissions as a threat to the site.

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 WHA. Mobility strategies must be well tailored to align with restrictions in the 1994 Royal Zoning Decree 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 markets (important given the recent decline in visitors to Siem Reap).

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/preserving the unique cultural and historical heritage of the WHA is an utmost priority – it is why millions of visitors come each year. The sites are at risk from converging issues such as congestion, noise, emission, etc. Negative impressions of the sites and experience can discourage visitors. Unlike Melaka and Tallinn, heritage and mobility plan is not integrated.

This may be achieved by tailoring initiatives to respect heritage and align with protective restrictions, integrate heritage and mobility plans to create a seamless network in/outside heritage areas, enhancing mobility at heritage sites, and broadening visitor experiences 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 Siem Reap 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. Siem Reap has great potential with its Angkor Bike Trail and possibilities of linking with planned bike lanes on Charles de Gaulle and the shared corridor along the Siem Reap River for a day or multi-day cycle 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 Siem Reap, green mobility elements are not defined in the legal statutes governing transport in the city and across Cambodia. 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, no definitive green mobility vision and objectives have been established, and 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 Siem Reap, 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 by 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 ASEAN Smart City Action Plan proposals for closed-circuit television (CCTV) monitoring of parking). 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, and environmental and social safeguard studies.

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/Outcomes

Box 2.1: Sustainable Urban Mobility Plan (SUMP)

A SUMP is a strategic plan designed to satisfy mobility needs of people and businesses in cities and surroundings for a better quality of life. It builds on existing planning practice and considering integration, participation, and evaluation principles. Compared to 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.

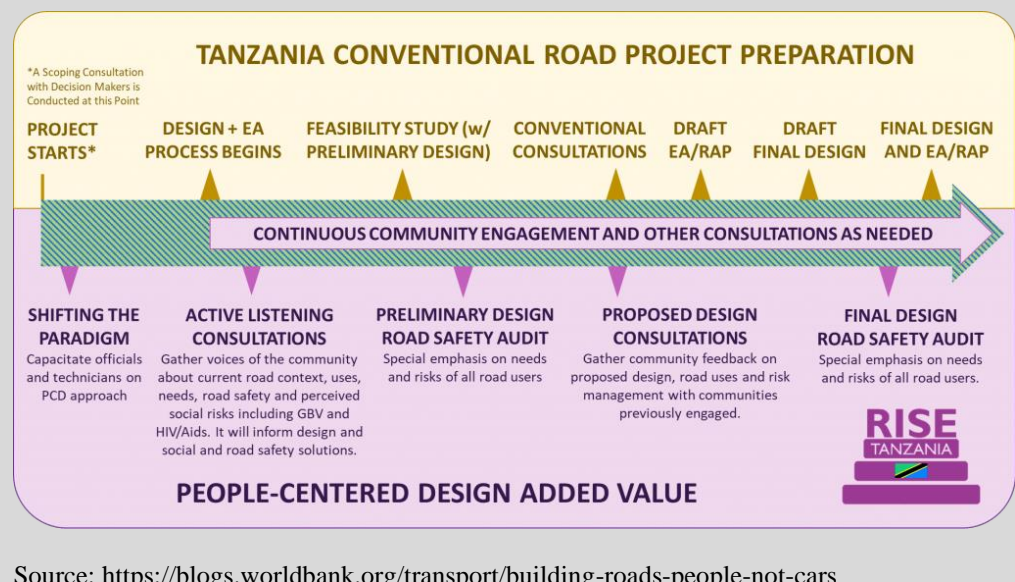
In comparison to SUMP, Transport Masterplans (TMPs) are more focused on transport-infrastructure, with a much more loosely-defined set of objectives that may not consider issues such as social inclusion, economic growth, or quality of life. Predict-and-provide modelling based approaches to transport planning (typically deployed for TMPs), produce certain outputs (such as large infrastructure projects) – but rarely include targets, monitoring, evaluation, public participation, or measures. Consideration of SUMP 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 Siem Reap to pinpoint key concerns to stakeholders and consultants/designers that may not recognize these issues if they have not experienced it themselves.



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 Siem Reap centers on the road sector, lacking provisions for cycling, public transport, and e-mobility. Agency roles and responsibilities for cycling and public transport are not 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 intended 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

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 Cambodia (with Siem Reap projects comprising a small portion of priority projects). There is a shortfall of identified financing of transport projects of over 50% from 2021 to 2023. 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 Siem Reap or Cambodia.

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

Strategy # Strategy

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 five key strategies/plans for Siem Reap 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	Public Investment Programme (2022-2024) ^A	<ul style="list-style-type: none"> The three-year rolling PIP was finalized in October 2021, which represents the Ministry of Planning's annual, rolling three-year investment program, reflecting the priorities and needs of the country to implement its development strategies for the 2022-2024 period. Please see Appendix A for a list of all projects in the PIP. Transport is estimated to comprise US\$3.638 billion of the total allocated US\$35.076 billion during this period. Specific to Siem Reap, aligns with Plan's proposals to invest in capital works to: (i) build climate resilient infrastructure and promote sustainable and innovative transport, including electric vehicles; (ii) install bus stops and stations along strategic national roads such as NR6; (iii) improve roads within/outside of Siem Reap City including NR6 and the Ring Road; and (iv) continue the restoration of the Siem Reap River. Most relevant, green mobility linked projects now include a US\$15.92 million project to introduce electric buses in Siem Reap (which is more specific than previous proposals in the PIP), with some US\$3.92 million in expenditures during the 2022-2024 period. Most transport related improvements remain as road-based ones.
2	2035 Land Use Master Plan ^B	<ul style="list-style-type: none"> The Green Mobility Vision aligns with Plan's future growth poles for Siem Reap, forecast to grow to 440,000 residents by 2035. The people-centric, integrated transport network seeks to facilitate more effective and sustainable people movement to reduce driving and vehicle use through priority active mobility and public transport corridors along major roads. The Green Mobility aligns with the Plan's priority to: (i) protect/conservate the WHA and other heritage relics through tailored adoption of green mobility strategies to/from and within

#	Strategy / Plan	Linkage and Potential Synergy Opportunities with Green Mobility Vision & Goals
		<p>the WHA and enhancing mobility to reduce congestion and related issues; and (ii) ensure social harmony and sustainable development by incorporating priorities for all users including women, disabled, elderly, etc.</p> <ul style="list-style-type: none"> • Lastly, the Green Mobility Vision aligns with the Plan’s proposals to (i) improve sidewalks and streets; (ii) improve the Siem Reap River to make it more hospitable for walking and cycling; (iii) manage the parking in the city area; (iv) identify green transport means to/from and within the WHA sites to reduce emissions and impact on the sites themselves; and (vi) optimize circulation and parking at the WHA sites.
3	Tourism Development Master Plan Siem Reap 2021-2035 (or 2035 Siem Reap Tourism Master Plan) ^C	<ul style="list-style-type: none"> • The Tourism Master Plan was finalized in October 2021 and proposed the following: <ul style="list-style-type: none"> ○ Promote environmentally-friendly transport and public transport in the WHA; ○ Improve walk facilities along the Siem Reap River riverbank; ○ Create a well-organized transport system with consistent and quality infrastructure that encourages public transport; ○ Expand bus stations in Siem Reap to offer more attractive service; ○ Leverage smart technology to turn Siem Reap into a “Smart City”; and ○ Strengthen transport infrastructure on major tourism routes (including wayfinding, signage, and a traffic management plan) and improving road infrastructure in Siem Reap City (including access roads to/from heritage sites) • No budgets were proposed for these elements, however, there is ample opportunity for linkage and synergies between this Master Plan and indicative green mobility investment priorities.
4	JICA Smart City Action Plan (2018-2020) (or JICA Smart City Study) ^D	<ul style="list-style-type: none"> • This JICA study is part of the umbrella ASEAN Smart City Action Plan (2018-2020). The study seeks to: (i) improve safety and security of the transport system – focusing on pedestrians and vehicles; and (ii) improve cultural, heritage and tourism services. It called for a proposed traffic signal system, parking management schemes, as well as illegal parking and enforcement system to improve management of curbs, roads, and parking to facilitate green mobility. • As of Spring 2021, a series of initiatives were proposed in three areas: <ul style="list-style-type: none"> ○ Mobility - Traffic management/safety, parking management, green transport (i.e., e-tuktuk), road maintenance, street lighting, and Mobility-as-a-Service (MaaS) ○ Tourism - E-tourism platform such as MaaS and cycle rental service. ○ Safety / Security - Crime/ accident prevention through environmental design, CCTV system • As of Fall 2021, the JICA team noted that a proof-of-concept (POC) parking project with CCTV monitoring was proposed in Siem Reap for late 2021 implementation. This would be implemented privately, although project details have yet to be finalized. • Lastly as of Fall 2021, the JICA team noted that the Provincial Government has decided to focus on improving management/administration procedures.
5	GGGI Pre-Feasibility Assessment on Electric Buses in Siem Reap, Cambodia (or GGGI E-Bus Study) ^E	<ul style="list-style-type: none"> • An e-bus pre-feasibility study was completed in June 2021, assessing technical, environmental, and financial feasibility of 12m e-buses in Siem Reap with three routes: (i) an east-west route between the Airport and city center; (ii) a north-south route between WHA-Tonle Sap via the city center; and (iii) a route along the 1st Ring Road. • Capital costs amount to US\$11.8 million (primarily vehicles and charging stations). • O&M costs amount to over US\$1.0 million annually (for electric/maintenance costs). • Alignment and synergy with this GGGI proposal is apparent – the proposed electric bus initiative in the indicative green mobility investment priority list is more extensive but would nonetheless benefit from collaboration in terms of operations, facilities, and possibly funding.

^A Source: Public Investment Programme, 3-Year Rolling 2022-2024, Royal Government of Cambodia, October 2021.

^B Source: 2035 Siem Reap Land Use Master Plan, MLMPUC, 2019.

^C Source: Tourism Development Master Plan Siem Reap 2021-2035, Royal Government of Cambodia, March 2021.

^D Source: Data Collection Survey on Urban Improvement in Siem Reap City in the Kingdom of Cambodia, Basic Survey for Smart City in Siem Reap, Interim Report 2, JICA, December 2020

^E Source: Pre-Feasibility Assessment on Electric Buses in Siem Reap, Cambodia, GGGI, June 2021.

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 3.3**):

- **National / Provincial Road Improvements** – National / provincial roads are planned and constructed by MPWT, with DPWT responsible for maintenance outside the city center. MPWT funds these (with overarching budget allocated by MEF). An MPWT/MEF committee allocates funding for maintenance of these roads.
- **Local and Other Road Improvements** – Local roads are planned, constructed, operated, and funded by the Provincial Government (which also receives budget from the Ministry of Interior for maintenance of roads inside the downtown area with technical support from DPWT). The Department of Rural Development handles rural roads.
- **Public Transport** – Introduction of public transport in Siem Reap 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 future public transport oversight authority could take over operations (and oversee maintenance of the facility) to ensure regional integration. Funding could come from the national level (with potential private sector involvement).
- **Cycle Improvement** – New bike lanes, bike parking, and bike sharing programs could be handled by the Province. For improvements included as part of a larger road improvement package, the responsible entity depends on road type (i.e., national/provincial would be MPWT/DPWT, while a

local road would be the Provincial Government). Coordination in planning and O&M is important between jurisdictions to ensure connectivity. O&M and funding for bike share could be handled by the private sector.

- **Sidewalk Improvement** – Sidewalk improvements including widening, creating new sidewalks, as well as installing trees/lights would be handled by the Provincial Government given its small-scale nature. For improvements included as part of a larger road improvement package, the entity depends on road type (i.e., national/provincial would be MPWT/DPWT, while a local road would be the Provincial Government). Coordination in planning/O&M is important between jurisdictions.
- **Parking Improvement** – Construction of or enhancement of parking facilities are relatively small-scale and would fall under the Provincial Government, while enforcement would remain with the Traffic Police.

Table 3.1: Proposed Responsibility Matrix for Green Mobility Component

Component	Typical Enhancement	Activity ^A	MPWT ^B	DPWT (Provincial/Municipal)	Siem Reap Provincial / Municipal Government	Traffic Police	Comment ^C	
National / Provincial Road Improvements	<ul style="list-style-type: none"> Road Widening Pavement Resurfacing New Zebra Crossing 	Plan	✓				<ul style="list-style-type: none"> Road improvement programs may also include packaged enhancements for sidewalks and crossings. Coordination with the Siem Reap Provincial Government is essential to ensure seamless network / design 	
		Construct	✓					
		O&M		✓				
		Funding	✓					
Local Road Improvements ^D	<ul style="list-style-type: none"> Road Widening Pavement Resurfacing New Zebra Crossing 	Plan		✓				
		Construct		✓				
		O&M		✓				
		Funding		✓				
Public Transport	<ul style="list-style-type: none"> New Bus System Bus Stops Bus Lanes Terminals/Depots E-Bus Charging Facilities 	Plan	✓				<ul style="list-style-type: none"> A future public transport authority could oversee planning and operations Potential exists for private sector involvement in operations and maintenance 	
		Construct	✓					
		Operation			✓ (See Comment)			
		Maintenance			✓			
		Funding	✓					
Cycle Improvements	<ul style="list-style-type: none"> New Bike Lane Bike Parking Bike Share 	Plan		✓			<ul style="list-style-type: none"> Coordination with MPWT/DPWT required for enhancements on national or provincial roads Potential exists for private sector involvement in bike share or parking 	
		Construct			✓			
		O&M			✓			
		Funding			✓			
Sidewalk Improvements	<ul style="list-style-type: none"> Sidewalk Widening Sidewalk Resurfacing New Sidewalk Trees / Lights / Street Furniture 	Plan		✓			<ul style="list-style-type: none"> If enhancement is part of wider road program, responsibilities fall under MPWT/DPWT if on national or provincial road Coordination with the Siem Reap Provincial Government is essential to ensure seamless network / design 	
		Construct			✓			
		O&M			✓	✓		
		Funding			✓			
Crossing Improvements	<ul style="list-style-type: none"> New Signal New Mid-Block Crossing New Zebra Crossing Traffic Calming 	Plan		✓			<ul style="list-style-type: none"> Coordination with the Siem Reap Provincial Government is essential to ensure seamless network / design 	
		Construct			✓			
		O&M			✓	✓		
		Funding			✓			
Parking Improvements	<ul style="list-style-type: none"> New Off-Street Lot Paid Parking & Meters Sidewalk / Curbside Parking Modification 	Plan		✓			<ul style="list-style-type: none"> Potential exists for private sector involvement in parking Enforcement handled by Traffic Police 	
		Construct			✓			
		O&M				✓		
		Funding			✓			

Notes: (i) ^A Funding pertains to the entity responsible for direct payments to implement the project; (ii) ^B MPWT proposes a list of projects to MEF, who then approves the projects based on alignment with country development vision and available budget; (iii) ^C Those improvements falling within the WHA are the responsibility of APSARA (who may conduct coordination with other related entities as warranted); and (iv) ^D The Department of Rural Development is responsible for rural roads.

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 Actions 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 75.3 km of Paved Sidewalk with Segregated Curb	<ul style="list-style-type: none"> Pavement resurfacing, sidewalk creation (including street furniture), curb installation, etc. 	17,000,000	✓	✓	DPWT	
				1A1.2	Create Pilot Walk District in Pub Street and Slow District around Pub Street	<ul style="list-style-type: none"> Walk-only district in Pub Street, with vehicle prohibitions at certain times of the day Access maintained with enhanced active mobility and public transport linkages. 	500,000	✓		DPWT	
		1A2	Create Bike Priority Network	1A2.1	Create 17.2 km of Bikeways, 67.6 km of Protected Bike Lanes, and 80.4 km of Sharrows	<ul style="list-style-type: none"> Priority bike facilities on key corridors to capture medium-distance trips and complement public transport network, linking to current/planned bike lanes (see Section 3.4) 	22,400,000	✓	✓	DPWT	
		1A3	Provide Walk/Bike Amenities to Complement Network	1A3.1	Install 160+ Bike Racks	<ul style="list-style-type: none"> Bike parking, bike share stations, and public toilets placed strategically along network to facilitate convenient access and comfort 	200,000	✓	✓	DPWT, Province	✓
				1A3.2	Implement Bike Share Program in City (1,250 Bicycles)		4,500,000	✓	✓	DPWT, Province	✓
				1A3.3	Install 30 Toilets along Key Walk/Cycle Corridors		200,000	✓	✓	Province, City	
1B	Safe, Secure and Comfortable Experience for All	1B1	Make Crossings Safer	1B1.1	Implement Crossing Improvement Plan including 20 Signalized Junctions, Mid-Block Crossing Enhancements at 100 Locations, as well as Zebra Crossing Improvements at 250 Locations	<ul style="list-style-type: none"> Various crossing treatments adopted based on junction and road type including zebra crossings, traffic calming measures, rumble strips, pedestrian signals, and/or traffic signals 	4,800,000	✓	✓	DPWT	
				1B1.2	Conduct Citywide Crossing Improvement Study and Implement Improvement Scheme	<ul style="list-style-type: none"> Conduct citywide study to understand crossing, traffic, and pedestrian crossing volumes for medium and long term 	200,000	✓		DPWT	
		1B2	Bolster Sense of Security for Women and Disadvantaged Groups	1B2.1	Implement Pedestrian Scale Lighting on 75.3 km of Sidewalks (at 25m intervals)	<ul style="list-style-type: none"> Lighting improves safety and security for all users, but especially women particularly at night 	6,900,000	✓	✓	DPWT	
				1B2.2	Implement CCTV Monitoring System along 65 km (about 50 CCTV) of Roads	<ul style="list-style-type: none"> CCTV system installed at strategic streets and locations to improve safety/security for women and disadvantaged users, leveraging ASEAN Smart Cities Action Plan CCTV proposal 	200,000		✓	DPWT	
				1B2.3	Integrate Crime Prevention Through Environmental Design (CEPTED) into Design Guidelines for Green Mobility Infrastructure	<ul style="list-style-type: none"> CEPTED is an approach to redesign streets to create safer corridors and reduce harassment/ dangers (see https://www.cpted.net/) See Action 4A1.4 	-	✓		MPWT	
		1B3	Integrate Universal Access into Streets and Designs	1B3.1	Implement Wheelchair Access Ramps at 370 Locations	<ul style="list-style-type: none"> Ramps provided at all retrofitted junctions to accommodate disabled, women and elderly. 	800,000	✓	✓	DPWT	
				1B3.2	Implement Tactile Pavement at 370 Locations	<ul style="list-style-type: none"> Tactile pavement provided along approaches to all retrofitted junctions for visually impaired 	400,000	✓	✓	DPWT	
				1B3.3	Integrate Universal Access into Design Guidelines for Green Mobility Infrastructure	<ul style="list-style-type: none"> Universal access elements integrated into design guidelines (see Action 4A1.4) 	-	✓		MPWT	
		1B4	Create All-Weather / All-Year Network	1B4.1	Implement Tree Planting Program along 75.3 km of Sidewalk	<ul style="list-style-type: none"> Trees provided on average every 10m for shading and protection. 	2,400,000	✓	✓	Province, City	
		1B5	Enhance Road Network and Safety	1B5.1	Improve 65km of roads for vehicles and active mobility	<ul style="list-style-type: none"> 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 	107,500,000	✓	✓	MPWT, DPWT	
				1B5.2	Integrate Road Safety Elements into Road Design Standards	<ul style="list-style-type: none"> Integrate international best practice and road safety elements into road and sidewalk design standards from MPWT/DPWT 	-	✓		MPWT	
				1B5.3	Conduct Road Safety Audits	<ul style="list-style-type: none"> Identify key road safety improvements via periodic safety audits 	900,000	✓	✓	DPWT	
				1B5.4	Create Road Safety Monitoring System / Database	<ul style="list-style-type: none"> Create database / system for road safety monitoring and enhancement 	500,000	✓		MPWT, DPWT	

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
1C	Integrated, Multimodal System, Emphasizing Efficient People Movement	1C1	Operate Green Public Transport Serving Key Attractions and Generators	1C1.1	Operate 210 km, 8 Line Bus System serving Siem Reap and Surrounding Area	<ul style="list-style-type: none"> Eight route system to be operated, serving the city center, Airport, WHA and other locations further afield see Section 3.4 to benefit residents and visitors 	27,500,000	✓	✓	MPWT, DPWT	✓
		1C2	Create Seamless and Integrated Interchange between Modes	1C2.1	Construct 2 Integrated Terminals for Multimodal Interchange	<ul style="list-style-type: none"> Grand Ibis Siem Reap Bus Station serves as major hub in east, while Western Siem Reap Bus Station serves as major hub to the west. These may be upgraded. 	5,400,000	✓		MPWT, DPWT	✓
		1C3	Create Public Transport Priority Corridors	1C3.1	Implement 6 km of Bus Lanes on NR6's Eastern Approach to the City Center (including Bus Signal Priority)	<ul style="list-style-type: none"> New bus lanes proposed on NR6 to reduce travel times along eastern approach to Siem Reap River, including bus signal priority 	3,600,000	✓		MPWT, DPWT	
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	<ul style="list-style-type: none"> Development of Grand Siem Reap and other new areas around active mobility and public transport can fundamentally alter travel behavior 	-	✓	✓	MPWT / MLMUPC	
2B	Accelerate Transition to Green Mobility and Minimize Adverse Environmental Effects of Transport	2B1	Accelerate E-mobility as Viable Mobility Option	2B1.1	Conduct Further Study to Develop E-Mobility Strategy	<ul style="list-style-type: none"> Strategy identifies key roles and responsibilities, e-mobility partnerships, and policy implications 	200,000	✓		DPWT	
				2B1.2	Initiate Pilot Low Emission Zone around Pub Street	<ul style="list-style-type: none"> Creation of low emission zone by leveraging Pub Street slow zone, permitting only e-vehicles 	500,000	✓		DPWT	
		2B2	Encourage Transition to Less Polluting Vehicles	2B2.1	Develop Policies to Tighten the Emission Limits for Vehicles	<ul style="list-style-type: none"> Policy development/alignment with national-level strategies to reduce emissions from second-hand motorbikes and set engine standards. 	-	✓	✓	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	<ul style="list-style-type: none"> Comprehensive parking management strategy to fully inventory parking patterns, illegal sidewalk parking, then identify city-wide restrictions, parking payment systems, areas for off-street lots, etc. 	200,000	✓		DPWT	
				2C1.2	Pilot Parking Management Zone in Pub Street	<ul style="list-style-type: none"> New mobility hubs, combined with more restrictive enforcement against sidewalk parking, and reduction of on-street parking 	500,000	✓		DPWT, Province, Traffic Police	✓
				2C1.3	Implement Parking Facilities to Provide Dedicated Off-Street Parking Spaces	<ul style="list-style-type: none"> Development of off-street parking to accommodate both vehicles and motorbikes to meet demand and address sidewalk parking 	1,000,000	✓	✓	DPWT, Province	✓
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)	<ul style="list-style-type: none"> Pilot schemes provide discounted or free public transport and bike share on specific days can encourage greater green mobility use. 	-	✓		MPWT, Province	
				2D2.1	Conduct Annual Walk/Car-Free Day Event		-	✓	✓	Province	
		2D2	Inspire and Educate the Public to Build Sentiment	2D2.2	Conduct Education Campaigns at Local Universities		-	✓	✓	Province	
				2D2.3	Conduct Communications Activities and Create Green Mobility Website & App to Educate and Provide Information	<ul style="list-style-type: none"> Education and public participation mechanisms build green mobility sentiment and encourage its use 	600,000	✓	✓	Province	✓
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	<ul style="list-style-type: none"> Resilience elements adopted and integrated within design guidelines (see Action 4A1.4) 	-	✓		MPWT	
		2E2	Integrate Resilience into Transport/Mobility Plans	2E2.1	Conduct Further Study for Transport System Resilience	<ul style="list-style-type: none"> Study for further development of transport resilience measures for operations/infrastructure 	200,000	✓		DPWT	

