



Global
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Institute

GREEN CITY STRATEGIC PLANNING METHODOLOGY

A guide for the development of a Green City Strategic Plan

August 2016

Prepared by the National Council for Sustainable Development (NCSD), Royal Government of Cambodia (RGC), the Global Green Growth Institute (GGGI) and the International Centre for Environmental Management (ICEM).



FOREWORD

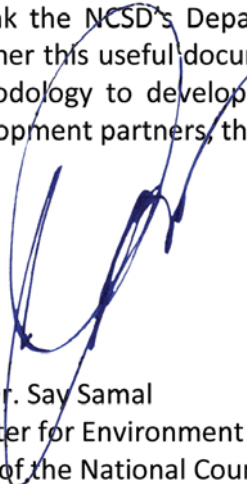
I would like to congratulate the National Council for Sustainable development (NSCD) and the Global Green Growth Institute (GGGI) for producing this Green City Strategic Planning Methodology which will serve as a guide to provide Cambodian policy makers at the national and sub-national levels with a guide on how to introduce and implement principles of sustainable and inclusive green growth in their urban development strategies.

The development of green and sustainable cities in Cambodia is a key policy priority for NSCD. Cities are the center of economic activity 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 industry and consumers to drive economic development. Cambodia has an opportunity to accelerate its growth potential further through city development; harnessing the opportunities of garment sector, tourism and the real estate construction boom.

But our cities are urbanizing at a rapid rate and our natural resources and infrastructure in our cities are under increasing pressure. Essential infrastructure for water supply, sanitation, waste management, transport and energy has been unable to match the rate of urban growth. Pressure on our cities and towns will be exacerbated by climate change. The projected increase in average temperature and extreme weather events is likely to require city dwellers to consume more energy to deal with the temperature rise – as well as manage increased flooding and storm-water runoff during the wet season.

If managed well, our cities also provide a great opportunity to curb our greenhouse gas emissions growth. Cities are also the most effective scale at which we can see innovative action on climate change. A green city development approach is critical for all Cambodian cities and towns to offer sustainable and resource-efficient urban lifestyles, provide secure energy and transport, and promote green businesses.

I thank the NSCD's Department of Green Economy and the GGGI for their hard work in putting together this useful document. I encourage government policy makers to make the best use of the methodology to develop a green city strategic plan for their respective city, with support from development partners, the private sector and the academic community.



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ABBREVIATIONS

BAU	business-as-usual
CBA	cost-benefit analysis
CEA	cost effectiveness analysis
GDP	gross domestic product
GGGI	Global Green Growth Institute
GHG	greenhouse gas
ICEM	International Centre for Environmental Management
IRR	internal rate of return
LCDF	Least Developed Countries Fund
LED	light-emitting diode
LEED	Leadership in Energy & Environmental Design
MACC	marginal abatement cost curve
MCA	multi-criteria analysis
MLMUPC	Ministry of Land Management, Urban Planning and Construction
MoI	Ministry of Interior
NCDD	National Committee for Sub-National Democratic Development
NCSD	National Council for Sustainable Development
NPV	net present value
RGC	Royal Government of Cambodia
UNEP	United Nations Environment Programme

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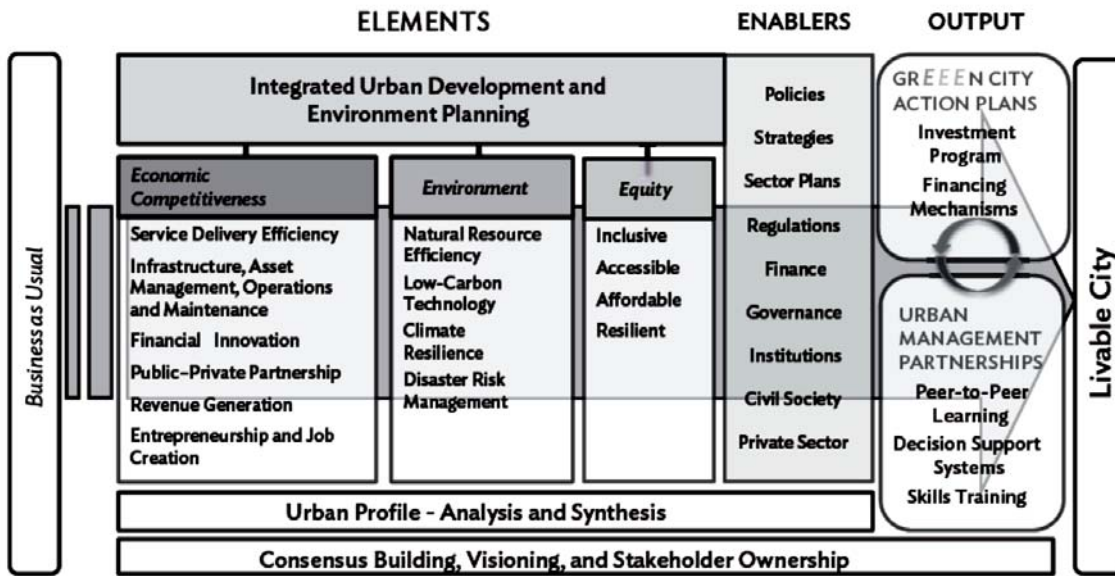
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INTRODUCTION

The **Green City Strategic Planning Methodology** has been conceived as a guide to provide Cambodian policy makers, at national and sub-national levels, with a road map to introduce and implement principles of sustainable and inclusive green growth in their urban development strategies. Inclusive urban green growth is the overarching goal and the process through which cities and towns can go from the current business-as-usual (BAU) scenario to a Liveable Cities scenario, as per Figure 1 below.

Figure 1. From Business-as-Usual to Liveable Cities



Source: Sandhu and Singru (2014), *Enabling GrEEEn Cities: An Operational Framework for Integrated Urban Development in Southeast Asia*, Asian Development Bank Southeast Asia Working Paper Series

The Green City Strategic Planning Methodology is one of the outputs of the **Cambodia Green Urban Development Program, Phase 1**. This program is being implemented as part of the collaborative agreement between the Royal Government of Cambodia (RGC) – represented by the National Council for Sustainable Development (NCS) – and the Global Green Growth Institute (GGGI).

NCS is the agency of RGC responsible for promoting national growth in the context of green economic development. It federates all line ministries in a common network. It facilitates exchanges and communications across the various government departments, at the central and at the provincial level, in order to achieve more integrated strategies and programs aiming at sustainability.

The **General Secretariat** of the NCS, has promotion of urban green growth among its mandates. It intends to assist provincial authorities and local governments across Cambodia in the development of local urban green development strategies. This assistance reflects the important role that cities and other urban centers play in the growth of the Cambodian economy and the wellbeing of its population.

GGGI is an international organization headquartered in Seoul, Republic of Korea, and supported by a number of national and multilateral partners. Its four strategic areas of intervention are energy, green city development, land use and water. Cambodia is one of the founding members of GGGI, and GGGI maintains an office in Phnom Penh.

