PHNOM PENH SUSTAINABLE CITY PLAN 2018-2030

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CONTENTS

KEY MESSAGE

The Royal Government of Cambodia (RGC) has put Green Growth at the center of its economic and social development planning and relies on Green Growth as a fundamental mechanism for achieving sustainable development, which contributes to upholding national economic growth, improving the quality of environment and reducing poverty.

The development of sustainable cities in the Kingdom of Cambodia is a key policy priority for the National Council for Sustainable Development (NCSD) and the Ministry of Environment (MoE). Cities are the center of economic activities and propel job creation and GDP growth. Cities are also the center of resource consumption, whereby energy, water and other natural resources are utilized by industries and consumers to drive economic development. The Kingdom of Cambodia has an opportunity to accelerate its growth potential further through green city development and harnessing the opportunities of garment sector, tourism and the real estate construction boom.

The Phnom Penh Sustainable City Plan 2018-2030 provides a concise and practical overview of the current situation in Phnom Penh, including the current green growth challenges and opportunities in the capital city. It provides some strategies for achieving an overarching green city vision and mission, and priority actions for 8 key urban areas. Moreover, the Sustainable City Plan provides us with a summary table of the 48 prioritized green investment projects, which are linked to the existing strategies and master plans of Phnom Penh.

The Phnom Penh Sustainable City Plan 2018-2030 paves the way for the institutionalization and policy arrangement for the implementation of the priority actions and green city projects. It needs our collective actions to move this forward from designing to planning and implementation and monitoring and evaluation.

I would like to extend my profound thanks to those who have provided support directly or indirectly to the development of this important document, especially NCSD, PPCA and GGGI. I strongly believe that this Plan will contribute to the sustainable development of Phnom Penh that will become a model for other cities across Cambodia.

Phnom Penh 26 **April 2019**

Say Samal

Chair of the National Council for Sustainable Development

Minister of Environment

FOREWORD

Social development needs to go hand in hand with a sustainable use of natural resources; as the advancement of technology and development cause fundamental changes in natural resources and environment. In modern society, environmental protection and sustainable development must be a high priority on the political agendas of the leader both in developed or developing counties.

Phnom Penh is the capital and largest city of Cambodia. It is a center of security, politics, economics, cultural heritage, and diplomacy. Phnom Penh is undergoing rapid urbanization with a population of over 2.5 million (including daily inflow/outflow of tourists and local traders from outside Phnom Penh). Therefore, the development of Phnom Penh must acknowledge its environmental impacts and pay full attention to climate change. This means development must go hand in hand with environmental by protection, ensuring a clean and green environment in the city. For this reason, we carefully develop city infrastructures with an environmental mindset-e.g. infrastructure for urban transport and road networks, flood management, waste management, poverty alleviation, climate change, and many other developments with high environmental and social quality. Phnom Penh Capital Administration intends to map city development by addressing flood management, wastewater treatment, pollution control, climate change and environment protection.

The Royal Government of Cambodia's vision for Phnom Penh is to make city green, with a clean environment, minimize environmental impact, and enhance competitive economic, business and cultural center of Cambodia with sustainable and equitable development under the Phnom Penh's Mater Plan on Land Use 2035. Therefore, we need green growth approaches for the sustainable development for our capital city. I am delighted to see this comprehensive Phnom Penh Sustainable city Plan 2018-2030 and its proposed urban solutions as well as identified several prioritized green investment projects for Phnom Penh, aligned with our existing Phnom Penh Master Plans. I am confident we can use this plan as our roadmap to pursue the implementation of urban green growth in Phnom Penh, thereby, tackling climate change, while pursuing economic growth, poverty alleviation, strengthening development, and social inclusion.

This Phnom Penh Sustainable City Plan 2018-2030 will contribute to our efforts to materialize our vision as set out in the "Phnom Penh Master Plan on Land Use 2035". The Sustainable City Plan was developed through various consultation, with inputs from our policymakers in Phnom Penh Capital Administration, and the 12 districts of Phnom Penh. Therefore, we see the important role of this Sustainable City Plan guiding our Master Plans for land use, transport. Drainage and waste management.

Under the leadership of the Royal Government of Cambodia, particularly through PPCA, the Phnom Penh Sustainable City Plan 2018-2030 will be implemented with active participation and involvement from relevant Miniseries and government institution, as well as support from the privation sectors and development partners to work together for Phnom Penh sustainable urbanization. On behalf of Phnom Penh Capital Administration, I would like to express my sincere thanks to the National Council for Sustainable Development (NCSD) and the Global Green Growth Institute (GGGI) for their initiative and great efforts to develop this Sustainable City Plan for Phnom Penh, which plays an important role in realizing the economic potential of our capital city and helping to improve the lives of all of residents in the capital with environmental harmony.

Phnom Penh, Date 19 November, 2018
Governor of Phnom Penh Capital City

KHUONG SRENG

ACKNOWLEDGEMENTS

The Phnom Penh Sustainable City Plan is the result of the collaboration between the Phnom Penh Capital Administration (PPCA), the Department of Green Economy of the National Council for Sustainable Development (NCSD), and the Global Green Growth Institute (GGGI) and its consultant team from the International Centre for Environmental Management (ICEM).

The preparation of the Phnom Penh Sustainable City Plan was made possible by the contributions of a broad range of stakeholders, including the relevant ministries of the Royal Government of Cambodia (RGC), representatives of the PPCA, Phnom Penh district authorities, development partners, community-based organizations and non-government organizations, academia, and private sector representatives which share the concerns of the national and local institutions for the sustainable future of the capital city, and which represent the viewpoints of residents and of various economic and development actors present in Phnom Penh.

The following government officials played important leadership roles in supporting and facilitating the preparation of the Green City Strategy for Phnom Penh:

- **H.E. Tin Ponlok,** Secretary-General, NCSD
- **H.E. E Vuthy,** Deputy Secretary-General, NCSD
- **H.E. Ken Sereyrotha,** Deputy Secretary-General, NCSD
- **H.E. Nuon Pharat,** Vice Governor of Phnom Penh, PPCA
- **H.E. Hout Hai,** Vice Governor of Phnom Penh, PPCA
- **H.E. Ieng Aunny,** Former Vice-Governor, PPCA
- **Mr. Lim Vichet,** Deputy Director, Department of Administration, PPCA
- **Mr. Taing Mengeang,** Director, Department of Green Economy, NCSD
- **Mr. Nop Sokhai,** Deputy Director, Department of Green Economy, NCSD
- **Mr. Khun Sovithea,** Former Deputy Director, Department of Green Economy, NCSD
- **Mr. Sath Sitak,** Deputy Chief of Office, Department of Green Economy, NCSD
- **Mr. Khim Sandab,** Deputy Chief of Office, Department of Green Economy, NCSD
- **Ms. Soeung Lyly** Technical official, Department of Green Economy, NCSD

The following RGC ministries were engaged in the drafting of the Phnom Penh Sustainable City Plan through coordination by the NCSD. (see Annex A for a complete list of stakeholders consulted)

- Ministry of Economy and Finance (MEF)
- Ministry of Interior (MOI)
- Ministry of Planning (MOP)
- Ministry of Land Management, Urban Planning and Construction (MLMUPC)
- Ministry of Environment (MOE)
- Ministry of Public Works and Transport (MPWT)
- Ministry of Industry and Handicrafts (MOIH)
- Ministry of Mines and Energy (MME)
- Ministry of Water Resources and Meteorology (MOWRAM)
- Ministry of Women's Affairs (MOWA)

The Global Green Growth Institute (GGGI) staff members who supervised the preparation of the Green City Strategy for Phnom Penh are:

- **Ms. Fiona Lord** Former Country Representative for Cambodia, GGGI
- **Mr. Adam Ward** Country Representative for Viet Nam, GGGI
- **Dr. Pheakdey Heng** Former Policy Lead, GGGI
- **Dr. James Kang** Principal Transport Specialist, GGGI
- **Dr. Okju Jeong** Principal Urban Development Specialist, GGGI
- **Mr. Chantharo Khan** Program Officer, GGGI

An ICEM team comprising international and national experts worked on the project from October 2015 to May 2016 and prepared the Green City Strategic Plan for Phnom Penh. Its members are:

- **Mr. Anthony Gad Bigio** Team Leader, Green Urban Planning Specialist
- **Dr. John Sawdon** Green Growth Economist
- **Dr. Wayne Stone** Urban Vulnerability Expert
- **Mr. Soktharath Chreung** Green Finance and Investment Specialist
- **Mr. Vin Spoann** Green Infrastructure Specialist
- **Mr. Kong Pagnarith** Green Energy Specialist
- **Mr. Chhun Bunlong** Urban Mapping Specialist

The ICEM Project Manager is **Mr. Nick Beresnev** and the Project Coordinator is **Ms. Nguyen Thi Phuong Thao. Dr. Jeremy Carew-Read** is the Project Director.

LIST OF ABBREVIATIONS

ACLEDA	Association of Cambodian Local Economic Development Agencies
ADB	Asian Development Bank
AFD	Agence Française de Développement
BAU	Business-as-usual
CCCA	Cambodia Climate Change Alliance
CDC	Council for the Development of Cambodia
CDM	Clean Development Mechanism
DFAT	Department of Foreign Affairs and Trade, Australia
DPWT	Department of Public Works and Transport
EAC	Electricity Authority of Cambodia
EDC	Electricité du Cambodge
EE	Energy efficiency
ESCO	Energy service company
EUROCHAM	European Chamber of Commerce, Cambodia
FDI	Foreign direct investment
GEF	Global Environment Facility
GGGI	Global Green Growth Institute
GHG	Greenhouse gas
GIZ	Gesellshaft fur Internationale Zusammenarbeit
GMAC	Garment Manufacturers Association in Cambodia
GWh	Gigawatt hour
ICEM	International Centre for Environmental Management
IFC	International Finance corporation
IFI	International financial institution
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
KHR	Cambodian riel (currency)

KOICA	Korea International Cooperation Agency
KTOE	Kilotonne of oil equivalent
kWh	Kilowatt hour
LCDF	Least Developed Countries Fund
LPG	Liquefied petroleum gas
MCA	Multiple criteria analysis
MEF	Ministry of Economy and Finance
MLMUPC	Ministry of Land Management, Urban Planning and Construction
MME	Ministry of Mines and Energy
MOE	Ministry of Environment
MOI	Ministry of Interior
MOIH	Ministry of Industry and Handicrafts
MOWM	Ministry of Women's Affairs
MOWRAM	Ministry of Water Resources and Meteorology
MPWT	Ministry of Public Works and Transport
MW	Megawatt
NCSD	National Council for Sustainable Development
NSDP	National Strategic Development Plan
OECD	Organisation for Economic Cooperation and Development
PPCA	Phnom Penh Capital Administration
PPSEZ	Phnom Penh Special Economic Zone
SEZ	Special economic zone
SME	Small- and medium-sized enterprise
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization


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1. Introduction

The Phnom Penh Sustainable City Plan provides a roadmap for Cambodian policymakers, local administrators and their national and international development partners in order to pursue the implementation of urban green growth defined as tackling climate change, while simultaneously pursuing economic development, poverty alleviation and social inclusion[1] . The target audience of this document is therefore multiple stakeholders, and includes national and municipal officials, as well as representatives of private sector, development agencies, non-governmental organizations and academia.

The Phnom Penh Sustainable City Plan is accompanied by a Green City Strategic Planning Methodology, which is a step-by-step guide for municipalities, district and commune officials and the relevant stakeholders of each municipality across Cambodia seeking to embark on the process of transforming their cities towards green growth. The methodology supports cities to assess and prioritize green growth options (investment projects and policy reforms) for implementation. This methodology holistically considers all aspects of green urban development, such as low-carbon development, climate resilience, resource efficiency, as well as social inclusion and poverty alleviation. The methodology has ten steps as outlined below:

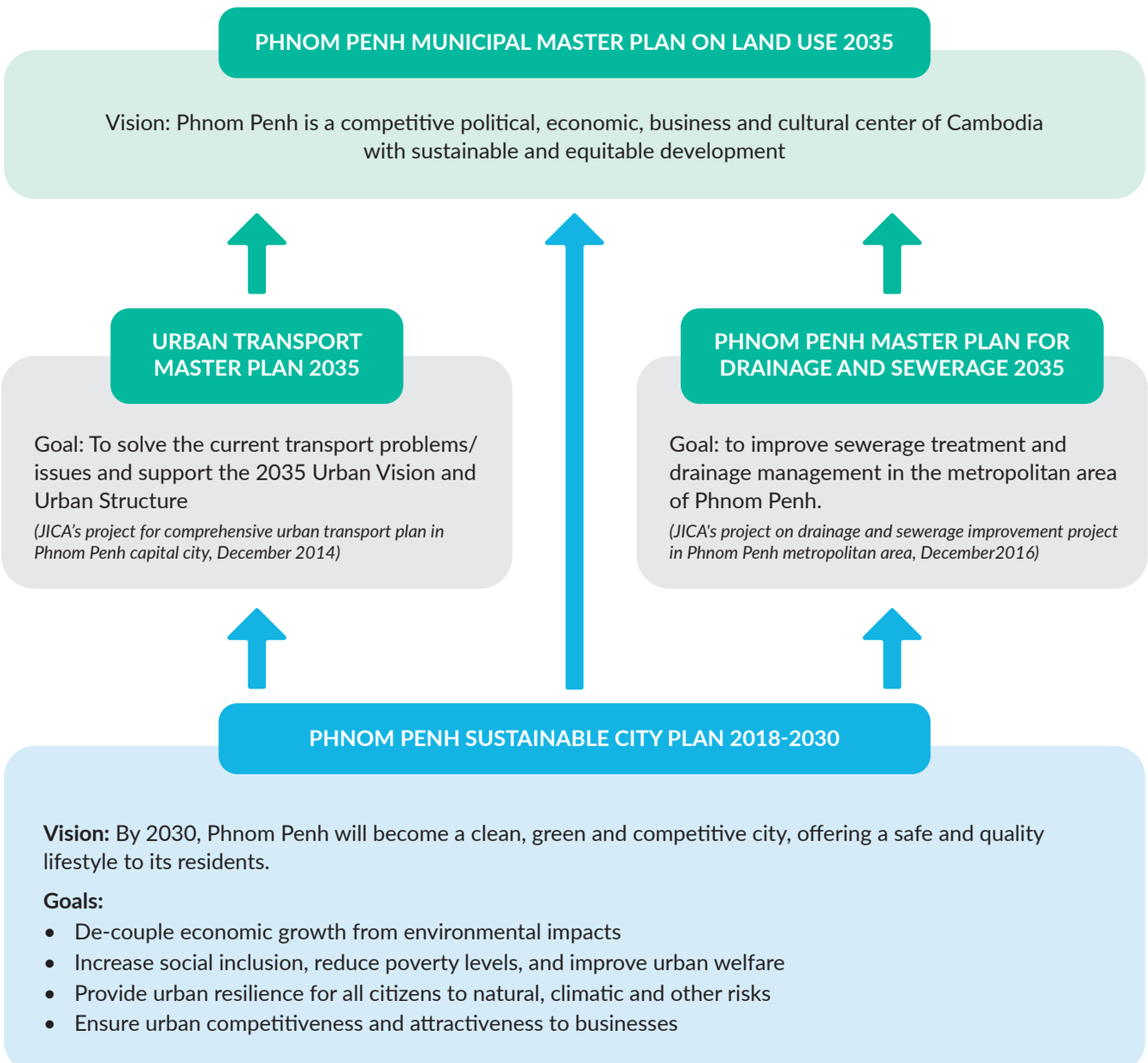
- **Step 1:** Establishment of sustainable city planning governance
- **Step 2:** Baseline assessment of the urban context
- **Step 3:** Setting a sustainable city shared vision, mission and urban development goals
- **Step 4:** Review of the key urban sectors for urban green growth
- **Step 5:** Establishing urban green growth priority objectives and actions for the key sectors
- **Step 6:** Identification of potential sustainable city development projects
- **Step 7:** Prioritizing sustainable city development projects
- **Step 8:** Envisaging urban green growth scenarios
- **Step 9:** Preparing the list of priority sustainable city projects
- **Step 10:** Implementation arrangements for the Sustainable City Plan.

Phnom Penh is the first city in Cambodia to apply this Green City Strategic Planning Methodology and has developed its Sustainable City Plan. The Phnom Penh Sustainable City Plan is designed to support the implementation of the Phnom Penh Master Plan for Land Use 2035, through the design of specific green growth actions related to the strategic priorities identified in the Master Plan. Moreover, it will support the achievement of the strategic goals set within the Phnom Penh Urban Transport Masterplan and the Phnom Penh Masterplan for Drainage and Sewerage.

The Phnom Penh Sustainable City Plan was successfully developed through a joint effort and multi-stakeholder engagement. The Plan also includes a list 48 potential green investment projects and each project has its rational and contextualized description including a detailed analysis of the risk factors and opportunities to support project prioritization and implementation.

[1] Social inclusion refers to the act of making all groups of people within a society feel valued and important. It is the process of improving the terms on which individuals and groups take part in society—improving the ability, opportunity, and dignity of those disadvantaged on the basis of their identity.

Figure 1: The linkages between the Phnom Penh Sustainable City Plan and Phnom Penh Municipal Master Plan on Land Use 2035



2. Vision & Mission For Green City Development

To achieve sustainable city development, Phnom Penh has identified the following vision:

VISION

By 2030, Phnom Penh will become a clean, green and competitive city offering a safe and quality lifestyle to its residents.

3. GOALS AND OBJECTIVES FOR SUSTAINABLE CITY DEVELOPMENT

To achieve the vision for Sustainable City Development, the following broad goals and objectives are proposed. Specific targets and indicators will be developed by the Technical Working Groups (TWGs) as described in the implementation arrangement section (section 7) of this plan.

3.1 OVERALL SUSTAINBLE CITY GOALS

1. De-couple economic growth from environmental impacts
2. Increase social inclusion, reduce poverty levels, and improve urban welfare
3. Provide urban resilience for all citizens to natural, climatic and other risks
4. Ensure urban competitiveness and attractiveness to businesses.