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 3 – Heritage / Tourism: Preserving and Respecting Heritage, while Accentuating Heritage and Broadening Tourism 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	<ul style="list-style-type: none"> Integrated heritage and mobility plans can ensure a seamless journey between historic areas and the larger urban transport networks to encourage active mobility and public transport. 	-	✓		MPWT, DPWT, APSARA	
				3A1.2	Develop Policies to Regulate the Size / Type of Vehicles Permitted to Access the WHA	<ul style="list-style-type: none"> Creation of restrictive vehicle entry policies combined with electric buggy schemes to reduce visitor impacts to WHA sites. Entry restrictions for non-zero emission vehicles 	-	✓		MPWT, Province, APSARA	
				3A1.3	Operate Green Public Transport System to/within Heritage Sites	<ul style="list-style-type: none"> Initiation of electric public transport services to the WHA as well as a clean buggy system (combined with restrictions and remote parking). 	7,800,000	✓		MPWT, APSARA	
				3A1.4	Implement Buggy Scheme with Remote Parking Scheme		3,700,000	✓		DPWT, APSARA, Province	✓
		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	<ul style="list-style-type: none"> Buses serve Roluos Group directly to diversify tourists offering and reduce peak loading at popular sites. Priority bike facilities link to Roluos Group and the Floating Villages. 	-	✓		MPWT	
3B	Intertwine Tourism and Mobility to Accentuate Siem Reap and Broaden the Experience	3B1	Leverage Green Mobility to Accentuate Regional / Heritage Appeal	3B1.1	Create and Promote Angkor Cycle Experience as Part of Tourism Package	<ul style="list-style-type: none"> Other cities marketed regional cycling circuits to broaden appeal. Potential to market Angkor Bike Trail and planned bike network as a multi-day cultural/heritage experience. 	-	✓		Province, APSARA	
				3B1.2	Create Committee to Develop Themed Experiences or Corridors	<ul style="list-style-type: none"> Cross-cutting committee formed to develop regional heritage/tourism/mobility themed tours / circuits to broaden tourist appeal. 	-	✓		MPWT, Province, APSARA	
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 & Environmental & Social Safeguards)	<ul style="list-style-type: none"> 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, environmental & social safeguard study. 	800,000	✓		MPWT, Province	
				4A1.2	Create Cross-Cutting Committee to Develop Green Mobility Performance Monitoring Mechanisms	<ul style="list-style-type: none"> Data-driven performance monitoring framework needed to assess achievement of green mobility plan 	-	✓		MPWT, Province	
				4A1.3	Establish Participatory Mechanisms for Green Mobility Plans/Schemes	<ul style="list-style-type: none"> Participatory processes improve buy-in and support for plans, making them people-centric. 	-	✓		MPWT	
				4A1.4	Integrate Green Mobility into Road Design Standards or in Standalone Standards (for Sidewalks, Crossings and Facilities)	<ul style="list-style-type: none"> 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. 	-	✓		MPWT	
		4A2	Leverage Technology to Improve Green Mobility Operations and Outcomes	4A2.1	Create Open-Data Sharing Platforms to Spur Innovation	<ul style="list-style-type: none"> Open-data platforms have led to citizen-centric innovations and plans to create safer, more secure, and more accessible active mobility networks. 	-	✓		MPWT, Province	
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	<ul style="list-style-type: none"> Legal framework lacks provisions for cycling, public transport, and e-mobility. Committee can be formed to develop legal basis for green mobility – learning from Phnom Penh 	-	✓		MPWT	
				4B1.2	Create Regional Committee to Assess Potential for Transport Authority	<ul style="list-style-type: none"> Public transport requires coordination/integration among entities/ jurisdictions. Establishment of authority to manage roads, signals, sidewalks, cycling, and public transport ensures integrated approach. 	-	✓		MPWT	
				4B1.3	Better Link Green Mobility into Project Prioritization Framework	<ul style="list-style-type: none"> Better linkage can help to deliver better outcomes and effective projects, while also addressing financing shortfalls 	-	✓		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
				4B1.4	Implement Targeted Capacity Building to Sharpen Skills Needed for Green Mobility	<ul style="list-style-type: none"> Skill development (including enforcement, funding, and financing) for effective implementation and operation. 	200,000	✓		MPWT, DPWT, Province	
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	<ul style="list-style-type: none"> New revenue sources can make up for current shortfalls. 	-	✓		MPWT, Province	
				4C1.2	Establish Dedicated Green Mobility Funding Pool	<ul style="list-style-type: none"> Dedicated funding pools for active and green mobility with earmarked revenue can also help to overcome shortfalls. 	-	✓		MPWT, Province	
		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)	<ul style="list-style-type: none"> Re-prioritizing projects after linking green mobility into the framework ensures better alignment with green mobility goals. 	-	✓		MPWT	
				4C2.2	Mobilize More Development Partner Financing	<ul style="list-style-type: none"> Developer partner financing, or private sector participation in urban transport sector can increase access to financing. 	-	✓		MEF	
				4C2.3	Mobilize Private Sector Capital and increase private sector participation (i.e., through PPP).		-	✓		MEF	

The total plan cost is US\$220.3 million, divided as follows: (i) Phase 1 – US\$123.4 million; and (ii) Phase 2 – US\$96.9 million. The biggest ticket item is the proposed road improvements (which also include some active mobility enhancements), followed by the proposed electric bus system, as well as other improvements such as extensive priority cycle network and sidewalk improvements. Several different elements require further study, as well as capacity building and public outreach/communications and this is also included in the overall indicative investment priorities costs including citywide parking, e-mobility, resilient transport, traffic management, motorbike policy, and environmental / social safeguards 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	\$48,900,000	\$60,000,000	\$108,900,000
Public Transport	\$36,400,000	\$7,700,000	\$44,100,000
Sidewalk Improvement	\$12,000,000	\$15,900,000	\$27,900,000
Cycle Facilities	\$14,700,000	\$12,200,000	\$26,900,000
Crossing Improvement ^C	\$4,200,000	\$600,000	\$4,800,000
Buggy Services	\$3,700,000	\$0	\$3,700,000
Consulting Services ^D	\$1,800,000	\$200,000	\$2,000,000
Other Improvement ^E	\$1,700,000	\$300,000	\$2,000,000
Total	\$123,400,000	\$96,900,000	\$220,300,000

Note:

^A Summations in this table by component may not match the totals from other due to rounding.

^B Road improvement include climate resilient paving and other sidewalk/crossing improvements as part of the overall road program.

^C Activities under this category are separate from crossing improvements made as part of the overall road improvements and are proposed solely for the benefit of pedestrians (thus excluding road paving improvements). These include improvements at junctions and at the mid-block.

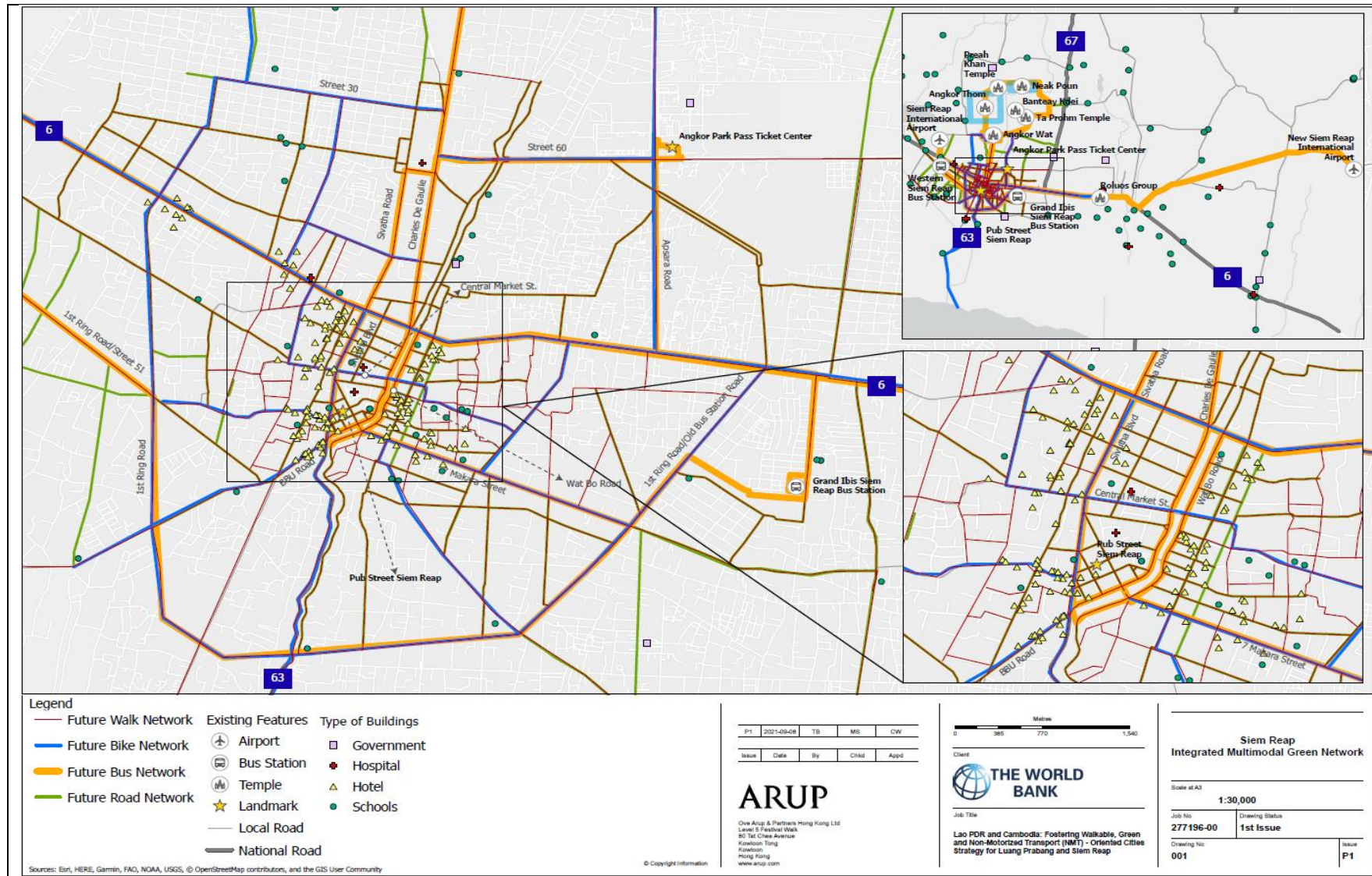
^D Consulting services include those for e-mobility, parking, traffic management, motorbike policy, environmental and social safeguards, as well as capacity building and public outreach/engagement.

^E Other improvements include pilot low emission and parking zones.

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 then supported by an extensive/connected walk network that includes both formal curbed sidewalks and shared streets. Selected road enhancements may create an all-weather network and improve pavement and 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\$30/night rate.

Figure 3.1: Integrated Multimodal Green Network

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 WHA, and new growth areas.

Building on the US\$150.0 million 38-road improvement project, planned Siem Reap city improvements and future ring road and bypass projects, as well as prevalent travel patterns from the mobile data, a network of road enhancements (approximately 65.0km) are proposed. The upgrades would include pavement enhancements, drainage, and select sidewalk and crossing improvements (including wheelchair ramps, tactile pavement, and some signalized crossings and traffic calming including raised crossing and medians). Associated sidewalk improvements include pedestrian-scale (3m-4m tall) lighting every 10m, and tree planting every 25m, as well as street furniture. 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. These are shown in **Table 3.4**.

Table 3.4: Proposed Road Network Improvements by Timeframe

Time-frame	Strategic Role	Network Length (km)		
		Urban	Rural	Total
Phase 1 (1-7 Years)	Enhance surfacing and active mobility conditions on already paved roads as well as providing upgraded alternate north-south paths west of Charles de Gaulle. Creating paved and quality connections between major roads to create additional pathways – this includes connecting NR67 with Charles De Gaulle and improved roads near the Airport	14.0	15.0	29.0
Phase 2 (8-10 Years)	Improving connections to planned major road improvements such as the Siem Reap Bypass and the 3 rd Ring Road and extending the network outward for future growth	18.0	18.0	36.0
Total		32.0	33.0	65.0

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\$108.9 million

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

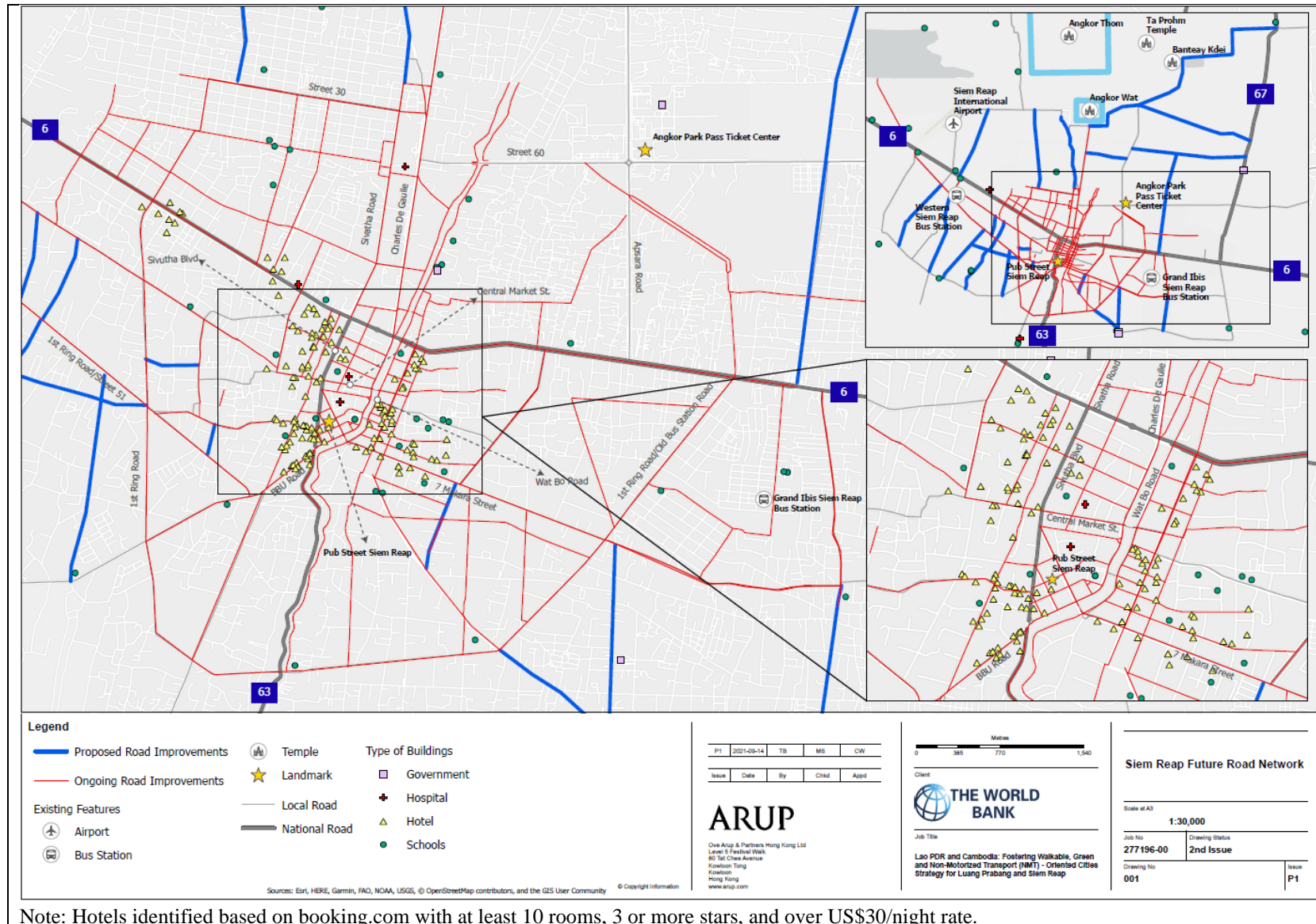
- Improves travel times for all users (including public transport and vehicles) from newly paved and flat surfaces
- Enhances safety for all users and reduces accidents and vehicle-related injuries

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 throughout the implementation period of the indicative investment priorities to identify opportunities for improving road safety for all 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 29 (Total 65) km of Roads for Vehicles and Active Mobility	MPWT, DPWT
	1B5.2	Integrate Road Safety Elements into Road Design Standards	MPWT
	1B5.3	Conduct Road Safety Audits	MPWT
	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 36 (Total 65) km OF Roads for Vehicles and Active Mobility	MPWT, DPWT
	1B5.3	Conduct Road Safety Audits	MPWT



Note: Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US\$30/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 reduce the vehicle volumes on the 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 Siem Reap International Airport with the central Pub Street area and city center, as well as key visitor attractions (i.e., Angkor, etc.) as indicated by the mobility data information. The introduction of bus lanes and other forms of transit priority can help to further increase the speed and reliability of buses, thereby providing a more time-competitive alternative to driving or tuk-tuks. Establishment of bus-friendly elements in new areas such as Grand Siem Reap and growth areas on the outskirts, with larger bus stops, bus lanes, etc. can establish the foundation for more effective and attractive bus services in the areas.

Electric bus (or e-bus) has strong support from local stakeholders and proponents (including the city and APSARA) to provide a clean and non-polluting mode to move residents and visitors throughout the city and the monuments. Support for e-bus adoption in Siem Reap is apparent in the Public Investment Programme (2022-2024), including US\$15.92 million (with expected US\$3.92 million in expenditures during the 2022-2024 period). This aligns with the global transition currently occurring towards electric units (which may be the prevailing propulsion technology in the near future). E-bus is also attractive 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, APSARA 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 Siem Reap 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 Phnom Penh 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.

The proposed network may consist of eight routes totaling some 210km in overall route length. 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 Siem Reap, through Angkor Wat and Angkor Thom, as well as the existing Airport. Service to/from new development areas to the east including Grand Siem Reap and the New Siem Reap International Airport are also proposed. The eight routes are shown in **Figure 3.3**, with indicative operating details proposed below.

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	Siem Reap International Airport - Grand Ibis Siem Reap Bus Station	Phase 1	Conventional	14.	30.0	4
2	Grand Ibis Siem Reap Bus Station - Angkor Park Pass Ticket Center	Phase 1	Conventional	11	15.0	6
3	Western Siem Reap Bus Station - Roluos Group	Phase 2	Conventional	22	30.0	5
4	Western Siem Reap Bus Station - Grand Ibis Siem Reap Bus Station (via NR6)	Phase 1	Conventional	13	20.0	5
5	Western Siem Reap Bus Station - Grand Ibis Siem Reap Bus Station (via Ring Road at the South)	Phase 1	Conventional	13	30.0	4
6	Angkor Park Pass Ticket Center - Angkor	Phase 1	Small	36	7.5	16
7	Western Siem Reap Bus Station - Grand Siem Reap	Phase 2	Conventional	50	30.0	8
8	Siem Reap International Airport - New Siem Reap International Airport	Phase 1	Conventional	50	30.0	8

Note:

^A Peak hour headways estimated from available information including: (i) tourist arrivals at the Airport; (ii) tourist arrivals at major WHA sites including Angkor; 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, with two types of vehicles: (i) a smaller 10m bus holding up to 20 passengers (and narrow enough to fit through the gate at Angkor Thom); and (ii) a larger 12m bus holding up to 65 passengers operated on other routes. The Angkor route is a one-way loop from the Angkor Park Pass Ticket Center to Angkor Wat, Angkor Thom, Pre Rup and back. Most routes are proposed to terminate at either the current Western Siem Reap Bus Station or the Grand Ibis Siem Reap Bus Station to the east, near the 1st Ring Road. Routes also may provide service to major tourist areas from the airport and the WHA to provide an alternative to tuk-tuks and other motorized vehicles.

The major public transport corridor is NR6. Buses may operate along the frontage roads to the west of the Siem Reap River, and then within dedicated curbside lanes in the right-of-way east of the Siem Reap River. Other key public transport corridors include Sivutha Blvd., 7 Makara Street, and the 1st Ring Road.

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.