EXECUTIVE SUMMARY

The **Green City Strategic Planning Methodology** is a step-by-step guide for Cambodia's municipalities, district and commune officials, as well as national line ministries, seeking to embark on the process of transforming Cambodia's cities towards greater sustainability and green growth, with the assistance of the NCSD and the GGGI. The Methodology is organized around **ten key steps**, which are summarized below. Each step is then discussed in detail in subsequent chapters of the report.

Step 1: Green city strategic planning governance arrangements

Green city planning is the primary responsibility of local governments at various scales. These governments will be developing the Green City Strategic Plan with the participation of all relevant local stakeholders and the support of NCSD and professional expertise as required. The Green City Strategic Plan will be the result of a process of consultation that has to be defined at the outset and carried out through well-defined steps. The Planning Secretariat, appointed by the local government, and supported by representatives from national ministries, will create a Green City Planning Group, which will carry out the fact-finding, technical and analytical work as required. The Green City Strategic Plan will be presented to, and endorsed by, relevant stakeholders and the public.

Step 2: Baseline assessment of the urban context

The assessment will provide a complete review of the current status of the target urban location, including the following main dimensions:

- present and future demographic growth;
- spatial and urban development plans;
- economic activities present in and around the urban center;
- municipal financial resources and budget allocations;
- assessment of natural hazards and other urban risks;
- review of present and future climate scenarios;
- environmental pollution and its impacts on public health and natural resources;
- ethnic and social composition of the population; and
- income distribution.

Step 3: Green city shared vision, mission and urban development goals

Green growth provides strategies to sustain economic expansion while protecting the environment and ensuring socially inclusive development. In the urban setting, green growth is defined through negotiating amongst stakeholders a shared vision and mission for green city development, as well as specific green growth goals related to resilience to climate change and natural hazard impacts, energy and resource efficiency and related savings, greater and more equitable access to urban services and welfare, poverty reduction, and urban competitiveness. Such goals have to be identified at the outset of the Green City Strategic Planning process as the most relevant ones for the local context.

Step 4: Review of the key urban sectors for urban green growth

The Green City Plan will review eight sectors of primary concern for urban development and the welfare of its population: 1) urban planning; 2) urban vulnerability; 3) energy; 4) transport; 5) built environment; 6) manufacturing; 7) solid waste management; and 8) public spaces and cultural heritage. The Green City Strategic Plan will establish how each sector is currently performing, identify shortcomings or malfunctions, and envisage the BAU future scenario for each sector if its current challenges are not addressed.

Step 5: Establishing urban green growth priority objectives and actions for the key sectors

The identified green city shared vision (Step 3) and the review of the key eight urban sectors (Step 4) will enable the Green City Planning Group to identify specific urban green development green growth

objectives and priority actions for each of the key urban sectors. These green growth objectives and priority actions will be defined through a participatory process and will help in establishing the collective expectations for the performance of that sector in a green growth vision of the future. A number of specific green growth objectives and priority actions in this planning methodology are proposed as a guide, but they will have to be adapted and prioritized according to the challenges of the specific urban area.

Step 6: Identification of potential green city development projects

Transforming the urban center towards a sustainable, green urban future is a long-term endeavour. However, it is critical to identify which priority green city development projects that can be carried out to initiate the process of change. A long list of possible interventions, relevant to all identified green growth objectives (Step 5) and for which the return will have been economically validated, will be developed. Projects will be classified into three groups: 1) short-term investments and actions, 2) comprehensive sector reforms, and 3) knowledge products which will address the current knowledge gaps. A project description template is provided for usage.

Step 7: Prioritizing green city development projects

The long list of possible interventions will be subject to a process of prioritization and short-listing. Prioritization can be achieved through the use of multi-criteria analysis (MCA) to establish priority projects on the basis of their expected green growth impact and public expectations. A set of ten criteria is suggested, which should be adjusted according to local circumstances. A MCA framework is also proposed, including the rationale for the criteria and scoring guidance. The process of prioritization and short-listing should be as objective, transparent and participatory as possible, and its materials and outcomes should be made accessible to the public.

Step 8: Envisaging urban green growth scenarios

Based upon Steps 3, 4, 5 and 6, the development of potential urban green growth scenarios draws together the economic and demographic projections with the analysis of different urban sectors, green growth goals, objectives, priority actions and green growth interventions. The methodology proposed that three scenarios are developed to illustrate the impact of the possible range of green growth interventions and their implications for city-level performance within the planning period. These are scenarios for business-as-usual, piloting green growth and mainstreaming green growth. These scenarios give a comparative qualitative account of the cumulative impact of urban activity on resource use, pollution and urban form and function, and summarize what this is likely to mean for broader development goals over the longer term.

Step 9: Preparing the list of priority green city projects

The short-listed projects resulting from the prioritization exercise (Step 7) will be subject to financial and economic analysis to ensure they can deliver satisfactory returns on investment. Financial analysis will be followed by the use of cost-benefit analysis (CBA), cost effectiveness analysis (CEA), marginal abatement cost curves (MACCs) and adaptation cost curves, depending on the contents and expected outcomes of each project. Projects that are confirmed as economically viable will be developed at the feasibility preparation level, including detailed descriptions of the technical aspects and arrangements for their successful implementation.

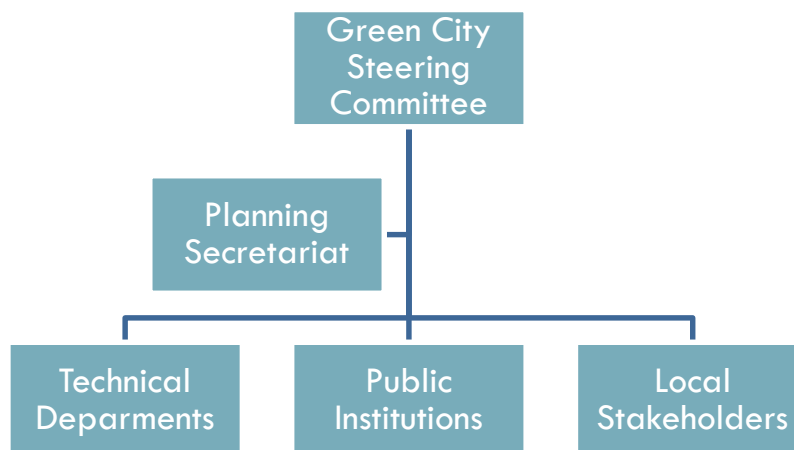
Step 10: Implementation arrangements for the Green City Strategic Plan

The confidence built via the preparation of the plan will have to be maintained during implementation. Governance arrangements will be put in place for this phase, while maintaining participation and consultation already in place. Possible financial sources will be reviewed and discussed. The responsibility for the implementation of specific projects will have to be assigned to relevant technical departments. The plan will be subject to regular monitoring of implementation and periodic reporting. A comprehensive system of communication and public awareness will be maintained, in order to provide information on progress and receive feedback.