3.2 SUSTAINABLE CITY SECTORAL OBJECTIVES

1. Urban Planning Objectives

- Implementation of the Phnom Penh Municipal Master Plan on Land Use 2035 (percentage implemented)
- Detailed Land-use map and land-use zoning (percentage of the city coverage)
- Sustainability of the seven satellite city projects scheduled for completion by 2030 (solid and liquid waste management systems in place, and compliance with green building standards)

2. Urban Vulnerability Objectives

- Protect the population of Phnom Penh from extreme flood events (percentage of the population negatively affected)
- Improve natural lakes and wetlands in the city, which serve as natural flood control and wastewater management systems (just like in 2003) (surface of natural lakes and wetlands in hectares or acres)
- Create or restore green corridors throughout the city (number of corridors)
- Secondary treatment of wastewaters generated in inner city areas (millions of cubic meters, as percentage of the total)
- Households in peri-urban areas use improved and secure sanitation systems that will prevent pollution dispersion during high rain and flooding events (number of peri-urban households with improved and secure sanitation systems with wastewater treatment, as percentage of total)

3. Energy Sector Objectives

- Increase the share of solar energy in electricity supply (percentage of increase from the current < 1%)
- Reduction of electricity consumption in commercial and service companies through the introduction of energy efficiency measures (percentage of reduction vs. current consumption baseline)
- Reduction of electricity consumption in households through the introduction of energy efficiency measures (percentage of reduction vs. current consumption baseline)
- Municipal and other government buildings with suitable roofs have solar PV installed (number of buildings retrofitted vs. total)

4. Transport Sector Objectives

- Reduce transport sector greenhouse gas emissions (percentage reduction over current baseline)
- Bus-based public transportation system in place, covering key transportation corridors in the city (percentage of total modal share)
- Reduce traffic accidents (percentage of reduction vs. current yearly baseline)
- Reduce traffic congestion (increase in average vehicle speed vs. current baseline)

5. Built Environment Objectives

- Adoption of green building standards for buildings to be constructed from 2020 onward (number of green building projects vs. number of building permits requested)
- Reduce energy use in existing buildings (percentage reduction vs. current baseline)
- Low-income housing units designed or retrofitted to be resistant to natural disasters (number of upgraded units vs. total urban housing stock)

6. Manufacturing Objectives

- Develop industrial zoning provided with supportive green infrastructure (number of industrial zones retrofitted)
- Reduce water pollution from the manufacturing sector (percentage of total volume of waste water treated)
- Increase energy efficiency in manufacturing industry (reduction of KW consumed per value of outputs)
- Carry out energy efficiency audits and put in place energy efficiency management plans for large manufacturing plants (number of audits and management plans vs. total number of large plants)
- Large manufacturing companies have water use audits conducted and water use management plans put in place (number of audits and management plans vs. total number of large plants).

7. Solid Waste Management Objectives

- Expand quality solid waste management collection services (number of districts covered)
- Reduce organic waste going to the landfill or incinerator (percentage of total organic waste)
- Waste separation to enable recycling by households, markets and commercial enterprises (percentage of separated waste vs. total)
- Implementation of the 4R principle (reduce, reuse, repair, recycle) (percentage reduction in volume of collected waste).

8. Public Spaces and Cultural Heritage Objectives

- Increase the green canopy coverage of the city (number of new native trees planted)
- Increase public green space in the city (number of hectares from current baseline of 70 ha)
- Develop a strategic plan to preserve urban cultural heritage (number of historic buildings inventoried and protected)
- Increase in tourism as a result of improved cultural heritage management (number of tickets sold at key urban sites).

4. STRATEGIC ANALYSIS

4.1 PHNOM PENH MASTER PLAN ON LAND USE 2035

In December 2015, the Council of Ministers approved a new master plan for managing urban development in Phnom Penh over the next 20 years. Phnom Penh Master Plan on Land Use 2035 aims to deal with population growth and a continued construction boom as the capital's population grows by more than a third to a projected 3 million by 2020. According to the plan, Phnom Penh's vision for 2035 is

"TO BECOME A COMPETITIVE POLITICAL,
ECONOMIC, BUSINESS AND CULTURAL CENTER OF CAMBODIA
WITH SUSTAINABLE AND EQUITABLE DEVELOPMENT".

The Master Plan on Land Use 2035 articulated three overarching goals to realize the vision:

1) To set the land use direction to ensure its potential for efficiency, sustainability, and equity that will contribute to Cambodia' socioeconomic development, food security, and clean environment
2) To set the development direction for Phnom Penh, balancing with the development of other smaller cities and provincial towns
3) To empower the city's identity and develop its competitiveness with other cities in the region, which will provide Phnom Penh with more technical and financial access.

The Master Plan for Land Use 2035 also proposes five main strategies for the development, improvement, and expansion of Phnom Penh so that the city will response to the need of growing urban population and challenges:

- Strategy 1: Phnom Penh to become a core centre for development
- Strategy 2: Phnom Penh to become an international standard city
- Strategy 3: Development of a reserve for the development of necessity physical infrastructure
- Strategy 4: Urban planning for Phnom Penh to become a metropolitan city
- Strategy 5: Development of a special area for cultural heritage and city's view.

Table 1: Prioritized actions under the Phnom Penh Municipal Master Plan on Land Use 2035

Action Plan 1: Dissemination of the Master Plan on Land Use 2035	• Organize workshops to disseminate the Master Plan to technical working groups, investors, and Cambodian people as a whole • Make the Master Plan available for the public through PPCA's website.
Action Plan 2: Potential projects that need to take immediate actions	• Set regulation and zoning, reserve for enlargement of road, railway, and urban sewage system • Create zoning for railway station reserve specifically for merchandise, and zoning for a big dry port at Samroung Por Sen Chey area • Approve the railway projects to connect from Phnom Penh to Ho Chi Minh city • Increase the size of the runways of the Phnom Penh International Airport • Build a dam and concrete shores of the Bassac river

	• Standardize buildings in some areas such as Chbar Ampov, Boeung Kroper (Crocodile Lake), Boeung Pong Peay and area in front of Tonle Bassac and Boeng Kok • Identify a new site for waste dumping, improve the current waste dumping site at Dangkor area by investing in waste recycle factories, and to design a garden along waste dumping site in Mean Chey area • Identify eco zone in Preak Phnov • Promote the conservation and improvement of historical centers.
Action Plan 3: Rules and regulations for urbanization	• Create map and zoning of land use in Phnom Penh • Develop plan to the expand the city to the Northern and Western areas • Install the water treatment basin at Cheung Ek lake. • Create mapping of public area improvement (lake, canal, road, railway, airport, port, and green areas) • Create mapping of the priority areas for development • Standardize the height of buildings • Create mapping of the historical and heritage buildings in Phnom Penh • Create mapping and master planning of a spectacular view area, maintain trees and design of landscape viewing areas with publicly-installed tools at the end of Chroy Changva area.
Action Plan 4: Continue the current development projects and public investments	• Develop and build satellite cities such as Koh Pich, Chroy Changva, CamKo. • Continue the development of Olympic satellite city in the North of Phnom Penh. • Continue the development of Boeng Kok area and roads within the area • Continue the development of dry port and Asian station at Samroung area in Por Sen Chey district • Continue the development of ring road within the city (connect from Roesey Keo to Sen Sok and to Por Sen Chey) • Build roads along national roads (National roads No. 1 , 2, 3, 4, 5) to reduce the traffic congestion at city's entry points • Build flyovers at big roundabouts • Build roads in peri-urban area • Build waste-water treatment basin at Choeng Ek area and installation of sewages system in Phnom Penh • Strengthen the implementation of Circulation 03 S.R on the Resolution of Temporary Buildings on Public Land, which were used illegally, in the city centers and urban areas • Improve the economic ability of potential sectors such as construction, textile, fishery, plantations, transportation and tourism, food industry, service, electronic, packaging, mechanic installation, and vocational trainings.

4.2 PHNOM PENH URBAN TRANSPORT MASTER PLAN 2035

Phnom Penh Capital Administration, with the assistance of the Japanese International Cooperation Agency (JICA), also developed the Phnom Penh Urban Transport Master Plan 2035 to solve the current transport problems and support the 2035 Urban Vision under the Phnom Penh Master Plan for Land Use 2035. The Urban Transport Master Plan 2035 aims to maintain the people-environment friendly urban conditions and vitalize the urban activities in Phnom Penh. The Mission of the Urban Transport Master Plan 2035 is two-fold:

1) to shift from a private-oriented urban transport system to a well-balanced system of public and private transport through a combination of road, public transport and traffic management for improving the mobility of citizens, and
2) to materialize the urban potential of Phnom Penh City.

Transport Master Plan 2035 proposes five strategies:

- Strategy 1: Formulation of people and environmentally friendly urban transport system with high mobility for the citizens
- Strategy 2: Formulation of physical framework of the city and creation of smooth connection between major cities in the Mekong Sub-regions
- Strategy 3: Maximum use of existing transport space s including underground and elevated spaces in the city center
- Strategy 4: Efficient traffic flow for commodity
- Strategy 5: Environmental / social consideration and establishing appropriate transport-related organizations are the fundamental concept of the master plan.

Table 2: Proposed Urban Transport Master Plan 2035

(1) Public Transport System 	1) Increase of modes of transport to improve the urban mobility
	2) Introduction of trunk public transportation system
	3) Broad integration of public transport means and related countermeasures such as seamless transfer between modes by mode interchange area development and restructuring the para-transit as the feeder of public transports
	4) Integration with land-use plan
	5) Linkage with tourism development
(2) Road System (Road Network) 	1) Radial and Ring Trunk Road Network System
	2) Road development plan strengthening east-west (northern and southern east-west trunk roads) and north-south (Hanoi and Hun Sen Blvd) corridors.
(3) Traffic Management Measures – to support road and public transport system. 	1) Various measures for increasing the attractiveness and comfort of the public transport system such as convenient mode interchange areas (terminal, station and bus stop)
	2) Various traffic management measures such as intersection improvement, traffic signal upgrading and introduction of one-way system
	3) Parking policies and measures
	4) Pedestrian environment development
	5) Restructuring of para-transit such as motodop (moto taxi), motorumok modern (tuk tuk) and Cyclo.
	6) Introduction of traffic demand management including mobility management such as park & ride system traffic demand management, such as driver's education.
(4) Freight Transport 	1) Inter-Regional Freight Transport System
	2) Urban Logistics System
	3) Freight Transport System in Urban Centre

The two master plans are used as the foundation for the development of the Phnom Penh Sustainable City Plan 2018-2030, which aims to support the master plan to promote green growth in Phnom Penh, which will ultimately contribute to the vision statement articulated in the Master Plan.

4.3 POLICY FRAMEWORK FOR SUSTAINABLE CITY DEVELOPMENT IN CAMBODIA

Cambodia's National Policy on Green Growth was approved by the Council of Ministers in March 2013. The policy is envisaged *"to strike a balance of economic development with environment, society, culture and sustainable use of national resources through integration, matching and adaptation, as well as harmonization between a green growth principle and national policy".*[2] The policy aims at enhancing the wellbeing and livelihood of all people in harmonization with ecological safety through green growth, basing on green economy, blue economy, environment protection, social safety nets system, and uphold of national cultural identity. The National Strategic Plan on Green Growth 2013-2030 was also approved by the Council of Ministers in March 2013. The plan focuses on nine related strategic directions[3] :

- Green Investment and Green Jobs Creation
- Green Economy Management in balance with Environment
- Blue Economy Development with Sustainability
- Green Environment and Natural Resource Management
- Human Resources Development and Green Education
- Effective Green Technology Management
- Promotion of a Green Social Safety System
- Uphold and Protection of Green Cultural Heritage and National Identity
- Good Governance on Green Growth.

Sustainable city development has been identified as a priority area for green growth planning and implementation, by the RGC, through its National Council for Sustainable Development (NCSD). Sustainable City Development aims to deliver a holistic and integrated approach to urban planning, investment prioritisation and economic development in the urban context – simultaneously addressing climate change, resource efficiency, environmental sustainability, social inclusion and poverty alleviation.

4.4 BASELINE ASSESSMENT OF THE URBAN CONTEXT IN PHNOM PENH

Phnom Penh is the capital and largest city of Cambodia. Located on the banks of the Tonlé Sap and Mekong River, Phnom Penh has been the national capital since French colonization of Cambodia and has grown to become the nation's centre of economic and industrial activities, as well as the centre of politics, cultural heritage, and diplomacy of Cambodia.

Geography: Phnom Penh has an area of 678.46 square kilometres (261.95 square miles) and is subdivided into twelve administrative divisions called Khans (districts). The Khans are further subdivided into 105 Sangkats (communes).

Governance: Phnom Penh City is governed by a Board of Governors consisting of one Governor and six Deputy Governors. The Board of Governors is responsible for providing public services to the citizens to meet their needs and rehabilitating infrastructure facilities of all kinds to improve the standard of living of the people in the city.[4]

Population: The population of the Phnom Penh approximately tripled from around 0.57 million in 1998 to 1.5 million in 2015[5]. The expansion of the city and creation of three additional districts added further to the population growth. Within the new administrative boundaries of the city, the population is projected to reach about 2.86 million in 2035, according to the population growth projection in JICA' study on the PP Transport Master Plan.[6]

[2] National Policy on Green Growth, Ministry of Environment, the Royal Government of Cambodia, 2013.

[3] National Strategic Plan on Green Growth 2013-2030, Ministry of Environment, the Royal Government of Cambodia, 2013.

[4] Phnom Penh Capital Administration's website http://phnompenh.gov.kh/en/about-us/governor-message/

[5] Bulletin No.35, Phnom Penh Capital Administration, September 2017.

[6] JICA 2014. Study report on the project for comprehensive urban transport plan in Phnom Penh Capital City.

Economy: Most of Cambodia's economic growth has been centered on Phnom Penh over the last decade. Double-digit economic growth rates in recent years have triggered an economic boom in Phnom Penh, with major investments in the construction sector, including in hotels, restaurants, bars, and high rise residential and commercial buildings. High industrial growth rates have has been driven largely by manufacturing, with the garment sector contributing 75% of the manufacturing output at a national level[7] The city accounts for approximately 75% of inward investment in the industrial sector and approximately one million tourist arrivals in 2015[8]. Growth in the services sector has been driven by growth in trade, finance and other services, primarily in Phnom Penh, including with a fast growing financial sector (19.4% in 2018)[9].

Poverty levels: The incidence of poverty is much lower in Phnom Penh than the rest of the country. Households in Phnom Penh have roughly double the income of the national average. Available data on income inequality shows a slight decline in the levels of income inequality in Phnom Penh between 2009 and 2014. However, despite decreasing inequality, poverty rates in Phnom Penh have increased during 2008-2012, reflecting the increased cost of basic consumption goods and services. Households in Phnom Penh also have experienced slower income growth, with an average annual growth rate between 2009 and 2014 of around 6.8% and a total increase of around 41%. [10]

Urban development challenges and climate change: Due to rapid urbanization, Phnom Penh is facing a number of challenges including unregulated construction, traffic congestion, unregulated parking, waste management, pollution and flooding. These challenges are further exacerbated by the threats of climate change impacts. Among lower Mekong Basin countries, Cambodia, together with Lao PDR, has been identified as the most vulnerable in part because of its relatively low elevation, proximity to the ocean and the Mekong River and its limited capacity to cope with climate related risks.[11] Flooding and changing precipitation patterns may also adversely affect the quantity and quality of water supplies to the city and result in negative consequences for millions of people. Other threats include the impact of tropical cyclones, which have already increased over the last few decades and are projected to further increase in frequency and intensity. Rising sea levels will also affect Phnom Penh's fresh water availability by increasing saltwater inundation of low-lying areas and contributing to coastal erosion.[12]

Environment and pollution: Data from the Ministry of Environment's real-time air quality monitoring station in Tonle Bassac indicates an average airborne particle level of 10.24 µg/m3 compared to the PM2.5 standard of 50 µg/m^3 within 24 hours from June 3 to June 9, 2018[13]. If these levels are representative of pollutions levels across the city, that would indicate no major respiratory or health risks from air pollution yet. With regard to wastewater, many locations in the city's system of rivers and lakes face extremely polluted water since Phnom Penh has no sewerage treatment system. Wastewater from homes and commercial enterprises flows directly into the storm drainage system, which eventually discharges into lakes or local streams.

[7] World Bank 2015. Cambodia - Economic Update: maintaining high growth. URL: http://documents.worldbank.org/curated/en/2015/04/24427602/cambodia-economic-update-maintaining-high-growth

[8] Ministry of Tourism 2015. Tourism Statistics Report – Year 2015. URL: http://www.tourismcambodia.org/images/mot/statistic_reports/tourism_statistics_2015.pdf

[9] 2018 National Bank of Cambodia (NBC) report

[10] RGC's calculation of poverty rates includes a food poverty line based on 2,200 calories per person per day, and a nonfood component that is estimated separately for Phnom Penh, other urban, and rural areas (ADB 2014). Cambodia: Country Poverty Analysis 2014. URL: http://www.adb.org/documents/cambodia-country-poverty-analysis-2014. Disaggregated data on poverty level for Phnom Penh is not available in the later date.

[11] Yusuf A.A. & Francisco H. (2009). Climate change vulnerability mapping for Southeast Asia. Economy and Environment Program for Southeast Asia (EEPSEA). URL: https://www.idrc.ca/sites/default/files/sp/Documents%20EN/climate-change-vulnerability-mapping-sa.pdf

[12] Ibid.

[13] Cambodian Air Quality Monitoring Project 2016. URL: http://agicn.org/country/cambodia and the Ministry of Environment's Information Note on Phnom Penh Air Quality http://www.moe.gov.kh/index/6143

4.5 REVIEW OF THE KEY URBAN SECTORS FOR URBAN GREEN GROWTH

Under Cambodia's Green City Strategic Planning Methodology, eight key sectors and issues have been identified as key to urban green growth and have been reviewed to evaluate both the constraints and opportunities for green growth (see Figure 2)[14]. This evaluation defines green growth in the context of climate change, resource efficiency, environmental sustainability, economic growth, poverty reduction and social inclusion. Overall, the city is facing a number of key green growth challenges and constraints (analyzed in further detail below). In summary, the key issues across these eight sectors/issues are:

- Rising infrastructure costs and lack of access to basic services for poor households
- Rapid urbanization (i.e. rural to urban migration) and limited enforcement of spatial planning
- Limited transport infrastructure and rising levels of traffic congestion and associated pollution
- High energy costs and low deployment of renewable energy and energy efficiency technologies
- Increasing pressure on the cities' natural systems, including its green spaces, lakes and wetlands
- Increasing vulnerability of the city to the impacts of climate change, including severe floods and drought
- Increasing levels of poverty in the city, despite decreasing levels of inequality
- Constraints on the equitable access to resilient housing, particular for poor households
- Rising levels of pollutants from industrialization, particularly from the manufacturing sector
- Constraints on the protection of tourism values of the city, including its heritage values.