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 (Airport to/from City Center and City Center to/from WHA)
- Goals: Reduce vehicles, reduce emissions, and improve road safety
- Operating Hours: 4:00AM-11:00PM (7 days per week)
- Headway: 15-30 minutes headway for convenient/attractive service (for reference Phnom Penh Airport Bus (Route 3) operates at 10-15 minutes headways, with more frequent service to/from Angkor for tourists)
- Peak Vehicles: 56 (including 10% spares based on 25 km/hour average speed)
- Indicative Cost: ~US\$44.1 million (summary costs from **Table 3.3**, which may differ from table below due to rounding)

Potential Benefits:

- Provides green, efficient, and reliable higher-capacity mode to serve both residents and visitors within the city, to/from the WHA, and to/from the Airport
- 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 in the city and the WHA, and reduces environmental impacts on the WHA monuments (a key concern of APSARA)
- Standard 12m bus can replace 40-50 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 the same timeline, 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) are proposed to provide required infrastructure for operation of bus services. The public transport system may focus on transporting passengers to/from city center, the WHA, and Airport. Phase 2 actions entail the expansion of services to the east (to Rolous Group and Grand Siem Reap) 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 by Timeline

Time-frame	#	Action	Lead Party / Parties
Phase 1 (1-7 Years)	1C1.1	Operate 138 (Total 210) km, 6 (Total 8) Line Bus System serving Siem Reap and Surrounding Area	MPWT, DPWT
	1C2.1	Construct 2 Integrated Terminals for Multimodal Interchange	MPWT, DPWT
	1C3.1	Implement 6 km of Bus Lanes on NR6's Eastern Approach to the City Center (including Bus Signal Priority)	MPWT, DPWT
	2D1.1	Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	MPWT, Province
	3A1.3	Operate Green Public Transport System to/within Heritage Sites	MPWT, APSARA
	4B1.2	Create Regional Committee to Assess Potential for Transport Authority	MPWT
Phase 2 (8-10 Years)	1C1.1	Operate 72 (Total 210) km, 2 (Total 8) Line Bus System serving Siem Reap and Surrounding Area	MPWT, DPWT

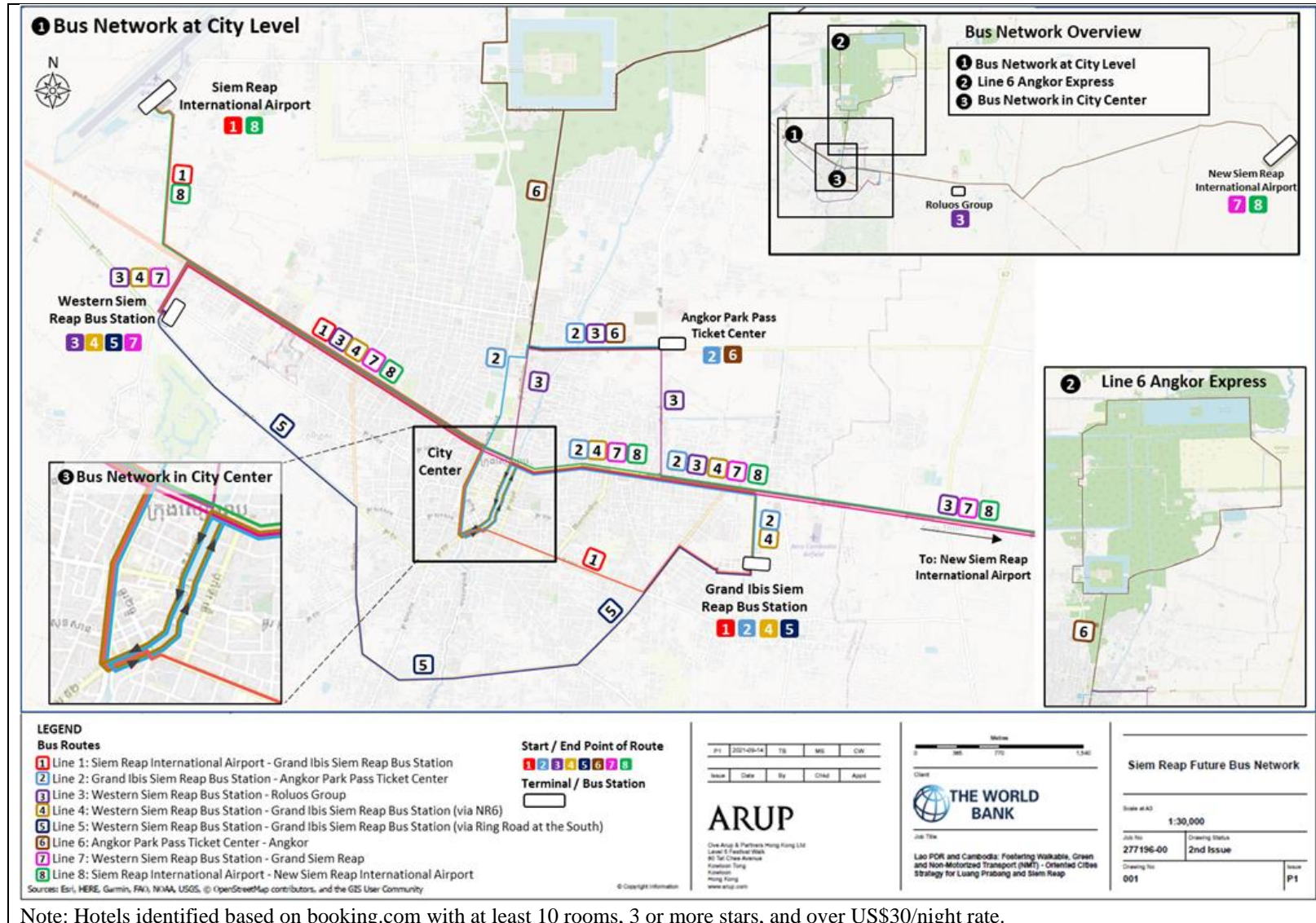


Figure 3.3: Proposed Electric Bus Network

Bike Network


In other cities around the world such as Amsterdam, Copenhagen, etc. cycling is a vital cog in the overall transport mobility scheme. Within Siem Reap, the Angkor Bike Trail has recently been opened, largely catering to visitors. Plans exist to expand the cycle network along Charles de Gaulle and the Siem Reap River to form a north-south spine from the city center. However, the lack of other dedicated cycle facilities (including bike lanes, bike sharing, or bike parking) discourages greater use of cycling throughout the city both for residents and tourists alike. 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.



Thus, dedicated bike lanes and priority facilities are proposed on 84.8km of roads in Siem Reap (with additional markings for shared bike lanes on 80.4km of roads). The bike network is meant to provide cyclists a more amenable and safer environment (i.e., slower traffic, segregation from other vehicles, etc.). The network complements the higher-capacity public transport network, seeking to capture medium-distance trips currently taken on motorbike or tuk-tuk. The bike network may tie into the Angkor Bike Trail and proposed bike lanes on Charles de Gaulle (as part of the US\$150 million, 38-road project) and the shared trail being built along the Siem Reap River to create a cohesive bike network with multiple options.

Within the city center, the cycle network also includes several segments that have been improved by the US\$150 million, 38-road improvement project. This project proposes several dedicated motorbike lanes, which are proposed to be converted (with additional signage) to bike lanes to promote green mobility and leverage infrastructure improvements by the government. The cycle network provides potential interchange with the bus system at multiple points on key corridors such as NR6, 1st Ring Road, 7 Makara Street, and Charles de Gaulle.

Dedicated bike facilities also include bike racks (assumed to be every 1km), and an extensive bike share program with up to 1,250 bicycles (500 in Phase 1 and 750 in Phase 2). Priority bike lanes are presented in the table below.

Table 3.8: Type of Priority Bike Lanes

Dedicated Bike Facility	Example
<p>Type 1: Bikeway – Specially designed bicycle travel facility, typically located off-street and with clear physical segregation from adjacent traffic with raised curbs, landscaping, etc. Bikeways offer the greatest level of segregation from motor vehicles and allows for the fastest and most comfortable cycling experience. For Siem Reap, the frontage road along NR6 is proposed for bikeways on both sides, as well as portions of Street 60 and Apsara Road.</p>	 <p><i>Amsterdam, Netherlands</i></p>

Dedicated Bike Facility	Example
<p>Type 2: Protected Bike Lanes – Bike lanes are located within the road right-of-way and delineated from traffic lanes with a combination of raised curbs, bollards, colored pavement, and/or signage. For Siem Reap, some segments of the US\$150 million, 38-road project are proposed for protected bike lanes (for instance on NR7 east of the Siem Reap River and the 1st Ring Road) by converting proposed motorbike lanes for biking.</p>	 <p data-bbox="1021 526 1329 555"><i>Near San Francisco, USA</i></p>
<p>Type 3: Shared Bike Lanes or Sharrows – These 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 minor roads radiating out from the city center.</p>	 <p data-bbox="1085 801 1265 831"><i>Portland, USA</i></p>

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	Bikeway	Facility provided along the bus lanes of NR-6 and frontage roads, as well as frontage roads	10.4	6.8	17.2
2	Protected Bike Lane	Aligns with 38 road improvement and fills strategic gaps based on assessment from mobile phone data of short-/medium-distance trips	33.4	34.2	67.6
3	Shared Street	Local roads that provide alternate corridors that are slower with less vehicles for less experienced users	30.2	50.2	80.4
		Total	74.0	91.2	165.2

Key Details:

- Target: Residents and Visitors
- Goals: Reduce driving / motor vehicle use for short/medium-distance trips
- Bike Parking Stations: 166
- Bike Share: 1,250 bicycles
- Indicative Cost: ~US\$26.9 million

Benefits:

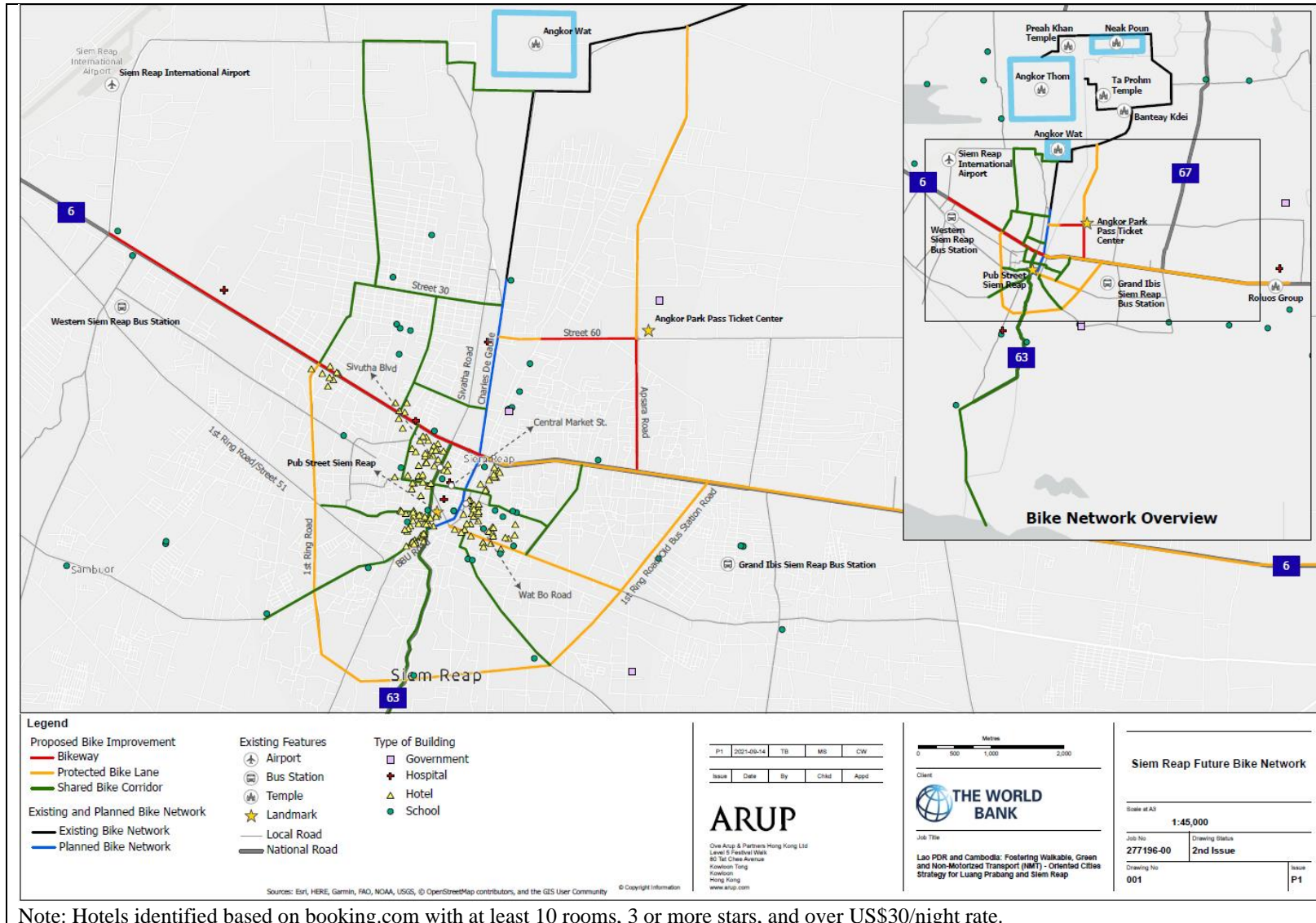
- Create more expansive bicycle network to encourage wider use of cycling
- Create memorable and sustainable cycling experience through the city and to/from Angkor for visitors and residents
- Improve air quality by reducing driving, vehicle use and carbon emissions
- Reduces necessity of driving or 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. Phase 1 actions 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 10.4 (Total 17.2) km of Bikeways, 33.4 (Total 67.6) km of Protected Bike Lanes, and 30.2 (Total 80.4) km of Sharrows	DPWT
	1A3.1	Install 74 (Total 166) Bike Racks	DPWT, Province
	1A3.2	Implement Bike Share Program in City (500 Bicycles; Total 1,250)	DPWT, Province
	1A3.3	Install 10 (Total 30) Toilets along Key Walk/Cycle Corridors	Province, City
	2D1.1	Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	MPWT, Province
Phase 2 (8-10 Years)	1A2.1	Create 6.8 (Total 17.2) km of Bikeways, 34.2 (Total 67.6) km of Protected Bike Lanes, and 50.2 (Total 80.4) km of Sharrows	DPWT
	1A3.1	Install 92 (Total 166) Bike Racks	DPWT, Province
	1A3.2	Implement Bike Share Program in City (750 Bicycles; Total 1,250)	DPWT, Province
	1A3.3	Install 20 (Total 30) Toilets along Key Walk/Cycle Corridors	Province, City



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

Figure 3.4: 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 network and cycle network, the fundamental walk network providing first/last mile connectivity has been identified and prioritized – in total some 63.3km for 2m sidewalk improvements and 12.0km for 3m sidewalk improvements (the latter coinciding with proposed dedicated bus lanes along NR6) and associated crossing improvements.²⁴ Given the scale of the Siem Reap street network, target corridors have been selected as part of the priority walk network for investment, with a clear focus on the city center. Many of these corridors have already been upgraded as part of the US\$150 million, 38-road project, 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 streets to encourage its use instead of motorbikes for short trip. Walk improvements in Phase 2 are not included as it is assumed integration of green mobility and walk facilities into layout of new development areas has been achieved.

Table 3.11: Proposed Walk Network Improvements by Timeframe

Time-frame	Strategic Role	Network Length (km)		
		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 NR6 and major roads such as Charles De Gaulle.	31.3	0	31.3
Phase 2 (8-10 Years)	Creating paved and quality connections between major roads to create additional pathways – this includes connecting Sivutha Street, Pokambor Avenue, and BBU Road.	32	12	44
Total		63.3	12	75.3

Figure 3.5 shows the corridors proposed for walk improvements, while **Figure 3.6** presents the crossing improvement locations. The blue lines represent the proposed walk network, while the red lines represent those already being upgraded by the US\$150 million, 38-road project, which is implementing a 2-3m sidewalk on both sides of these roads (as well as street furniture including streetlights, benches, trees, bollards, etc.). Street improvements (excluding those associated with the road network upgrades in **Figure 3.2**) under the Green Mobility Vision include sidewalk widening to 2-3m, as well as provision of street trees (every 10m) and pedestrian

²⁴ 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.

scale lighting (every 25m), based on international standards identified in Technical Report - Siem Reap Green Urban Mobility.

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):
 - 63.3km of 2m sidewalk improvement
 - 12.0km of 3m sidewalk improvement (along Bus Lanes on NR6)
 - 20 new traffic signals
 - 100 mid-block crossings
 - 250 enhanced zebra crossings
 - Access-for-all enhancements at all improved crossings
- Indicative Cost: ~US\$32.7 million (Sidewalk – US\$27.9 million and Crossings at US\$4.8 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

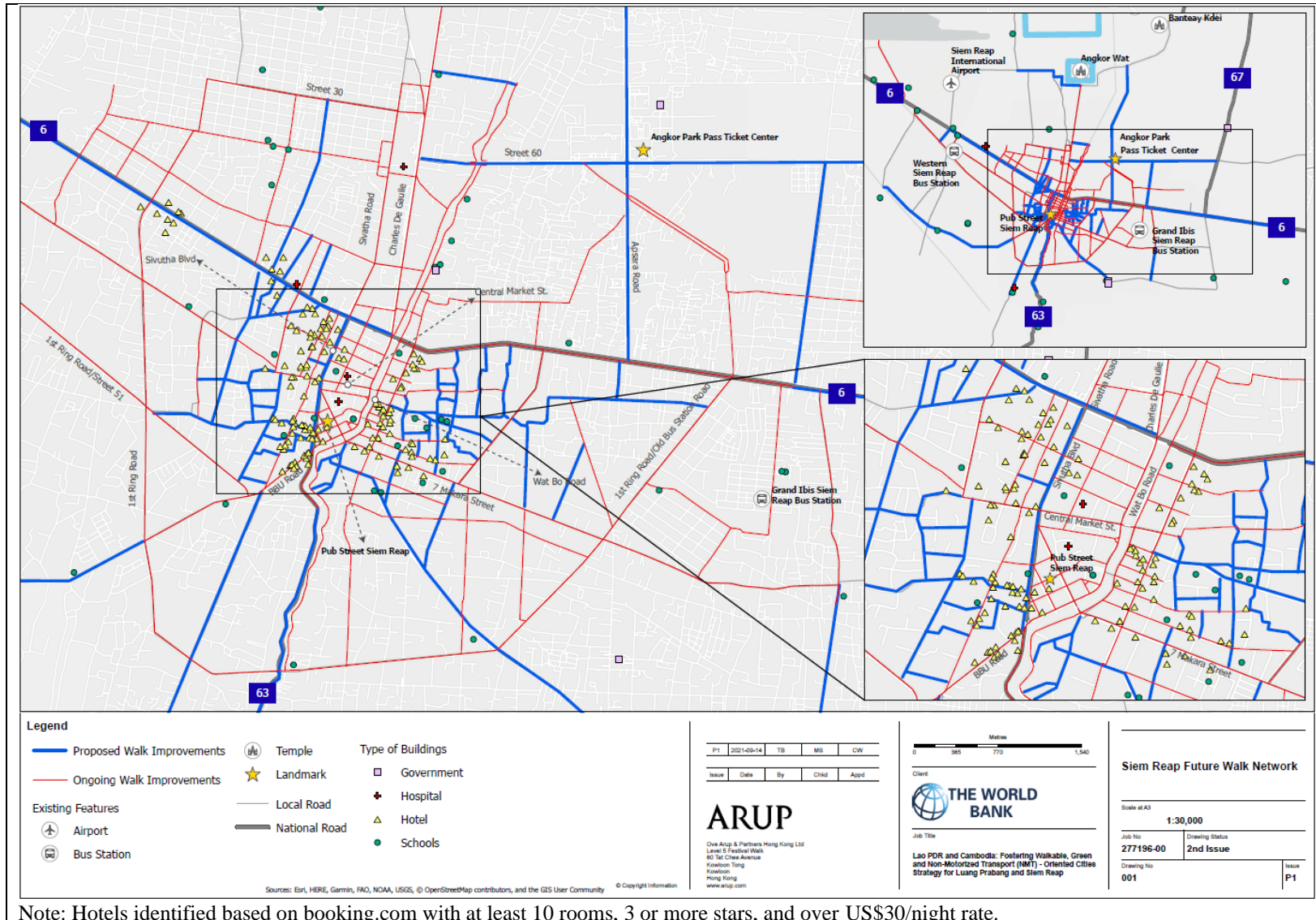
Key Related Actions:

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 interventions including a slow traffic district. The walk network may be built in phases. In Phase 1, street enhancements (i.e., light, tree, wheelchair access ramps, street furniture, etc.) 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

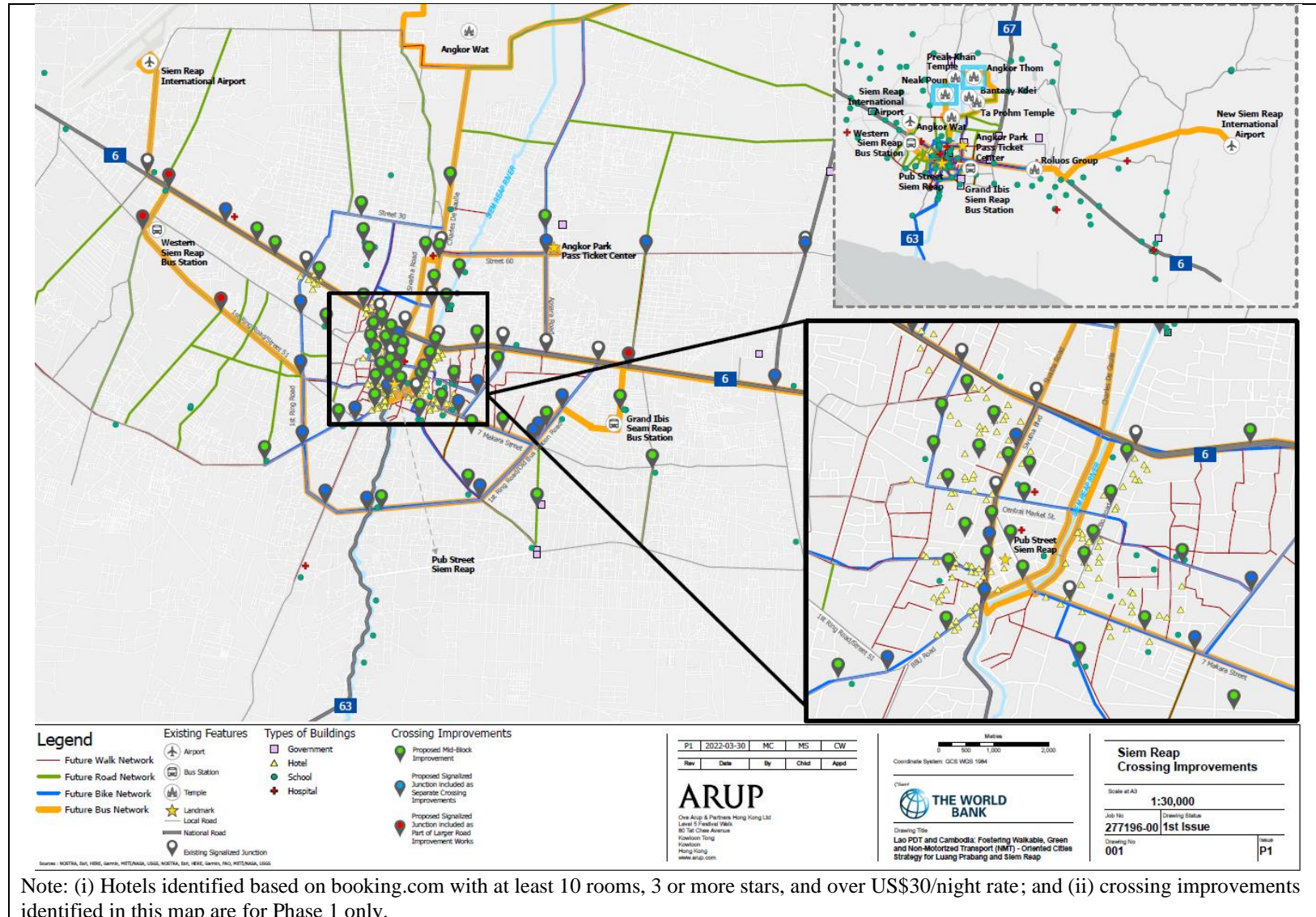
Time-frame	#	Action	Lead Party / Parties
Phase 1 (1-7 Years)	1A1.1	Create/Improve 31.3 (Total 75.3) km of Paved Sidewalk with Segregated Curb	DPWT
	1A1.2	Create Pilot Walk District in Pub Street and Slow District around Pub Street	DPWT
	1B1.1	Implement Crossing Improvement Plan including 20 Signalized Junctions, Mid-Block Crossing Enhancements at	DPWT

Time-frame	#	Action	Lead Party / Parties
		50 Locations, as well as Zebra Crossing Improvements at 125 Locations	
	1B1.2	Conduct Citywide Crossing Improvement Study and Implement Improvement Scheme	DPWT
	1B2.1	Implement Pedestrian Scale Lighting on 31.3 (Total 75.3) km of Road (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 195 (Total 370) Locations	DPWT
	1B3.2	Implement Tactile Pavement at 195 (Total 370) Locations	DPWT
	1B3.3	Integrate Universal Access into Design Guidelines for Green Mobility Infrastructure	DPWT
	2D2.1	Conduct Annual Walk/Car-Free Day Event	Province
	4A1.4	Integrate Green Mobility into Road Design Standards or in Standalone Standards (for Sidewalks, Crossings and Facilities)	MPWT
	1B4.1	Implement Tree Planting Program along 31.3 (Total 75.3) km of Road	Province, City
Phase 2 (8-10 Years)	1A1.1	Create/Improve 44 (Total 75.3) km of Paved Sidewalk with Segregated Curb	DPWT
	1B1.1	Implement Crossing Improvement Plan including Mid-Block Crossing Enhancements at 50 Locations as well as Zebra Crossing Improvements at 125 Locations	DPWT
	1B2.1	Implement Pedestrian Scale Lighting on 44 (Total 75.3) km of Road (at 25m intervals)	DPWT
	1B2.2	Implement CCTV Monitoring System along 75.3 km (about 50 CCTV) of Sidewalks	DPWT
	1B3.1	Implement Wheelchair Access Ramps at 175 (Total 370) Locations	DPWT
	1B3.2	Implement Tactile Pavement at 175 (Total 370) Locations	DPWT
	1B4.1	Implement Tree Planting Program along 44 (Total 75.3) km of Road	Province, City
	2D2.1	Conduct Annual Walk/Car-Free Day Event	Province



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

Figure 3.5: Proposed Walk Network



Note: (i) Hotels identified based on booking.com with at least 10 rooms, 3 or more stars, and over US\$30/night rate; and (ii) crossing improvements identified in this map are for Phase 1 only.