1. GREEN CITY STRATEGIC PLANNING GOVERNANCE ARRANGEMENTS

The development of a **Green City Strategic Plan** requires strong local government planning leadership, and active coordination with and participation by a broad range of stakeholders. Green city planning can be embedded into the existing local planning institutional setup. However, the planning network should be broadened to include robust and continued participation from other organizations and stakeholders such as relevant national ministries, provincial and local public institutions, community organizations, the private sector and donors active in the locality. The membership of an expanded and inclusive **Green City Planning Group** is depicted Figure 2 below.

Figure 2. Green City Strategic Planning Group



The existing local planning authority should receive authorization from the provincial, municipal or district governor to form the Green City Strategic Planning Group and to undertake the green city planning process with the full cooperation and coordination of **public institutions, technical departments** and **local stakeholders**, as shown in Table 1 below.

The Green City Planning Group will be managed by a **Green City Steering Committee**, co-chaired by the governor and by the representative of the NCSO, which will be supporting the green city strategic planning process. A **Planning Secretariat** should also be appointed, with the responsibility to manage and coordinate day-to-day operations.

Table 1. Suggested Green City Planning Group Membership

Technical Departments	Public Institutions	Local Stakeholders
<ul style="list-style-type: none"> • Land Use and Urban Planning • Mines and Energy • Public Works and Transport • Environment • Industry and Handicrafts • Education, Youth, Sport • Women Affairs • Tourism • Others as relevant 	<ul style="list-style-type: none"> • Provincial government • Municipal government • District councils • Commune councils • Ministry of Interior • Ministry Economy and Finance • Ministry of Planning • Other relevant ministries 	<ul style="list-style-type: none"> • Non-government organizations • Civil society organizations • Private sector companies • Business trade associations • Donor organizations • Universities/academia • Others as relevant

The Planning Secretariat should send **official letters of invitation** to each potential member of the Green City Strategic Planning Group. The letters of invitation should request that each participating organization nominate only one person (and an alternate) to join the group. Throughout the green

city planning process, it is essential that each organization be represented by the same person in order to maintain continuity and technical integrity.

The Green City Strategic Planning Group should also make use of the **technical expertise and coordination links** provided by the NCSD. The Planning Secretariat should establish communication links with the NCSD's General Secretariat. The General Secretariat has technical resources and a broad overview of sub-national green city development initiatives, which can assist the Green City Planning Group in the planning process. The General Secretariat can also assist in coordinating green city planning between neighboring provinces and municipal jurisdictions.

Once the Green City Planning Group has been formed, the Planning Secretariat should organize and conduct a series of **consultative planning meetings** attended by all representatives. A list of suggested sequential meetings and their respective agendas is provided in Figure 3 below. The list is only indicative of the types of meetings to be held and agenda items discussed. The collaborative meetings should be organized to meet the ongoing concerns and the capacities of the local urban planning context.

Figure 3. Suggested Planning Meetings and Indicative Agenda Items

Introductory meeting	<ul style="list-style-type: none"> • Agreed-upon terms of reference for Green City Strategic Planning group • The terms of reference to contain group objectives, outputs, activities, responsibilities, schedules, reporting and coordination mechanisms
Data gathering	<ul style="list-style-type: none"> • Collaborative data gathering and analysis • Baseline analysis of the urban context
Shared city shared vision, mission and goals	<ul style="list-style-type: none"> • Mutually agreed-upon shared vision and mission statement for green urban development • Establish short-, medium- and long-term goals
Review of key sectors	<ul style="list-style-type: none"> • Sectors to be covered include urban planning, urban vulnerability, energy, transport, built environment, manufacturing, public spaces and cultural heritage, solid waste management
Sectoral objectives, Priority actions, and green city projects	<ul style="list-style-type: none"> • Identification of sectoral objectives and actions • Identification of multiple short- and medium-term investment options across all sectors • Short-listing priority investments • Feasibility profiles of priority projects
Final plan endorsement	<ul style="list-style-type: none"> • Final consultation and endorsement of Green City Strategic Plan • Plan distribution to the public and NCSD

Each of the consultative planning meetings will result in a **progressive integration of views** as a result of exchanges of information among participants and their direct involvement in the green urban planning process. Non-governmental participants will become more knowledgeable of the public planning mechanisms and sector operations, while government representatives will obtain a wealth of information on local perspectives and knowledge, and priority problems and needs. It is particularly important that specific needs of women and youth are taken into account in the plans.

For some collaborative meetings, it may be beneficial to solicit **technical and financial expertise from experts**. These experts will be most helpful in assisting the Green City Strategic Planning Group with data gathering, review of the key sectors and preparation of the priority actions and projects.

During the Introductory Meeting, **time schedules** should be established for the work of the Green City Strategic Planning Group. Table 2 below lists the collaborative meetings and possible time required for accomplishing each phase milestone. It is foreseen that the green city planning process could be completed between **9 to 12 months**.

Table 2. Target dates for accomplishing agenda of meetings

Meetings	N. of months to complete agenda items
Introductory meeting	1
Data gathering for baseline analysis	2-3
Shared green city vision, mission and specific goals	1
Review of key sectors	2-3
Sectoral objectives, Priority actions and prioritization of green city projects	2-3
Final plan endorsement	1

2. BASELINE ASSESSMENT OF THE URBAN CONTEXT

The Green City Strategic Plan will be based on a thorough **understanding of the demographic, economic, governance, social and environmental challenges** of the urban center for which it is being prepared. This will require collecting data and carrying out assessments of the contextual issues discussed below. In some cases, the data will be easily available and the capacity of the Green City Strategic Planning Group will be sufficient. In others, such as for the downscaling of climate projections and for the evaluation of pollution loads, the support of specialized expertise will be required.

2.1 PRESENT AND FUTURE DEMOGRAPHIC GROWTH

It will be important to assess the **size of the current resident population** and its general characteristics: gender and age distribution, household size, occupation and employment. Furthermore, the knowledge of birth and death rates will help establish the rate of demographic growth of the resident population and projections on its future size. The figures for the additional population resulting from rural-to-urban migration and migration from other urban centers should also be taken into account. Demographic data provides the basis to assess the **ongoing rate of urbanization** and the pressures on land use related to the expansion of the urban footprint in the coming decades.

2.2 ECONOMIC BASELINE AND TRENDS

A critical review of existing economic activities serves to identify the available resource base, the **current state of economic growth and development**, the likely future development trends, and which sectors should be a focus for green urban development. The review involves an appraisal of current economic planning documents and available statistical data, and consultations with stakeholders for a shared endorsement of green city development goals. Establishing a baseline enables the **understanding of the current situation in the city** and how it has developed over recent years. This should encompass a number of economic indicators including:

- City economy and structure (e.g. gross domestic product [GDP], GDP growth, sector shares of GDP, sector outputs);
- Inward investment, including sources of investment and sectors invested in;
- Trade in goods and services;
- Labour force size and structure; and
- Poverty rate and social indicators (e.g. poverty headcount, poverty rate, infant malnutrition rate).

Approximately the past 10 years of data should be collected to allow the identification of development trends. Quantitative data should be supplemented with qualitative data where appropriate, such as in accounting for informal economic activity (which is generally not captured by national statistics).