Figure 2. Priority sectors for the sustainable city development in Phnom Penh

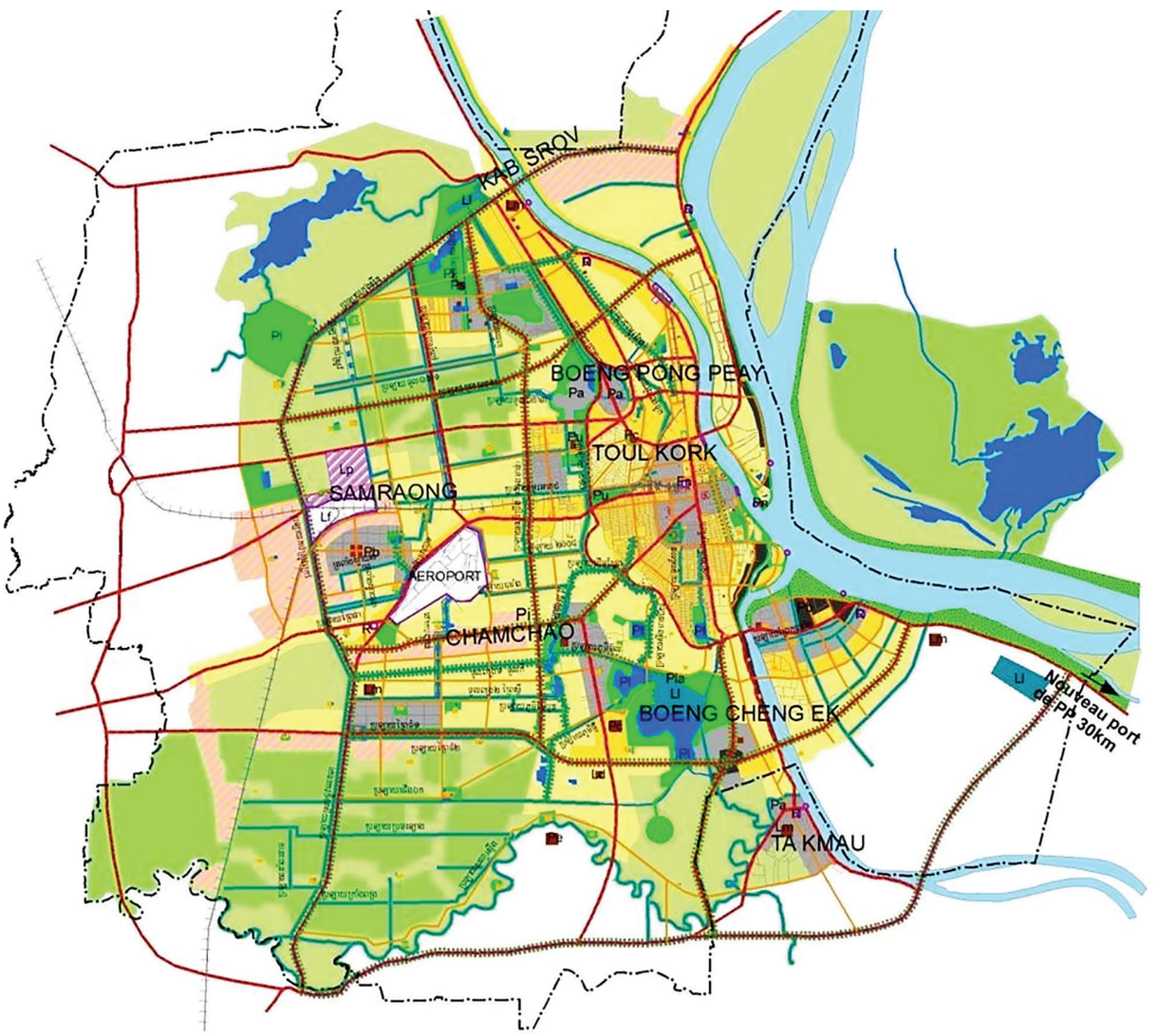
4.5.1 Urban Planning

In December 2015, the Council of Ministers approved a revised *Phnom Penh Master Plan on Land Use 2035*, which has the vision of "transforming Phnom Penh to become the heart of Cambodia, located at the intersection of four rivers, as a competitive center for politics, business, and culture with equitable and sustainable development by 2035."

[14] NCSD and GGGI, 2016. Green City Strategic Planning Methodology.

The Phnom Penh Master Plan for Land Use 2035 states the ambition of seeing the capital area growing from the current population of under 2 million to 6 million by 2035, due to rural to urban migration towards the capital area. This evokes urban management strategies options, ranging from integrated urban planning between Kandal Province and Phnom Penh Municipality, to the expansion of the municipal boundaries with the incorporation of about half of Kandal Province. The Ministry of Interior coordinates this integrated planning process and any required updating of the administrative boundaries of Phnom Penh.

Figure 3. Phnom Penh's administration map (source: Phnom Penh Masterplan).



The Master Plan for Land Use 2035 also contains to a list priority projects to be implemented in the capital city, as well as urban regulations to be formulated in the short term, including:

- Land-use map and land-use zoning
- Urban planning for development in the Northern and Western parts of Phnom Penh
- Urban planning for development in Southern part of the city and for the water treatment plant plan at Boeung Cheung Ek
- Public space planning (lake, canal, roads, railway, ports, airport and green areas)
- Prioritized/special development area maps
- Map for identifying high-rise building and height auditing for airplane flight safety

- Map for urban heritage buildings
- Map and regulation on master plan of urban landscape, protecting landscape of tree planting and landscape management as well as public sector facilities.

Existing policies and regulatory framework

The development of a Master Plan is the requirement of the Cambodian Urban Planning Law (1994). The Ministry of Land Management, Urban Planning and Construction is currently updating the urban planning law through its draft Law on Land Management and Urban Planning (2013), supported a National Urban Development Strategy (under development), for which a national framework was developed in 2015-2016. Cambodia's urban regulations were strengthened in the sub-decree #42 on Urbanization for the Capital, City and Urban Areas (2015), which defines lot sizes and floor area ratios for different types of on-site developments and construction projects (residential, commercial or industrial). Building heights are also addressed, as well as on-site parking requirements. While the sub-decree #42 does not address zoning or land-use issues, it strengthens regulations for future construction activities. Cambodia's National Land Policy (2009) also provides a national framework for the administration and management of land in Cambodia, supported by the National Policy on Spatial Planning (2011) and the Spatial Planning Handbook (2013). Further to this, under the Organic Law of 2008, the National Programme for Sub-National Democratic Development, provides for improved planning, financing and management of services at the sub-national levels of government.

Outstanding challenges and constraints

Prior to the adoption of the Masterplan on Land Use 2035, Phnom Penh was susceptible to a range of private redevelopment schemes and had limited provisions for the protection of its overall urban structure, zoning, heritage, natural resources, and its most vulnerable residents. It has been estimated that since 1999 about 150,000 people have been displaced from central locations within Phnom Penh to make room for such re-developments.[15] Continuation of privatized development remains a risk for Phnom Penh's urban land-use and the vulnerability of its urban poor.

Phnom Penh has expanded rapidly with the construction of new buildings, high-rises, malls, casinos, gated communities, and high-end residences for the wealthy over the last decade. Seven satellite city projects are scheduled for completion during the next 10-15 years, covering nearly 8,000 hectares, or 12% of the city's land area. If construction remains largely unregulated under the Law on Construction, it will negatively impact on the functioning of the city. The lack of management on private individual development will undermine the implementation of the *Master Plan on Land Use 2035*.

[15] Sebatian Strangio 2014, p.155. Hun Sen's Cambodia. Yale University Press.

The Phnom Penh skyline is rapidly changing with the construction boom and substantial private investment (photo by GGGI)

4.5.2 Urban Vulnerability

Due to its location on the alluvial plain of the Mekong River, Phnom Penh is highly vulnerable to flooding. Flood drainage is complicated since the landscape of Phnom Penh is relatively flat. The water level in the rainy season can sometimes increase more than 10 meters, which can result in inundation in many parts of the city. Surveys show that 30% of the capital area is lower than 8 meters, 45% lower than 9 meters, and 60% lower than 10 meters river elevation[16]. Flooding can be caused by heavy prolonged seasonal monsoon rains, by recurring extreme storm events, by seasonal high water levels in the Tonlé Sap and Mekong rivers, or by a combination of these events. The destructive impacts of flooding are further exacerbated by uncontrolled property development, inadequate drainage and wastewater treatment infrastructure.

Phnom Penh city is working to improve its drainage infrastructure, in partnership with the Japanese International Cooperation Agency (JICA). Robust drainage systems constructed in the city core protect the city centre properties to some extent, but outlying and peri-urban areas still remain at great risk to more frequently occurring flooding. Since 1998, JICA grant assistance has helped to improved flood mitigation in central parts of the city through a succession of projects. Phase 1 and 2 succeeded in lessening the damage of floods in the South-Western part of the South-Eastern and North-Eastern part of Phnom Penh. Earlier ADB loan projects also supported flood protection drainage, between 2000 and 2003.

[16] JICA 2015a. The Study on Drainage and Sewerage Improvement Project in Phnom Penh Metropolitan Area. Progress Report II, November 2015.

In 2015, the Department of Public Works and Transport of Phnom Penh, prepared a Study on Drainage and Sewerage Improvement in Phnom Penh Metropolitan Area, with JICA support, to underpin a draft Master Plan for Drainage and Sewerage. The scope of the Master Plan covers sewerage treatment for the entire area of Phnom Penh. Sewerage treatment options consider both off-site and on-site wastewater treatment, depending on location and population density. It is expected that a combined drainage and off-site wastewater treatment facility will be constructed for the densely populated parts of Phnom Penh. Cheung Aek Lake and Tamok Lake are the two identified sites and studied for construction of sewage treatment plant in off-site area. Trabek Lake and Tumpun Lake are also identified as potential for the off-site sewerage treatment plants. The wastewater treatment facilities are planned for construction in phases (Table 3), subject to the securing of finance to support this STP investment project.

Table 3. Sewerage Treatment Plant Implementation Schedule

Implementation Phase	Sub-project	Commission year	Population serviced by facility in 2035
Pilot phase and sludge disposal	Construction of STP, 5,000 m^3/day capacity	2020	19,000
Phase 1	Construction of STP, 58,000 m^3/day capacity	2026	219,000
Phase 2	Construction of STP, 38,000 m^3/day capacity	2031	153,000
Phase 3	Construction of STP, 181,000 m^3/day capacity	2035	703,000

Source: JICA 2015b

Existing policies and regulatory framework

The legal framework for urban vulnerability sub-sectors, including urban sanitation, drainage and wastewater treatment, is complex, and managed between several ministries. The Ministry of Environment is responsible for administration of the Sub-decree #27 on Water Pollution Control (1999), which provides the standards for wastewater to be released into the *environment*, *in line with the Law on the Environmental Protection and Natural Resources Management (1996).* Furthermore, the *Sub - decree #72 on Environmental Impact Assessment (EIA) Process (1999)* outlines the EIA requirements for waste processing and wastewater plants of all sizes. These pollution controls are now being updated through the development of the *Natural Resources and Environmental Code (drafted since 2015).*

Cambodia does not have a law governing wastewater treatment and sewerage, however there are several relevant policies and regulations. The Ministry of Land Management Urban Planning and Construction's (MLMUPC) *Sub-Decree #86 for Construction Permits* requires all houses/ buildings to install septic tank based systems. Furthermore, *the Sub-Decree #39 on Management of Borey (2011)* requires that developers should "put in place minimum infrastructure" including for "dirty water sewage and dirty water treatment station" (art 8). The Ministry of Public Works and Transport (MPWT) also has the *National Policy for Water Supply and Sanitation (2003)* and jointly with MoI and MoE developed a *Sub-decree on the Management of the Sewerage System and Wastewater Treatment System (2017),* which aims to decentralize the responsibilities for sewerage and wastewater management to the sub-national levels of government (municipality and/or district level).

The Ministry of Industry and Handicrafts (MIH) is responsible for implementing and administering the *Law on Administration of Factories and Handicrafts (2006),* which requires the treatment of waste prior to dumping and the prohibition of discharging industrial waste without prior treatment. *The Law on Water Resources Management (2007),* administered by the Ministry of Water Resources and Meteorology, also provides scope for the ministry in coordination with other concerned ministries to develop technical standards, monitoring and control the disposal of water-polluting substances.

Another issue for urban vulnerability is the management of urban resettlement programs for infrastructure and housing development. The RGC has introduced Circular *No. 3 on the Resolution on Temporary Resettlement on Land which has been illegally occupied in the Capital, Municipal an Urban Areas (2010).* This Circular is intended to support urban poor settlements deemed illegal and sets minimum standards for resettlement sites.

Outstanding challenges and constraints

Flooding is becoming more serious in Phnom Penh. Over the last 50 years, destructive flooding has occurred approximately every 5 years.[17] The flooding events are becoming more serious because of the commercial developments in areas that were originally public green spaces, natural lakes or wetlands, and which historically served as natural flood control and wastewater management systems. During the period of 2003-2015, it is estimated that the area of Phnom Penh marshes, lakes and wetlands decreased by 50%.[18]

Recent flooding and rainfall records suggest that the 5-year flooding interval may be shortening. In 2011 and 2013, Phnom Penh experienced some of the most extreme flooding in history, which had a substantial economic impact and affecting thousands of families. For example, the 2011 flood (visualised in figure 5) impacted over 17,000 families in Phnom Penh. The 2013 flood cost about USD 662 million nationwide for flood damages and losses and for recovery and reconstruction. The most damaging flooding impacts have been felt in peri-urban and low-lying areas, where low-income residents reside. The flood waters remain for longer periods in these areas, due to a lack of drainage infrastructure. To adapt to frequent flooding events, the low-income households have resorted to building elevated housing platforms and walkways, or by moving to temporary shelters.

A further challenge in urban vulnerability is lack of wastewater treatment infrastructure. In the main urban areas, most domestic and commercial wastewater discharges to onsite septic tanks, which connect to the municipal sewer and drainage system, consisting of subterranean drains and open canals. Surveys have concluded that about 70% of households have septic tanks that connect to the drainage system while about 20% have septic tanks with no connection.[19]

Wastewater and surface drainage generated from central Phnom Penh drains to catchment lakes to the north or the south. Drainage flowing north is channelled to Boeng Pung Peay Lake before being discharged to the Tonlé Sap river. Most of the city's wastewater (about 80%) flows south and is partially naturally treated in a network of wetlands, marshes and lakes. In both Boeung Tumpun and Boeung Choeung Ek lakes, nutrients from wastewater nourish the growth of morning glory fields, which are harvested by the local populations and sold in city markets. It is estimated that 20% of total vegetable consumption in Phnom Penh comes from harvesting gardens from these lakes. If not properly washed and cooked, vegetables grown under such circumstances could pose a public health problem.[20]

Phnom Penh also has no facilities for disposing sludge accumulated from septic tanks. Previously, sludge from commercial buildings and households, was extracted by sludge privately operated tanker trucks then disposed in a lagoon at the solid waste dumpsite. Once the lagoon became overloaded with sludge, the dumpsite operators suspended the dumping of sludge. Since there is no current location to disposal of sludge, most sludge operators now illegally dump the sludge in drainage channels and in low-lying wetlands.

In the peri-urban and low-income areas sanitation facilities are still weak. Most households that have sanitation facilities use pour flush latrines, which leach directly into local drains and water-courses. About one third of households in extremely poor areas either buries' sanitary wastes or practices open defecation, and there are reported high incidences of diarrheal diseases, hepatitis A, intestinal worm infections, and protozoan infections resulting from faecal contamination linked to unsanitary living conditions and exposure to waste water discharges.[21]

[17] People in Need Cambodia, 2015. Urbanizing Disaster Risk, Vulnerability of the Urban Poor in Cambodia to Flooding and Other Hazards.
[18] JICA 2015a. The Study on Drainage and Sewerage Improvement Project in Phnom Penh Metropolitan Area. Progress Report II, November 2015.
[19] JICA 2015c. The Preparatory Survey for Project of Development of Traffic Management System In Phnom Penh. Preparatory Survey Report.
[20] Otis Daniel, 2013. Putrid Lakes Offer Sweet Relief to a City Lacking Water Treatment Plants. Resilient Cities, 18 November 213. URL: https://nextcity.org/daily/entry/putrid-lakes-offer-sweet-relief-to-a-city-lacking-water-treatment-plants.
[21] People in Need Cambodia and UNICEF. Undated. Multiple Indicator Assessment of the Urban Poor. URL: http://www.unicef.org/cambodia/PIN_URBAN_POOR_FA.PDF

Land tenure insecurity is also another challenge to urban vulnerability. Forced evictions of low-income residents as a result of large-scale development projects, has left many families more vulnerable to the destructive impacts of flooding and continued poverty, given they are often relocated to peri-urban areas and exposed to higher risks.

Phnom Penh flooding has adverse economic impacts, including on the trade of goods and services (photo by GGGI)

4.5.3 Energy

While Cambodia relies predominantly on traditional biomass and imported petroleum products, Cambodia's energy supply mix is changing rapidly to meet the demands or urbanization, and structural change in the economy.[22] In 2016, Cambodia consumed 7,033.15 GWh of electricity, with 77.96 percent of that generated within the country. Vietnam supplied 16.74 percent of the kingdom's electricity, Thailand 4.77 percent and Laos 0.53 percent. Cambodia's reliance on its neighbors has been declining. The 22 percent of electricity supplied from imported power in 2016 is a large reduction from the 64 percent imported in 2011.[23]

By 2018, Cambodia's electricity supply totaled 9,307.44 GWh, including 7,953.64 GWh (85.45%) of domestic sources and imported from neighboring countries such as Vietnam, Thailand and Lao PDR totaled 1,353.80 GWh (14.55%). For domestic sources, the largest contributor was from hydropower and coal which accounted for 48.47% and 34.50% respectively. The contribution from renewable energy stood at only 0.46%[24].