Figure 3.6: 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 Siem Reap 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 Siem Reap 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: NR6

Background of Corridor

NR6 is the major east-west mobility corridor in the city, serving as the principal vehicular thoroughfare, as well as an important walk corridor. East of the Siem Reap River, NR6 has two lanes in each direction, with a wide frontage area including sidewalk and parking areas – with road widths of between 25-30m roughly. West of the Siem Reap River, the configuration narrows considerably (where short sections only accommodate one lane of traffic in each direction), before opening up further west towards the Airport with two lanes in each direction, with parallel frontage roads alongside.

The priority green mobility corridor along NR6 extends from the Airport Road in the west to the eastern edge of the 1st Ring Road / Old Bus Station Road in the east. The corridor passes through the city center and across the Siem Reap River. The total corridor length is 8.3km.

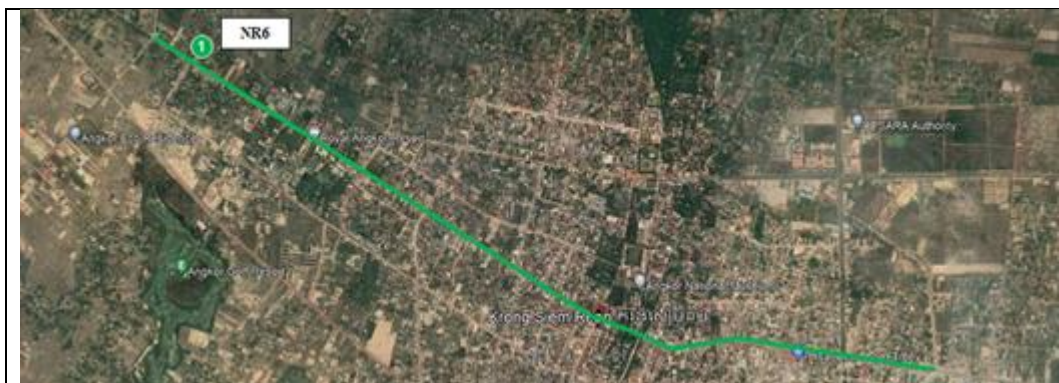


Figure 3.7: Extent of Priority Green Corridor along NR6

Key Green Mobility Issues on Corridor

Key mobility issues along this stretch of NR6 are as follows:

Table 3.13: Key Mobility Issues on NR6

#	Key Mobility Issue	Description / Details
1	Vehicle Congestion	<ul style="list-style-type: none"> According to a 2020 JICA Study, congestion is observed on NR6 in the AM/PM peak (with a volume/capacity ratio exceed 1.0).^A
2	Sidewalk Parking and Obstructions	<ul style="list-style-type: none"> Significant sidewalk parking together with other obstructions are observed on NR6 (both from the 2018 Korean green transport study, an on-street metered parking study in 2019 and video observations in the Fall of 2020).^{B,C} Illegal sidewalk parking impacts pedestrian safety in terms of direct conflicts with vehicles on the sidewalk and pedestrians being forced to walk into the road carriageway to avoid parked vehicles.
3	Sidewalk Quality and Provision	<ul style="list-style-type: none"> The 2018 Korean green transport study found that of 150 respondents, more than one-third cited road crossing safety as “dangerous” or “very dangerous” (with NR6 cited as the most dangerous). The same Korean study found more than half of respondents consider sidewalk provision “insufficient” or “very insufficient,” while 60% cite the NR6 sidewalk experience as “inconvenient” NR6 lacks separated sidewalks with raised curbs, which are not uniformly provided as the walk path is integrated into the street-fronting parking area for parallel businesses and establishments particularly east of the Siem Reap River.
4	Crossing Experience	<ul style="list-style-type: none"> NR6 is relatively wide with fast-traveling vehicles. It typically has two travel lanes in each direction, and in some instances dual frontage roads. Crossing distance is typically 25-30m, without median refuges in some stretches. Limited signalized crossing facilities across NR6 and lack of central median, creates dangerous and uncomfortable crossing experiences.
5	Limited Access-for-All-Facilities	<ul style="list-style-type: none"> No wheelchair ramps or tactile pavement are observed on NR6, creating mobility difficulties for those with disabilities, etc.
6	Lack of Cycle Facilities	<ul style="list-style-type: none"> No bike lanes, bike share facilities, or bike parking exists along NR6, although nearby facilities are being developed along the Siem Reap River.
7	Lack of Public Transport Facilities	<ul style="list-style-type: none"> As no public transport system operates in Siem Reap, no facilities are provided on this corridor.

Notes:

^A Source: Data Collection Survey on Urban Improvement in Siem Reap City in the Kingdom of Cambodia – The Basic Survey for Smart City in Siem Reap – Draft Interim Report, JICA, 2020.

^B Source: Green Urban Transport & Road Network Improvement Master Plan in Siem Reap, Cambodia – Volume I: Green Urban Transport & Road Network, Korea Ministry of Land, Infrastructure & Transport (MoLIT), 2018.

^C Source: Siem Reap Smart Road (On-Street Parking) Feasibility Study Report, SONATRA Carling Co., Ltd., October 2019.

Proposed Green Mobility Initiatives and Costs

At present, concurrent improvement works have been undertaken on sections of NR6 passing through the city including: (i) an Asian Development Bank (ADB) road improvement works west of the Siem Reap River (focusing on repaving and drainage); and (ii) the US\$150 million, 38-road improvement project, which includes road pavement and drainage improvements, 2-3m sidewalk widening, and lighting installation east of the Siem Reap River. The JICA Smart City Study also proposes parking improvements along this stretch with CCTV monitoring.

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. This includes implementing infrastructure for public transport with bus stops and bus lanes (east of the Siem Reap River), bike (including bike lanes, bike parking, and bike share), as well as walk (including tree shading and light), crossings (such as improving zebra crossings, creating new mid-block crossings,

and installation of new traffic signals to facilitate safe pedestrian movements), and access-for-all (wheelchair ramps and tactile paving) enhancements.

Table 3.14 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 NR6 is US\$17.0 million or roughly US\$2.05 million per km.

Table 3.14: Enhancements/Costs for Priority Green Mobility Corridor – NR6

#	Type	Proposed Initiative in Indicative Investment Priorities	Notes	Costs (US\$)
1	Public Transport	<ul style="list-style-type: none"> 2.9km of dedicated bus lane (each direction) Bus stops ~every 500-600m (27 stops) Transit signal priority at key junctions 	<ul style="list-style-type: none"> Extensive public transport service envisioned along NR6 Enhancement to transform NR6 into the major public transport corridor in city Buses may operate on frontage roads to increase speeds west of Siem Reap River Costs for procuring buses and operating service is not included in the costs Furthermore, costs for infrastructure outside of this section (i.e., terminals or depots) or other bus lane portions are excluded as well. 	\$1,900,000
2	Road	<ul style="list-style-type: none"> None (improvements handled by others – see next column) 	<ul style="list-style-type: none"> Upgrades are part of the US\$150 million road improvement project and ADB NR-6 project, but may nonetheless benefit green mobility with a smoother ride and all-weather roads (enhancing walk, cycle, and public transport conditions) No road improvement costs are attributed to the investment priorities list in this segment 	-
3	Sidewalk	<ul style="list-style-type: none"> 5.4km of sidewalk widening and paving, as well as new trees and streetlights (each direction) and street furniture Tactile paving and wheelchair ramps at select junctions 	<ul style="list-style-type: none"> Sidewalk enhancements east of the Siem Reap River to be covered by the US\$150 million road improvement project (including 2-3m sidewalks, lighting, and trees) Improvements on sections west of the Siem Reap River proposed by this Green Mobility Vision and part of the indicative investment priorities Street furniture may create a more friendly walk environment and better separate vehicles from pedestrians. Tactile paving may improve access and safety for vision-impaired pedestrians, while wheelchair ramps may improve safety and access to/from the curb. 	\$3,650,000
4	Crossing	<ul style="list-style-type: none"> Seven mid-block crossing improvements (with pedestrian flashing beacon/signal, zebra crossing improvements, median, speed humps, etc.) Upgraded zebra crossing / markings at two junctions Select traffic calming measures 	<ul style="list-style-type: none"> Signal improvements should be coordinated with those upgraded as part of the US\$150 million road improvement project Traffic calming may reduce speeds of vehicles approaching crossings Wheelchair ramps may improve access and safety for all types of users 	US\$300,000

#	Type	Proposed Initiative in Indicative Investment Priorities	Notes	Costs (US\$)
5	Cycle	<ul style="list-style-type: none"> • 5.4km of off-street bikeway (each way) • 2.9km of protected bike lane with bollards (both directions) • Short sharrow section west of Siem Reap River • Six bike share stations (~120 bikes) • Eight bike parking facilities (~100 spaces) 	<ul style="list-style-type: none"> • Combined strategy of bike lanes, parking and cycle share beneficial for residents and tourists • Bike facilities tie directly into the public transport network and walk improvements 	\$10,850,000
6	Parking	<ul style="list-style-type: none"> • Six off-street lots within 400m walk distance of the corridor (~375 spaces) 	<ul style="list-style-type: none"> • Off-street parking located in key locations near key generators and where significant illegal sidewalk parking observed • Park-and-ride lots proposed on the periphery of the city near major junctions with NR6 and public transport hubs, intended to intercept vehicles prior to entering the city 	\$300,000
Total				\$17,000,000

Figure 3.8 presents the concept for the NR6 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).

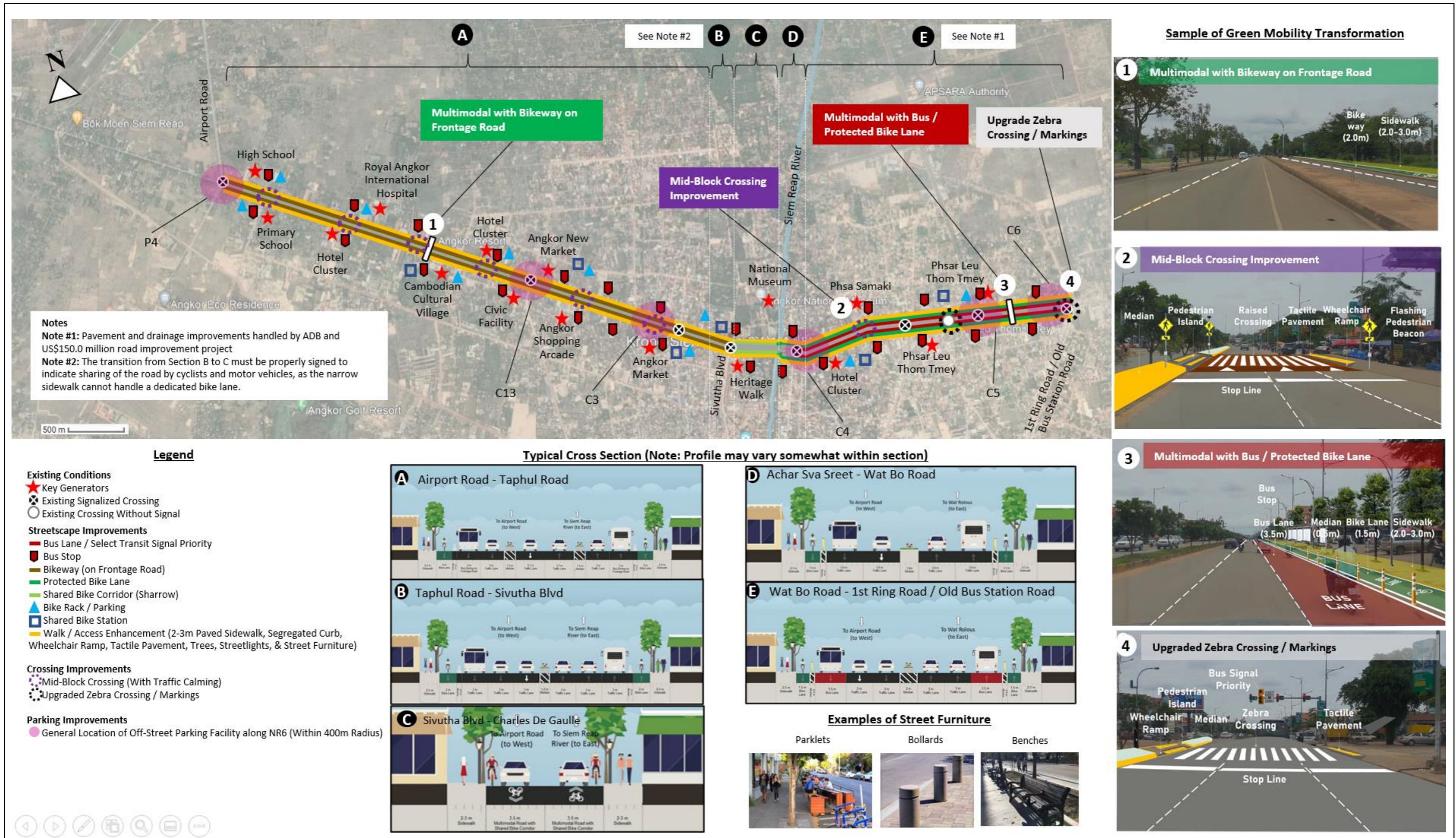


Figure 3.8: Conceptual Design of Priority Green Mobility Corridor – NR6

Priority Green Mobility Corridor#2: Sivutha Blvd.

Background of Corridor

Sivutha Blvd. is a major north-south local road, located west of the Siem Reap River. This road is part of NR63 passing through the Old Market and Pub Street areas and continuing north across NR6. Sivutha Blvd. has two lanes (one lane in each direction) as well as curbside parking and loading/ unloading areas (with a road profile of exceeding 10.0m width). Significant vehicular and pedestrian activity occurs in this segment, especially at night when activity in the Pub Street area peaks.

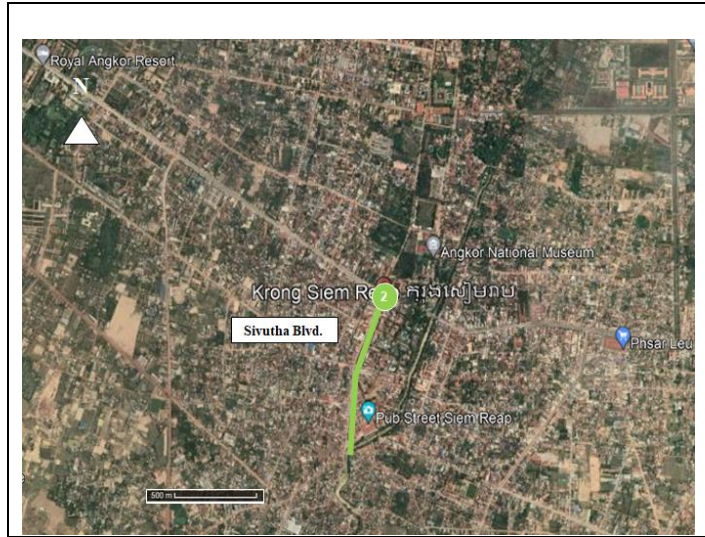


Figure 3.9: Extent of Priority Green Corridor along Sivutha Blvd.

The priority green mobility corridor along Sivutha Blvd. extends from the NR6 junction in the north to BBU Road to the south (at the southeast edge of the Pub Street Area). The corridor passes to the west of the Pub Street area, with a total corridor length of 1.2km.

Key Green Mobility Issues

Key mobility issues along this stretch of Sivutha Blvd. are as follows:

Table 3.15: Key Mobility Issues on Sivutha Blvd.

#	Key Mobility Issue	Description / Details
1	Vehicle Congestion	<ul style="list-style-type: none"> A 2018 Korean green transport study identified Sivutha Blvd. as one of the more congested corridors in the city (based on a survey of tuk-tuk drivers).^A
2	Sidewalk Parking and Obstructions	<ul style="list-style-type: none"> Significant sidewalk parking together with other obstructions are observed on Sivutha Blvd. (both from the 2018 Korean green transport study, an on-street metered parking study in 2019 and video observations in the Fall of 2020).^B Illegal sidewalk parking impacts pedestrian safety in terms of direct conflicts with vehicles on the sidewalk and pedestrians being forced to walk into the road carriageway to avoid parked vehicles.
3	Sidewalk Quality and Provision	<ul style="list-style-type: none"> Sivutha Blvd. has dedicated raised sidewalks, though lacks standard, consistent curb heights of 150mm or higher.
4	Crossing Experience	<ul style="list-style-type: none"> A single signalized crossing is provided along Sivutha Blvd., although numerous zebra crossings are provided. Sivutha Blvd. exceeds 10.0m width in most locations without a median refuge.
5	Limited Access-for-All-Facilities	<ul style="list-style-type: none"> Sivutha Blvd. provides several wheelchair ramps at junctions, but no tactile pavement at crossings.

#	Key Mobility Issue	Description / Details
6	Lack of Cycle Facilities	<ul style="list-style-type: none"> No bike lanes, bike share facilities, or bike parking exists along Sivutha Blvd., although nearby facilities are being developed along the Siem Reap River.
7	Lack of Public Transport Facilities	<ul style="list-style-type: none"> As no public transport system operates in Siem Reap, no facilities are provided on this corridor.

Notes:

^A Source: Green Urban Transport & Road Network Improvement Master Plan in Siem Reap, Cambodia – Volume I: Green Urban Transport & Road Network, Korea Ministry of Land, Infrastructure & Transport (MoLIT), 2018.

^B Source: Siem Reap Smart Road (On-Street Parking) Feasibility Study Report, SONATRA Carling Co., Ltd., October 2019.

Proposed Green Mobility Initiatives and Costs

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

- Transforming Sivutha Blvd. 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 and targeted crossing enhancements, facilitated by traffic calming; and
- Removing illegally parking vehicles along the sidewalk by providing nearby off-street parking facilities.

Table 3.14 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 Sivutha Blvd. is US\$1.8 million or roughly US\$1.5 million per km.

**Table 3.16: Enhancements/Costs for
Priority Green Mobility Corridor – Sivutha Blvd.**

#	Type	Proposed Enhancement	Notes	Costs (US\$)
1	Public Transport	<ul style="list-style-type: none"> Bus stops every ~ 300m (8 stops) 	<ul style="list-style-type: none"> Enhancement to transform Sivutha Blvd. to facilitate accessible public transport in the area Costs for procuring buses and operating service is not included in the costs Furthermore, costs for infrastructure outside of this section (i.e., terminals or depots) or other bus lane portions are excluded as well. 	\$25,000
2	Road	<ul style="list-style-type: none"> None (improvements handled by others – see next column) 	<ul style="list-style-type: none"> Road improvement works being undertaken by local government No road improvement costs are attributed to these indicative investment priorities in this segment 	-
3	Sidewalk	<ul style="list-style-type: none"> 1.2km of sidewalk widening and paving, as well as new trees and streetlights (each direction) and street furniture 	<ul style="list-style-type: none"> Provision of off-street parking lots may complement sidewalk improvements Street furniture may create a more friendly walk environment and better separate vehicles from pedestrians. 	\$825,000

#	Type	Proposed Enhancement	Notes	Costs (US\$)
		<ul style="list-style-type: none"> Tactile paving and wheelchair ramps at select junctions 	<ul style="list-style-type: none"> Tactile paving may improve access and safety for vision-impaired pedestrians 	
4	Crossing	<ul style="list-style-type: none"> Three new signalized junctions Three mid-block crossings (including pedestrian flashing beacon, crosswalk, raised crossing, median, etc.) One enhanced existing signal Select traffic calming measures 	<ul style="list-style-type: none"> Combined package of crossing improvements and traffic calming to reduce vehicular speeds and facilitate safer crossings Traffic calming may reduce speeds of vehicles approaching crossings Drop ramps may improve access and safety for all types of users 	\$700,000
5	Cycle	<ul style="list-style-type: none"> 1.2km of shared bike lane (sharrow) each way Three bike parking facilities (~40 spaces) Four bike share facilities (~80 bikes) 	<ul style="list-style-type: none"> Combined strategy of shared bike lane, parking and cycle share beneficial for residents and tourists Bike facilities tie directly into the public transport network and walk improvements 	\$50,000
6	Parking	<ul style="list-style-type: none"> One off-street lot within 400m walk distance of the corridor (Lot C1 – see Figure 3.16) 	<ul style="list-style-type: none"> Off-street parking located in key locations near key generators and where significant illegal sidewalk parking observed Lot C3 is at the junction of Sivutha Blvd. and NR6, but allocated to the NR6 corridor (see Figure 3.16) 	\$150,000
			Total	\$1,800,000

Figure 3.10 presents the concept for the Sivutha Blvd. 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).

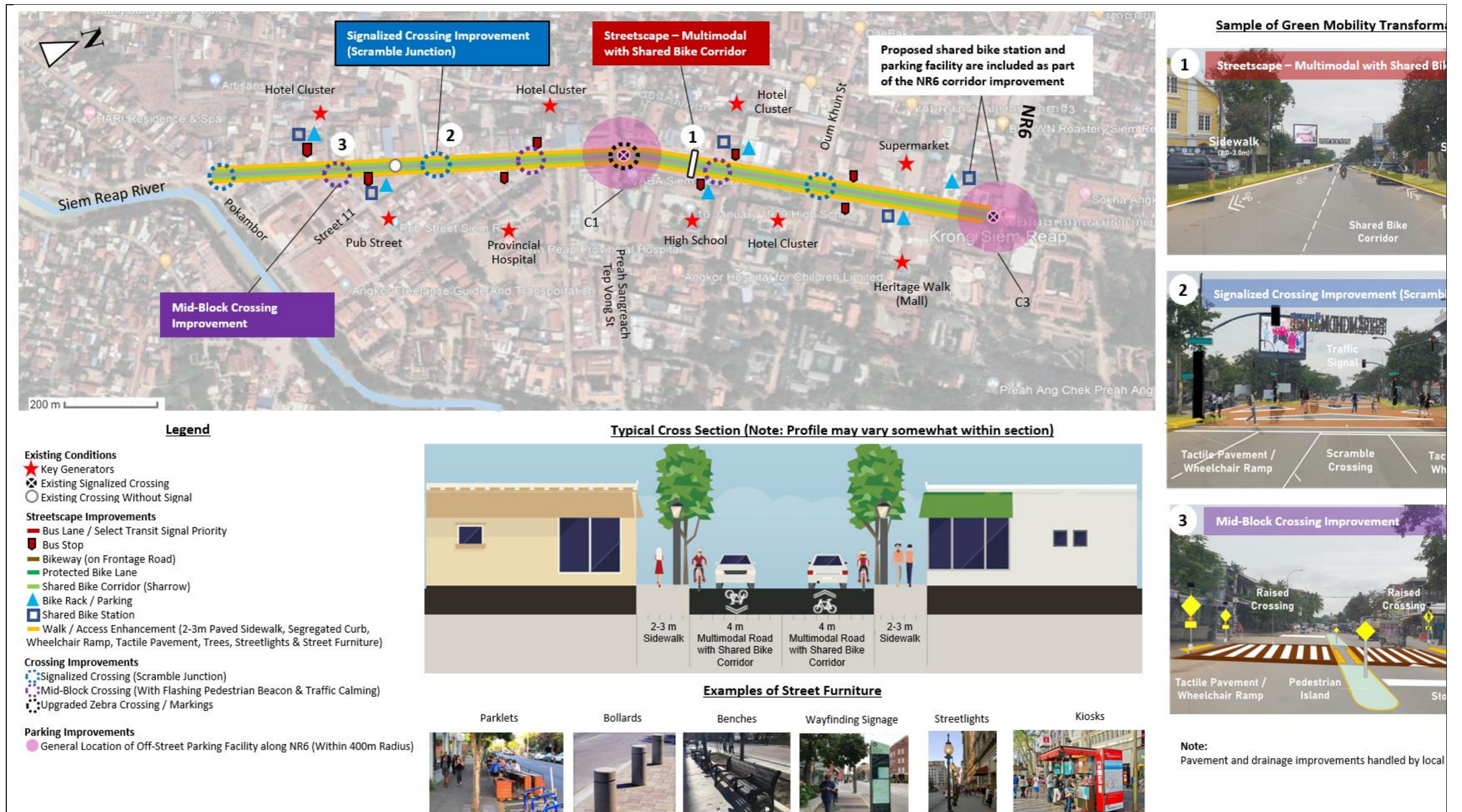


Figure 3.10: Conceptual Design of Priority Green Mobility Corridor – Sivutha Blvd.