2.3 ETHNIC AND SOCIAL COMPOSITION OF THE POPULATION, AND INCOME DISTRIBUTION

Cambodian cities and towns host communities from different parts of the country, and sometimes from abroad. Their levels of **integration in the social fabric of the urban center** differ. It will be important to identify and to map their presence as a first step towards better and more harmonious integration. Similarly, the analysis of context and background data will include a review of the various urban social groups, their participation in the formal and informal urban economies, and the income distribution. The percentage of households below the poverty line will be an important indicator to measure. The **enrollment of girls** in the local educational establishments and the **participation of women** in the workforce will be important indicators of the achievement of gender equality.

2.4 URBAN GOVERNANCE AND MUNICIPAL FINANCES

Urban governance will be determined by the current juridical set-up of local governments and their mandate for the **planning and management of urban centers**, as illustrated in Table 3 below. Understanding the current situation of municipal finances, including the resources available and the processes of revenue generation and allocation, will be critical. This will involve consideration of both national- and city-level financial processes. The review will be predominantly concerned with the **availability of public and private financial resources for investment in green growth actions**:

- Establish a financial baseline through a review of municipal budgets for a number of years;
- Include capital investments, recurrent expenditures on infrastructure and services, and sources of revenue in the municipal area;
- Identify recent trends in investment, revenue generation and expenditure within the city to understand the key constraints and opportunities facing municipal finances;
- Review current municipal budget planning, including expected investments in infrastructure and services in the city, and expected sources of revenues and capital;
- Review municipal financing institutional arrangements, including budgeting processes and mobilisation of investment capital, identifying key opportunities and constraints for financing green growth actions.

Table 3. Juridical texts for land use and urban planning in Cambodia, 2008-2015.

Juridical texts for land use and urban planning	Institution
Law on the Administrative Management of the Capital, Provinces, Municipalities, Districts, and Khans (2008) – “the Organic Law”	MoI
Sub-Decree No. 72 (RGC) of May 05, 2009 on the Procedure of Land Use Planning in Communes and Sangkat	MLMUPC
Circular No.03 “Resolution on Temporary Settlement on Land which has been illegally Occupied in the Capital, Municipal, and Urban Areas” (2010)	MLMUPC
National Policy on Spatial Planning of the Kingdom of Cambodia, adopted by the Council of Ministers on 08 April 2011	MLMUPC
Royal-Decree on Establishment of National Committee for Land Management and Urbanization (2012)	MLMUPC
Comprehensive Land Policy “the White Paper on Land Policy”, Council for Land Policy (August 2012)	MLMUPC
Sub-Decree No. 77 on Establishment of Committee for Land Management and Urbanization at the Level of Municipality, Province, District and Khan (2012)	MoI
Sub-Decree #68 (RGC) on General Process of Delegating Functions and Resources to Sub-National Administration	NCDD/ MoI
Sub-Decree No. 108 on Organization and Functioning of the General Department of the National Urbanization and Land Management Committee (2013)	MLMUPC
Sub-Decree on Urbanization for Capital, City and Downtown (2015)	MLMUPC

2.5 NATURAL AND CLIMATIC URBAN RISKS

Cities have to coexist with nature, and in their growth and expansion **natural hazards and urban risks** are sometimes overlooked. Flooding, torrential rains, coastal storm surges and typhoons represent primary hazards for Cambodian cities and towns (Figure 4). Urban risks can also include threats due to the location of highly polluting industries, the storage of hazardous industrial materials, and fire hazards. All of these have to be all identified and carefully mapped. Poorer neighborhoods are generally the most vulnerable, and often coincide with the location of major sources of urban risk.

Climate change is affecting the world, including Cambodian cities and towns. The ongoing increase in ambient temperature, more frequent and intense rainfall events, longer periods of drought, sea-level

rise and other associated phenomena manifest themselves differently in different locations. Despite the associated uncertainty, it is possible to obtain “downscaled” projections of these phenomena, which will help to understand what additional risks the urban center will be exposed to in the future decades. This will require support from specialized professionals.

Figure 4. Flood map for Phnom Penh and the Kandal region, October 2014



Source: E-geos

2.6 STATE OF THE URBAN ENVIRONMENT AND PUBLIC HEALTH IMPACTS FROM POLLUTION

Economic activities may have **negative consequences** for the environment and public health, via pollution caused by untreated sewerage and wastewater, solid waste, atmospheric discharges from vehicles, and industrial emissions (Figure 5). Affected natural resources (land, water and air) may extend well beyond the city boundaries. The resident population of the urban center will be affected with **increased morbidity and mortality levels**, which can be traced back to exposure to pollution sources. Municipal and district authorities can help retrieve and process this information.

Figure 5. Urban pollution of waterways from solid waste in Phnom Penh



Source: Phnom Penh Post

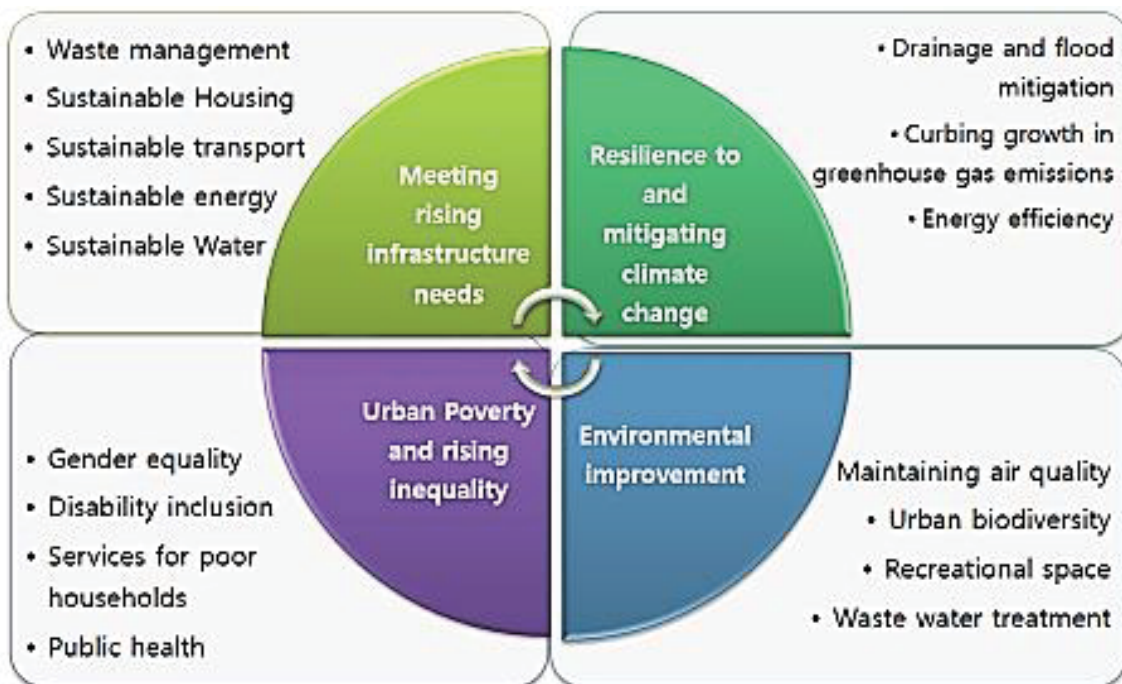
3. GREEN CITY SHARED VISION, MISSION AND URBAN DEVELOPMENT GOALS

Cambodia is urbanizing fast under the double impetus of demographic growth and the expansion of the formal economy, which concentrates increasing shares of investments and jobs in the urban centers of the country. **Urban growth is an opportunity for Cambodia**, as it can generate welfare and increase access to essential services, in addition to attracting foreign direct investment.