At the national level, the transport sector is the biggest consumer of energy, responsible for 46% of total final energy consumption (TFEC) and 91% of consumption of petroleum products, followed by the residential sector (31%), the industry (16%) and commercial and public services (7%).[25]

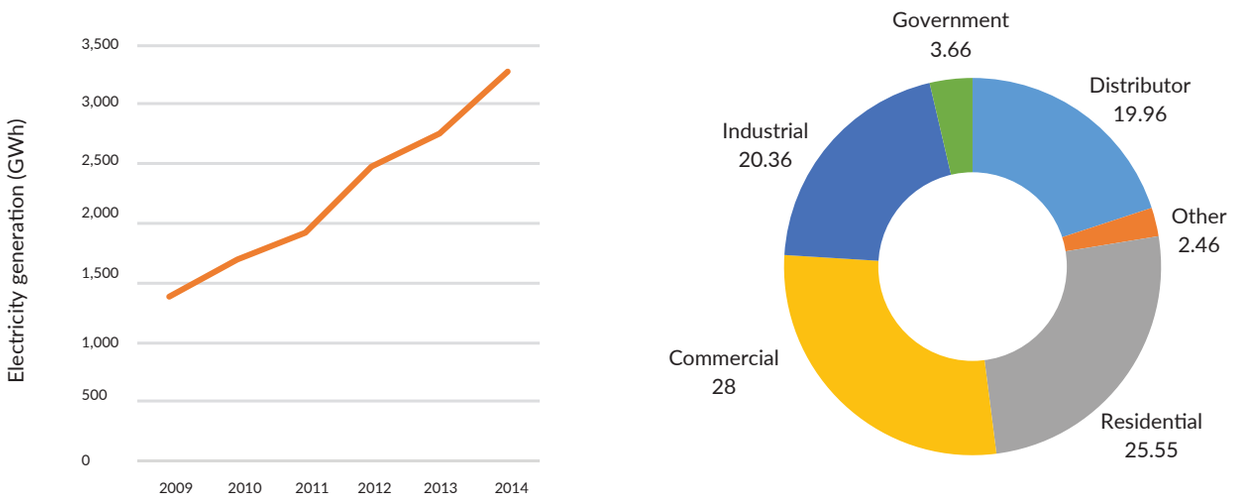
Out of the Phnom Penh's 916 villages, only 2 villages that do not yet have an electricity grid, but the authorities are planning to build a distribution network for both villages. Access to electricity in Phnom Penh is relatively good, with more than 90% of households connected to the network. The Phnom Penh's power system is supply by national grid via 230 kV substations with the total capacity of about 900 MW and additional injection of about 194 MW generated

[22] Ministry of Mines and Energy and Economic Research Institute for ASEAN and East Asia, 2016. Cambodia's National Energy Statistic 2016. URL: http://www.eria.org/RPR_FY2015_08.pdf
[23] Open Development Cambodia, 2017. Electricity Production. URL: https://opendevelopmentcambodia.net/topics/electricity-production/#ref-74476-9
[24] Summary Report 2018 on key aspects of the power sector of the Kingdom of Cambodia. Electricity Authority of Cambodia (2018).
[25] Cambodia Energy Balance Table, 2015

from local fuel oil power plants (data 2016). In 2016, the maximum demand for the Phnom Penh's power system is around 757 MW. The Phnom Penh's power system has extracted from national sources 4,596 GWh in 2016 compared to 4,113 GWh in 2015[26].

Energy consumption in Phnom Penh is dominated by the residential sector, commercial activities and industry (see figure 4). Phnom Penh, as Cambodia's centre of industrial activity, is a major consumer of commercial energy services. Among the energy-consuming industries, the garment sector is the leading consumer, followed by brick-making, rice mills, rubber production and the food sector[27]. The industrial sector consumes most of its energy from biomass (58% of industrial TFEC), followed by petroleum products (21%) and electricity (18%). Particularly for Cambodia' Small and Medium Enterprises (SMEs) report to frequently use diesel or heavy fuel-oil (HFO) generators as backup to avoid disruption to their production processes whenever the grid goes offline.

Figure 4. PP electricity generation, 2009-2014 (left); share of energy sales by customer, 2014 (right)



Source: EDC 2015[28]

Existing policies and regulatory framework

The Electricity Law of the Kingdom of Cambodia (2001) regulates the operations of the electric power industry and service providers.[29] One of its objectives is to encourage the private sector to invest in the energy sector to supplement EDC's capability.

Cambodia's National Energy Policy has four objectives: 1) To provide an adequate supply of energy throughout Cambodia at reasonable and affordable price; 2) To ensure a reliable and secured electricity supply at reasons price, which facilitates investment in Cambodia and development of national economy, 3) To encourage exploration and environmentally and socially acceptable development of energy resources needed for supply to all sectors of Cambodia economy, and 4) To encourage the efficient use of energy and to minimize the detrimental environmental affects resulted from energy supply and consumption.

The RGC's activities to promote renewable energy to date have focused on development of large-scale hydropower and rural electrification. However, renewable energy deployment is supported by the National Policy on Green Growth (2013), National Strategic Plan on Green Growth 2013-2030, and the Cambodian Climate Change Strategic Plan (2014-2023), and *Cambodia's Intended Nationally Determined Contribution to the UNFCCC (2015).*

[26] Electricity Du Cambodge (2016). Annual Report 2016.
[27] Ibid.
[28] Disaggregated data for share of energy sales by customer is not available in a later date.
[29] ADB. 2015b. Renewable energy developments and potential in the Greater Mekong Subregion. URL: http://www.adb.org/publications/renewable-energy-developments-and-potential-gms.

The National Energy Efficiency Policy, Strategy and Action Plan, drafted in 2013, is scheduled to be finalised and adopted in 2017. It set targets of reducing the national energy demand by 30% and national CO_2 emissions by 3m tons by 2035, compared to BAU projections.[30] Furthermore, Cambodia's draft Natural Resources and Environmental Code includes incentives to promote renewable energy efficiency. In January 2018, EAC issued a Prakas on the general conditions of connecting solar generation to the electricity distribution system or the electricity consumption system that is under the distribution system of the National Grid. This Prakas allows consumers under certain conditions to install solar power for additional self-consumption

Outstanding challenges and constraints

System losses in the Phnom Penh electricity distribution system have been running at between 8.2% and 9.6% between 2009 and 2014.[31] The power sector is also beset with inefficiencies in its administration, and transmission and power generation infrastructure. Quality of supply remains low, power outages and voltage fluctuations are common. In 2015, the average number of power outages in Phnom Penh a customer could expect was 24, and the average duration of outage was 720 minutes (the worst rate in ASEAN); domestic and foreign firms identify the high costs and electricity supply shortages as a main constraint to doing business in Cambodia. [32]

Cambodia has considerable renewable energy potential, including solar, biomass and waste-to-energy. However, their application in Cambodia remains low.[33] Municipal solid waste and sewerage are other potential sources of bio energy.[34] Generation of biogas for heating purposes and electricity generation has significant potential in Phnom Penh at water treatment plants and manufacturing plants in the city. [35]

Grid-connected renewable energy faces a number of challenges in Phnom Penh, including: high interest rates for small loans, which make the upfront costs difficult to overcome; reluctance of cost-sensitive industries to make unnecessary longer-term capital investment; a lack of regulatory support, for example through net-metering or a feed-in tariff; a lack of awareness of systems amongst potential customers; and a lack of maintenance service providers.[36]

To date, there has been uneven implementation of Cambodia's policies to promote renewable energy. Cambodia is yet to adopt any renewable energy targets, and its future forecasts for electricity generation usually show only large hydropower and fossil fuels as major sources. Without a policy framework or programs to promote non-hydro renewable energy, the development of renewable energy industry has largely been left to the private sector.[37]

With high energy costs in Cambodia, energy efficiency measures present an economic opportunity. Possible energy efficiency savings in Phnom Penh include:

- Industry: 15-50% saving potential in garments, ice factories, food industry, etc.
- Household appliances: up to 50% by introducing energy efficiency labelling schemes
- Building sector: 20-30% via the use of appropriate building materials and construction principles
- Use of biomass: 30-50% via the use of ICS (Improved Cook Stoves), more efficient charcoal kilns and char briquettes; [38]
- Municipal services: measures including energy efficient lighting (using 40-80% less electricity), efficient water pumps (10-30% efficiency savings);
- Energy sector: improving transmission and distribution efficiency (reducing losses from 9.6%), reducing own use, improving efficiency of generation assets.

[30] RGC. 2013. Draft National policy, strategy and action plan on energy efficiency in Cambodia

[31] EDC Annual Report 2014.

[32] ADB. 2011b. 'Country Partnership Strategy: Cambodia, 2011-2013'. Sector assessment (summary): energy. URL: http://www.adb.org/sites/default/files/linked-documents/cps-cam-2011-2013-oth-01.pdf.

[33] Dr. Magaret Njirambo , 2012. 'Sustainable Energy for All - Rapid Assessment and Gap Analysis - RGC'. Draft 1.

[34] Ibid.

[35] ADB. 2015b. Renewable energy developments and potential in the Greater Mekong Subregion. URL: http://www.adb.org/publications/renewable-energy-developments-and-potential-gms.

[36] Ibid.

[37] Dr. Magaret Njirambo , 2012. 'Sustainable Energy for All - Rapid Assessment and Gap Analysis - RGC'. Draft 1.

[38] RGC. 2013. Draft National policy, strategy and action plan on energy efficiency in Cambodia

The absence of energy efficiency standards and labelling means that consumers lack information on the efficiency of household appliances and other products. This puts more expensive energy-efficient appliances at a disadvantage, leading to proliferation of cheaper, inefficient products.[39] Cambodia also does not currently have energy efficiency standards for buildings or vehicle emission standards.[40]

Other barriers to increased energy efficiency in Cambodia include:

- A lack of awareness of energy efficiency opportunities, despite high energy costs; [41]
- Lack of understanding of energy efficiency investment amongst commercial lenders leading to reluctance to finance energy efficiency projects at businesses;
- Lack of funding for a dedicated RGC program on energy efficiency;[42] and
- Lack of institutions that can undertake energy audits and implement energy efficiency measures (such as energy service companies (ESCOs)).[43]

There is substantial potential for roof-top solar PV in Phnom Penh to service households, businesses and manufacturing (photo by GGGI)

4.5.4 Transport

Phnom Penh's transport is dominated by roads and the use of private vehicles. In 2015, the total number of registered vehicles country-wide was estimated at 2,300,000 for motorbikes, 159,000 for cars, and 72,000 for vans/trucks/buses[44]. Phnom Penh has seen rapid growth in transport demand over the last decade, driven by rapid population growth and increasing economic activity. At the same time, improved incomes and cheaper imported vehicles have led to increased motorisation and vehicle ownership. While Phnom Penh's population grew by approximately 2.3% per year between 2001 and 2011, vehicle registrations grew by over 11.7% per year, more than tripling the number of registrations over the decade.[45]

[39] Ibid RGC 2013; Matinga 2012.
[40] RGC, 2013. National Policy on Green Growth.
[41] Minute from the meeting with EUROCHAM, 29/10/2015.
[42] Ibid
[43] Ibid
[44] Assessment of Regulatory and Fiscal Policies for Road Transport Vehicles in Cambodia, Clean Air Asia, 2019 (draft)
[45] JICA, 2014. The project for comprehensive urban transport plan in Phnom Penh Capital City (PPUTMP). Final report – Executive summary.

The rapid expansion of the use of private transport in the city has resulted in increasing traffic volumes as Phnom Penh's infrastructure development and traffic management has been outpaced. The net result of this has been slowing traffic and increased levels of congestion, increased road accidents and high levels of air pollution. Average driving speed in the city decreased from 22.9 km/h in 2000 to 14.6 km/h in 2012[46]. At peak times traffic speeds can be extremely low in central areas, at around an average of 10 km/hr. [47]

Freight transport is growing in the city, along with its economic expansion. Road freight is extremely important in Phnom Penh, with freight traffic volumes increasing dramatically in areas that service the manufacturing industry (largely in the peri-urban areas).

Phnom Penh is currently without a system of public mass transit. Buses and ferries are the only two modes of public transport available. Motodops (motorcycle taxis) are unregulated and there are effectively as many in operation as motorcycles in the city (i.e. 500,000). The number of registered tuk-tuks have also increased dramatically over recent years, totalling approximately 6,000 in the city.[48]

Cambodia has seen a steep increase in its traffic accident rate, with a number of 2,231 fatalities in 2015, almost double the number in 2006[49]; motorcycle users and tuk-tuks accounted for 77% of the casualties and 68% of the fatalities, and the majority of motorcycle accidents occurred in Phnom Penh. The two leading causes of fatalities were speeding (51%) and alcohol abuse (18%).[50&51]

Existing policies and regulatory framework

Phnom Penh's Urban Transport Master Plan 2035 has been drafted to help solve the current transport problems and support the Urban Vision under the Master Plan for Land Use 2035 (see section 4.2). The Mission of the Urban Transport Master Plan 2035 is two-fold:

1) to shift from a private-oriented urban transport system to a well-balanced system of public and private transport through a combination of road, public transport and traffic management for improving the mobility of citizens, and
2) to materialize the urban potential of Phnom Penh City.

The Urban Transport Master Plan 2035 builds on the first Urban Transport Master Plan 2015 for Phnom Penh that was developed in 2001 with the assistance of JICA. The 2001 Master Plan was partially implemented, resulting in installation of traffic signals at major road intersections. This installation helped alleviate traffic issues to some degree, but the lack of public transport was not addressed. *The Urban Transport Master Plan* 2035 seeks to increase the use of public transport to over 30% of the modal share by 2035. This would be achieved by introducing (among other measures) 10 bus routes by 2020 as part of a bus rapid transit scheme, and a partially underground elevated rail transit system by 2035.

At the national level, there are legal requirements for sidewalks to be reserved for pedestrians, and parking management regulations, provided under the *Road Traffic Law (2015)*, the *Road Law (2014)* and *Sub-decree #42* on Urbanization for the Capital, City and Urban Areas. The Ministry of Public Works and Transport has also developed its Climate Change Action Plan for the Transport Sector (2014-2018), which identifies a number of priority actions for green transportation, including the need for integrated public transport systems in the main cities, and enhancing the maintenance and inspection of vehicles.

[46] Ibid.
[47] Ibid.
[48] Ibid.
[49] Kitamura, Y., Hayashi, M., & Yagi, E. (2018). Traffic problems in Southeast Asia featuring the case of Cambodia's traffic accidents involving motorcycles. IATSS Research.
[50] Phnom Penh Post. 18/11/2014. "Road deaths to rise: minister". URL: http://www.phnompenhpost.com/national/road-deaths-rise-minister.
[51] Following the introduction of the road traffic law in 2009, motorcycle drivers have been required to wear helmets, and the law is being enforced in Phnom Penh, although it is not clear what impact this has had on reducing injuries.

Outstanding challenges and constraints

The provision of transport infrastructure has not kept pace with the rapid traffic expansion. Compared to other cities in the region, Phnom Penh has a low road density, particularly outside the city centre (central khans account for 94% of the roads). Some residential projects have been pursued in suburban areas without consideration being given to road network access and traffic dispersal. Similarly, a lack of planning for heavy vehicles serving factories and construction depots has led to the deterioration of roads in some areas.

There are several challenges identified with Phnom Penh's traffic management: problematic intersections; inadequate travel signage systems; a lack of road markings and uncontrolled parking. The inadequate parking spaces in the city centre, is becoming an acute problem, resulting in drivers parking on the road or on the sidewalk and obstructing pedestrians. Furthermore, Phnom Penh's pedestrian sidewalks have been eroded by street widening in favour of cars. Enforcement of the parking regulations is a significant challenge. Freight transport is also facing problems, including damage to the roads, which slows the trucks down, some narrow routes, and a lack of off-road space for loading and unloading.

Domestic freight in Phnom Penh (photo by GGGI)

4.5.5 Built Environment

The built environment in Phnom Penh consists of a vast array of architectural styles and housing types. French colonial style buildings and villas historically dominated the cityscape. Now some of these buildings have been restored, but many have been destroyed or are in disrepair. Currently, typical homes consist of either the Chinese style shop houses, or single detached villas. The shop house is the most predominant since it is less expensive and can be used for both commercial and room renting purposes.

More recently, there have been significant investments in high-rise luxury apartments, entertainment complexes, commercial buildings and satellite cities. These types of structures require large amounts of energy unless energy conservation and efficiency measures are integrated into their construction and operation. Examples of new construction projects include Koh Pich, Bodaiju Residences and Booyoung Town. Climate change, and the projected increases in temperatures and flooding, could reduce the resilience of urban buildings. Structural damage could result from severe and frequent flooding events in the future. "No regret" options for building codes that homes withstand changing climatic conditions would reduce this risk for Phnom Penh's urban population. This is a particular challenge for urban dwellings in peri-urban areas where proper housing is scarce. Evicted families often need to resort to building their own houses from recycled materials, which are more vulnerable to urban flooding events.

Existing policies and regulatory framework

The Sub-Decree No. 43 on Urbanization of the Capital City, Towns, and Urban Areas. This sub-decree regulates land use within a construction plot, and places limits on the construction footprint within a parcel of land to ensure that adequate open spaces remain for trees and gardens. The benefits of this sub-decree include the following: cooler and more attractive built environment; opportunity for onsite rainwater capture / infiltration to curtail flooding; less densely packed housing; and more open space to create natural ventilation corridors.

The Ministry of Land Management, Urban Planning and Construction (MLMUPC) is currently revising the Construction Law to incorporate requirements on health and safety.[52] The RCG has also recognized the lack of affordable housing as a problem and has adopted the *National Housing Policy (2014)*. The goal of the policy is to provide low- and medium-income households and vulnerable groups with access to decent housing, or improvement in existing housing. The policy is inclusive and calls for collaboration with development partners, civil society, charitable organizations, private sector, and sub-national and national authorities. ,[53,54]

More recently, the MLMUPC has also sought to address the needs of vulnerable households through its *Climate Change Action Plan 2015-2018*. The Climate Change Action Plan has promoted proper shelters for low income and vulnerable households and envisages that green building design and low-carbon technologies will be considered in future building codes.

Outstanding challenges and constraints

Despite the efforts under the affordable housing policy, there is an insufficient supply of comfortable low-cost housing in Phnom Penh. Almost all new housing developments in the city are targeted towards high-income earners and foreigners. The challenge is to make affordable and green housing projects a priority and attractive to private investors. The existing shop houses, while relatively low-cost, are not well designed with regards to energy efficiency and natural ventilation. Low-income labourers tend to rent rooms in shop houses where overcrowding and heat stress can be hazardous to occupants. Furthermore, shop houses are also normally built right up to the sidewalk, leaving no space for green areas or trees.[55]

While the construction boom is taking place, there is limited documented evidence that the concept of green building design[56] is being integrated into architecture and property development plans. With the current updating of the Construction Code, there is an opportunity to integrate the concepts of green building design into the code.

[52] Nara, H. Undated. "Regulations of the Building Regulations and Codes". PowerPoint presentation by MLMUPC
[53] OHCHR Cambodia 2012. Resettlement Study. URL: http://cambodia.ohchr.org/WebDOCs/DocProgrammes/Resettlement_Study-28_Feb_2012_Eng.pdf
[54] Beng Hong Socheat Khemro. 2014. 'Housing Policy and Circular No. 3 on Squatter Settlement Resolution'. URL: http://giz-cambodia.com/wordpress/wp-content/uploads/9-Summer-School_Beng-Hong-Socheat-Khemaro.pdf.
[55] Ibid.