3.6 Pilot Projects

Pilot#1: Park and Ride Service via Buggy

Congestion and parking are identified as key issues by APSARA at Angkor and the other WHA sites. One potential strategy adopted elsewhere is an integrated solution involving remote parking, vehicle entry restrictions, and electric buggies to ferry visitors inside the site. This has been implemented in several major tourist destinations including UNESCO World Heritage Sites in Hampi and the Taj Mahal in India, Pingyao Ancient City in China, and the Al Baleed Archaeological Park UNESCO World Heritage Site in Salalah city in Oman. Buggy services have been offered free or are included in the price of entry – often times these are electric.

As a pilot to assess feasibility for wider implementation throughout the WHA, buggy services could be arranged along with remote parking and transfer centers at the current parking facilities at Angkor Wat. Private vehicles and tour buses could be prohibited on certain days or times from entering Angkor Thom. Two buggy routes/circuits could be operated, following the typical “Grand Circuit” and “Small Circuit” of Angkor Wat and Ta Prohm Temple.

Figure 3.11 illustrates the proposed routes and stops for buggy service in Siem Reap. This scheme would cost about US\$3.7 million to start, including an estimate of about 245 10-person buggies being required. A longer term pilot could extend the buggy service to the south to serve the Angkor Park Pass Ticket Center at the junction of Street 60 and Apsara Road. significant open space, which could serve as a new parking and buggy interchange area.

Key Actions For Siem Reap:

- Coordination with APSARA, DPWT and City of Siem Reap necessary to assess roles and responsibilities
- Assessment of measures to prevent vehicles from coming to Angkor Wat in their own vehicles
- Identification of third-party operator of the buggy system
- Creation of fun and green attraction in Angkor Wat

Benefits:

- Reduce vehicle impacts within Angkor Thom and the near vicinity
- Better control entry and exit points for visitors to make loading/unloading more manageable and orderly

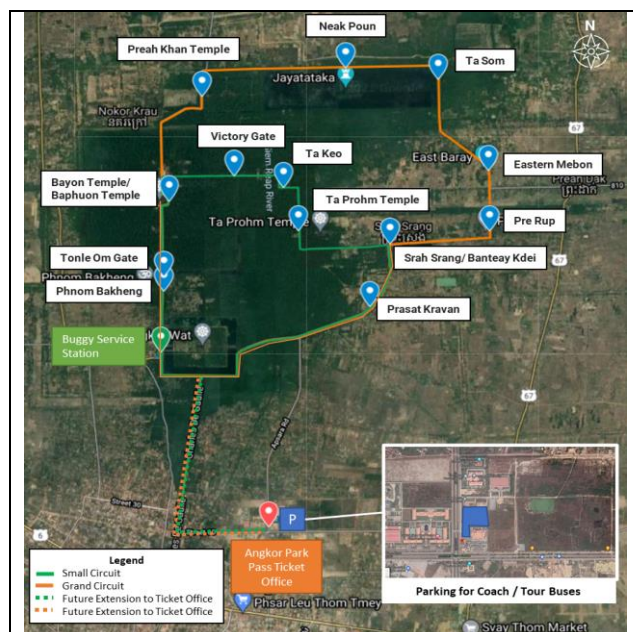


Figure 3.11: Proposed Route and Stations for Angkor Wat Buggy System

- Opportunity to extend pilot to transform the Angkor Park Pass Ticket Center into the main interchange location, which is further from Angkor, to more significantly reduce direct vehicle impacts on the sites

Box 3.1: Taj Mahal Vehicle Prohibition, Remote Parking and Green Access Scheme

Background and Remote Access Scheme

The Taj Mahal is a UNESCO World Heritage Site located in Agra, India. Prior to the COVID-19 pandemic, the Taj Mahal received some seven to eight million annual visitors. To reduce emission and vehicle impacts on the site, carbon-emitting vehicles (including petrol and diesel running) are prohibited from operating within a 500m radius of the Taj Mahal based on a Supreme Court ban in 1998 (as part of the so-called Taj Trapezium Zone (TTZ)). As such, a remote parking and shuttle/buggy scheme was introduced at the Taj Mahal, which consists of the following:



- **Remote Parking and Vehicle Restrictions** - Two remote parking lots have been designated to the west and east of the Taj Mahal, both about 1.0km away from the Taj Mahal formal entrance.
- **Linkage of Lots and Taj Mahal** - Access to the Taj Mahal from either of the two remote parking sites is via: (i) walking; (ii) hired rickshaws; (iii) electric buggies; and (iv) electric shuttles.
- **Pricing Scheme for Remote Access** - While the rickshaws are hired on an individual basis, buggy/shuttle transport from the remote parking lots to the site are included in the entry price for foreign visitors (1,100 rupee or about US\$14.75 as of July 2021).



Management and Operations of Shuttle/Buggy Service

The management committee is comprised of the Agra Development Authority (ADA), the Regional Transport Office, and Agra Municipal Corporation. Currently, ADA handles operation of the service. Fare revenues partially cover the operating and maintenance costs for the service.

The vehicle fleet consists of 12 battery/electric buses and 44 buggies (seating between 11-14 passengers). Operating hours coincide with the Taj Mahal's – that is from 6:00AM-7:00PM, except Fridays.



Potential Lessons Learned and Applicability for Siem Reap

- **Scheme Effective at Reducing Vehicles/Emissions, but Additional Measures Could Further Improve Effectiveness** – Promotion of e-mobility (or prioritized parking for such vehicles) combined with the remote buggy scheme could also further preserve the monument (which is unclear).
- **Strong Government Support and Commitment Required** – The Indian Supreme Court dictated protective measures to preserve this national monument and symbol of India and its rich cultural heritage. For the WHA, strong commitment is needed, but possibly at national levels to ensure the scheme is successful and local authorities are committed.
- **Strong Enforcement Essential** – Enforcement of vehicle prohibitions requires commitment and resources from local authorities, traffic police, as well as local citizens and merchants.
- **Multiple Options Cater to Different Types/Market Segments to Provide Convenient and Retain Attractive Experience** – Two remote parking lots are provided. While this may be due to the presence of residential areas directly to the south of the monument, this nonetheless provides options for visitors arriving from different directions. In addition, multiple “green” access modes are available including dedicated walking paths, hired rickshaws, as well as the aforementioned buggy and shuttle services.

Pilot#2: Designate Local Streets as Pedestrian Priority Street and Slow Zone

Local streets are the foundation of the pedestrian network and would be the predominate street type in the city center. Within the local streets, certain sections are designated as pedestrian priority streets and slow zones with enhanced treatments. This could be applied to a specific pilot area in Siem Reap in order to showcase the approach and to build support for wider implementation.

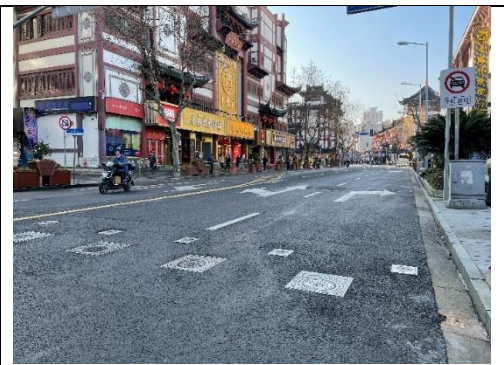
Slow Zone

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 a “Shared Street” or “Living Street”.



Source: Google Maps, 2021.

Figure 3.12 Shared Streets in Chinon, France



Source: Arup, 2021.

Figure 3.13 Restricted Vehicle Access with Retractable Bollards in Shanghai Yu Garden

Pedestrian Priority Street with Restricted Vehicle Access

In pedestrian priority streets, **vehicle access is restricted** during the times where pedestrian volumes are high, while allowing access for delivery and goods vehicles during the off-peak hours. It also provides an enhanced visitor experience and a destination of its own.



Source: Google Maps, 2021.

Figure 3.14 Street 8 (Pub Street) – the Prime Area for a Slow Zone Pilot Scheme

Prioritizing Treatment at Gateways and along Street Blocks

The implementation of a slow zone and pedestrian priority streets requires priority treatments at the gateway (entrance) location and along street blocks. Gateway treatments are suggested to inform the motorists, cyclists, and pedestrians that they are entering a pedestrian priority zone. Street block improvements are created to improve street scape, slow vehicles down and create more comfortable and accessible pedestrian experience. The treatment elements are summarized in the table below:

Gateway Treatments



Signage - Slow Zone



Signage - Pedestrian Priority Street



Fixed and Retractable Bollards



Designated Pickup / Dropoff Zones



Bike Parking

Source: (i) <https://www.seattletimes.com/seattle-news/transportation/seattle-uber-and-lyft-drivers-often-stop-in-the-street-to-pick-up-or-drop-off-riders-heres-a-way-to-reduce-that/>; (ii) <https://www.dutchnews.nl/features/2021/03/who-will-rule-the-roads-making-sense-of-dutch-street-design/>; and (iii) [3.6 Street and Pedestrian Lighting-Seattle Streets Illustrated.](#)

Street Block Treatments



Specially Treated Surfaces – Paint (Phase 1) and Pavement (Phase 2)



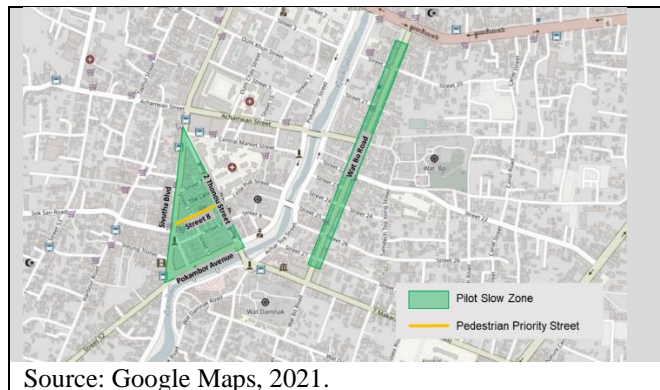
Pedestrian-Scale Lighting



Planters and Street Furnitures

Key Actions For Siem Reap:

- Create pilot vehicle restriction scheme on Pub Street from 12:00PM to 12:00AM. All motorized vehicles may be restricted during this time, while bicycles and rickshaws are allowed. CCTV may be leveraged from the ASEAN Smart City Action Plan for enforcement.
- Create pilot slow zone in the area bounded by Sivutha Blvd., 2 Thonou Street and Pokambor Avenue. Vehicles entering the slow zone should give priority to pedestrians. The pilot may implement temporary planters and street furniture.
- Conduct educational campaign, similar to Walk Day campaign from Jeju.
 - Create slow zone on Wat Bo Road between 7 Makara Street and Street 20.
 - After successful pilot, expand slow zone to all local streets.



Source: Google Maps, 2021.

Figure 3.15: Location of Pilot Pedestrian Priority Street and Slow Zone

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)
- Could be potential showcase for low-emission zone (in which only low-emission vehicles are allowed into the area) or as a parking management zone (whereby on-street and off-street restrictions would be combined with a more managed loading/unloading scheme with mobility hubs).

Pilot#3: 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 WHA and focus on three areas:

Table 3.17: Key Focus Areas for Pilot Parking Management Zone

Element	Potential Actions/Strategies
Supply	Phase 1: <ul style="list-style-type: none"> • 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 – with reduced fee to encourage parking off-street. • Designate tourist bus parking in heritage area (and require engines to be switched off). • 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: <ul style="list-style-type: none"> • 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 demand to identify additional capacity needs and shared parking possibilities.
Enforcement	Phase 1: <ul style="list-style-type: none"> • Establish clear enforcement strategies, roles and responsibilities and tie into institutional capacity • Prohibit parking on sidewalk outside designated area. Leverage the 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 Siem Reap:

- 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 ASEAN Smart Cities Action Plan CCTV plans)
- Leverage proposed slow zone and low-emission zone to demonstrate new parking regulations and operations for larger roll-out

Benefits:

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

Pilot#4: 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

The two types of off-street parking facilities have been added to the plan as per stakeholder comments and review of existing parking conditions: (i) city center lots, whose aim is to reduce on-street parking and illegal sidewalk parking; and (ii) periphery lots, whose aim is to serve as quasi park-and-ride facilities along the outskirts of the city along major roads served by public transport. It is noted that on-street parking improvements are proposed as part of the Pilot Project around Pub Street. Key characteristics of these off-street facilities follows below:

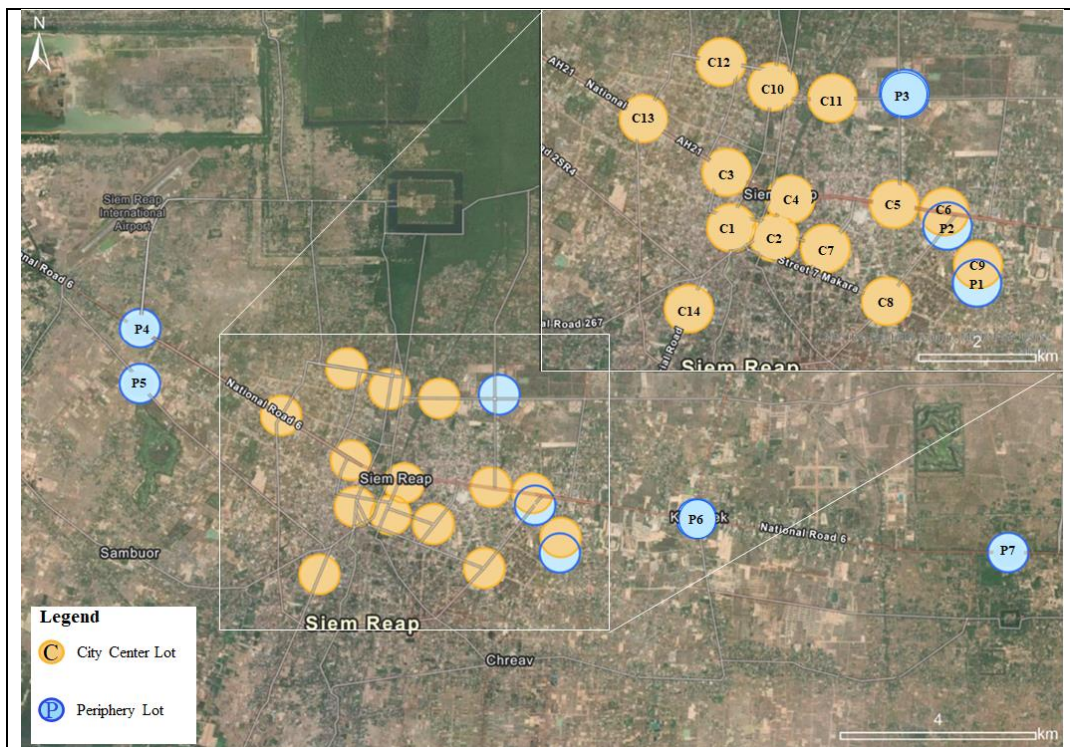
Table 3.18: Description of Proposed Off-Street Parking Facilities

Type of Lot	Purpose	Target User(s)	Key Locational Considerations
City Center	<ul style="list-style-type: none"> • Provide off-street parking in central area • Reduce on-street and illegal sidewalk parking 	<ul style="list-style-type: none"> • Residents, commercial users, and tourists 	<ul style="list-style-type: none"> • Near areas with significant illegal sidewalk parking • 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)	<ul style="list-style-type: none"> • Provide periphery parking • Intercept vehicles prior to entering city to reduce congestion and emissions • Encourage public transport to city center 	<ul style="list-style-type: none"> • Regional / long-distance users 	<ul style="list-style-type: none"> • Along major highways on city outskirts • At or near planned public transport terminals / stations at 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 – location is based on an analysis of illegal parking for city center lots as well as location relative to major arterial roads accessing the city. A total of 14 lots are proposed in the city center, with a capacity of 925 spaces, with an additional seven periphery lots with a capacity of 350 spaces. Overall capacity of proposed off-street facilities is 1,275 spaces (assuming around 30m² per space including circulation and maneuver area, the total area for the parking would be above 38,000m² – this could also be flexibly used to accommodate motorbikes and tuk-tuks while decreasing the number of full-size automobile spaces). The figure below depicts the parking locations throughout the city.

Total cost is about US\$920,000 with each space costing approximately US\$500 with additional costs for parking barriers, lighting, and CCTV.



Notes:

^A City center lots (C6 and C9) serve local trips for shopping and school. Nearby periphery lots (P1 and P2) serve as park-and-ride facilities close to the Giant Ibis Siem Reap Bus Station.

^B Circles represent general location (i.e., within a 400m walk). Specific location is subject to additional Provincial Government or DPWT 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

Key Actions For Siem Reap:

- 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 first/ last-mile connectivity modes convenient to parking facilities

- Identify private sector opportunities for implementation and O&M
- Identify mechanisms to allow surplus revenues for green mobility O&M

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 3.19: Priority Studies to Advance Investment Preparation

Element	Action #	Action / Study	Key Components and Additional Details for Priority Studies
Public Transport	1C & 4B1.1	Public Transport Studies	<ul style="list-style-type: none"> • 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 Phnom Penh) • 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	<ul style="list-style-type: none"> • 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
Road	1B5.3	Road Safety Audits	<ul style="list-style-type: none"> • 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

Element	Action #	Action / Study	Key Components and Additional Details for Priority Studies
	4A1.1	Traffic Management Study	<ul style="list-style-type: none"> Review traffic flows and congestion currently and forecast in the future, especially related to Grand Siem Reap 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	<ul style="list-style-type: none"> 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 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Conduct environmental and social safeguard studies for all related green mobility initiatives
	4A1.1	Motorbike Policy Study	<ul style="list-style-type: none"> 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 Siem Reap. Then, based on the institutional and capacity gaps from **Table 1.4** 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), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), and Japan International Cooperation Agency (JICA) in Siem Reap as well as Phnom Penh include the following:

- **JICA Comprehensive Urban Transport Plan in Phnom Penh City** (or JICA Phnom Penh Urban Transport Study) – A study completed in 2014 to formulate a transport master plan for 2035 and enhance knowledge / technology transfer to authorities and staff in Phnom Penh.
- **JICA Project for Development of Traffic Management System in Phnom Penh** (or JICA Phnom Penh Traffic Study) – A study completed in 2015 to establish a traffic control center in Phnom Penh and enhance technical capacity of DPWT for effective operation of traffic control system.
- **JICA Project for Improvement of Transportation Capacity of Public Bus in Phnom Penh** (or JICA Phnom Penh Public Bus Study) – A study completed in 2016 to improve capacity of the public bus operator, including institutional capacity focused on operations, management, and maintenance.
- **GGGI Pre-Feasibility Assessment on Electric Buses in Siem Reap, Cambodia** (or GGGI E-Bus Study) – A study completed in 2021 focused on assessing feasibility of electric buses. This study recommended training and capacity building dealing with electric buses and charging.
- **Tourism Development Master Plan Siem Reap 2021-2035** (or Siem Reap Tourism Master Plan) - This Tourism Master Plan was formulated by the Ministry of Tourism – transport constitutes a key component including promoting the use of eco-friendly public transport. The Master Plan also

includes action plans focusing on institutional arrangements and governance, as well as financial and monitoring & evaluation mechanisms.

- **ADB Supporting Sustainable Integrated Urban Public Transport Development** (or ADB Sustainable Public Transport Study) – This on-going program aims to improve management of public transport in Phnom Penh. Key elements include: (i) development of sustainable integrated urban public transport policy guides and planning toolkits; and (ii) urban public transport management capacity building and public awareness.
- **GIZ Sustainable Design of Urban Mobility in Medium-Sized Metropolitan Regions** (or GIZ Study) - To align with ASEAN’s Sustainable Urbanization Strategy, GIZ developed two policy documents on urban public transport: (i) Guidelines for the Development of Sustainable Urban Mobility Plans; and (ii) Toolbox for the Establishment of Metropolitan Transport Executives in ASEAN Metropolitan Regions including Phnom Penh.
- **JICA Basic Survey for Smart City in Siem Reap** (or JICA Smart City Study) – This study seeks to formulate a Smart City Vision 2035 and: (i) development of a data sharing platform; and (ii) agency capacity building.