However, **it can have negative consequences as well**, in the form of higher impacts on natural resources (land, water and air) and on public health via pollution caused by untreated sewerage, atmospheric discharges from vehicles, and industrial emissions. A higher consumption of energy and fuels will also increase Cambodia's currently low contribution to greenhouse gas (GHG) emissions, which are rapidly altering the Earth's climate.

Green growth – and urban green growth in particular – is a development paradigm whereby economic growth is not accompanied by such negative consequences. In this approach, the expansion of economic activities is conducted in a way to ensure environmental protection, appropriate levels of public health, low carbon emissions, and socially inclusive urban development. Some of Cambodia's green urban challenges and opportunities are provided in Figure 6 below.

Figure 6. Cambodia's Green City Challenges and Opportunities



Source: GGGI

The concept of green growth has been endorsed by the RGC, which considers cities as the engines of transformation of the national economy towards green growth. The National Policy on Green Growth of 2013 set the stage for the National Strategic Plan on Green Growth 2013-2030, which includes the following actions related to green city development:

- Creating green transport infrastructure at national and sub-national levels, and developing plans to reduce traffic congestion and traffic accidents
- Creating green business environments with relevant regulations, and encouraging renewable energy, improving energy efficiency and green industry development
- Developing and effectively implementing a national strategic plan for waste management
- Improving land use and the city environment to promote good health

- Establishing green industry and integrating it into national strategic development
- Strengthening the private sector to implement good green growth governance
- Integrating gender equality into green growth.

Cambodia's national climate change engagement is summarized in the Cambodia Climate Change Strategic Plan 2014-2023. Further to this, the Ministry of Environment's Climate Change Action Plan 2016-2018 has prioritized green city development. Among the 17 priority actions listed in the Action Plan, #7 is titled "Develop and test low carbon resilient approaches and options in urban areas". This action covers the implementation of low-carbon resilient urban development initiatives, such as the Green Urban Development Program (with support from GGGI) and the Building Climate Resilience of Urban Systems through Ecosystem-based Adaptation) with support from UNEP/LCDF. The Department of Green Economy is responsible for implementation of priority #7 within the action plan.

Among relevant international references, it should be noted that the Sustainable Development Goals (SDG) launched in September 2015 by the United Nations include SDG #11, which aims to "Make cities and human settlements inclusive, safe, resilient and sustainable". Its target 11.b states "By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels."

Based on the above national and international references, which provide the basis for the development of a shared vision of the future livable city, the Green City Strategic Planning Group should brainstorm and reach **consensus on the green urban development vision, mission and goals** for its city. Table 4 provides a potential list of goals for green urban development.

However, each urban center in Cambodia is unique, with its own set of priorities, challenges and opportunities. Some are more industrial, others more tourism-oriented, and others still very much depending on the agricultural activities surrounding them. The environmental and sustainability challenges will be unique to each location. Depending on the specific conditions of each urban center, these goals will therefore be more or less relevant. In preparing a Green City Plan, it will be important to review these goals and decide which ones represent local priorities.

Table 4. Potential green urban development goals for the Green City Strategic Plan

- | |
|--|
| <ul style="list-style-type: none"> • De-coupling economic growth from environmental impacts • Promoting social inclusion, poverty reduction, and urban welfare • Providing urban resilience to natural, climatic and other risks • Ensuring urban competitiveness and attractiveness to businesses • Generating savings from energy and resource efficiency • Reducing carbon emissions from energy, transport, and the built environment • Limiting dependency on fossil fuels |
|--|

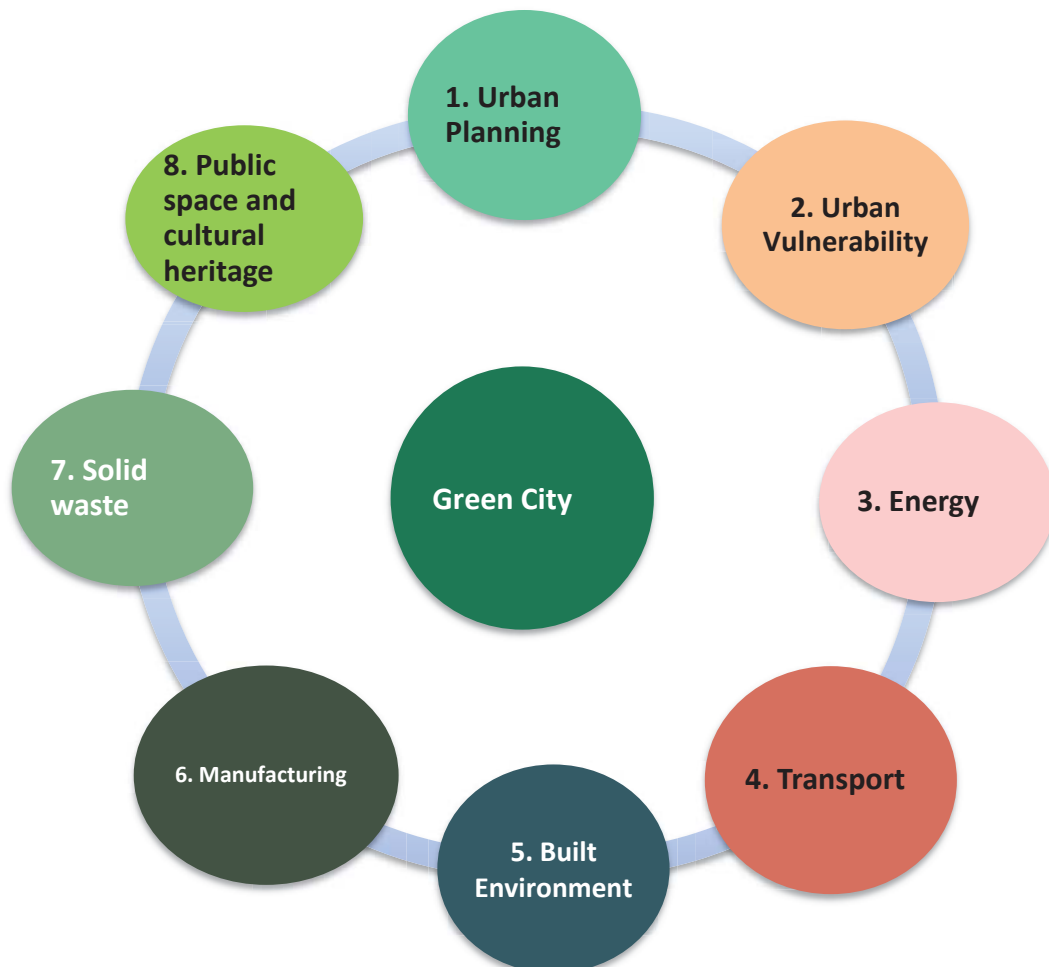
4. REVIEW OF THE KEY URBAN SECTORS FOR URBAN GREEN GROWTH