Green building design is already evident in some building in Phnom Penh. It enables electricity savings through the use of natural cooling systems (photo by GGGI)

4.5.6 Manufacturing

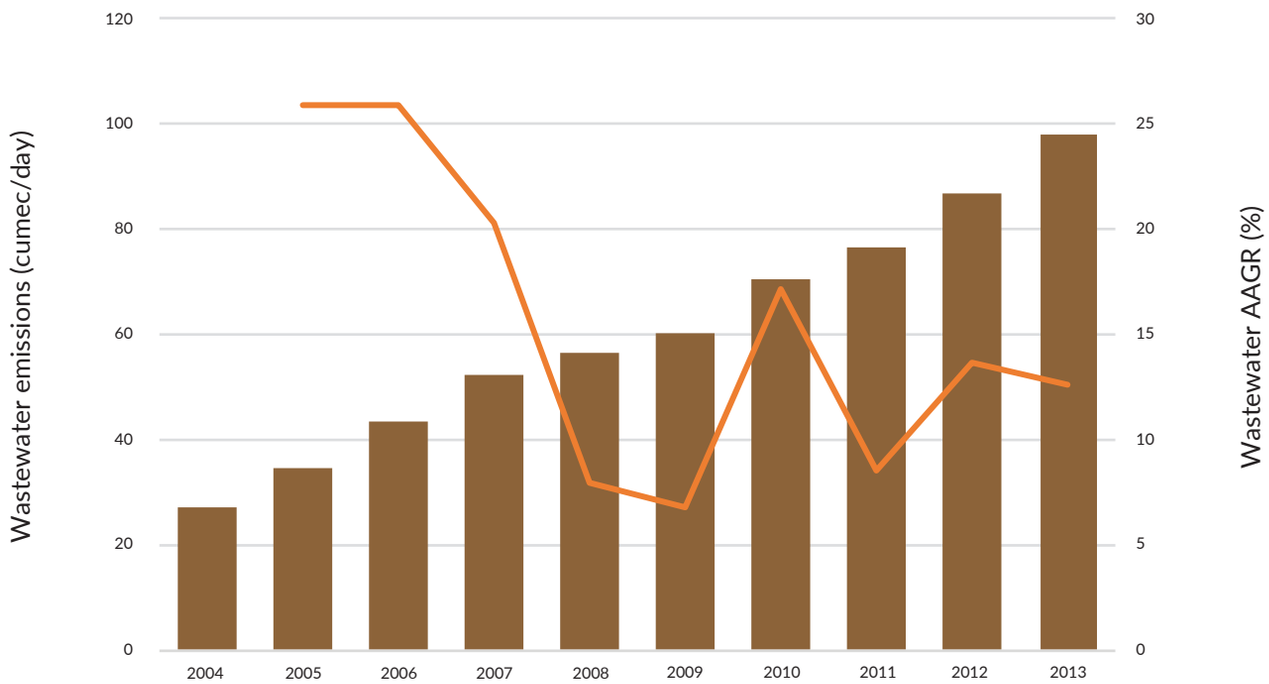
The manufacturing sector has been a key contributor to Cambodia's economic growth. It has accounted for the largest share of productivity growth in the country, growing by about 11% in the period of 2010-2015. It currently accounts for approximately 32% of Cambodia's GDP.[57] Cambodia's large manufacturing firms are geographically concentrated, with 68% being located in Phnom Penh and a further 13% in the adjacent Kandal Province.[58]

Garment manufacturing is the largest manufacturing subsector in Cambodia, accounting for 10.5% of GDP in 2015, and the growth rate of the subsector is projected to remain higher than the GDP growth rate until 2019.[59] Both the number of garment factories and the number of people employed in the sector increased in 2012-2015. Nationwide this industry also employs around 80% of the non-agricultural labor force, 86% of who are women.[60]

Pollution is a growing issue for manufacturing in the city. This includes pollutants to air from energy production (including off-grid and back up diesel generation), solid and hazardous waste, noise pollution, and possibly, most acutely water pollution. Although detailed figures on pollution issue attributable to the manufacturing sector are not available, estimates for water pollution were developed from water consumption figures available from the Phnom Penh Waters Supply Authority (PPWSA) for commerce and industry (see Figure 5).

[56] Green building design refers to both a structure and the using of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from siting to design, construction, operation, maintenance, renovation, and demolition. In other words, green building design involves finding the balance between homebuilding and the sustainable environment.
[57] World Bank. 2018. World Bank Database. Washington, D.C.: The World Bank. URL: http://data.worldbank.org/indicator/NV.IND.TOTL.ZS.
[58] Central Intelligence Agency (CIA). 2015. "The World Factbook – Cambodia". URL: https://www.cia.gov/library/publications/the-world-factbook/geos/cb.html
[59] National Institute of Statistics, Ministry of Planning, 2015.
[60] ILO Cambodia. 2015. "Cambodian Garment and Footwear Sector Bulletin, Issue 2". URL: http://betterfactories.org/?p=10557.

Figure 5. Estimated wastewater discharges from commerce and industry in Phnom Penh 2004-2013



Source: Consultants calculations based upon PPWSA figures cites in JICA 2015a.

Existing policies and regulatory framework

The Law on Administration of Factory and Handicraft (2007) regulates the establishment and operation of factories. The law stipulates the following:

- Factory floors should be free of smoke, dust and other pollutants;
- All industrial waste should be discharged in accordance with standards and regulations 'of competent institutions';
- Discharging of toxic industrial wastes or hazardous substances without prior treatment is prohibited;
- Management of industrial waste is the responsibility of the factory owner.[61]

Cambodia's Industrial Development Policy 2015–2025 lays out a vision to diversify the country's industrial base and increase exports of manufactured products other than garments.[62] One of its o bjectives is to reduce the export share of garment and footwear to 50% of total merchandise exports by 2025. The policy also seeks to strengthen skill development, to ensure stability of labor supply, productivity growth and improving living standards of workers.[63]

Water emissions standards are in place under the Sub-Decree on Water Pollution the Sub-decree #27 *on Water Pollution Control (1999)*, which provides the thresholds (standards) for wastewater to be released into the environment, in line with the *Law on the Environmental Protection and Natural Resources Management (1996)*, including requirements to treat waste products such that emissions standards are met. Air and noise pollution standards are provided in Sub-decree #42 *on Air Pollution and Noise Disturbance Control.*

[61] RGC 2007b. Law on Administration of Factory and Handicraft, enacted 23 June 2006. URL: http://www.opendevelopmentcambodia.net/pdf-viewer/?pdf=download/law/Law_on_Administration_of_ Factory_and_Handicraft_23_June_2006_Eng.pdf
[62] RGC 2015. Industrial Development Policy 2015-2025. URL: http://eurocham-cambodia.org/uploads/97dae-idp_19may15_com_official.pdf
[63] Ibid.

Outstanding challenges and constraints

For Cambodia's manufacturing sector, the key challenges to greener operations include reducing pollution, reducing energy consumption through energy efficiency and conservation measures, improving occupational health and safety, and improving working conditions. The monitoring and enforcement of pollution control standards requires further strengthening.

The key environmental problems for the garment industry are: air pollution, GhG emissions from boilers, and potentially toxic wastewater from dyeing and bleaching processes.[64] The industry is also very energy-intensive and typically operates using outdated and inefficient equipment. In addition, providing adequate work place ventilation and avoiding worker exposure to toxic chemicals are necessary to improving the working environment.

An additional issue is the location of manufacturing industries in areas of the city with mixed uses, such as next to residential or agricultural land uses. In these circumstances pollution emissions from industry can cause significant problems for people living and working nearby. This has been an important source of complaints to the city authorities. Similarly, the location of manufacturing industry in areas with unsuitable transportation access can cause traffic congestion problems for the surrounding area.

Energy costs are a significant burden for garment factories, even with discounted electricity rates. The cost for charcoal and wood (used to fuel boilers to supply steam-irons and fabric dying basins) is also steadily rising. Selected factories have undergone energy efficiency audits, which found 30% energy savings are readily achievable via efficiency improvements to lighting, boilers, vents, sewing machines, compressors and other equipment.[65]

4.5.7 Solid Waste Management

It is reported that domestic waste generation in Phnom Penh is about 1,868 tons per day (Data in 2015). A study concluded that about 72% of domestic waste is organic.[66] More in-depth technical analyses have measured Phnom Penh domestic waste characteristics with the following results:

- combustible content = 90% (due to high waste food content);
- moisture content = 64%;
- calorific value = 1,598 Kcal per kg; and
- carbon / nitrogen ratio = 20:1.[67]

These statistics indicate that the domestic wastes are suitable as an energy generation source or for composting.

Solid waste management in urban areas is recognized by all stakeholders as a priority environmental problem. Particular attention has been given to the lack of waste management in Phnom Penh, since waste collection in many parts of the city is haphazard or lacking altogether. As a result, many tons of wastes are routinely dumped into local rivers and ponds, are burned or remain uncollected. Uncollected waste is scattered, often blocks local drainage channels and creates unsanitary conditions.

Waste collection is unreliable or non-existent in the outlying or peri-urban areas where most low-income residents live. In a recent survey, it was reported that a majority residents living in outlying Phnom Penh districts were not receiving any waste collection services. The districts where waste collection is most lacking include Russey Keo, Mean Chey, Chbar Ampov, Chraoy Changvar and Dangkao. Where waste collection services are not available, residents reported that they either burned the waste or dumped waste on existing uncollected piles.

[64] For example, RGC's Green Growth Roadmap identified toxic pollution from the garment sector as one of the most pertinent challenges to urban green growth.
[65] GGGI. 2014b. Cambodia Private Sector Analysis - Green Growth Opportunities Perspective
[66] Ministry of Environment. "Solid Waste Management of Cambodia". Presentation at a Regional Workshop on National Strategy for Integrated Solid Waste Management / 3R, Hai Phong, Viet Nam, 28–29 July 2010.
[67] Seng et al. 2011. Seng, B., Kaneko, H., Hirayama, K. and Katayama-Hirayama, K. 2011. "Municipal solid waste management in Phnom Penh, capital city of Cambodia". Waste Management Research Group, May 2011, 29(5): 491-500.

Solid waste that is uncollected often accumulates in drainage channels and natural watercourses. During heavy rain events, the drainage capacity is limited due to the blockages from the wastes. It is forecasted that, due to climate change, more severe and frequent rainfalls will occur, and that solid waste collection will need to be improved to ensure that drainage channels can function properly.

The domestic waste that is collected is transported to a dumpsite in Dangkao district, which is located 15 km from city center. At the waste dump, the transported waste is scattered. As many as 500 waste scavengers, of which 80% are women, make their living through informal recycling at the dumpsite.[68] Children often accompany their mothers to the dumpsite. In October 2009, PPCA attempted to institutionalize the role of waste scavengers by defining their roles with respect to waste management, but this initiative did not result in any formal registration of waste pickers.[69]

In the Phnom Penh municipality, a private company Cintri Ltd manages domestic waste collection and transport. In 2002, Cintri entered into a contract with the Phnom Penh Municipality, which gave Cintri exclusive rights for municipal waste management, continuing from PSBK for municipal waste collection, transport to the dumping site up until 2048.

Existing policies and regulatory framework

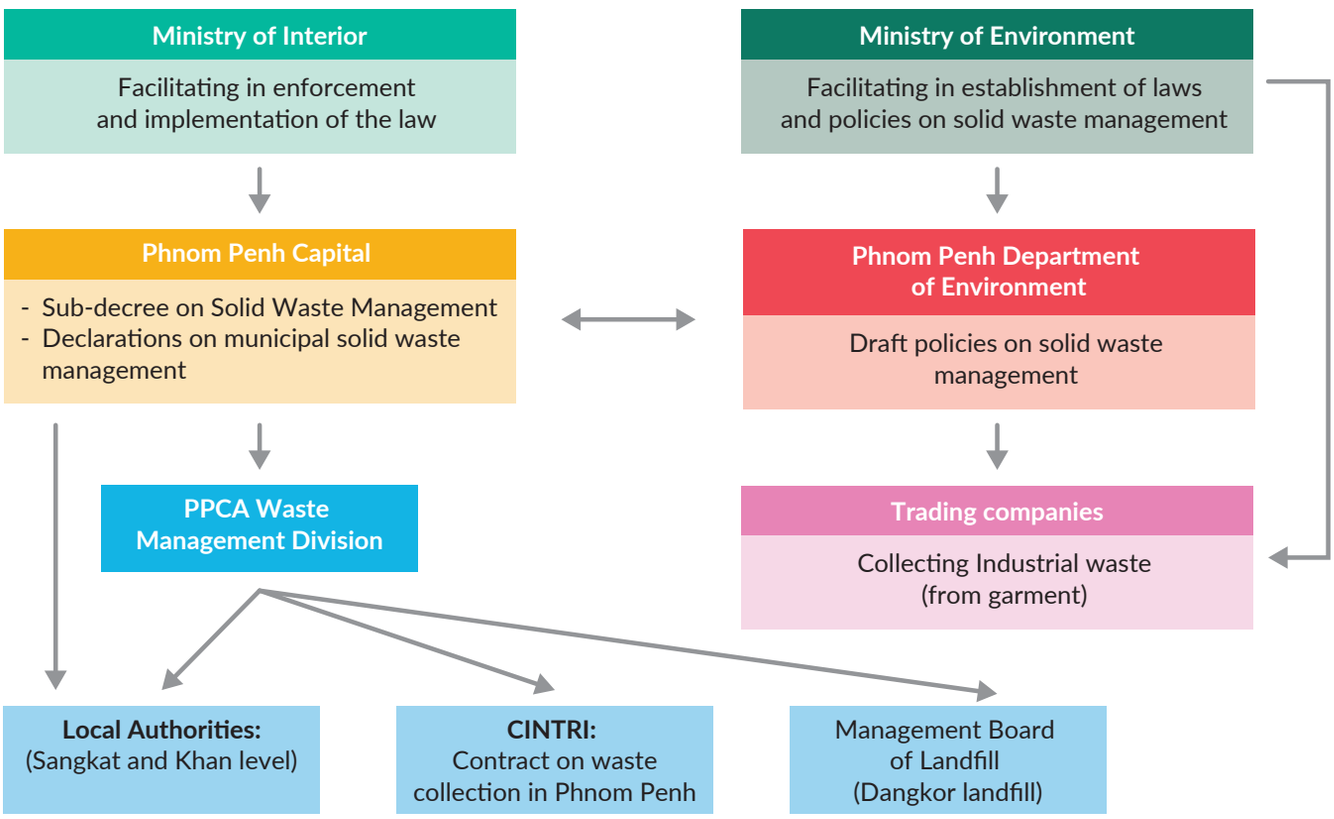
Many authorities and institutions are involved in solid waste management in Phnom Penh (Figure 6). The Ministry of Environment (MOE) is responsible for preparing guidelines on solid waste management including collection, transportation, storage and recycling. However, it has limited capacity to enforce or monitor the guidelines. At the local level, the Waste Management Division of the PPCA is responsible for waste management within Phnom Penh. Under the Waste Management Division, there are two supporting offices: Technical Environmental Impact Monitoring Office and Waste Management Authority Office. The Waste Management Authority Office is responsible for overall solid waste management in Phnom Penh including waste collection, transport, and disposal, and also for monitoring private waste collection companies. Under PPCA, there is also a Landfill Management Authority responsible for operating the Dangkor landfill site.

The Phnom Penh Department of Environment has prepared eight plans for improving solid waste management in Phnom Penh. These plans include the following :[70]

- Waste management database;
- Waste separation;
- Waste discharge and waste collection;
- Landfill waste disposal according to waste separation plan;
- Waste recycling and reuse;
- Waste treatment;
- Capacity building; and
- Enforcement and penalties.

[68] Meeting with Phnom Penh Waste Management Division, 13 January 2016.
[69] Cambodian Education and Waste Management Organization 2014. Policy Framework and Institutional Arrangement on Solid Waste Management and the Development Landfills in Phnom Penh.
[70] Kuok Federo, Im Makara, Hul Seingheng, and Soy Ty, 2015. Solid Waste Generation and Life-Span with Credible Growth Forecasts of Waste Generation, Volume and Composition.

Figure 6. Phnom Penh solid waste management authorities and institutions



Source: Asia Foundation and in consultation with PPCA

In sub-decree 113 ANK/BK enacted on 27 August 2015, urban solid waste management was decentralized and responsibilities shifted to the provincial, municipal and district levels. As a result, Phnom Penh Municipality has delegated responsibility for waste collection and disposal to the 12 city districts. This sub-decree aims to improve waste management of urban waste efficiently, transparently and accountable to ensure aesthetics, public health and environmental protection.[71]

Non-governmental organizations such as UNEP, IGES, COMPED, and Nexus, together with the Ministry of Environment, Department of Green Economy in the General Secretariat for Sustainable Development (GSSD), and Phnom Penh Capital Administration (PPCA), are currently developing a Solid Waste Management Strategy for Phnom Penh which addresses environmental and climate change risk along the entire solid waste management value chain in Phnom Penh to reduce greenhouse gas emissions from landfill sites and other unsustainable waste disposal behavior. The implementation of the strategy would result in a cleaner city, with less hazardous waste, with more amenity and less odour. The city's emissions could be reduced by over 250,000 tonne of CO2-e annually by 2024.

Outstanding challenges and constraints

The entire urban waste management system in Phnom Penh needs to be improved, from the point of waste generation to final disposal. At the household and commercial points of generation, waste needs to be separated at the source to enable any type of efficient recycling, composting or waste-to-energy conversion. Furthermore, waste is not collected in all parts of the city since Cintri is unable to physically access certain parts of the inner city core and does not have facilities for servicing outer peri-urban areas.

Other challenges include the need for construction and operation of a technically sound waste disposal landfill facility, with potential for waste composting and waste-to-energy conversion facilities. The old waste dump at Steung Mean chey, which had been in operation since 1965, has had continuous trash fires. This facility has become overloaded with waste, and thus closed and decommissioned in an environmentally sound manner since 2009.

[71] Sub-Decree No.113 ANK/BK on Municipal Solid Waste Management, enacted on the 27th August 2015

Since July 2009, a new landfill was opened at Dangkor Landfill with four waste disposal cells (A, B, C and D). The location is 15 km from city center and encompasses an area of about 26 ha. Two cells (A and B) are filled to capacity and Cells C and D were opened in April 2016. The landfill has quickly filled, and there have been observations that it is not operating in a technically sound and environmentally friendly manner. For example, proper waste compaction is not routinely practices resulting in inefficient use of landfill capacity.