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 **Table 1.4** - 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 Royal Government of Cambodia on urban green mobility (including Siem Reap);
 - Creating a consistent basis for the development of urban transport plans that integrated green mobility and *are aligned with global best practice*

and frameworks and that are coordinated at all levels (i.e., between agencies and between geographies);

- 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 to enforce the draft 2021 Parking Decree (seeking to improve parking conditions and reduce curbside illegal parking); and
 - *Formulating a performance monitoring mechanism and body* to allow the city to assess its achievement of urban 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 lessons learned from Phnom Penh – 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 or a 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 MEF 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*** 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; and
 - ***Overcoming financial constraints through various government and city actions*** including: (i) reprioritizing projects once the linkage with green mobility is established 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 Siem Reap***, 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 and GIZ in Phnom Penh and JICA in Siem Reap 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 1.4)	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
<i>Legal, Regulatory, and Policy Elements</i>							
Visions, Goals, and Strategies/ Plans	Develop Targeted Green Mobility Strategy, including Clear Goals/Objectives into Transport Plans and City Strategy (including Resilience)	<ul style="list-style-type: none"> Lack of Overall Green Mobility Vision or Discrete Targets/Goals included in Overarching Transport Plans National Plans Prioritize Resilience Tied to Flooding, but Not for Mobility 	Province, City, DPWT, APSARA	<ul style="list-style-type: none"> 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 Royal Government of Cambodia on urban green mobility (including Siem Reap) is needed to drive this effort and ensuing refinements to various frameworks. Integrating resilience into the framework may also ensure mobility systems consider redundancy and operability in all situations. 	GIZ Study	Phase 1	✓ (Represents the essential foundational element to set city's agenda and inform decision-making)
	Develop Consistent Guideline for Developing Urban Transport Plans (Integrating Green Mobility) Aligned to Global Best Practice	<ul style="list-style-type: none"> Limited Expertise in Developing Urban Transport and Mobility Plans 	MPWT, DPWT	<ul style="list-style-type: none"> Developing a consistent planning framework may allow project formulation and plan development to be comprehensive, holistic, and fully integrated to ensure that actions meet the vision and goals, and also contribute to sustainable development and green mobility. Training by GIZ could be leveraged to improve staff expertise in developing and owning this exercise. 	GIZ Study		
	Coordinate Mobility Plans at All Levels including Inter-Agency and Between Geographies	<ul style="list-style-type: none"> APSARA Has Its Own List of Priority Mobility Projects, thus Coordination Needed to Align APSARA with Green Mobility Goals Spatial Plans at Multiple Levels Requires Special Coordination for Green Mobility 	MPWT, DPWT, APSARA, Province, City, etc.	<ul style="list-style-type: none"> Ensuring full coordination of all transport enhancement efforts between different agencies (i.e., APSARA, DPWT, etc.) and different geographies (province, district, sangkat, etc.) may create a more integrated and cohesive transport and green mobility plan allowing for seamless interface. Coordination can also build synergies between different areas and reduce potential duplication of efforts (while aligning with overall land use plans at all levels). Support from MPWT is essential. 	-	Phase 1	
Laws / Regulations	Identify Innovative Practices to Facilitate Green Mobility and Align with 1994 Royal Decree (with Gradual Change to Decree to Facilitate Green Mobility)	<ul style="list-style-type: none"> 1994 Royal Decree Places Limitations on Green Mobility Planning and Operations in WHA Green Mobility Initiatives within WHA Must Align with "Outstanding Universal Value" (OUV) 	APSARA, DPWT	<ul style="list-style-type: none"> The 1994 Royal Decree The 1994 Royal Decree dictates allowable size of public transport vehicles serving the WHA as well as vehicle operating and stopping/parking restrictions Given these restrictions, innovative strategies learning from global best practice can help to deliver desired green mobility benefits, without violating these mandates. In addition, operation of smaller electric buses for public transport adhering to size limitations could also be adopted. Regardless, all plans proposed in the WHA would need to be approved by APSARA. Long-term change to the 1994 Royal Decree may face challenges as these would need to be approved by the APSARA and UNESCO. 	-	Phase 1 (Immediate Measures); Phase 2 (Change to Decree)	
	Create Cross-Cutting Committee to Investigate Green Mobility (in Particular Cycling, Public Transport and E-Mobility) into the Legal Framework	<ul style="list-style-type: none"> Current Legal Statutes Governing Transport in Cambodia Focus on Roads, with Limited Regulations for Green Mobility Green Mobility Infrastructure Not Specifically Categorized under Law on Expropriation 	MPWT	<ul style="list-style-type: none"> Currently, the legal framework has limited provisions for active mobility, 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 (including for expropriation) – learning from best practice worldwide and experience in Siem Reap (for the urban transport management). 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. Financing mechanisms and frameworks are key to supporting implementation and operation of various green mobility initiatives as well and should be assessed (note – this is included in the Funding/Financing section in the next table as an explicit enhancement/recommendation). 	GIZ Study	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)
Design, Operational Norms, and Guidelines	Integrate Green Mobility into Infrastructure Design Guidelines or Manuals	<ul style="list-style-type: none"> Limited Consideration of Active Mobility and Green Mobility in Road Design Standards 	MPWT, DPWT	<ul style="list-style-type: none"> Integrating activity mobility elements into local design standards can ensure that needs of such users are included throughout the development process and that the visionary green mobility goals of the city can be achieved. 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 and practices 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 WHA should also integrated priorities of APSARA as well. Support from MPWT is essential. 	--	Phase 1 (Mayoral Decree); Phase 2 (Change to National Guidelines)	

Category	Proposed Enhancement / Recommendation	Green Mobility Gap Enhancement/ Recommendation Seeks to Address (Refer to Table 1.4)	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
Enforcement	Develop Parking and Enforcement Plan and Improve Training Establish Parking Pilot Zone to Test Enforcement Procedures and Demonstrate Public Benefits	<ul style="list-style-type: none"> Enforcement of Illegal Parking Is Inconsistent and Penalties Not Clearly Defined 	DPWT, City, Traffic Police	<ul style="list-style-type: none"> 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. The newly drafted 2021 Parking Decree identifies illegal parking and penalties. Enhanced enforcement is needed to carry forward this decree. 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 (around Pub Street). 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 JICA Smart City CCTV Program to Enhance Enforcement		DPWT, City, Traffic Police	<ul style="list-style-type: none"> Enforcement using digital means has been adopted in other cities and is being planned for roll out by the JICA Smart City 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. 	JICA Smart City Study		
Monitoring / Evaluation	Formulate Green Mobility Performance Monitoring Mechanism and Framework	<ul style="list-style-type: none"> No Monitoring System in Place to Track Green Mobility Achievement 	DPWT, City	<ul style="list-style-type: none"> 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 JICA Smart City proposed CCTV scheme and data gathering mechanisms for road maintenance under DPWT. 	JICA Smart City Study	Phase 1	✓ (The city requires a system to monitor attainment of goals to achieve the green mobility vision)
Decision-Making, Organizational, Engagement, and Funding/Financing							
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	<ul style="list-style-type: none"> No Clearcut Agency Responsible for Green Mobility Overlapping Responsibilities for Road 	MPWT, DPWT, City	<ul style="list-style-type: none"> 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. Involvement and support from MPWT is essential to achieve this as well. 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. Lessons from Phnom Penh should be heeded to create a more inclusive body encompassing the metropolitan area, rather than the city of Siem Reap itself. This body could deal with issues such as road design and interface between MPWT, DPWT, and APSARA (as well as the Department of Rural Development) to ensure continuity in quality and design among these entities and they roads they have jurisdiction over. 	GIZ Study	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	<ul style="list-style-type: none"> No Clear Entity Responsible for Public Transport Operations 	MPWT, DPWT, City	<ul style="list-style-type: none"> A public transport oversight entity is important in Siem Reap 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 oversight body, then determine optimal means to achieve this and whether this body should be incorporated under DPWT or created separately. Lessons learned from Phnom Penh should be heeded – particularly related to the geographic jurisdiction of the agency (should be at the metropolitan level rather than municipal). Multiple jurisdictions may require involvement of MPWT for coordination and integration. 	ADB Sustainable Public Transport Study GIZ Study	Phase 1 (Committee) Phase 2 (Authority)	
	Develop Steering Committee to Address Cross-Cutting Issues	<ul style="list-style-type: none"> Coordinating Authority for Transport Needed 	Province, City, APSARA, MPWT, DPWT, DLMUPC	<ul style="list-style-type: none"> APSARA oversees transport projects within WHA. The DPWT and Province are responsible for transport projects outside this jurisdiction. There is a need to identify a body with overarching transport management and oversight responsibilities – regardless of geography/jurisdiction. To address and build consensus at the regional level, formation of a Steering Committee is suggested – to include a wide range of relevant departments including DLMUPC. 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. 	GIZ Study	Phase 1	
Project Formulation and Prioritization / Decision-Making	Better Link Green Mobility into Project Prioritization Framework	<ul style="list-style-type: none"> Limited Inclusion of Green Mobility in Local Prioritization Framework National Agendas May Not Reflect Local Needs for Green Mobility 	MPWT, MEF, DPWT, City	<ul style="list-style-type: none"> 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 undertake a prioritization exercise locally. This shortlist is passed to MPWT and ultimately the Ministry of Economy and Finance (MEF), 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 metrics for incorporation. However, modification of the overall national level prioritization process (used by MEF) 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 Cambodia to achieve its Nationally Determined Contributions (NDDs) to reduce national emissions. 	GIZ Study	Phase 1	✓ (Incorporating green mobility goals into investment decision-making can ensure green mobility considerations are integrated into forthcoming projects)
Civic/ Community Participation	Establish Participatory Mechanisms for Green Mobility Plans/Schemes –	<ul style="list-style-type: none"> Limited Citizen Engagement / Participation in Development of Transport Plans 	DPWT, City	<ul style="list-style-type: none"> 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. 	ADB Sustainable Public Transport Study GIZ Study		✓ (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	<ul style="list-style-type: none"> 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. 	JICA Smart City Study	Phase 1	
Public Outreach and Education	Develop Education/ Awareness Program to Promote Green Mobility	<ul style="list-style-type: none"> Limited Public Outreach and Green Mobility Education Campaigns 	DPWT, City	<ul style="list-style-type: none"> 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. 	ADB Sustainable Public Transport Study	Phase 1	✓ (Communications plans with the public are needed to educate them about green mobility and build

Category	Proposed Enhancement / Recommendation	Green Mobility Gap Enhancement/ Recommendation Seeks to Address (Refer to Table 1.4)	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
				<ul style="list-style-type: none"> Specific focus areas should be on walk, driving etiquette, as well as parking. 			groundswell support at the start)
	Ensure Participation Mechanism in Place Prior to Developing Public Transport System	<ul style="list-style-type: none"> Public Engagement of Existing Operators Essential in Introducing New Bus System 	DPWT	<ul style="list-style-type: none"> 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). 	ADB Sustainable Public Transport Study	Phase 1	
Private Sector Involvement	Promote PPP for Large-Scale Prioritized Investments (i.e., Public Transport & Road Improvements)	<ul style="list-style-type: none"> PPP Potentially Promising for Large-Scale Green Mobility Initiatives, But Limited Experience in the Country 	MPWT, MEF	<ul style="list-style-type: none"> Further promotion of PPP for large-scale projects, and opening these to international bidders, could increase participation of the private sector which would bring in private financing and capabilities in the transport sector in Siem Reap. Given costs of set up, procurement and contracting, and PPP would be most suitable for large-scale green mobility initiatives including public transport and roads. Market sounding needs to be conducted to ensure capability and appetite exists in the local context, including determining the need for international involvement, while commercial arrangements may need to be structured appropriately. Government plays a key role in addressing PPP regulatory gaps by showing commitment to PPP projects to ensure an effective and transparent environment that would encourage private sector participants. Staff specifically trained in submissions for PPP opportunities can guide the private sector entities through this process and ensure smooth and efficient implementation (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 the City-Level), Vehicle Taxation and Parking Charges for Green Mobility	<ul style="list-style-type: none"> No Dedicated Funding for Urban Transport or Green Mobility 	MPWT, DPWT, Province, City	<ul style="list-style-type: none"> 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 might have a property element or would help drive footfall to nearby businesses, may be able to justify earmarking a proportion of property taxes for funding. Other non-fare funding instruments could be achieved through local policy and / or process setting (i.e., tourism levy on accommodation). 	-	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)
	Ensure Sufficient O&M Funding via: (i) New Non-Transport Revenue Sources (such as a City-Level Tourism Levy); (ii) Allocation of Surplus Collected from Parking Charges or Public Transport Fares (for Bus Service); and (iii) Adequate Allocation of Subsidies from National/ Provincial Budgets	<ul style="list-style-type: none"> Limited Budget for Green Mobility 	MEF, DPWT, Province, City	<ul style="list-style-type: none"> 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 in Siem Reap given the high volume of visitors. Collection of parking revenues would be a good example, where on-street parking revenues could be used to offset operating deficits of other green mobility systems (possibly including public transport). Defining adequate subsidy levels requires coordination among various agencies and overall capacity of both national/provincial government budgets. A detailed analysis of the economic and social impact needs to be conducted when considering potential new revenue sources. A solid communication plan to the public is essential when introducing charges to manage public expectations and demonstrate potential public benefits from increased funding sources. 	-	Phase 1	
Financing Schemes for Green Mobility	<p>Phase 1 (Year 1-7)</p> <ul style="list-style-type: none"> Leverage on international financing sources Reprioritize Projects to meet Immediate Funding Need of Top Prioritized Projects Leverage Private Sector Financing Explore Potential Revenue Sources for Green Mobility and Urban Transport (and Develop Financing Mechanism for Green Mobility) <p>Phase 2 (Year 8-10)</p> <ul style="list-style-type: none"> Gradually Increase Public Expenditures for Green Mobility and Urban Transport 	<ul style="list-style-type: none"> Constrained Fiscal Space in Cambodia Has Resulted in Insufficient Financing to Meet the Needs for Public Works and Transport Sector Expenditure 	MPWT, MEF, DPWT	<ul style="list-style-type: none"> Exploring the opportunity to leverage international sources of finance could help to supplement local sources, bring in know-how, and accelerate local skills development. Reprioritizing projects helps to re-allocate available resources in the short term to immediate prioritized investments. Detailed assessment needs to be carried out to determine the ability of national government to allocate budget to green mobility and urban transport. Exploring PPP options for larger projects would 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. Introduction of new revenue sources requires the consideration of social and economic impact, 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	<ul style="list-style-type: none"> Capacity Building Agenda Set at National Level 	MPWT, DPWT, APSARA	<ul style="list-style-type: none"> 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 Siem Reap 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. 	ADB Sustainable Public Transport Study; GGGI E-Bus Study; JICA Phnom	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
	Coordinate Capacity Building Programs and Ensure Continuities in Knowledge and Skills Within / Outside WHA	<ul style="list-style-type: none"> Separate Capacity Building Efforts between APSARA and Sub-National Levels 	DPWT, APSARA	<ul style="list-style-type: none"> Regardless of project locations (within or outside WHA), knowledge and skills on green mobility planning, design, and maintenance should be consistent and coherent. Potential barriers and impacts on convenient/safety issues may be minimized. Heritage preservation should be at the heart of any capacity building program within WHA. Capacity building programs in terms of infrastructure planning/design may differ by type of heritage zone. 		Phase 1	

Category	Proposed Enhancement / Recommendation	Green Mobility Gap Enhancement/ Recommendation Seeks to Address (Refer to Table 1.4)	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
	Develop Targeted Technical Capacity Building Program on Green Mobility and Urban Transport	<ul style="list-style-type: none"> Limited Technical Expertise on Green Mobility and Urban Transport 	MPWT, DPWT, APSARA, City	<ul style="list-style-type: none"> 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, design, and management; (ii) road safety and traffic signage; (iii) public transport planning, operations, and maintenance (particularly for electric buses); (v) traffic calming and trip reduction measures; and (vi) municipal infrastructure management. 	Penh Urban Transport Study & Traffic Study; JICA Smart City Study	Phase 1	plans and projects. The training should focus on technical and soft aspects to ensure that funding and programming also are developed appropriately.
	Develop Soft-Skill Capacity Building Program Focused on Project Formulation, Funding, Procurement and Delivery	<ul style="list-style-type: none"> Limited Staff Capacity to Develop Projects and Proposals to Obtain Funding 	MPWT, DPWT	<ul style="list-style-type: none"> 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. 	Siem Reap Tourism Master Plan	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.²⁵ 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\$123.4 million, with US\$84.7 million attributed to the national and US\$38.7 million to the sub-national level. Annual O&M costs are estimated at US\$8.1 million, with US\$6.7 million attributed to the national and US\$1.4 million to the sub-national levels. **Appendix B** presents the list of initiatives prioritized for Phase 1.

**Table 5.1: Green Mobility Indicative Investment Priorities – Phase 1
(by Component, Rounded to Nearest US\$10,000)**

Component	Capital Costs (US\$)		Annual O&M Costs (US\$)	
	National Level	Sub-National Level	National Level	Sub-National Level
Road Improvement	48,300,000	600,000	1,000,000	-
Public Transport	36,400,000	-	5,700,000	-
Cycle Facilities	-	14,700,000	-	500,000
Sidewalk Improvement	-	12,000,000	-	300,000
Crossing Improvement	-	4,200,000	-	100,000
Other-Buggy Services	-	3,700,000	-	400,000
Other-Parking	-	800,000	-	100,000
Other-Pilot	-	1,000,000	-	-
Other-Technical Study	-	1,200,000	-	-
Other-Capacity Building	-	500,000	-	-
Other-Institutional/Regulatory/Legal	-	-	-	-
Sub-Total	84,700,000	38,700,000	6,700,000	1,400,000
Total	123,400,000		8,100,000	

²⁵ 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 from Phnom Penh accounting for electric buses.

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 initiative 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 Siem Reap, 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 from 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., 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 cyclical);
- **Public acceptance**; and
- **Ease of implementation** in Cambodia and / or Siem Reap.

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
<i>Financing</i>				
National and International Grants and Loans	<ul style="list-style-type: none"> • Loans and grants provided by national and 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	<ul style="list-style-type: none"> • Typically used to finance incremental costs associated with mitigation of environmental impact financed through these instruments • 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	<ul style="list-style-type: none"> • PPP is a contractual agreement between public and private sectors in which the public sector obtains 	High	✓	✓

Financing / Funding Instrument	Definition / Notes	Level of Income Stream	Upfront	Recurrent
Partnerships (PPP)	resources from the private sector, and pays the private sector for resources/services <ul style="list-style-type: none"> A financing mechanism that secures funding for the overall lifecycle of the project (from construction to O&M) 			
Funding				
Public Transport Subsidies	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> A form of revenue based on taxes on value of properties that can be used to fund general infrastructure development or urban transport 	High		✓
Tourism Levy	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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) Revenue can be earmarked for urban transport 	High		✓
Farebox Revenue	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 C**, which focuses on adoption of these instruments in similar emerging market context as Siem Reap and Cambodia 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 such as the e-bus 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.
- **Potential for Earmarking Property Taxes for Green Mobility Funding** – Green mobility initiatives such as public transport, cycling, walking, roads, parking and the WHA buggy, 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 Siem Reap given the large volume of tourists and potentially appropriate to fund assets that both enhance Siem Reap’s appeal as a tourism destination and improve green mobility and amenity 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/parking, and public transport can be used to offset O&M costs for these types of 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 indicative investment priorities by component (i.e., road, public transport, etc.) indicating 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 (based on the 2022-2024 PIP). Finally, potential financing/funding instruments to consider are presented. Note all costs estimated 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 PIP has committed funding to specific components, including public transport in Siem Reap. 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 for Siem Reap by Component

Component	Example Green Mobility Initiatives	National		Sub-National		Amount of Committed Financing in 2022-2024 PIP (US\$'000)	Potential Financing & Funding Instruments
		Capex (US\$ '000)	Annual Opex (US\$ '000)	Capex (US\$ '000)	Annual Opex (US\$ '000)		
Road Improvement	<ul style="list-style-type: none"> 29.0km of multimodal road improvements Updated road safety & design standards 	48,300	1,000	600	-	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Climate-related financial instruments PPP Property taxes Fuel taxes and surcharges Vehicle taxation
Public Transport	<ul style="list-style-type: none"> Electric bus system with 10m/12m buses 6 routes, 138km (serving City Center, Airport, the New Airport & WHA) 2 Integrated Bus Terminals 6 km of bus lanes on NR6 (including bus signal priority) 	36,400	5,700	-	-	15,920 ^B	<ul style="list-style-type: none"> National/international loans and grants Climate-related financing instruments PPP Public transport subsidies Property taxes Tourism levy Fuel taxes and surcharges Farebox revenue Advertising
Cycle Facility	<ul style="list-style-type: none"> 10.4 km of off-street bikeways & 33.4 km of bike lanes 30.2 km of sharrow (shared bike/vehicle lanes) ~80 bike racks Bike share program (~500 bicycles) 	-	-	14,700	500	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Climate-related financial instruments PPP Public transport subsidies Property taxes Tourism levy Parking charges Farebox revenue Advertising
Walk / Crossing Improvement	<ul style="list-style-type: none"> 31.3km of paved sidewalk with segregated curb, street lighting and trees Traffic signals at 20 junctions 	-	-	16,200	400	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Climate-related financial instruments Property taxes Advertising

Component	Example Green Mobility Initiatives	National		Sub-National		Amount of Committed Financing in 2022-2024 PIP (US\$'000)	Potential Financing & Funding Instruments
		Capex (US\$ '000)	Annual Opex (US\$ '000)	Capex (US\$ '000)	Annual Opex (US\$ '000)		
	<ul style="list-style-type: none"> Mid-block crossings at 50 locations Wheelchair access ramps and tactile pavement at 195 locations Street furniture and traffic calming 						
Other - Buggy	<ul style="list-style-type: none"> Buggy scheme with remote parking at Angkor (with two routes) 	-	-	3,700	400	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Climate-related financial instruments PPP Property taxes Tourism levy Farebox revenue/advertising
Other - Parking	<ul style="list-style-type: none"> 18 off-street lots (including 14 city center and 4 periphery lots) 	-	-	800	100	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Property taxes PPP Parking charges Advertising
Other - Pilot Studies	<ul style="list-style-type: none"> Pilot low emission zone around Pub Street Pilot parking management zone around Pub Street 	-	-	1,000	-	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Parking charges Advertising
Other - Technical Study	<ul style="list-style-type: none"> E-mobility strategy Citywide parking & management strategy Transport system resilience study Traffic management Motorbike policy Environmental and social safeguards (for bus project, parking, etc.) 	-	-	1,200	-	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Property taxes
Other - Capacity Building	<ul style="list-style-type: none"> Education and communication campaigns 	-	-	500	-	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Property taxes

Component	Example Green Mobility Initiatives	National		Sub-National		Amount of Committed Financing in 2022-2024 PIP (US\$'000)	Potential Financing & Funding Instruments
		Capex (US\$ '000)	Annual Opex (US\$ '000)	Capex (US\$ '000)	Annual Opex (US\$ '000)		
	<ul style="list-style-type: none"> Green mobility website/app for education Targeted capacity building 						
Other - Institutional/Regulatory/ Legal	<ul style="list-style-type: none"> 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 	-	-	-	-	See Note ^A	<ul style="list-style-type: none"> National/international loans and grants Property taxes
	Total	84,700	6,700	38,700	1,400	See Note ^A	

Notes:

^A The PIP contains several potentially relevant projects with linkage to green mobility. However, it is unknown the committed financing is divided up between modes (i.e., walk, cycle, road, public transport, etc.) and by geographic region (Phnom Penh, Siem Reap, Sihanoukville, etc.). Therefore, further discussions should be initiated to understand potential eligibility of Siem Reap Green Mobility initiatives for these funds. In total, some US\$752,689 is earmarked for future mobility projects that may be applicable to Siem Reap. These include: (i) PIP#44: Project Promoting Environmentally Transport - US\$375,000; (ii) PIP#45: Reducing Greenhouse Gas Emission by Urban Transport – US\$800,000; (iii) PIP#49: Raising Public Awareness About Climate Change Caused by GHG Emission in Transport Sector – US\$2.1 million; (iv) PIP#81: Project to Standardize Climate Change-Responsive Design for National and Provincial Road Construction and Maintenance – US\$500,000; (v) PIP#949: Assessment of Impact of Regulatory Instruments in the Public Works and Transport Domain – US\$870,000; (vi) PIP#950: Legal and Regulatory Capacity Building to Improve Legal System in the Public Works and Transport Domain – US\$870,000; (vii) PIP#987: Installation of Bus Stop Stations Along NR1, NR2, NR3, NR4, NR5, NR6 and NR21 – US\$3.724 million; (viii) PIP#1152: Siem Reap Ring Road Project – US\$73.85 million; (ix) PIP#1155: Project to Build Climate Resilient Infrastructure and Promote Sustainable and Innovative Transportation – US\$669.0 million; and (x) PIP#1298: Study to Prepare National Transportation Policy – US\$600,000. The amount of pledged sources differs by project.