The preparation of the Green City Strategic Plan will include the review the key urban sectors that are most important to the wellbeing and functionality of the urban center, and where there are opportunities for reductions of pollution and emissions loads, for social inclusion and poverty reduction. These sectors are:

- Urban planning
- Urban vulnerability
- Energy
- Transport
- Built environment
- Manufacturing
- Solid waste management
- Public spaces and cultural heritage

All these sectors contribute to the creation of a Green City, as illustrated in the Figure 7 below.

Figure 7. Key urban sectors relevant to a Green City Strategic Plan



For each of these sectors, the participatory review process for the preparation of the Green City Strategic plan will include two steps:

- Conducting a review of the current status of the sector, leading to the preparation of its profile and representing a baseline against which to measure any future improvements.

- Forecasting the BAU future for the sector, illustrating the likely worsening of the current issues if the development trend remains unchanged. This is the future to be avoided, where the issues are not addressed.

Further detail on these steps for each of the eight key urban sectors is provided below.

4.1 URBAN PLANNING

Profiling the existing state of the urban planning sector

- Review the existing urban planning documents (if any) in place for the urban center
- Assess the urban planning activities of the provincial, district and commune councils
- Assess support of the National Committee for Land Management and Urbanization
- Map the urban footprint of present built-up area compared with previous urban footprint
- Produce urban land-cover map classifying land use (water bodies, parks and public space, urban agriculture, infrastructure, residential, commercial, service and industrial areas, health and educational facilities, administrative centers, cultural heritage, hospitality)
- Calculate urban density (persons per hectare)
- Determine percentage of properties that have clear land ownership titles

Business-as-usual future

- Likely urban sprawl to continue due to expanding urban population and activities; insufficient titling, zoning enforcement and urban infrastructure and services provisions

4.2 URBAN VULNERABILITY

Profiling the existing state of the urban vulnerability sector

- Map areas severely impacted by seasonal flooding or extreme rainfall events
- Map existing green and blue areas, and natural hydrological systems (streams, lakes, wetlands)
- Analyze extreme weather occurrences, return periods for extreme events, and damages in terms of human fatalities, property damage and business losses
- Describe existing infrastructure for drainage and flood control
- Conduct an inventory of households connected to the sewer lines or with sanitary toilet facilities and septic tanks
- Analyze local flooding adaptations methods, analyze existing disaster management readiness, response and recovery capacity

Business-as-usual future

- Increasing environmental pollution impacts, public health and safety issues, and property damages resulting from continuing in current development mode

4.3 ENERGY

Profiling the existing state of the energy sector

- Conduct audit of energy sources: % electricity grid, % diesel, % heavy fuel oil, % charcoal, % biomass, % solar
- Conduct audit of energy consumption: % residential, % commercial, % industry, % transport, % public services
- Record frequency of power shortages and voltage instability
- Conduct an inventory of residences and commercial buildings with back-up generators

- Research public access to energy-efficient lighting and appliances

Business-as-usual future

- Likely increase in electricity demand versus availability of traditional energy sources, increased periods of power shortages, and increases in electricity tariffs as a result on continuing reliance on fossil-based energy sources

4.4 TRANSPORT

Profiling the existing state of the transport sector

- Transport modality mix (% use of automobile, tuk-tuk, motorcycle taxi, private motorcycles, public transit and river ferry)
- Number of registered automobiles and motorcycles, and rates of annual increase
- Characteristics of public transit systems (mini-buses, large city buses, routes)
- Number of annual traffic accidents and fatalities over the last decade
- Map of major traffic congestion points (road sections)
- Number of parking facilities and spaces in core urban areas
- Pedestrian mobility in the city and status of pedestrian side-walks
- Status of traffic regulations and enforcement
- Concentration of air pollutants (NO_x, SO_x, CO, particulates) in traffic-congested areas and impacts on respiratory diseases

Business-as-usual future

- Likely rise in traffic congestion, traffic fatalities, and lost time in commuting to and from work resulting from continuing reliance on private automobile and motorcycle mobility

4.5 BUILT ENVIRONMENT

Profiling the existing state of the built environment sector

- Inventory of building types: shop-houses, detached villas, colonial buildings, traditional Cambodian houses, floating villages, slums
- Availability of low-cost housing
- Inventory of the market for Green Building Design: availability of suppliers and market penetration of green buildings
- Statistics on building / housing damages due to fire and weather events
- Number of fatalities and illness complications from heat-related stress due to poorly ventilated enclosures
- Availability of land for housing and other residential development

Business-as-usual future

- Likely insufficient housing structural stability, housing availability, affordability and green building design as a result of continuing the current urban building and construction modes.

4.6 MANUFACTURING

Profiling the existing state of the manufacturing sector

- Industry type by sector
- Location within or in proximity of the urban area
- Raw materials input: sources and quantities
- Production methods - type and age of equipment

- Product outputs
- Energy consumption and water consumption
- Waste generated and classification
- Customers or purchasers of goods (local, national, international)

Business-as-usual future

- Likely increases in environmental pollution, waste generation, and energy consumption resulting from continuing the same production processes.

4.7 SOLID WASTE MANAGEMENT

Profiling the existing state of the solid waste sector

- Percentage of urban area served by solid waste collection system
- Organization and management of solid waste collection service
- Description of waste problems and citizen complaints, including areas of uncollected waste, and waste clogging of drains and natural water courses
- Composition and amount of household solid waste - % food waste, plastic, paper, glass, metal, textiles, electronics
- Percentage of waste from households, commercial establishments, and industrial production units
- Fees for collection and disposal of waste (if any)
- Willingness of households to pay additional fees for improved services
- Description of informal waste collection and recycling
- Type of final disposal (waste dump or sanitary landfill)

Business-as-usual future

- Likely threats to public health and the environment if existing solid waste management practices are continued

4.8 PUBLIC SPACES AND CULTURAL HERITAGE

Profiling the existing state of the public spaces and cultural heritage sector

- Percentage area of open spaces, public parks and recreational facilities, and their distribution within the city
- Inventory of urban biodiversity, including indigenous species, flora, fauna and natural wetlands, lakes, ponds and canals
- Inventory of cultural heritage sites and buildings, including religious and administrative buildings belonging to the private and to the public sectors
- Extent of urban agriculture and its distribution within the city

Business-as-usual future

- Insufficient green areas and open spaces as a result of continuing the current urban expansion pattern; loss of cultural heritage buildings due to demolition and abandonment.