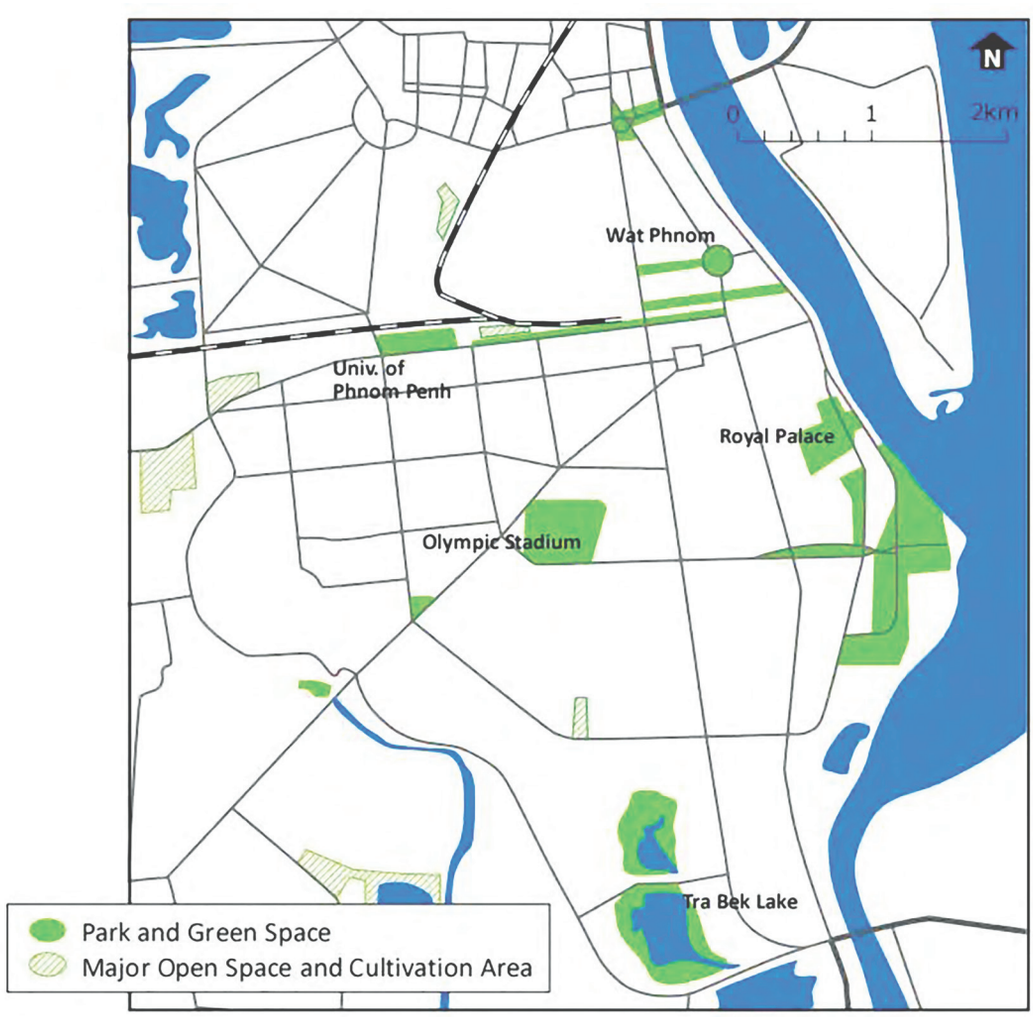
4.5.8 Public Space and Cultural Heritage

Historically, Phnom Penh was rich in parks, green areas and cultural heritage buildings and sites. However, the redevelopment of the city since the 1990s has led to much of the green areas and the city's cultural heritage buildings and sites being either destroyed to make way for new development projects or being left to deteriorate.

The amount of green space and open areas in Phnom Penh has decreased markedly in recent years. According to the Phnom Penh's Urban Transport Master Plan 2035, Phnom Penh has much less green area per capita than many other densely populated major cities in the world. Phnom Penh has only 1.1 m^2 green space compared to New York City at 29.2 m^2 , and Tokyo at 5.5 m^2 per person.[72]

As for the state of public space in Phnom Penh, it should be noted that the Sisowath riverside promenade in the central district has been refurbished into an accessible, landscaped public space, which generates opportunities for urban recreation for residents and many visitors of the area. Various urban public parks, which had run into disrepair, have now been refurbished with landscaped designs.

Figure 7. Parks and Green Spaces in Phnom Penh (source: JICA 2014)



[72] JICA. 2014. The project for comprehensive urban transport plan in Phnom Penh Capital City (PPUTMP). Final report – Executive summary.

Existing policies and regulatory framework

Provisions for the protection of Phnom Penh's sidewalks are provided in the Sub-Decree #42 on *Urbanization of the Capital, Municipalities and Urban Areas*. However, enforcement of the sub-decree's provisions to ensure that new developments provide sufficient parking spaces and enable a sufficient "public right of way" for new buildings can be difficult to enforce. Furthermore, the provisions in the Road Law (2014) and the *Road Traffic Law (2015)* to reserve sidewalks for pedestrians have also been challenging for local authorities to enforce.

Currently there are no clear zoning by-laws or building preservation regulations to protect these historic structures. Cultural Heritage is managed by the *Law on Protection of Cultural Heritage 1996*, and by Sub-decree #98 on respecting implementation of cultural heritage protection. According to definitions of cultural heritage listed in the law and its regulation, it is unclear whether architectural structures such as New Khmer Architecture or French Colonial Architecture qualify as cultural heritage sites. There is a need to define regulations for preserving cultural heritage buildings, and to establish mechanisms for financing rehabilitation of cultural heritage.

Outstanding challenges and constraints

Many critical public spaces such as city sidewalks are entirely taken over by parked cars, motorcycles and informal vendors, making walking in Phnom Penh extremely difficult and sometime dangerous. Furthermore, many of the created public spaces are not well designed with regards to water management and natural cooling. Many inner district parks and gardens have been extensively paved with impenetrable materials, which prevent water from being absorbed into the ground. Furthermore, the decorative trees and shrubs in these gardens have limited capacity for shading and for water containment. Many of the historic cultural heritage buildings and sites have been torn down to make way for new urban development projects or have been allowed to deteriorate. These building provide examples of architecture from the French Colonial era and also from the New Khmer Architecture movement of the 1950s and 1960s. Threatened historic buildings include the National Stadium, the old Phnom Penh Police Station, and the historic Renakse Hotel. Not only do these buildings provide cultural identity to the city, but (if restored) they also have the potential for attracting tourists. Sum intistio. Et dunt labore sit ulliquia ad quibusanduci delessit unt.

5. SUSTAINABLE CITY DEVELOPMENT PRIORTY ACTIONS

This section describes the green growth actions identified from the consultations as necessary to achieve the overall vision, goals and objectives listed in sections 2 and 3 above.

5.1 URBAN PLANNING PRIORITY ACTIONS:

- Dissemination of the Master Plan on Land Use 2035 to determine the future structure of the urban agglomeration, the location of its functions, the density of its built environment, the direction of its growth, and the zoning of its neighborhoods.
- Define protection areas where no infrastructure or building activities may take place (protected natural resources, public spaces, cultural heritage and monuments).
- Direct urban expansion away from areas that are subject to natural and climatic risks such as flooding or coastal erosion.
- Plan for compact, low-carbon urban forms providing for high agglomeration density and for an optimal use of urban infrastructure.
- Avoid lock-in to costly, energy-inefficient and polluting transport and energy urban systems.
- Provide land for low-income residential areas and concentrate factories away from housing.
- Improve data collection and management as a basis for evidence-based urban policy-making.
- Improve coordination and transparency of the planning process, with participation of all stakeholders and the public (particularly those directly affected by planning decisions).
- Implement public information campaigns by the local authorities on the planning process.
- Improve local governance and enforcement of urban regulations by all stakeholders.

5.2 URBAN VULNERABILITY PRIORITY ACTIONS:

- The city's natural lakes, streams and wetlands are protected and not used for further commercial development.
- Green corridors are restored or created throughout the city.
- To capture rainwater, reduce flooding and increase biodiversity, the existing green space per person ratio of 1.1 m^2 will be doubled.
- Natural hydrological systems will be restored with the intent of multiple uses (fisheries, aquaculture, recreation, and biodiversity enhancement).
- Drainage systems in flood-prone areas are made more robust using an integrated system of rain-water retention, rain water harvesting, restoration of natural hydrological systems, green areas, and engineering structural measures.
- Where feasible, bioengineering using native plant species is used to prevent erosion and capture rain or flood waters.
- Wastewaters generated in inner city areas are treated using at least secondary treatment.
- Decentralized wastewater treatment systems will be operating in poor and vulnerable peri-urban communities.
- Property destruction, loss of life, and economic damages resulting from flooding are reduced in all parts of the city.
- Residents living in highly flood prone or erosion areas are favourably relocated to safer and more secure locations in the city.
- All households in peri-urban areas are using improved and secure household sanitation systems that will prevent pollution dispersion during high rain and flooding events.

5.3 ENERGY PRIORITY ACTIONS:

- GHG emissions are reduced significantly from the current trajectory, at least to the extent that abatement costs are negative, neutral or are otherwise supported by donors, carbon markets or climate finance.
- Energy efficiency audits are conducted as standard practice across all municipal services and properties, energy management plans are instituted, and appropriate energy efficiency measures (and renewable installations) are identified and implemented;
- All electrical appliances and cook-stoves tested and labelled following national standards, energy efficiency labelling is in Khmer;
- Market for energy efficiency services and finance developed in Phnom Penh servicing municipal, commercial and industrial sectors.
- All new government, commercial and industrial buildings have renewable energy installed.

5.4 TRANSPORT PRIORITY ACTIONS:

- Comprehensive and integrated traffic management system in place, adequately resourced and staffed,
- Parking regulations are enforced,
- Introduce sulphur content limits for transportation fuel in line with regional standards (in the region of 50 ppm reduced from current 1,000 ppm),
- A system of daily air quality monitoring (increased from the current three monitoring stations) put in place across the city monitoring for key air pollutants (PM10, PM2.5, SOx, NOx , CO and O3),
- Reduce the use of motor vehicles,
- A plan in place to encourage cycle use in the city, including consideration of segregated lanes and cycle paths,
- A system of inducements to encourage the use of low-emission vehicles in place (i.e. those with better emissions performance standards in terms of gCO2/km or similar, hybrid or electrical vehicles).

5.5 BUILT ENVIRONMENT PRIORITY ACTIONS:

- Affordable low-cost and resistant to natural disaster housing is available throughout the city,
- The urban housing profile consists of a mix of modern and traditional architectural styles to maintain Phnom Penh's distinct cultural and urban identify,
- Guidance is available for flood proofing households and commercial enterprises,
- Guidance on constructing or retrofitting energy-efficient housing and buildings is available and being used,
- New large construction projects dedicate sufficient space for green corridors, and adhere to green building standards administered by the building industry.
- The recent law on urbanization is enforced with regards to allocating sufficient open space on construction plots for green and permeable surfaces.

5.6 MANUFACTURING PRIORITY ACTIONS:

- Monitoring and enforcement pollution emissions standards in the manufacturing sector
- Access to funding for energy efficiency and pollution control – Capital facilities in place for lending to energy efficiency and pollution control projects in the manufacturing sector.
- Energy service company (ESCO) – establishment of an energy use service company in the city to enable energy and resource use efficiency at manufacturing enterprises.
- Waste water treatment plants – All water pollution emitters in the manufacturing sector must be connected to a waste water treatment plant.

- Resource use assessment – Resource use assessments conducted for major industrial sectors in the city, looking in particular at material flows and opportunities for using waste flows from some industries as inputs into other industries.
- Increase green jobs – in the manufacturing sector, including in the production of green handicrafts.

5.7 SOLID WASTE MANAGEMENT PRIORITY ACTIONS:

- Each district has the resources and capacity to manage waste collection companies.
- A competitive market is established in order for districts to select waste collection companies most suitable for their respective waste management requirements.
- In some outer districts, entrepreneurship is encouraged to provide waste collection
- Public awareness campaigns are established to instruct households, commercial enterprises and markets of methods for waste separation and respective environmental benefits.
- Strengthening waste separation measure at manufacturing sites
- A public awareness campaign is launched to inform citizens of alternatives to plastic bag use and the environmental consequences of continued plastic bag use.
- Plastic bags are banned and replaced with reusable bags (eco-friendly bags).

5.8 PUBLIC SPACES AND CULTURAL HERITAGE PRIORITY ACTIONS:

- Public parks, gardens, and green corridors are significantly expanded throughout the city.
- Some existing public areas are redesigned and reconstructed to include more shade trees, biodiversity, permeable surfaces and rain capturing vegetation to manage rain runoff.
- The urban heat island effect is measurably reduced through establishment of more green areas.
- More multi-functional recreational areas are developed to support exercise, sport activities and socializing.
- Historic cultural heritage sites and buildings in Phnom Penh are preserved and renovated, including the National Stadium, the old Police Station, and the Renakse Hotel.
- Regulations are enacted and enforced to protect and renovate key cultural heritage buildings and sites.
- A city or national budget, supported by tourist fees or other user fees, is established to preserve cultural heritage buildings and sites.
- Tourism campaigns featuring cultural heritage promotion and awareness.

6. GREEN GROWTH SCENARIO

This section develops illustrative future green growth scenarios for the city. It is assumed that demographic, economic and climatological trends as described in Section 2 will remain largely the same. These scenarios represent outcomes of different approaches to urban green growth. Given the lack of reliable data, it has not been possible to develop a completed quantitative projection. Nevertheless, these scenarios are deemed to give an overview of the expected benefits of adopting green growth approach for the development of sustainable city.

Three scenarios are presented hereunder for the 2030 horizon:

a. **Business-as-usual** – representing a continuation of currently established trends;
b. **Piloting Green Growth** – representing the implementation of basic sector reforms already proposed along with the piloting of new greener technologies; and,
c. **Mainstreaming Green Growth** – representing the implementation of sector reforms and mainstreaming new green growth technologies and approaches to urban development.

6.1 BUSINESS-AS-USUAL SCENARIO

The BAU scenario assumes that no major improvement in the sustainable provision of urban infrastructure and services take place between the current time and 2030. This includes the absence of required sectoral reform, including in transport, waste, energy and sanitation. Overall, without any significant changes to urban management, as economic activity and population in Phnom Penh expands, the quality of the living environment will decline, the functionality and competitiveness of the urban area will be compromised, and the city will put increasing and unsustainable pressure on national resources. The particular issues projected under a BAU scenario, include the following:

- Energy consumption – Energy use will increase rapidly. Growth in transportation demand coupled with an increasingly inefficient transportation system will drive rapid growth in demand for fossil fuels. Demand for electricity is expected to continue growing extremely rapidly from all sectors.
- Water consumption – Water use will continue to rise rapidly. Household water consumption will rise with population growth, the extension of supply in peri-urban areas and increased incomes. Growth in manufacturing and structural shifts to more water intensive manufacturing sub-sectors will also lead to increased demand for water.
- Local air pollution – Local outdoor air pollution will increase rapidly, and air quality is likely to decline. The single largest cause of air quality deterioration is likely to be transport (i.e. traffic congestion). The location of manufacturing industries in close proximity to commercial and residential uses will exasperate these air quality issues.
- Water pollution – Water pollution will increase rapidly. Increased municipal wastewater emissions will be a consequence of increased water consumption in Phnom Penh. As a consequence, water quality in water bodies throughout the city will decline dramatically. All water bodies in the vicinity of the city will be effectively dead.
- Solid waste – volumes of solid waste will increase dramatically. Growth in economic production, a growing population and higher levels of personal consumption will in all likelihood lead to increases in the amount of solid waste produced.
- Urban form and function – With no coherent and regulated urban development strategy, the physical structure of the city will continue to develop in ways that impair its function and reduce the quality of life for its inhabitants. Uncontrolled real estate development will have a range of detrimental effects.
- Poverty and socio-economic development – socio-economic trends continue along currently established lines. Poverty remains a persistent problem. With limited low-income housing provision in suitable locations the poor and lower income groups will increasingly be forced to live in inappropriate, temporary and semi-permanent dwellings often in the urban periphery or land otherwise marginally suitable for residential development.

Under a BAU scenario, by 2030 the combination of these factors, increased pollution levels, road congestion, and uncontrolled private development will lead to a gradual deterioration in the living environment in Phnom Penh. By 2030 the functionality and competitiveness of the city will start to be seriously impaired. Aspirations to move up the value-chain under the Cambodia Industrial Development Policy 2015-2025 will be hampered and the city will remain a center for low-cost production. Poor infrastructure provision (energy, water, transport, waste) will further compromise competitiveness relative to other low-cost countries, making the city's development progress increasingly precarious. Growth in tourism will be compromised as the city becomes an increasingly unattractive place to visit due to congestion, high pollution levels and the loss of cultural and amenity areas. High-end developments in peri-urban areas will stand empty or under-utilized, locations next to polluting manufacturing industries and open water bodies filled with solid waste and undergoing eutrophication will be undesirable. Overall, the city's national function, and the quantity and quality of economic growth will be compromised.

6.2 PILOTING GREEN GROWTH SCENARIO

Under this scenario a number of important plans are implemented covering essential urban services and infrastructure, including the Phnom Penh Transportation Master Plan, the new urban Master Plan, the Master Plan for Drainage and Sewage, plans to upgrade the electricity distribution in the city, and the National Energy Efficiency Policy, Strategy and Action Plan.[73] In addition, some pilot investment projects for green city development are implemented but major sector reforms are not implemented. The particular issues and changes projected under a "piloting green growth" scenario for the city include:

- Energy consumption – Energy use will increase rapidly, with increases in measures of energy intensity (energy use per capita and energy use per unit value added), but less so than under the BAU scenario. Together with a declining average off-take tariff – falling to 0.10 USD/kWh by 2020 (in line with current policy) – large consumers who formerly relied on isolated generation will switch to grid-based power, and there the need for back-up generation is diminished. At the same time, demand in manufacturing industry, residential and commercial demand will continue to grow quickly.
- Energy Efficiency and Renewables – The progress in energy efficiency technology deployment will lead to some increased energy efficiency. Similarly, renewable energy will make some headway in power generation within the city. Solar PV will be used as part of hybrid systems in some isolated manufacturing plants. For buildings with significant energy demands, particularly from cooling loads, solar PV will be increasingly common. Similarly, waste processing plants will seek to cover some of their own energy needs though waste-to-energy technologies.
- Transport management – Growth in transportation demand will be the most important driver of greater fossil fuel use. However, better public transport provision, better integration of land-use planning with road provision, the development of a more effective parking and traffic management systems will ease congestion despite increased transportation demand. Vehicle energy efficiency will also be improved overall with the implementation of a vehicle-testing regime.
- Water consumption – Structural drivers will also lead to rapidly increasing water demands. The introduction of more water efficient practices and processes in the manufacturing industry relative to the BAU will be an important contributor to relative reductions in water use.
- Local air pollution – Local air pollution will be significantly reduced relative to the BAU scenario, but increased substantially relative to current conditions. The improvements in the energy efficiency of the transport sector (referred to above) will contribute to these relative reductions.
- Water pollution – Given the relatively modest changes in water consumption relative to BAU, wastewater discharges will remain a challenge. Progress will be made on treatment plants for municipal waste-water, although this will be partial, and it is likely that discharges of untreated municipal wastewater will exceed what is currently the case.