^B The amount here is the estimated expenditures for PIP#1255 – Project Introducing Electric Vehicles in Siem Reap City, Siem Reap Province (US\$15,920,000). At the time of the PIP, no pledged sources have been identified for this.

5.3 Exemplary Funding / Financing Schemes from Elsewhere and Application to Siem Reap




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 Siem Reap’s local government given the significant role of tourism in the city. Collected tourism levies could be earmarked for dedicated green mobility fund in Siem Reap to fund proposed prioritized initiatives. There are various ways to generate tourism revenue for Siem Reap, 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 ongoing 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 – whether to be included in the airline ticket or collected at special counters at the airport.
 

Potential Applicability to Siem Reap:

Around 2.2 million international tourists visited Angkor Wat in 2019. A potential tourist tax could be a daily rate per tourist per night (e.g., 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 in Bali). Average stay by tourists in Siem Reap is between 2 and 3 days. Assuming a daily rate of US\$2.60 (being a simple average of tourist taxes in Barcelona and Switzerland), tourist tax on foreign visitors in Angkor Wat in 2019 would amount to US\$14.3 million, based on an average stay of 2.5 days. Under a flat rate policy of US\$10.00 per tourist, the

generated amount would be US\$22.0 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 Siem Reap:

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 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 Siem Reap, 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 Siem Reap, 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 are 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 (at the city, provincial and national levels –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 Siem Reap 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.). Likewise, if a public transport system was to be implemented, policies to subsidize fares (at least in the beginning), transfer discounts, parking restrictions / fees, parking minimums, and land use would all be key levers to encourage green mobility behavior and mode choice.
- **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.
- **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** – Several large-scale measures are proposed in Phase 1 (1-7 years) and Phase 2 (8-10 years) such as public transport, cycle and crossing improvements. 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, and environmental and social safeguards. Understanding the

potential ramifications of reallocating roadscape 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 around the globe and potential applicability to the city are presented in **Appendix D**).

6.2 Institutional and Implementation Success Factors

Finally, based on experience and review of other relevant mobility projects including the ADB Sustainable Public Transport Study and others, several key factors for success have been identified that relate to the institutional setup and capacity building of the key stakeholders in Siem Reap. They include the following:

- **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 Royal Government of Cambodia on urban green mobility (including Siem Reap) 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 Cambodia 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** – Formulation of a Steering Committee including various departments can allow for quicker endorsements and decision-making. Such a committee can help to ensure that green mobility projects are aligned with national priorities and local needs and identify potential operational / management risks to achieve intended project outcomes. This cross-cutting framework is essential to efficient decision-making and is proposed in the institutional strengthening mechanisms.
- **Leverage Capacity Building Programs in Phnom Penh to Accelerate Green Mobility Training in Siem Reap** – Technical assistance to enhance skills and knowledge in the urban transport sector in Phnom Penh can serve as a reference for authorities and staff in Siem Reap. Proposed training programs include operation/ management of urban transport management, public transport, electric bus, and smart city. Moreover, materials can be used for training for Siem Reap stakeholders, while upcoming sessions in Phnom Penh could also be attended by Siem Reap 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 the residents of and visitors to Siem Reap and their way of travel. Green mobility is in its incipient stages in Siem Reap – 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

Siem Reap is growing and developing quickly – tourism is the lifeblood of the city and also a key revenue generator for the economy. Siem Reap is facing several key mobility issues, principally due to its road-based transport system. Thus, Siem Reap 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 Siem Reap, 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 trip demand has been repressed and visitors have yet to return. Already, Siem Reap is in the midst of implementing the US\$150 million, 38-road improvement project, which is improving sidewalks and providing select bike lanes. This Green Mobility Strategy builds upon these efforts by laying the strategy, vision, and actions that may help shepherd Siem Reap towards achieving a more green and sustainable transport system. Key elements of the Strategy include:

- **Green Mobility Vision Built on Four Key Goals** - The Green Mobility Vision for Siem Reap – 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 underlying goals, objectives and action is the need for integration. Integration of modes (i.e., intermeshed public transport with active mobility network) as well as integration horizontally and vertically with inter-linked strategies/objectives helping to move green mobility forward instead of separate, individual actions. Second, integration is important in 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\$220.3 Million of Activities over the Next Ten Years** – The indicative investment priorities are delineated into two phases: (i) Phase 1 (1-7 years); and (ii) Phase 2 (8-10 years). The total cost associated with this is as follows by phase: (i) Phase 1 – US\$123.4 million; and (ii) Phase 2 – US\$96.9 million.

- **New Electric Public Transport System to Be Showcase** – The proposed eight-route electric public bus system may be a showcase for Siem Reap that achieves several different goals including: (i) providing higher capacity service to meet the outward development of the city; (ii) providing direct service between the Airport and the city center and the city center and the WHA, which has strong trip linkages based on mobile data and shared taxi analysis; (iii) providing a comfortable long-distance alternative to current modes; and (iv) providing a clean mode of transport within the city, but also to/from the WHA (as APSARA noted acid rain as a threat to monuments).
- **Extensive Cycle and Walk Networks Leverage On-Going Road and River Improvement Projects** - The US\$150 million, 38-road improvement project and the Siem Reap River Rehabilitation Project are on-going. The former is widening sidewalks to 2-3m on numerous streets throughout the city, as well as installing better drainage and lights/trees/CCTV. One stretch of Charles de Gaulle is proposed as a bike lane. The latter project is rebuilding its embankment, which can serve as a shared path. 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, wide-reaching network. Sections of the US\$150 million road project propose dedicated motorbike lanes – this Green Mobility Vision seeks to prioritize green mobility by converting these to bike lanes.
- **Road Enhancements Further Improve All-Weather Network and Facilities Green Mobility** – Some 65.0km of road improvements are proposed beyond the US\$150.0 million 38-road improvement project and the targeted cycle/walk/public transport improvements above. These roads focus on filling gaps and creating an all-weather network passable during the wet season (instead of being filled with puddles and standing water) and creating alternate paths for vehicles instead of focusing traffic on key corridors and connecting strategically to major road upgrades in the future. This may improve active mobility conditions on these roads and encourage greater use of active modes and public transport. Enhanced pavement may also reduce dust generated by passing vehicles and improve air quality.
- **Indicative Investment Priorities Align with 2022-2024 Public Investment Plan** – The proposed indicative investment priorities largely align with the Ministry of Planning’s annual, rolling three-year Public Investment Plan (PIP) (2022-2024) to reflect the priorities and needs of Siem Reap City towards achieving green mobility. The PIP proposals include building climate resilient infrastructure, promoting sustainable and innovative transport including public transport and electric vehicles, and enhancing institutional and regulatory framework.
- **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 NR6 and the Sivutha Blvd. 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. These transformations include wider sidewalks with pleasant trees/lighting and street furniture, crossing enhancements include signalized junctions and new mid-block crossings, as well as bike lanes (dedicated and shared), bike parking and bike share, and finally public transport amenities. The total expected magnitude costs of these (US\$17.0 million for NR6 and US\$1.8 million for Sivutha Blvd.) align with the 2022-2024 PIP.
- **Four Pilot Projects Identified and Can Be Steppingstone for Wider Implementation** – A pilot project is often a means to demonstrate and proof the feasibility and value of an idea/approach. Given issues with visitor and vehicle congestion around the Pub Street area, a pilot scheme is proposed to fully pedestrianize Pub Street at certain times of the day (i.e., banning vehicles completely), then adopting a “slow zone” around the area and on Wat Bo Road as a means of “slowing traffic” and encouraging active modes. Adoption of a parking management zone would allow for innovative schemes to reduce sidewalk parking and improve enforcement and overall parking management – while off-street parking facilities can create a more orderly parking environment in the city center (allowing the sidewalk to be reclaimed for pedestrians) and potentially reduce vehicle trips into the city center (with park-and-ride lots on the outskirts). In addition, another pilot scheme is proposed focusing on remote parking and buggy system for Angkor Wat to reduce vehicle and visitor pressures on the sites.
- **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 Siem Reap 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 Siem Reap. 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

Public Investment Program
2022-2024

A1 Projects Relevant to Green Mobility under 2022-2024 Public Investment Plan (PIP)

No.	Projects	PIP #	Project Cost (US\$ mil)	2020 Expenditure	Estimated Expenditure (US\$ mil)			Total (2022-2024)
					2022	2023	2024	
1	Project promoting environmentally effective transport	44	375	0	100	100	175	375
2	Reducing greenhouse gas emission by urban transport	45	800	0	120	120	560	800
3	Raising public awareness about climate change caused by GHG emission in transport sector	49	2,100.00	0	600	600	600	1,800.00
4	Project to standardize climate change-responsive design for national and provincial road construction and maintenance	81	500	0	170	150	180	500
5	Siem Reap River Restoration (Phase II)	705	13,303.00	0	3,873	3,961	0	7,834
6	Assessment of impact of regulatory instruments in the public works and transport domain	949	870	0	290	290	290	870
7	Legal and regulatory capacity building to improve legal system in the public works and transport domain	950	870	0	290	290	290	870
8	Installation of Bus Stop Stations along NR1, NR2, NR3, NR4, NR5, NR6, and NR21	987	3,724.00	0	1,337.10	1,628.00	759.1	3,724.20
9	Siem Reap Ring Road Project	1152	73,850.00	0	14,000.00	18,000.00	18,000.00	50,000.00
10	Project to Build Climate Resilient Infrastructure and Promote Sustainable and Innovative Transportation	1155	669,000.00	0	1,000.00	1,000.00	1,000.00	3,000.00
11	Natl Road 6 Expansion Project (1 st Section: Skun – Kpg Thom)	1246	210,000.00	0	0	42,000.00	63,000.00	105,000.00
12	Project Introducing Electric Vehicles in Siem Reap City, Siem Reap province	1255	15,920.00	0	692.6	3,099.00	128.4	3,920.00
13	Study to prepare national transportation policy	1298	600	0	200	200	200	600
				Total	22,672.70	71,438.00	85,182.50	179,293.20

Source: Ministry of Planning, 2021.

Appendix B

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

B1 Details for Indicative Investment Priorities – Phase 1 (by Green Mobility Initiative)

Initiative #	Component	Initiative	Plan & Design ^A	Implement / Construct ^A	Operate & Maintain	Capital Cost (US\$) ^{B,C}	Annual O&M Cost (US\$) ^{C,D}	Potential Synergy Opportunity with On-Going Plans / Projects					For Priority Implementation
								PIP 2022-24	2035 Land Use Master Plan	2035 Tourism Master Plan	GGGI Initiatives	JICA Smart City Study	
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	-	-	-	-	-	Yes	
1B5.1		Improve 29 (Total 65) km of Roads for Vehicles 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 (See Note) ^F	DPWT (See Note) ^F	47,800,000	960,000	Yes	Yes	Yes	-	-	
1B5.4		Create Road Safety Monitoring System / Database	MPWT	MPWT	DPWT	500,000	10,000	-	-	-	-	Yes	
4B1.2	Public Transport	Create Regional Committee to Assess Potential for Transport Authority	MPWT	MPWT	-	-	-	-	-	-	-	-	
2D1.1		Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	MPWT/ Province	MPWT/ Province	-	-	-	-	-	-	-	-	
1C1.1		Operate 138 (Total 210) km, 5 (Total 8) Line Bus System Serving Siem Reap and Surrounding Area ^G	MPWT	MPWT	DPWT	28,800,000	5,500,000	Yes	Yes	Yes	Yes	-	✓
1C2.1		Construct 2 Integrated Terminals for Multimodal Interchange	MPWT	MPWT	DPWT	4,200,000	90,000	Yes	-	Yes	-	-	
1C3.1		Implement 6 km of Bus Lanes on NR6's Eastern Approach to the City Center (including Bus Signal Priority)	MPWT	MPWT	DPWT	3,600,000	80,000	-	-	-	-	-	
2D1.1	Cycle Improvements	Introduce Discounted/Free Green Mobility Schemes (for Public Transport and Bike Share)	MPWT/ Province	MPWT/ Province	-	-	-	-	-	-	-	-	
1A2.1		Create 10.4 (Total 17.2) km of Bikeways, 33.4 (Total 67.6) km of Protected Bike Lanes, and 30.2 (Total 80.4) km of Sharrow	DPWT	DPWT	Province	12,900,000	260,000	-	Yes	-	-	-	✓
1A3.1		Install 74 (Total 166) Bike Racks	DPWT	DPWT	Province	100,000	10,000	-	-	-	-	-	✓
1A3.2		Implement Bike Share Program in City (500 Bicycles; Total 1,250)	DPWT	DPWT	Province	1,800,000	180,000	-	-	-	-	Yes	✓
1A3.3		Install 10 (Total 30) Toilets along Key Walk/Cycle Corridors	Province	Province	City	100,000	10,000	-	-	-	-	-	✓
1B1.2	Walk / Sidewalk Improvements	Conduct Citywide Crossing Improvement Study and Implement Improvement Scheme	DPWT	DPWT	-	200,000	-	-	-	-	-	-	
2D2.1		Conduct Annual Walk/Car-Free Day Event	Province	Province	-	-	-	-	-	-	-	-	✓
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	-	-	-	-	-	-	-	Yes	
1A1.1	Create/Improve 31.3 (Total 75.3) km of Paved Sidewalk with Segregated Curb (including Street Furniture)	DPWT	DPWT	Province	7,100,000	150,000	-	Yes	Yes	-	-		

Initiative #	Component	Initiative	Plan & Design ^A	Implement / Construct ^A	Operate & Maintain	Capital Cost (US\$) ^{B,C}	Annual O&M Cost (US\$) ^{C,D}	Potential Synergy Opportunity with On-Going Plans / Projects					For Priority Implementation
								PIP 2022-24	2035 Land Use Master Plan	2035 Tourism Master Plan	GGGI Initiatives	JICA Smart City Study	
1A1.2		Create Pilot Walk District in Pub Street and Slow District around Pub Street	DPWT	DPWT	-	500,000	-	-	-	-	-	-	✓
1B3.1		Implement Wheelchair Access Ramps at 195 (Total 370) Locations	DPWT	DPWT	Province	400,000	10,000	-	-	-	-	-	✓
1B2.1		Implement Pedestrian Scale Lighting on 31.3 (Total 75.3) km of Road (at 25m intervals)	DPWT	DPWT	Province	2,900,000	60,000	-	-	-	-	Yes	✓
1B3.2		Implement Tactile Pavement at 195 (Total 370) Locations	DPWT	DPWT	Province	200,000	10,000	-	-	-	-	-	✓
1B4.1		Implement Tree Planting Program along 31.3 (Total 75.3) km of Road	Province	Province	City	1,000,000	20,000	-	-	-	-	-	✓
1B1.1	Crossing Improvements ^F	Implement Mid-Block Crossing Enhancements at 50 (Total 100) Locations (with Traffic Calming)	DPWT	DPWT	Province	4,200,000	90,000	-	-	-	-	-	✓
3A1.4	Other-Buggy	Implement Buggy Scheme with Remote Parking Scheme	DPWT / APSARA	DPWT / APSARA	Province / APSARA	3,700,000	370,000	-	Yes	Yes	-	Yes	✓
2C1.3	Other-Parking	Implement Parking Facilities to Provide Dedicated Off-Street Parking Spaces	DPWT	DPWT	Province	800,000	80,000	-	Yes	-	-	Yes	✓
2B1.2		Initiate Pilot Low Emission Zone around Pub Street	DPWT	DPWT	-	500,000	-	-	-	-	-	-	
2C1.2	Other-Pilot ^I	Pilot Parking Management Zone in Pub Street	DPWT / Province / Traffic Police	DPWT / Province / Traffic Police	Traffic Police	500,000	-	-	Yes	-	-	Yes	✓
2B1.1	Other-Technical Study ^J	Conduct Further Study to Develop E-Mobility Strategy	DPWT	DPWT	-	200,000	-	-	-	-	-	-	
2C1.1		Conduct Further Study for Citywide Parking Strategy and Management Study	DPWT	DPWT	-	200,000	-	-	Yes	-	-	Yes	✓
2E2.1		Conduct Further Study for Transport System Resilience	DPWT	DPWT	-	200,000	-	-	-	-	-	-	
2D2.2		Conduct Education Campaigns at Local Universities	Province	Province	-	-	-	-	-	-	-	-	✓
2D2.3		Conduct Communications Activities and Create Green Mobility Website & App to Educate and Provide Information	Province	Province	-	300,000	-	-	-	-	-	Yes	✓
4B1.4	Other-Capacity Building ^K	Implement Targeted Capacity Building to Sharpen Skills Needed for Green Mobility	MPWT, DPWT, Province	MPWT, DPWT, Province	-	200,000	-	-	-	-	-	-	✓
3B1.1		Create and Promote Angkor Cycle Experience as Part of Tourism Package	MPWT, Province, APSARA	MPWT, Province, APSARA	-	-	-	-	-	-	-	-	
3A1.1		Integrate Heritage Preservation and Mobility Plans	MPWT, Province, APSARA	MPWT, Province, APSARA	-	-	-	-	Yes	-	-	Yes	
4A1.3		Establish Participatory Mechanisms for Green Mobility Plans/Schemes	MPWT	MPWT	-	-	-	-	-	-	-	-	
4B1.3		Better Link Green Mobility into Project Prioritization Framework	MPWT	MPWT	-	-	-	-	-	-	-	-	✓
4C2.1	Other-Institutional/Regulatory/Legal ^L	Re-Prioritize Projects by Strengthening Linkage to Green Mobility (see Initiative 4B1.3)	MPWT	MPWT	-	-	-	-	-	-	-	-	✓
4A1.1		Develop Targeted Green Mobility Strategy including Clear Goals/Objectives and Undertake Green Mobility Policy / Technical Studies (for Traffic Management, Motorbike Policy & Environmental & Social Safeguards)	MPWT / Province	MPWT / Province	-	800,000	-	-	Yes	-	-	-	✓
4A1.2		Create Cross-Cutting Committee to Develop Green Mobility Performance Monitoring Mechanisms	MPWT / Province	MPWT / Province	-	-	-	-	-	-	-	-	

Initiative #	Component	Initiative	Plan & Design ^A	Implement / Construct ^A	Operate & Maintain	Capital Cost (US\$) ^{B,C}	Annual O&M Cost (US\$) ^{C,D}	Potential Synergy Opportunity with On-Going Plans / Projects					For Priority Implementation
								PIP 2022-24	2035 Land Use Master Plan	2035 Tourism Master Plan	GGGI Initiatives	JICA Smart City Study	
4C1.1		Explore New Revenue Sources	MPWT, Province	MPWT, Province	-	-	-	-	-	-	-	-	
4C1.2		Establish Dedicated Green Mobility Funding Pool	MPWT, Province	MPWT, Province	-	-	-	-	-	-	-	-	
4C2.2		Mobilize More Development Partner Financing	MEF	MEF	-	-	-	-	-	-	-	-	
4C2.3		Mobilize Private Sector Capital and increase private sector participation (i.e., through PPP).	MEF	MEF	-	-	-	-	-	-	-	-	
2A1.1		Integrate Green Mobility into Urban Planning and Future Master Plans	MPWT/MLMPUC	MPWT/MLMPUC	-	-	-	-	-	-	-	-	✓
2E1.1		Integrate Resilience into Design Guidelines for Green Mobility Infrastructure	MPWT	MPWT	-	-	-	-	-	-	-	-	
4B1.1		Create Cross-Cutting Committee to Integrate Green Mobility into the Legal Framework and Define Roles/ Responsibilities	MPWT	MPWT	-	-	-	-	-	-	-	-	✓
3B1.2		Create Committee to Develop Themed Experiences or Corridors	MPWT, Province	MPWT, Province	-	-	-	-	-	-	-	-	
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 WHA	MPWT / DPWT / APSARA	MPWT / DPWT / APSARA	-	-	-	-	-	-	-	-	
3A2.1		Connect Outlying Heritages Sites with Green Mobility to Diversify Tourism Products and Reduce Visitor Loads	MPWT	MPWT	-	-	-	-	-	Yes	-	-	
4A2.1		Create Open-Data Sharing Platforms to Spur Innovation	MPWT / Province	MPWT / Province	-	-	-	-	-	-	-	-	

Notes:

^A It is assumed that for initiatives led by the province, appropriate coordination with the City may also be required as warranted.^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 an associated capital cost, but not an O&M one. For these cases, O&M costs are assumed to be embedded in the initial capital cost already. This may be noted expressly by initiative.^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 Local roads may be handled by the province, rural ones by the Department of Rural Development, and ones within the WHA by APSARA.^G The cost for 1C1.1 is the sum of US\$15,521,000 for 1C1.1 (12m bus) and \$8,056,000 for 3A1.3 (10m bus).^H New signalized junctions including pedestrian countdown signals and zebra crossings are included as part of the 1B5.1 Multimodal Road Improvements.^I 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.^J 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.^K 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.^L 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 C

Potential Funding/Financing Instruments for Green Mobility and Case Studies

C1 Financing Instruments for Indicative Investment Priority List

Financing & Funding Instruments	Opportunities in Siem Reap / Comments	Applicable Component		Selected Case Studies / Precedents
National and International Loans and Grants	<ul style="list-style-type: none"> National and international loans and grants are key financing sources for transport infrastructure investment in Cambodia and Siem Reap Over 99% of committed financing for MPWT's on-going and planned projects for 2021 to 2023 is from international development partners (i.e., China and Japan) and multilateral agencies (i.e., World Bank, ADB and JICA) Existing shortfalls in financing for transport from national and international loans/grants, demonstrates a need to re-prioritize projects to strengthen linkage between green mobility and 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 applicable 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	✓	<ul style="list-style-type: none"> Bus Operations, Phnom Penh, Cambodia^A – 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^B - 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. Vientiane Sustainable Urban Transport Project, Lao PDR^C - ADB approved a special fund loan of US\$35 million for the project, intended 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, OPEC Fund), private sector and the Lao Government, with contributions of about 35%, 44%, 6% and 15% respectively.
		Public Transport	✓	
		Cycling	✓	
		Sidewalk / Crossings	✓	
		Buggy	✓	
		Parking	✓	
		Others	✓	
Climate-Related Financial Instruments ^D	<ul style="list-style-type: none"> Climate-related financial instruments have been used in Cambodia's transport sector, but mainly for road projects. Under the Climate Investment Fund (CIF)'s Pilot Program for Climate Resilience (PPCR), Cambodia is allocating US\$91 million to integrate climate risk and resilience into development planning, including rural/urban infrastructure. US\$464 million of co-financing from ADB, World Bank and other development partners is used with PPCR financing. 	Roads	✓	<ul style="list-style-type: none"> Vientiane Sustainable Urban Transport Project, Lao PDR^E – 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.
		Public Transport	✓	