5. IDENTIFICATION OF GREEN GROWTH OBJECTIVES AND PRIORITY ACTIONS FOR THE KEY URBAN SECTORS

The review of the key urban sectors will allow the Green City Planning Group to revisit the green urban development goals (discussed in Section 3) in order to define **specific green growth objectives and priority actions** for the key urban sectors. Provided below is a listing of proposed green growth objectives for the key urban sectors, which will have to be adapted and better defined by a Green City Planning Group according to the specific challenges of each urban location.

Proposed objectives for the urban planning sector

- Directing urban expansion away from areas that are subject to natural and climatic risks such as flooding or coastal erosion
- Planning for compact, low-carbon urban forms providing for high agglomeration density and for an optimal use of urban infrastructure
- Minimizing urban footprint over neighboring agricultural areas
- Avoiding lock-in to costly, energy-inefficient and polluting urban systems

Proposed objectives for the urban vulnerability sector

- Areas to preserve as green spaces and natural hydrological regimes
- Number of households to be relocated from flood prone areas
- Reduction in human fatalities, property damage and business losses due to flooding
- Increase in household access to sanitation facilities

Proposed objectives for the energy sector

- Reliable power availability throughout the year
- Percentage increase in the use of solar energy for water heating, air cooling and power generation
- Percentage decrease in the energy intensity of residential, commercial, industry and public services
- Percentage increase in the energy efficiency of the residential, commercial and service sectors
- Increase decentralized electricity production and reduce reliance on back-up generators

Proposed objectives for the transport sector

- Percentage reduction in traffic fatalities and accidents
- Increased enforcement of traffic regulations
- Reduced air pollution in traffic congested areas or compliance with national ambient air quality standards or international standards
- Percentage increase in the use of public transport
- Eliminate parking on sidewalks
- Regulate street-parking via parking meters
- Improved mobility access for the poor and the disabled
- Improved pedestrian mobility and walkways
- Increase in automobile-free zones

Proposed objectives for the built environment sector

- More energy-efficient and disaster-resistant buildings and homes
- In-situ upgrading or removal of slum areas due to availability of affordable housing
- Increased housing comfort and livability due to improved designs

Proposed objectives for the manufacturing sector

- Transform manufacturing sector into modernized green production units
- Significantly reduce intensity of energy consumption (depending on industry type)
- Reduce generation of waste, particularly toxic and hazardous waste
- Improve occupational health and safety conditions for workers; reduce occupational injuries and job-related health conditions

Proposed objectives for the solid waste management sector

- Extend solid waste coverage to 100% of urban area
- Percentage of waste collection and recycling by 2020 and 2030
- Percentage of waste reduction at source of generation
- Infrastructure in place for household waste separation and subsequent recycling and reuse
- Sanitary conditions and operation of final disposal location
- Commitment to waste-to-energy conversion
- Targets for carbon emissions reduction from solid waste management

Proposed objectives for the public spaces and cultural heritage sector

- Percentage increase of areas for public spaces, public parks and recreational facilities
- Preservation of biodiversity and mixed land use with green and blue corridors
- Preservation of cultural heritage locations and buildings
- Preservation of urban agriculture

Priority actions: Stemming from each of these sector-based objectives, the Green City Strategic Planning Group can identify priority actions that the city could take to achieve the green growth objectives for each sector. The actions identified should include short, medium and longer-term measures, which can be achieved through the prioritization and implementation of green city development projects (see Step 6).

6. IDENTIFICATION OF GREEN CITY DEVELOPMENT PROJECTS

Under the framework of the overall green city shared vision, mission and goals, the Green City Planning Group **will identify potential green city development projects** that can help achieve those sectoral objectives and priority actions, and address the shortcomings reviewed in each sector.

The assumption is that the transformation of the urban area into a green, sustainable city is likely to be a long-term process. Therefore, the urban greening will start with pilot, demonstration projects to test innovative approaches and prove the viability and benefits of urban green growth. These are defined as **Short-term investments and actions**, and are to be classified as **'projects A'**.

These projects would open the way for more ambitious **Comprehensive sector reforms**. These are likely to take time to be prepared, approved and implemented, but would give the city a sustainable framework for the urban management of the given sector. These are to be classified as **'projects B'**.

The preparation of the Green City Strategic Plan is likely to identify a number of knowledge gaps, i.e. areas where more data collection and analysis is needed in order to carry out evidence-based planning and policy-making. The related **Knowledge products** are to be classified as **'projects C'**.

The Green City Planning Group will identify projects for each of the sectors, responding to proposals and priorities as expressed by all the stakeholders involved in the process. At this stage, it will be important to be as inclusive as possible in **capturing all the possible opportunities for urban change** and coming up with a long list of projects, which will be later subject to a screening and priority-setting exercise (Section 7).

It is suggested that the identification of the projects at this stage should consist of a simple procedure **using a standard format** presented in Table 5 below. Guidance on the basic information to be covered in each field is also provided in the table.