[73] Yet to be adopted by the RGC.

- Solid waste – As with the BAU scenario, the overall volume solid waste will increase dramatically by 2025. Within districts serviced by the new waste reduction and collection regimes, solid waste is drastically reduced, and remaining waste is collected efficiently. However, unregulated dumping will remain a problem, particularly in peri-urban areas, and the lack of adequate solid waste disposal in the form of sanitary land-fills – with knock-on implications for water quality.

This scenario represents significant improvement relative to BAU. In key areas which have a direct and visible impact on enterprises bottom-line such as transport and energy there are significant improvements over the BAU scenario. This in turn will result in lower levels of air pollution in particular. Moreover, spatial planning projects in several central districts will greatly improve the functionality of those areas, with reductions in speculative development, greater provision of public areas, protection of heritage, improved pedestrian environment and lowered local flooding risks. The local environment will be improved still further when coupled with interventions to improve solid waste collection. Broader initiatives affecting peri-urban areas to make provision for low income housing and industrial development will further improve the city's functionality and environment. Nevertheless, air pollution levels are still likely to rise, and water and solid waste issues will remain a critical problem. Some uncontrolled development will continue unabated resulting in similar issues to those experienced in the BAU scenario. Overall, the city will see some environmental improvements which may allow it to remain competitive for low cost production and maintain its present national function at a larger scale.

6.3 MAINSTREAMING GREEN GROWTH SCENARIO

Under this scenario all sector plans and reforms identified in the "Piloting Green Growth" scenario are implemented, but also the city-wide scale up of the concrete pilot projects and sector wide reforms. This scenario includes sectoral reform to support for the adoption of electrical vehicles, improvement in transportation fuel standards, cross-sectoral support for renewable energy and energy efficiency, support for the implementation of wastewater treatment for municipal and manufacturing wastewater, effective solid waste reduction, collection and disposal, city-wide land-use zoning, the protection and enhancement of cultural heritage and the provision of public space and green areas. The changes projected under a "mainstreaming green growth" scenario for the city include:

- Energy consumption – As under other scenarios energy use will increase rapidly, although more aggressive energy efficiency policies and the promotion of renewable energy will result in lower demand for conventional energy relative to the BAU scenario. Electricity consumption is also likely to see rapid growth, although lower than BAU and PGG scenarios.
- Energy Efficiency and Renewables – There will be a higher penetration of renewable electricity generation. Despite falling average off-take tariffs rooftop solar PV will become ubiquitous. Uptake of solar PV will be driven by falling costs, the implementation of net metering and time-of-day pricing, and this will have a significant impact on daytime peak demand. Other renewable energy options such as waste-to-energy will be used widely in waste treatment facilities. Wide-scale adoption of energy efficiency measures will result in reduced energy demand from all sectors.
- Transport reforms – As in the other scenarios, growth in transportation demand will be significant and will remain the most important driver of greater fossil fuel use. As with the PGG scenario, energy efficiency in the transport sector will be improved relative to the BAU scenario. Electrical vehicles will make significant in-roads into the sector with support for electric bikes and solar tuk-tuks seeing their widespread adoption in the city and displacement of conventional technologies.
- Water consumption – Water use will continue to rise rapidly, although at a more moderate rate relative to BAU and PGG scenarios. Household water use is expected to grow with some moderation relative to alternative scenarios due to more widespread availability of energy (and water) efficient appliances.

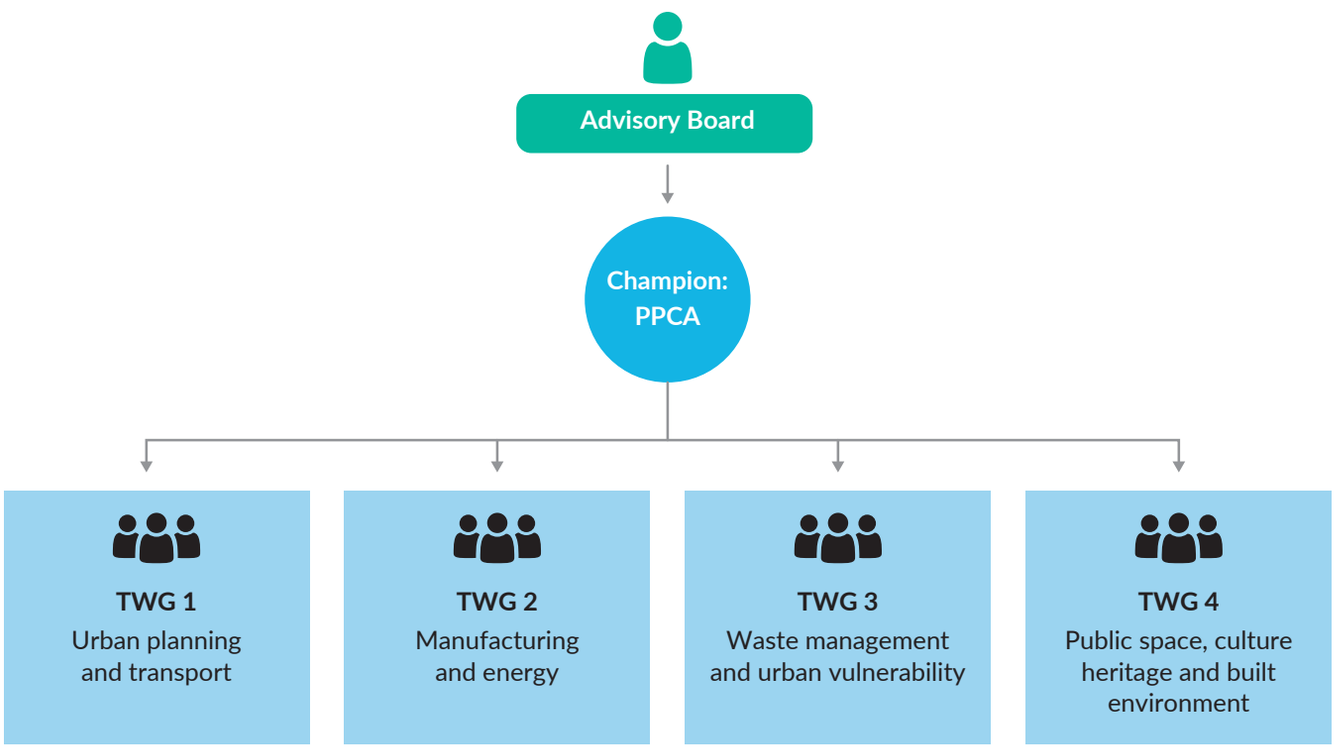
- Local air pollution – Local air pollution will change in its composition and increase somewhat relative to the current situation but less than either BAU or PGG scenarios. Improvements will result from better road infrastructure, improved traffic management, vehicle emissions testing, improved transportation fuel standards, provision of public transport and lower levels of congestion. There will also be better enforcement of environmental protection standards in the manufacturing industry will significantly reduce air pollution from this sector.
- Water pollution – As with the other scenarios, water pollution emissions are likely to increase although this will be moderated due to efficiency measures more substantial than those realized in the PGG scenario. Greater progress will be made on wastewater treatment plants for municipal and manufacturing water emissions, as funds are made available for wastewater treatment facilities through a series of fees and fines for wastewater emissions.
- Solid waste – Under this scenario, solid waste production will increase relative to current conditions. However, citywide efforts to promote product repair, and the reuse, reduction and recycling of waste streams will reduce waste generation significantly relative to the other scenarios. The collection of solid waste under this scenario is managed effectively throughout the city, reducing air pollution from open burning and blockages of drainage culverts and drains from solid waste.

By 2030, pollution levels and resource usage will have increased dramatically. However, better traffic management, integrated land use planning, strict pollution control and energy efficiency regimes coupled with an expanded financing facility for environmental investments will lead to a gradual improvement in the living environment for most residents of the city. The functionality and competitiveness of the city will gradually improve. Aspirations to move up the value-chain will be enhanced. Better, more efficient infrastructure and service provision will make doing business easier and Phnom Penh will be able to attract more productive, higher value-added investment. A better living environment, public amenities and the protection of cultural heritage will make the city a much more attractive place to live and do business. These improvements will also enhance the city's attractiveness to tourists. The adoption and diffusion of new green technologies in the city will also generate a market for high-tech infrastructure provision and manufacturing industries engaged in rapidly growing markets for green technologies, many of which may choose to locate in the city. Overall, a mainstreaming approach to green city development would not only enhance the local and national environment, but also enhance the prospects for long-term productivity gains and competitiveness for the city.

7. PROPOSED IMPLEMENTATION ARRANGEMENTS

An Advisory Board, and four Technical Working Groups shall be established to support Phnom Penh Capital Administration to effectively implement the sustainable city plan. The following section provides the detail description of the role and responsibilities of the Advisory Board and the Technical Working Groups.

Figure 8. Proposed implementation arrangements of the Phnom Penh Sustainable City Plan



7.1 ADVISORY BOARD

The main role of an Advisory Board is to provide strategic advice and oversight on the implementation of the sustainable city plan. It aims to ensure that the vision is realized, the goals are met, and the overall sustainable city plan is successfully implemented within the set time frame.

The Advisory Board will have the following responsibilities:

1. Provide strategic oversight and direction to the implementation of the sustainable city plan and ensure that the plan's vision is realized, the goals are met, and the overall sustainable city plan is successfully implemented by the end of the deadline
2. Appoint an officer(s) from their respective ministry to be members in one or more of the sector-based TWGs [74]
3. Endorse and support the delivery of activities of PPCA
4. Meet regularly to review and monitor the implementation progress and achievement.

[74] There will be four sector-based TWGs under the Advisory Board to be set up to support the GUDP's activities in 8 urban sectors. Each TWGs will responsible for two sectors. The Terms of Reference for each TWGs will also be developed accordingly.

The Advisory Board shall consist of senior representatives from relevant ministries ,PPCA and government institutions. The Board will be chaired by National Council for Sustainable Development (NCSD) given its strong coordination experience among relevant line ministries and its role in green urban development in Cambodia and the Vice Chair will be the Ministry of Interior, given its responsibility for sub-national level development planning.

7.2 TECHNICAL WORKING GROUP

The main objective of the TWGs is to support PPCA with the implementation of the sustainable city plan by providing technical advice and support in order to achieve the plan's set goals. The roles and responsibilities of the TWG are as follows:

- Provide technical inputs for the implementation
- Produce short and medium-term action plan for the respective sector
- Mobilize resources for the implementation of priority green city projects
- Monitor progress toward the green urban goals in the respective sector
- Produce annual progress report
- Report to PPCA on a regular basis.

PPCA will report to the Advisory Board on the progress made by the four TWGs.

The following four TWGs shall be established to lead the implementation of the eight sectors mentioned in the sustainable city plan.

1. TWG 1: Urban planning and transport. This TWG will cover topics such as land use planning, zoning, planning of new industrial zones and clusters, creation of urban land reserves for low-income housing, public transport, traffic management, vehicle control, air pollution, parking, etc.
2. TWG 2: Manufacturing and energy. Topics covered include renewable energy, energy efficiency, green manufacturing process, water use in SMEs and Special Economic Zone, etc.
3. TWG 3: Waste management and urban vulnerability. This TWG is responsible for leading the technical work on solid and liquid waste management, household sanitation, decentralized waste water facilities, flood prevention, drainage, etc.
4. TWG 4: Public space, culture heritage and built environment. Topic to be discussed in this TWG may include cultural heritage preservation and restoration, multi-functional recreational park, etc.

Phnom Penh Capital Administration, with the support of the NCSD, GGGI and other development partners, shall provide leadership and coordination among the four TWGs. To the extent possible, PPCA shall make use of its existing institutional coordination structures.

Members of each TWGs shall consists of technical representatives from PPCA's relevant department, representatives of the 12 districts in Phnom Penh, relevant department of each ministry, development partners, NGOs and civil society, private sector and the academic partners working on relevant sector. Each TWG should have a chair and co-chair who will report the progress to PPCA.

7.3 FINANCIAL RESOURCES

Each TWG will propose a financial mobilization plan which lays out the resources needed to implement their activities and the strategy to get those resources. Possible funding sources include municipal revenue from PPCA and line ministry budget, development partners, international funds and private sector investment. In 2016, private sector accounted for 62% of global climate finance. By creating the right regulatory environment, financing mechanisms (as shown in figure 9) and risks reducing instruments (as shown in table 4), public sector can go a long way in stimulating such private investment.

Figure 9. Financing mechanism at the urban scale

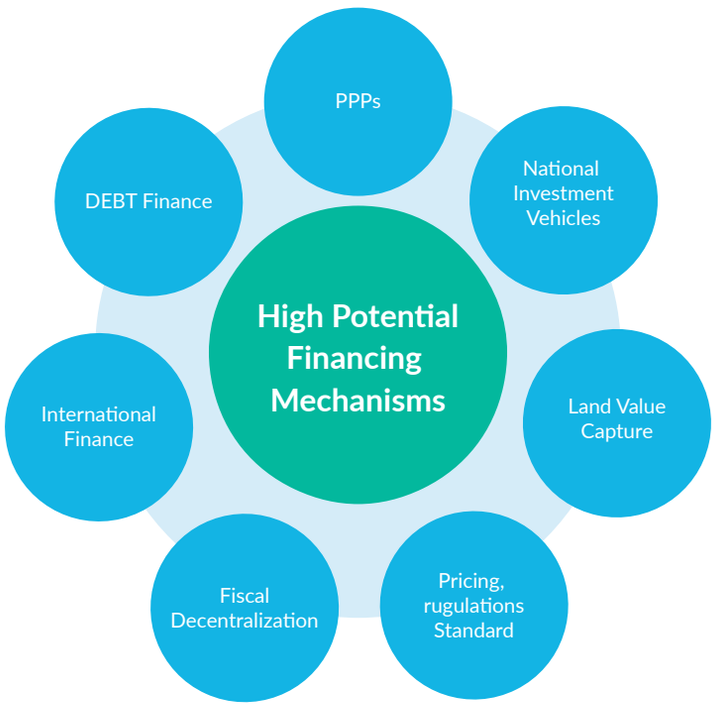


Table 4: Green growth financing – Risk

Category of Risk	Common Examples
Political Risk	• Unstable political environment, security concerns • Changes in national or local government support for green projects
Regulation Risk	• Policies that promote "brown" growth (e.g., fossil fuel subsidies) • Insufficient enabling policies, regulatory changes • Weak legal frameworks and limited enforcement of regulations
Technology Risk	• Technology underperformance, limited in-country expertise • Inadequate supporting infrastructure (e.g., transmission)
Credit Risk	• Counterparty creditworthiness, risk of default or non-payment • End-user payment for public services
Capital Markets Risk	• Immature national and local financial markets, limited market liquidity • Currency fluctuations

A few climate funds are particularly worth highlighting. The Cambodia Climate Change Alliance (CCCA)'s grant facilities are a potential source of funding. The grant, which is managed by the Climate Change Department, aims to support the implementation of the Cambodia Climate Change Strategic Plan (CCCSP) 2014-23, by providing support for catalytic initiatives that will help leverage the required human, institutional and financial resources in the various sectors of the climate change response. Between 2011 and 2014, 20 demonstration projects led by Government agencies, universities and NGOs have been financed under two separate calls for proposals, for a total value of over USD 6 million.[75]

Another funding source worth considering is the Global Environment Facilities (GEF)- administered Funds. The GEF provides support for activities that protect the global environment through the different trust funds it administers. The GEF's Trust Fund is provided for activities in biological diversity, climate change mitigation, land degradation, international waters, and chemicals and waste. The Special Climate Change Fund (SCCF) finances adaptation and technology transfer in all developing country parties to the UNFCCC. It provides support for the additional cost of adaptation to generate measurable adaptation benefits. The Least Developed Countries Fund (LDCF) addresses the urgent and immediate adaptation needs of the 51 Least Developed Countries that are especially vulnerable to the adverse impacts of climate change. The Adaptation Fund supports adaptation projects and programs in developing countries that are Parties to the Kyoto Protocol and are particularly vulnerable to the adverse effects of climate change.[76]

The Green Climate Fund (GCF) is the latest international funding mechanism that assist developing countries in adaptation and mitigation practices to counter climate change. The GCF supports projects, programs, policies and other activities in developing country Parties using thematic funding windows. It is intended to be the centerpiece of efforts to raise Climate Finance of $100 billion a year by 2020. The GCF gives recipient countries access to funding through accredited national, sub-national and regional implementing entities and intermediaries. Countries can also access funding through accredited international and regional entities (such as multilateral and regional development banks and UN agencies) under international access. Some funds will be distributed through Enhanced Direct Access, in which developing country-based accredited institutions receive an allocation of GCF finance and then make their own decisions on how to program resources. In October 2016, the GCF approved USD 745 million in funding proposals. There are 10 projects and programmes which have a combined value of USD 2.6 billion and will help 27 countries across the globe to reduce their emissions and adapt to the impacts of climate change. The projects and programmes are mainly about adaptation (52%), cross-cutting (22%), and mitigation (26%) .[77]

7.4 MONITORING AND EVALUATION

The implementation of the Phnom Penh Sustainable City Plan will be subject to rigorous monitoring and evaluation. To the extent possible, PPCA shall make use of its existing monitoring and evaluation processes. In additional to the annual monitoring, there will also be mid-term evaluation to be carried out in 2024 and end of implementation evaluation in 2030. Each TWG shall develop specific evaluation targets and indicators and shall submit an annual monitoring report to PPCA which outlines the progress and challenges in the implementation of the priority actions, projects and resource mobilization. PPCA will then compile all the TWG's findings and produce a consolidated report for the Advisory Board. The mid-term and end-of-term evaluation process could be conducted by an external consultant, under the direction of PPCA. The results of the monitoring and evaluation will be also made publicly accessible.

[75] More information on how to apply is available in this website http://www.camclimate.org.kh/en/grant-facility/description.html.
[76] More information on how to apply for these funds is available at https://www.thegef.org/gef/who_can_apply.
[77] More information about the Fund is available here http://www.greenclimate.fund/home.