Financing & Funding Instruments	Opportunities in Siem Reap / Comments	Applicable Component		Selected Case Studies / Precedents	
	<ul style="list-style-type: none"> To date, transport projects using the PPCR Fund include the following road projects: Rural Roads Improvement Projects II in Kampong Cham Province and provincial road improvement project for roads in Prey Veng, Svay Rieng, Kampong Chhnang and Kampong Speu Provinces. Cambodia has not used CTF (part of CIF) for transport projects. To date, Cambodia has US\$104 million allocated from the Green Climate Fund (GFC) for four projects in the agricultural sector and general climate change and adaptation (which includes the ASEAN Catalytic Green Finance Facility (ACGF): Green Recovery Program). This initiative by GFC/ADB supports low-emission investments in selected Cambodia and other Southeast Asia countries, including low-emission transport to support economic recovery after the pandemic. Opportunities exist to explore financing from climate funds in particular CIF / CTF and GCF, given the alignment of their focal areas with prioritized green mobility investments in Siem Reap. Based on precedent and how climate funds support urban transport projects, this instrument would be suitable for public transport (e-bus), bike-scheme, walk, road and buggy in Siem Reap 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 	Cycling	✓	<ul style="list-style-type: none"> CTF in Philippines^F - 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: <ul style="list-style-type: none"> 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 aimed at supporting reduction of emissions for Cebu’s transport sector (a savings from 24% to 41% after BRT completion). Funded investments include bus stations, system management / marketing, 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^G - GFC funding accounts for ~8% (US\$49 million) of total cost for the zero-emission BRT system Semarang BRT, Indonesia^H - 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. 	
		Sidewalk / Crossings	✓		
		Buggy	✓		
		Parking			
		Others			
PPP	<ul style="list-style-type: none"> There is potential for the Royal Cambodian Government (RCG) to explore PPPs and private sector involvement to unlock private sector financing in the transport sector in Cambodia and Siem Reap. However, there are limited PPP precedents in the transport sector in Cambodia, for smaller cities like Siem Reap. PPPs in the transport sector have so far focused largely on toll roads or national highways in or connecting Phnom Penh. RCG plays a key role in supporting PPPs by addressing institutional and regulatory gaps to provide an effective and transparent environment to encourage private sector participation. 	Roads	✓	<ul style="list-style-type: none"> BRT Lite, Yangon, Myanmar^I – BRT Lite was implemented in 2016 via a pilot PPP scheme for two routes with 45 vehicles (representing a scaled down version of the 2013 JICA plan). System cost (~US\$19.2 million) was fully financed by a newly created entity, the 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 the need to compete for passengers and reduce reckless driving. Public Bus Service, Yangon, Myanmar^J - 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 	
		Public Transport	✓		
		Cycling	✓		

Financing & Funding Instruments	Opportunities in Siem Reap / Comments	Applicable Component		Selected Case Studies / Precedents	
	<ul style="list-style-type: none"> The recent draft PPP law to be approved by MEF is a key step towards PPP development in the country PPPs could be considered for public transport (e-bus) and road improvements in Siem Reap 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 also be considered for bike share schemes, based on the success of Hoi An's bike-sharing scheme. This could similarly be applied to the Buggy & Parking schemes. Despite the relatively small scale of such projects, the private sector could still profit from supplying buggies or parking facilities as well as on-going O&M services. Given relatively limited experience in PPPs in the transport sector, private sector may be uncertain on the level of government commitment and viability of the investment. It is key for market sounding to be conducted to gauge private sector appetite and understand concerns from the market. 	Sidewalk / Crossings		<p>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.</p> <ul style="list-style-type: none"> Bike Share Scheme, Hoi An, Vietnam^K – 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 funded the project with US\$200,000 (part of which was used to improve a 3-5 km road with a dedicated 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. 	
		Buggy	✓		
		Parking	✓		
		Others			

Notes:

^A Source: https://www2.jica.go.jp/en/evaluation/pdf/2017_1000212_4_f.pdf^B 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>^C Source: https://www.adb.org/sites/default/files/project-documents/45041/45041-002-apfs-en_0.pdf^D Source: (i) <https://www.climateinvestmentfunds.org/country/cambodia>; and (ii) <https://www.climateinvestmentfunds.org/projects/promoting-climate-resilient-agriculture-koh-kong-and-mondulkiri-provinces-part-greater>^E Source: (i) <https://greatermekong.org/lao-pdr-setting-vientiane-road-sustainable-transport>; (ii) ADB Global Environmental Facility 2021 Project Implementation Report for Vientiane Sustainable Urban Transport Project; and (iii) <https://www.adb.org/sites/default/files/project-document/155510/45041-002-pam.pdf>^F 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>; (iii) <https://www.climateinvestmentfunds.org/country/philippines>^G Source: <https://www.greenclimate.fund/project/fp085>^H Source: <https://www.greenclimate.fund/sites/default/files/document/ppf-application-integrated-sustainable-bus-rapid-transit-development-semarang.pdf>^I Source: <https://www.mmtimes.com/national-news/yangon/18990-bus-upgrade-offers-commuters-a-relieve.html>^J Source: (i) https://www.unescap.org/sites/default/files/SUT1%20Final%20Report%20Submission_ED.pdf; (ii) <https://www.mmtimes.com/business/23485-yangon-transport-authority-2.html>; and (iii) <https://www.mmtimes.com/business/21621-govt-to-offer-financial-support-for-yangon-ppp-bus-lines.html>^K Source: (i) <https://e.vnexpress.net/news/travel/places/hoi-an-s-first-bicycle-sharing-scheme-hits-the-streets-3932468.html>; (ii) https://smmr.asia/wp-content/uploads/2020/01/Trang_Bike_Hoi_An.pdf; (iii) <https://en.vietnamplus.vn/hue-to-pilot-public-bikesharing-scheme/200913.vnp>; (iv) <https://en.vietnamplus.vn/hcm-city-pilots-bicyclesharing-service-in-central-area/218285.vnp>; and (v) <https://vietnamnet.vn/en/society/bicycle-sharing-scheme-to-be-extended-to-hanoi-ba-ria-vung-tau-danang-803577.html>

C2 Funding Instruments for Indicative Investment Priority List

Financing & Funding Instruments	Opportunities in Siem Reap / Comments	Applicable Mode		Selected Case Studies / Precedents
Public Transport Subsidies	<ul style="list-style-type: none"> Public transport subsidy is a key funding source for public transport, e-bus schemes, and/or bike share in Siem Reap if farebox revenue or bike-sharing scheme charges 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 Siem Reap or to compensate for initial low demand for the e-bus 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		<ul style="list-style-type: none"> Public Transport Subsidies, Yangon, Myanmar^A - 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^B - 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^C - 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^D – 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		
		Buggy		
		Parking		
		Others		
Property Taxes ^P	<ul style="list-style-type: none"> Cambodia’s property tax, known as the Tax on Immovable Properties (TOIP), imposes an annual tax rate of 0.1% on immovable properties valued over US\$25,000 (KHR100 million)^E A capital gains tax (parka) was tabled in April 2020, and expected to be implemented in 2022. The capital gains tax extends existing capital gains tax for Cambodian businesses to individuals. The capital gains 	Roads	✓	<ul style="list-style-type: none"> Property Taxes for Transit Infrastructure in Minnesota, United States^F - 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 Siem Reap / Comments	Applicable Mode	Selected Case Studies / Precedents														
	<p>tax is 20% of profits derived from the sale or transfer of six types of capital, including immovable property, land, buildings, and other constructions, and given it is a new tax, some proceeds may be able to be allocated to green mobility schemes.</p> <ul style="list-style-type: none"> • Cambodia could consider potential use of property tax as a funding source to support urban transport development (e.g., by earmarking a portion of property taxes to a dedicated green mobility fund). This can be allocated to Siem Reap’s proposed green mobility initiatives. • The fund is a potential source to fund all types of transport modes. 	<table border="1"> <tr> <td data-bbox="1108 327 1232 391">Sidewalk / Crossings</td> <td data-bbox="1236 327 1276 391">✓</td> </tr> <tr> <td data-bbox="1108 394 1232 458">Buggy</td> <td data-bbox="1236 394 1276 458">✓</td> </tr> <tr> <td data-bbox="1108 461 1232 525">Parking</td> <td data-bbox="1236 461 1276 525">✓</td> </tr> <tr> <td data-bbox="1108 528 1232 592">Others</td> <td data-bbox="1236 528 1276 592">✓</td> </tr> </table>	Sidewalk / Crossings	✓	Buggy	✓	Parking	✓	Others	✓	<ul style="list-style-type: none"> • Property Tax, Toronto, Canada ^G - 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 ^H - 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 						
Sidewalk / Crossings	✓																
Buggy	✓																
Parking	✓																
Others	✓																
Tourism Levy (Included in Box 3-1)	<ul style="list-style-type: none"> • A tourism levy could be a potential funding source for Siem Reap’s local government given the significant role of tourism in the city. • Collected tourism levies could be earmarked for dedicated green mobility fund in Siem Reap to fund proposed prioritized initiatives. There are various ways to generate tourism revenue for Siem Reap, which will require further assessment. Examples from select case studies that could be tailored to the local context include: <ul style="list-style-type: none"> ○ Charging higher airport fees or public transport, bike, and buggy fares for tourists to cross-subsidize other transport development in the cities (i.e., parking and roads), similar to Barcelona ○ Charging taxes for staying in Siem Reap, similar to Switzerland and Indonesia • Around 2.2 million international tourists visited Angkor Wat in 2019, which is a top tourist destination in Siem Reap. A potential tourist tax could be a daily rate per tourist per night (e.g., 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 in Bali). Average stay by tourists in Siem Reap is between 2 and 3 days. Assuming a daily rate of US\$2.60 (being a simple average of tourist taxes in Barcelona and Switzerland), tourist tax on foreign visitors in Angkor Wat in 2019 would amount to US\$14.3 million, based on an average stay of 2.5 days. Under a flat rate policy of US\$10.00 per tourist, the generated amount would be US\$22.0 million. • Several options exist to collect the tourist tax: (i) including it in airline tickets; (ii) charging this at special arrival or departure counters at the 	<table border="1"> <tr> <td data-bbox="1108 611 1232 675">Roads</td> <td data-bbox="1236 611 1276 675"></td> </tr> <tr> <td data-bbox="1108 678 1232 742">Public Transport</td> <td data-bbox="1236 678 1276 742">✓</td> </tr> <tr> <td data-bbox="1108 745 1232 809">Cycling</td> <td data-bbox="1236 745 1276 809">✓</td> </tr> <tr> <td data-bbox="1108 812 1232 876">Sidewalk / Crossings</td> <td data-bbox="1236 812 1276 876"></td> </tr> <tr> <td data-bbox="1108 879 1232 943">Buggy</td> <td data-bbox="1236 879 1276 943">✓</td> </tr> <tr> <td data-bbox="1108 946 1232 1010">Parking</td> <td data-bbox="1236 946 1276 1010"></td> </tr> <tr> <td data-bbox="1108 1013 1232 1077">Others</td> <td data-bbox="1236 1013 1276 1077"></td> </tr> </table>	Roads		Public Transport	✓	Cycling	✓	Sidewalk / Crossings		Buggy	✓	Parking		Others		<ul style="list-style-type: none"> • Tourist Tax, Barcelona, Spain ^I - 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 ^J - 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.
Roads																	
Public Transport	✓																
Cycling	✓																
Sidewalk / Crossings																	
Buggy	✓																
Parking																	
Others																	

Financing & Funding Instruments	Opportunities in Siem Reap / Comments	Applicable Mode		Selected Case Studies / Precedents	
	airport; or (iii) indirect billing by tourist agencies. In case of adopting a daily rate per tourist per night, an additional option could be through accommodation invoices (i.e., hotels, holiday apartments, etc.).				
Parking Charges	<ul style="list-style-type: none"> • Parking charges are not levied on public spaces in Siem Reap. • Parking charges and or fines for violations of parking regulations could be introduced in Siem Reap 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		<ul style="list-style-type: none"> • Parking Revenue Allocation in Milton Keynes, United Kingdom ^K - 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 ^L - Mobility funds have been established to collate parking income, which can be dedicated to transport projects (including bike, road safety, and public transport projects including new routes and bus stops), etc. • Mass Transit Improvement Fund, Mexico City, Mexico ^M – 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			
		Buggy			
		Parking	✓		
Fuel Taxes and Surcharges ^N	<ul style="list-style-type: none"> • Fuel taxes and surcharges are a stable funding instrument with relatively low administration cost. Apart from additional revenues, they have potential to encourage a switch to low emissions modes. • Cambodia’s national government imposes a special import tax on gasoline, diesel, and kerosene. • There is no fuel tax and surcharges on fuel consumption (i.e., based on engine size, average carbon emissions) in Cambodia • Cambodia could consider use of fuel taxes and surcharges as a funding source to support urban transport development (by earmarking a portion of fuel taxes and surcharges to a dedicated green mobility fund, like the road fund of Lao PDR or fuel tax earmarked for rail in Germany). The dedicated green mobility fund can be allocated to green mobility enhancements such as public transport and roads, but care must be taken given potential public 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 (note fuel import taxes were cut in 2018 due to rising petrol prices). 	Roads	✓	<ul style="list-style-type: none"> • Fuel Taxes for Road Fund, Lao PDR ^O – Lao PDR established an earmarking system in 2002, whereby fuel levies are collated within a special fund (Road Fund) for road maintenance. The revenue collected in 2002 was only US\$2.0 million. Currently it has reached almost US\$100.0 million per year. • Fuel Taxes for BRT Investment, Bogota, Colombia ^O - 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			
		Buggy			
		Parking			
		Others			

Financing & Funding Instruments	Opportunities in Siem Reap / Comments	Applicable Mode		Selected Case Studies / Precedents
Vehicle Taxation ^P	<ul style="list-style-type: none"> Cambodia imposes vehicle taxation (road tax) on private vehicle owners. Vehicle tax rates vary by vehicle make/model. In December 2021, the General Department of Taxation (GDT) reported an increase in vehicle tax revenue for the most recent collection period, following stricter enforcement of collection. Like the cases cited in the United States and London, Cambodia 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. 	Roads	✓	<ul style="list-style-type: none"> Vehicle Taxes, Wisconsin, United States ^Q - In Wisconsin, vehicle taxes can only be spent on transport projects by regulation. Road Taxes, London, United Kingdom ^Q - 90% of the road tax has been used for road network projects in 2018.
Farebox Revenue	<ul style="list-style-type: none"> Farebox revenue is a key funding source for operating the proposed e-bus scheme, bike schemes and buggy, however it may be insufficient to cover all O&M costs (including debt repayment if any) in the context of Siem Reap. Fare pricing requires careful assessment to encourage use of the e-bus, bike and/or buggy 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 Siem Reap, pricing differences between tourists and locals could be key to ensuring equitable access to the services for residents. 	Roads		<ul style="list-style-type: none"> Bus Farebox Revenue, Yangon, Myanmar ^R - Fares are priced by route type and distance by the operator. Farebox recovery (i.e., farebox revenue divided by O&M costs) is relatively high – with one operator exceeding a ratio of 1.2. The remaining 20% surplus is allocated to debt service and investor return. Cost-plus Formula, Thailand ^S - 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 ^T – Public transport fares are relatively low compared to income (4.4% of annual income). These low fares, however, reduce farebox recovery (around 46% in 2017), requiring government subsidies to ensure smooth operation. Free Public Transport, Tallinn, Estonia ^U - 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.
Advertising	<ul style="list-style-type: none"> Advertising is a key non-fare revenue to cover O&M costs of e-bus, bike, parking, and buggy schemes in addition to farebox revenue or parking charges. 	Roads		<ul style="list-style-type: none"> Bus Advertising, Yangon, Myanmar ^V - The Yangon City Development Committee (YCDC) owns the rights to advertising on buses. When the bus system was launched, the Government intended to generate revenue through selling advertisements at bus stops, which could be used to upgrade bus stops without using State budget (if YCDC relinquished its rights to advertising). In June 2018, YCDC awarded FMIDecaux Co. an exclusive 20-year contract for advertising at bus shelters, for building 500 new bus shelters equipped with

Financing & Funding Instruments	Opportunities in Siem Reap / Comments	Applicable Mode		Selected Case Studies / Precedents
		Sidewalk / Crossings	✓	<p>digital City Information Panels totaling US\$13 million to replace existing bus stops. The project is financed by advertising, based on a JCDecaux business model, at no cost to the city/ residents.</p> <ul style="list-style-type: none"> • Electric Vehicle Financing, Bogota, Columbia^W - A financing scheme for promotion of investments in electric vehicles was developed by the municipal government. Owners of electric buses (not diesel buses) are able to collect revenue from bus advertising space. • Bus Contracting Model, Singapore^X - Since implementation of the Bus Contracting Model in 2016, operators must adhere to new guidelines on commercial bus advertising and are thus able to retain advertising revenue from assets such as buses and bus interchanges.
		Buggy	✓	
		Parking	✓	
		Others		

^A 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>

^B 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>

^C Source: <https://www.bbc.com/news/world-europe-52483684>

^D 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>

^E Note: Immovable properties include land, houses, infrastructure, buildings, other construction etc. Source: (i) <https://www.khmertimeskh.com/50776024/capital-gains-tax-delayed-to-2022/>

^F Source: <https://www.transportationalliance.com/sites/ta/files/uploads/inline/docs/FinalFundingOptions.pdf>

^G Source: <https://www.toronto.ca/legdocs/mmis/2019/ex/bgrd/backgroundfile-140989.pdf>

^H 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/>

^I 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

^J 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>

^K Source: <https://www.miltonkeynes.co.uk/news/traffic-and-travel/council-pockets-ps12-million-annual-profit-parking-charges-and-fines-milton-keynes-1271094>

^L Source: https://park4sump.eu/sites/default/files/pushandpull/CS24_Amsterdam_mobility_fund_final.pdf

^M Source: <https://www.itf-oecd.org/sites/default/files/docs/reversing-car-dependency.pdf>

^N Source: <https://www.phnompenhpost.com/business/pm-announces-new-scheme-petrol-pricing>

^O Source: (i) <https://documents1.worldbank.org/curated/zh/685751526873414645/pdf/Lao-National-Road-PAD-05012018.pdf>; and (ii) World Bank: Sustainable Urban Transport Financing from the Sidewalk to the Subway 2016

^P Source: (i) Source: <https://www.phnompenhpost.com/national/vehicle-taxes-be-collected-june>; (ii) Source: <https://www.khmertimeskh.com/727329/road-tax-on-vehicles-gears-up-next-month/>; (iii) Source: <https://www.khmertimeskh.com/50948985/following-calls-to-pay-vehicle-taxes-only-150-owners-comply/>; and (iv) Source: <https://www.khmertimeskh.com/50948985/following-calls-to-pay-vehicle-taxes-only-150-owners-comply/>

^Q Source: Urban Transport in Yangon and Mandalay – Review of Sector Institutions, Expenditures and Funding 2020 (the World Bank Group).

^R 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>

^S Source: https://www.changing-transport.org/wp-content/uploads/E_K_NUMP-Inventory-and-Assessment_Thailand_2019_EN.pdf

^T Source: <https://www.unescap.org/sites/default/d8files/knowledge-products/SUTI%20%20Mobility%20Assessment%20Report%20-%20Ho%20Chi%20Minh%20City.pdf>

^U Source: <https://www.weforum.org/agenda/2018/06/estonia-is-making-public-transport-free/>

^V Source: (i) Source: <https://www.mmtimes.com/business/21621-govt-to-offer-financial-support-for-yangon-ppp-bus-lines.html>; (ii) <https://www.mmtimes.com/business/21621-govt-to-offer-financial-support-for-yangon-ppp-bus-lines.html>; and (iii) <https://www.jcdecaux.com/press-releases/fmidcaux-wins-exclusive-20-year-advertising-street-furniture-contract-yangon-city>




^W Source: https://www.changing-transport.org/wp-content/uploads/2019_Busfleet_Modernisation_Financial_Mechanisms.pdf




^X Source: <https://landtransportguru.net/commercial-advertising-on-bus-contracting-model-buses/>





Appendix D



Motorbike Restrictions and Policies

D1 Potentially Relevant Motorbike Management Measures Adopted Elsewhere

#	Category	Policy Measures	Cities	Description	Potential Benefits / Results	Potential Applicability to City
1	Motorbike Ownership Restrictions	<p>Vehicle Quota System</p> 	<ul style="list-style-type: none"> • Singapore • Hanoi 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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.) 	<ul style="list-style-type: none"> • 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	<p>Parking Pricing</p> 	<ul style="list-style-type: none"> • Taipei 	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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		<p>Parking Supply</p> 	<ul style="list-style-type: none"> • Taipei 	<ul style="list-style-type: none"> • Regulate motorbike parking on sidewalks by creating dedicated motorbike spaces 	<ul style="list-style-type: none"> • Dedicated motorbike spaces reduce the sidewalk areas used for parking, thereby freeing the sidewalk, and 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 	<ul style="list-style-type: none"> • Enforcement is a key issue. Without proper enforcement, continued parking on sidewalks in an unmanaged fashion may occur. • Although parking fines are enshrined in relevant legal statutes, limited enforcement reduces the deterrence factor.

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						<ul style="list-style-type: none"> A comprehensive signage program would also be needed on the sidewalks and on the roads for both pedestrian and the motorcyclists.
4		Parking Enforcement 	<ul style="list-style-type: none"> Taipei 	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> Higher parking fines would ideally discourage motorbikes parking outside of designated zones as well as those overstaying maximum time limits. 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Taipei 	<ul style="list-style-type: none"> Establish maximum motorbike parking requirements are established for different types of building by the Building Code 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Taipei, Hanoi, Guangzhou Beijing Shanghai 	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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
7		Congestion Charge and Prohibitions	<ul style="list-style-type: none"> Vienna Singapore Melbourne 	<ul style="list-style-type: none"> Introduce congestion charges and motorbike bans to reduce congestion and air pollution 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Convenient and accessible alternate transport options are necessary to compensate for the loss of access in these central areas

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					<ul style="list-style-type: none"> Cities have implemented restrictions based on type of motorbike (based on Euro emission standard) with varying hours and pricing schemes 	
8	Motorbikes as Part of Multimodal Mobility System	<p>Integrated Mobility Planning</p> 	<ul style="list-style-type: none"> Taipei 	<ul style="list-style-type: none"> Create motorbike parking (park and ride facilities) near public transport stations/stops to encourage motorcyclists to use public transport for longer distance trips 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<p>Electric Motorbike Share</p> 	<ul style="list-style-type: none"> Taipei, Portland, USA 	<ul style="list-style-type: none"> Introduce e-motorbike sharing schemes 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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		<p>Emission Standards</p> 	<ul style="list-style-type: none"> Singapore, London, 	<ul style="list-style-type: none"> Restrict/ban vehicles exceeding emissions thresholds 	<ul style="list-style-type: none"> In London, motorbikes failing to meet a minimum Euro 3 emission standards are prohibited from operating within London's Ultra Low Emissions Zone This effort led to a 65% reduction in the number of older, more polluting (non-compliant) vehicles driving in the zone 	<ul style="list-style-type: none"> 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 Convenient and accessible alternate transport options are necessary to compensate for loss of access

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1 1		Vehicle Renewal (Economic Incentive) 	<ul style="list-style-type: none"> Bangalore Taipei 	<ul style="list-style-type: none"> Provide economic incentives (government subsidies) to replace diesel models with new low-emission or electric motorbikes 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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
1 2	Digital Tools to Improve Motorbike Operations	Pre-Trip Planning 	<ul style="list-style-type: none"> Hong Kong 	<ul style="list-style-type: none"> Information on-street parking spaces can be searched through “HKeMobility” app to facilitate motorcyclists’ pre-trip planning and transfer to public transport 	<ul style="list-style-type: none"> Guides people to find on-street parking spaces before departure and shift to public transport 	<ul style="list-style-type: none"> 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

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Photos:

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