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ANNEX A: LIST OF STAKEHOLDERS CONSULTED

NATIONAL GOVERNMENT

- National Council for Sustainable Development (NCSD)
- Ministry of Economy and Finance (MEF)
- Ministry of Interior (MOI)
- Ministry of Planning (MOP)
- Ministry of Land Management, Urban Planning and Construction (MLMUPC)
- Ministry of Environment (MOE)
- Ministry of Public Works and Transport (MPWT)
- Ministry of Industry and Handicrafts (MOIH)
- Ministry of Mines and Energy (MME)
- Ministry of Water Resources and Meteorology (MOWRAM)
- Ministry of Women's Affairs (MOWM)
- Ministry of Tourism (MOT)
- Ministry of Commerce (MOC)

NGOS AND ACADEMIC INSTITUTIONS

- Nexus
- GERES
- Cambodian Institute for Urban Studies
- NGO Forum
- The Asia Foundation
- People in Need
- World Wide Fund for Nature (WWF)
- Heinrich Böll Stiftung (HBS)
- Royal University of Phnom Penh
- Netherlands Development Organization (SNV)
- Enrich Institute
- IGES

LOCAL GOVERNMENT IN PHNOM PENH

- Phnom Penh Capital Administration
- Khan Chamkar Morn
- Khan Daun Penh
- Khan 7 Makara
- Khan Toul Kork
- Khan Dong Kor
- Khan Mean Chey
- Khan Russey Keo
- Khan Sen Sok
- Khan Por Sen Chey
- Khan Chbar Ampov
- Khan Chroy Chang Var
- Khan Prek Pnov

DEVELOPMENT PARTNERS AND PRIVATE SECTOR

- Cambodia Climate Change Alliance (CCCA)
- Asian Development Bank (ADB)
- UNDP
- UN Habitat
- USAID
- KOICA
- European Union
- Japanese International Cooperation Agency
- World Bank
- GIZ
- Department of Foreign Affairs and Trade
- Agence Francaise Development
- UNIDO
- UNESCO
- UNCDF
- KFW
- WaterAid
- International Finance Corporation
- EuroCham Green Biz

ANNEX B: SUSTAINABLE CITY DEVELOPMENT PROJECTS*

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
1. Detailed land-use and zoning plan for Daun Penh District The detailed land-use and zoning plan for the Doun Penh District will protect streetscapes, building stock and public areas of critical importance to the identity of the city. It will improve the livability and functionality of the area and increase its attractiveness to residents and visitors alike.	Short Term	• PPCA, MLMUPC, District and commune authorities, civic association for cultural heritage, local businesses and architecture universities
2. Detailed land-use and zoning plan for Takmao growth pole The plan will ensure a robust urban future for Takmao's expansion; it will also ensure that urban transport and land-use are planned hand-in-hand, to optimize the use of urban infrastructure. According the approved Master Plan on Land Use 2035, Takmao is slated to become one of the major four urban growth poles within the agglomeration.	Short Term	• PPCA, MLMUPC, Provincial authorities (including at district and commune levels) • Universities (CIUS)
3. Planning of new industrial zones and clusters The planning of new industrial zones and clusters will be guided by issues of competitiveness, urban resilience, urban traffic flows, as well as by the goal of concentrating them away from residential areas in order to protect public health. Manufacturing processes would be organized around clean production principles.	Medium Term	• PPCA, MLMUPC, MIH, GMAC, CDC.
4. Creation of urban land reserves for low-income housing The creation of urban land reserves implies the a) identification of state private land that can be set-aside for residential purposes; and b) the acquisition of privately owned land, be it agricultural or otherwise. The creation of land reserves will entail institutional arrangements, financial resources to be made available by the Government, and a clear identification of the mechanisms for the allocation of the land to specific low-income housing development schemes.	Medium Term	• PPCA, MLMUPC

**Note: Each of the 48 investment projects has a detailed concept note which is available in a separated study report*

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
5. Validation of Master Plan for Land Use for metropolitan Phnom Penh. This validation process will be a major step in ensuring the credibility and reliability of local governance. It will require specialized resources and dedicated skills, as well as a functional information system to present, convey proposals, and record feedback.	Medium Term	• PPCA, MLMUPC
6. Study of metropolitan management arrangements for the capital city. The study will: a) review relevant international experience with metropolitan management in low-income and low-middle income countries; b) look at institutional, legal and fiscal options possible in the current Cambodian context; c) conduct consultations with relevant stakeholders; and d) offer recommendations and options to construct a roadmap for reform.	Short Term	• PPCA, MoI, MEF
7. Improved household sanitation systems in peri-urban areas. The project would demonstrate the use of a low-cost household sanitation system using simple technology for containing wastes and limiting human waste dispersion and public health threats during flooding events. An Eco-san toilet or a similar design could be used in the demonstration area.	Short Term	• PPCA, MPWT,
8. Demonstration of a decentralized wastewater system in a peri-urban area. The project would demonstrate the feasibility and affordability of using a decentralized treatment system in a peri-urban area not covered by the Phnom Penh's forthcoming centralized treatment facility. Small-scale decentralized systems can be mass-produced and easily installed, and the highly treated water can be discharged locally.	Short Term	• PPCA, MPWT, MIH, MLMUPC, MOE, Phnom Penh District and commune authorities
9. Demonstration of a redesign of an existing park area for improved water retention and cooling Several parks and gardens have been extensively paved with impenetrable materials that prevent water from being absorbed into the ground. The project would remove some trees and shrubs and replace them with native species that are more efficient in water capture and retention.	Short Term	• PPCA, MLMUPC, MOE

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
10. Demonstration of a small scale constructed wetland for wastewater treatment. Phnom Penh has several natural wetland areas that have historically served as natural wastewater treatment systems. The project would demonstrate the feasibility of constructing a wetland for wastewater treatment on a relatively small scale for possible replication in other areas.	Short Term	• PPCA, MOE,
11. Regulations, zoning, safeguards to protect blue / green areas Phnom Penh's Master Plan on Land Use 2035 includes development goals to preserve natural systems such as lakes and wetlands and creating green areas within the city. The project would prepare a set of land use zoning regulations and safeguards identifying critical green areas for conservation.	Medium Term	• PPCA, MLMUPC
12. Downscaling climate change threat forecast for Phnom Penh The project would consist of downscaling climate data from IPCC scenarios, Global General Circulation Models, Regional Climate Models, and Weather Research and Forecasting Models to the Phnom Penh area and then using downscaled data as input to standard hydrological and flood drainage models.	Short Term	• PPCA, NCSD, MOE, MOWRM • Universities
13. Pilot energy efficient street lighting Street lighting in Phnom Penh has significant potential for energy efficiency upgrades and the installation of energy efficient lighting in new developments. Three main options for improving lighting efficiency include: 1. Replacement of conventional lighting with LED street lighting; 2. Retrofit/install dimmable ballasts to existing/planned metal halide and sodium vapor lamps to improve energy efficiency, control of lighting; and 3. Smart control/lighting management systems for 1 and 2.	Short Term	• PPCA, NCSD, MME, EDC
14. Labelling for energy efficient appliances The project would support, 1) the development of a labeling system; 2) capacity development for testing and labeling energy efficient products; 3) enforcement of the labeling and testing regime; 4) awareness raising among consumers and retailers.	Short Term	• PPCA, NCSD, MME
15. Promotion of Solar Water Heaters Solar thermal technology can be used to provide hot water for domestic and industrial uses. This project aims to provide a revolving fund to support the implementation of this technology at private households, hotels and commercial establishments.	Short Term	• PPCA, • MME, MIH, NCSD

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
16. Energy Service Company (ESCO) for Roof-top solar PV at municipal buildings Developing an ESCO to finance, supply, install and operate the technology is a common approach to overcome barriers to technology implementation from risks relating to energy price, technology performance, installation and achieving financing for the project.	Short Term	• PPCA, NCSD, MME, EDC
17. Hybrid diesel solar generation for large industrial users Large industrial electricity users often use isolated or back-up HFO/diesel generation to replace or supplement grid-based electricity. The project would promote the use of hybrid solar diesel technology as a more cost-effective and environmentally benign alternative to HFO and diesel generation.	Medium Term	• PPCA, MME, MIH, EDC, EAC, NCSD
18. 'Super ESCO' for public sector energy services in Phnom Penh This project is to develop a super ESCO under an appropriate public institution in Phnom Penh, possibly EdC. A Super ESCO is a publicly owned entity created by the government that serves as an ESCO for the public (hospitals, schools,	Medium Term	• PPCA, MME, EDC, NCSD
19. Policy and institutional support for renewable electricity generation The policy development package would include a number of research components aimed at investigating appropriate policy approaches (e.g. feed-in tariff levels, suitable time-of-day tariff regime, etc.), as well as development of institutional and legislative reforms.	Short Term	• PPCA, MME, EDC, NCSD, EAC • Solar Energy Association
20. GHG inventory and mitigation modelling for Phnom Penh The development of a GHG emissions inventory and more robust GHG emissions projections and mitigation scenarios would enable the city to 1. Identify cost-effective mitigation opportunities; 2. Develop a robust MRV mechanism; 3. Better account for emissions reductions in mitigation projects and programs; and, therefore 4. Enable the mobilization of carbon finance for project investment.	Medium Term	• PPCA, NCSD, MOWRM

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
21. Promotion of Solar Tuk-Tuks Electrical tuk-tuks for passenger transport or light freight transport with lead-acid or lithium ion batteries changed by solar PV integrated into the roof of the vehicle represent a potentially viable alternative to conventional tuk-tuks using gasoline.	Short Term	• PPCA, MME, MPWT
22. Promotion of e-bikes E-bikes are a proven and increasingly common technology. There are potential synergies with the expansion of renewable energy generation. This project proposes to promote the expansion in use of e-bikes while at the same time addressing concerns related to safety thorough an integrated policy package.	Medium Term	• PPCA, MoE, MPWT
23. Parking support package for Phnom Penh In many places parked cars and motorbikes and encroachment by commercial activities make sidewalks impassable. This project envisages a package of measures to better regulate parking.	Medium Term	• PPCA, MLMUPC, MPWT, Phnom Penh District and Commune authorities
24. Piloting pedestrianized areas This project would support i) a consultative and awareness raising process involving residential and commercial residents, urban planners, district and city administrations and the transportation authorities, highlighting the advantages of such a scheme and addressing local concerns; ii) trialing road closures for pedestrian only access during established time windows; iii) redesigning infrastructure to enhance area for pedestrians and commerce.	Medium Term	• PPCA, MLMUPC, MPWT
25. Air Quality Monitoring This project seeks to develop a more extensive air quality monitoring system with adequate capacity to maintain the system at Phnom Penh Department of Environment with support from MOE.	Medium Term	• PPCA, MOE
26. Investigation of changes in fuel quality standards for transport fuels The proposed study will look at the potential for tightening controls on fuel quality including: i) Assessment the impact of poor quality transport fuels on air quality in urban areas; ii) Assess the enforcement and testing system for transportation fuels in Cambodia; iii) Assess the availability of cleaner transportation fuels and perform a cost comparison with current fuels; iv) Develop a roadmap for the introduction of cleaner transportation fuel standards.	Short Term	• PPCA, MLMUPC, MPWT, MOC, NCSD

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
27. Pilot Demonstration of Low cost Sustainable housing The project would demonstrate the feasibility of using low cost home construction in peri-urban areas using low-cost locally available sustainable materials.	Short Term	• PPCA, MLMUPC
28. Demonstration of renovation of a cultural heritage building for commercial purposes using energy efficient and green building designs The project would renovate an old cultural heritage building – either French Colonial or New Khmer Architecture – for commercial purposes using energy efficiency and green building concepts with the ultimate goal of enabling the property to receive a Leadership in Energy and Environmental Design (LEED) building certification.	Short Term	• PPCA, MCFA, MME
29. Household flood-proofing guidelines Flooding occurs on a regular or seasonal basis for many households and small businesses in Phnom Penh. Flood proofing guidelines can provide information on how to make households more resilient to flooding. The guidelines could consist of the following flood adaptation techniques.	Short Term	• PPCA, MLMUPC, NCDM, NCSD
30. Guidelines for constructing energy- and resource-efficient buildings (residential and commercial) Energy-efficient guidelines could address the following energy conservation and energy efficiency measures: building orientation and size of structural openings to promote natural ventilation, window glazing to reduce solar irradiation, window over-shading / automated louvered windows to decrease solar penetration, solar water heating, solar electrical generation, smart energy management systems, use of thermal insulation materials, and energy efficient lighting fixtures.	Medium Term	• PPCA, MLMUPC, MME, NCSD
31. Flood management guidelines for property development The guidelines could consist of the following rainwater management measures: optimum types of trees, green canopy and gardens for rainwater capture; rainwater harvesting and retention ponds; bio-swales and storm water tree pits to capture and promote infiltration of rainwater; and use of permeable surfaces for parking areas.	Medium Term	• PPCA, MLMUPC, NCDM

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
32. Development of water pollution control fund This project would provide long-term finance for environmental protection projects at manufacturing industry in the city through the development of a revolving fund and technical support facility.	Medium Term	• PPCA, MIH, MoE
33. Efficient water use pilot in PPSEZ There is significant potential to reduce water use at manufacturing industries, resulting in lower water bills, reduced energy demands and lower levels of waste water emissions. Water use reductions can be realized through modification of existing processes and management techniques, the application of new more efficient technology and the reduction in water losses through leaky pipes and valves.	Short Term	• PPCA, MIH, MoE, CDC, NCSD
34. Pilot ESCO in PPSEZ This project would support the development of a pilot energy services company (ESCO) to support the deployment of energy efficient technologies, with a special focus on PPSEZ. The ESCO would provide energy audits and management plans and identify and implement energy efficiency projects for firms.	Short Term	• PPCA, MIH, MME, NCSD
35. Pilot to Improve Access to Finance for EE at SMES (Training/Seed Capital Fund at Commercial Banks) Some of the main barriers facing cleaner and more efficient production in Cambodian manufacturing enterprises (especially SMEs) are access to finance and access to high quality, affordable technical services. This project would seek to increase the amount of financing available on suitable terms for energy efficiency and cleaner production projects at manufacturing enterprises in Phnom Penh.	Short Term	• PPCA, MIH, MME, NCSD
36. Study on Waste Exchange Potential across industrial sectors with special focus on Special Economic Zone This study would look at the potential for recycling by-products from manufacturing to be used as inputs in different industries. Examples might include the use of slag from steel production in cement production, the production of bricks from various manufacturing residues etc.	Short Term	• PPCA, MIH, MoE, NCSD • Universities

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
37. Green manufacturing at village handicraft industrial clusters This study would seek to investigate the potential for developing a "one village one product" model of handicraft villages that have been successful elsewhere in the region, with an additional emphasis on the potential for green production.	Medium Term	• PPCA, MIH, MoE
38. Study on pollution loads and hazardous waste management in the manufacturing sector This project would i) develop comprehensive estimates of pollution loads and toxicities and their geographical distribution in the city; ii) Ground truth estimates through monitoring at selected sites; iii) Estimate impact on environmental quality (air, water, solid waste and hazardous waste) and identify pollution hot-spots; iv) Ground-truth impact estimates with measurements at selected sites; v) Conduct an audit of pollution control technologies and management practices in the city; vi) Review legislation in light of findings and make proposals for improved environmental protection through improved legislative safeguards, enforcement and monitoring regimes.	Short Term	• PPCA, MIH, MoE
39. Waste source separation and 4R pilot demonstration in one district. The project would establish a waste source separation pilot demonstration in one district including undertaking a public awareness campaign, supplying containers for waste separation, establishing separated waste collection points, and identifying options for recycling and composting the reusable components of the separated wastes.	Short Term	• PPCA, MoE, Phnom Penh District and commune authorities
40. Pilot demonstration of waste-to-energy conversion The project would undertake a waste-to-energy conversion demonstration in a pilot district practicing waste source separation. The organic and combustible component of municipal wastes will be burned in a specially designed incinerator for producing steam and ultimately electricity.	Medium Term	• PPCA, MME, MOE, NCSD, Phnom Penh district authorities
41. Solid waste management strategy for Phnom Penh The project will prepare a Solid Waste Management Strategy for Phnom Penh that will define coordinating mechanisms between districts, which may include possibilities for districts to join together as cooperative units to manage their respective solid wastes.	Short Term	• PPCA, MoE, Phnom Penh district authorities

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
42. Regulations for banning use of plastic bags The project would draft a single-use plastic bag ban regulation, for inclusion in the Environmental Protection and Natural Resources Management Act, sub-decree on Solid Waste Management. The scope of the regulation would include all markets, restaurant, and other retailers. Exceptions to the ban could be made for containing large bulk items.	Short Term	• PPCA, MoE, Phnom Penh district authorities
43. District level Capacity Building for Solid Waste Management The project would undertake a waste management capacity building training program in one pilot district of Phnom Penh, for future replication in others. The capacity building program would include all aspects of waste management including establishing collection tariffs, financial management, customer service, and waste contractor management.	Short Term	• PPCA, MoE, Phnom Penh district authorities
44. Multi-functional recreational park The project would design the landscape into a multi-use public park area with exercise, skateboarding and relaxing facilities. The public area would also be designed with a green canopy for shading and planted with vegetation and shrubbery for water retention.	Short Term	• PPCA, MPWT, MOE, NCSD, MLMUPC
45. Demonstration of cultural heritage site restoration The project would select an unoccupied French Colonial building or a New Khmer Architecture building for demonstration, and then completely renovate the structure for functional use and tourism.	Short Term	• PPCA, MCFA
46. Demonstration of pilot green / blue corridors for multi-functional use The pilot green corridor would integrate natural hydrological systems into a multi-use recreational and city beautification green areas. The multi-use functions could include walking, jogging and cycling paths and nature trails. The pilot area would also increase urban biodiversity and attract many bird species back to the inner-city areas.	Medium Term	• PPCA, MPWT, MOE, MLMUPC

PROJECT TITLE	TIME FRAME	POTENTIAL IMPLEMENTING INSTITUTIONS
47. Regulations for cultural heritage preservation The project would draft a Cultural Heritage Preservation Act for Cambodia, modelled after similar legislation in other countries. The Act would define the types of cultural heritage sites and monuments to be protected, stipulate national and sub-national responsibilities, collect documentation and records for all sites, empower a state institution for implementing the Act, and create mechanisms for funding through state, international and private contributions.	Medium Term	• PPCA, MCFA
48. Fund creation for cultural heritage preservation. The project would analyses several potential funding mechanisms for cultural heritage preservation in Phnom Penh. Once a suitable funding mechanism has been selected, the project would build upon this mechanism to establish an organizational structure to manage and implement the fund.	Medium Term	• PPCA, MCFA

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