Table 5. Green city development project identification sheet

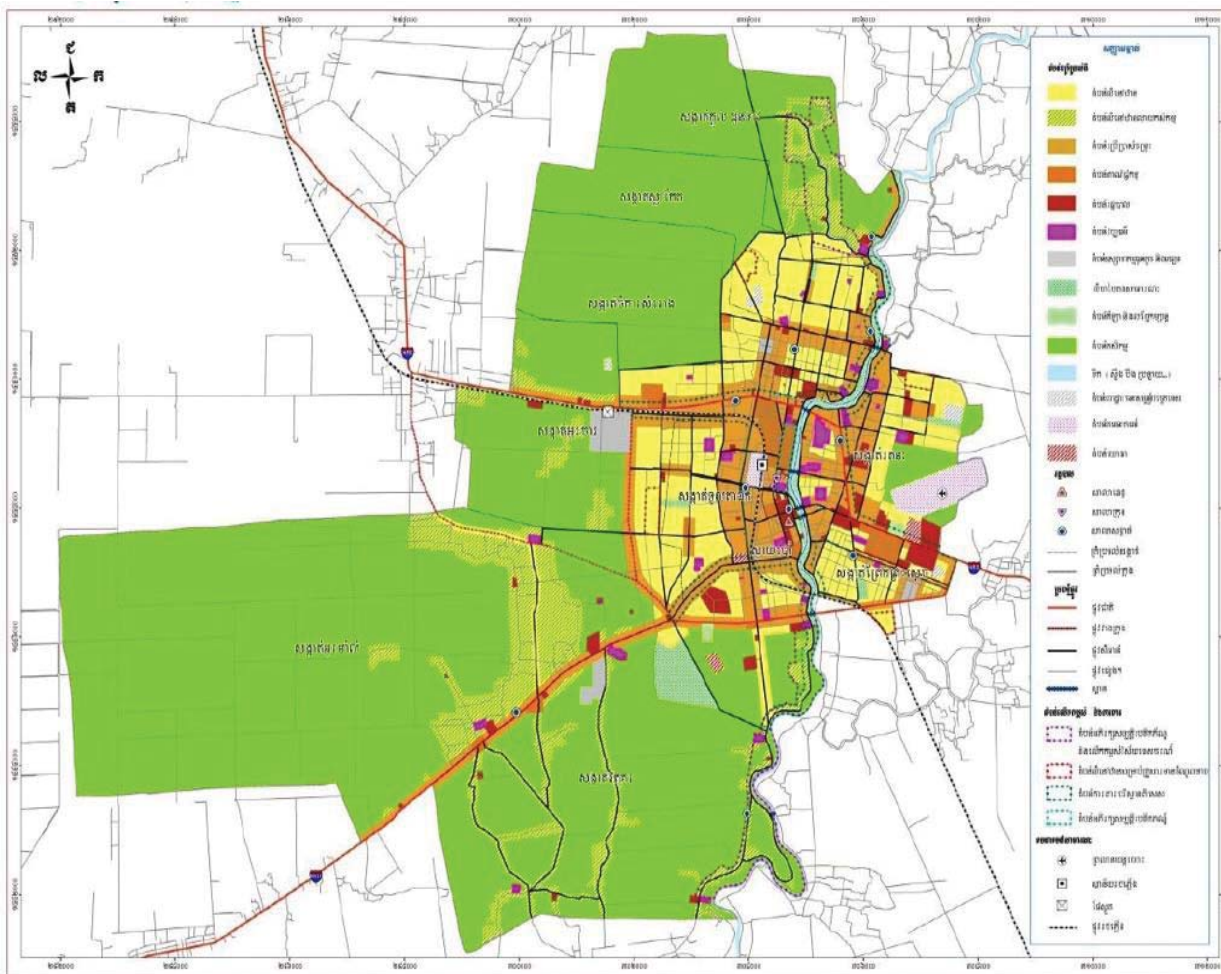
Sector: <i>Refer to one of the key eight urban sectors</i>	Type of project: <i>A, B or C as per above</i>
PROJECT TITLE: <i>Define the name of the project concisely</i>	
Urban green goals pursued: <i>Refer to the sector green goals as previously defined</i>	
Preliminary project description: <i>2-3 paragraph description of project content</i>	
Expected urban green benefits: <i>Define positive outcomes of project implementation</i>	
Linkages with other urban sectors: <i>Describe which other urban sectors will be affected and how</i>	
Linkages to policies and action plans: <i>Refer to national or local policies and programs</i>	
Proposed location (if applicable): <i>Name of district or commune</i>	
Envisaged implementation partners: <i>Which organizations would likely be involved</i>	
Possible sources of funding: <i>Refer to likely sources of financial resources</i>	
Barriers to implementation: <i>Identify sources of local resistance to the project</i>	

The remainder of this section provides examples of potential projects for the eight key sectors, together with their expected benefits and sources of additional information.

6.1 EXAMPLES OF URBAN PLANNING GREEN CITY PROJECTS AND EXPECTED BENEFITS

- Prepare or update comprehensive Master Plan for the entire urban agglomeration, including contiguous communes or districts which are part of the same urban economy (as illustrated in Figure 8 below)
 - ➔ **Optimizes urban planning efforts and provides for integrated land-use planning**
- Define protection areas where no infrastructure or building activities may take place (areas at risk, protected natural resources, public spaces, cultural heritage and monuments)
 - ➔ **Avoids risks of encroachment and prevents illegal development activities**
- Spatially integrate the green growth actions across the urban sectors (vulnerability, energy, transport, built environment, manufacturing, solid waste, public spaces and cultural heritage)
 - ➔ **Allows for the optimization of the green sector planning at the urban scale**
- Develop zoning plans to regulate mixed land use and density according to urban functions, coupled with permitting and enforcement regulations.
 - ➔ **Directs future development in areas and into urban forms coherent with the Master Plan**

Figure 8. Land-use master plan of Battambang City 2030



Source: Technical Report on the Land Use Master Plan for Battambang Municipality, 2015

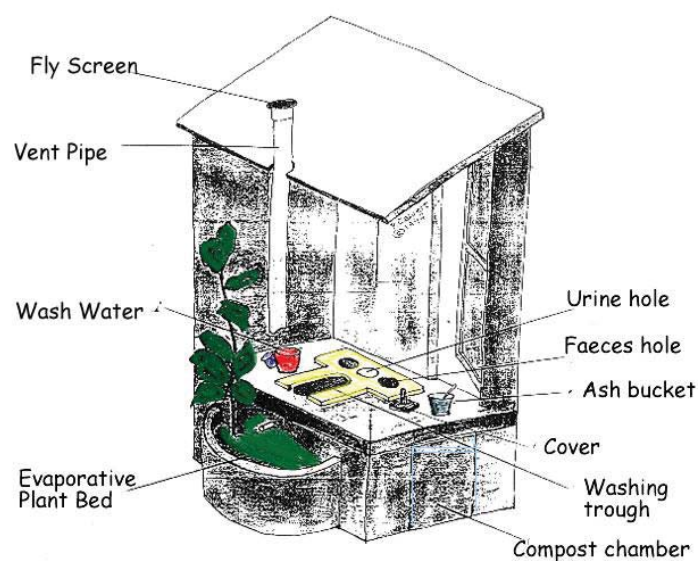
Sources of Additional Information

- <http://www.greengrowthknowledge.org/learning/green-city-development-toolkit>.
- <http://www.undp.org/content/undp/en/home/librarypage/environment-energy/toolkit-inclusive-green-growth.html>
- <http://gggi.org/report-urban-green-growth-strategies-for-indian-cities>
- <http://www.oecd.org/regional/green-growth-in-cities.htm>.
- http://www.unicef.org/cambodia/PIN_URBAN_POOR_FA.PDF

6.2 EXAMPLES OF URBAN VULNERABILITY GREEN CITY PROJECTS AND EXPECTED BENEFITS

- Integrate green drainage and waste water treatment methods (such as constructing wetlands or using existing wetlands) into urban design (see Figure 9)
 - ➔ **Reduces flooding and environmental pollution**
- Maintain and extend green areas (green urban canopy) for improved rain water management and urban comfort
 - ➔ **Reduces flooding and carbon emissions**
- Rehabilitate natural hydro systems (lakes, streams, canals), thus creating urban blue belts
 - ➔ **Reduces flooding and helps sustain seasonal water supply imbalances**
- Investigate the feasibility of decentralized wastewater treatment systems
 - ➔ **Reduces pollution during flooding events**
- Encourage the use of improved household sanitation systems (see Figure 9)
 - ➔ **Reduces pollution during flooding events**
- Investigate the use of public wetland toilets as demonstrated by Pissoir in Phnom Penh
 - ➔ **Reduces pollution and contributes to growth of green areas**

Figure 9. Diagrams of eco-sanitary toilets



<http://b1b2.org/EcoSan/biotoilets2.htm>

Sources of Additional Information

- www.epa.gov/owow/wetlands/pdf/ConstructedW.pdf
- water.epa.gov/type/wetlands/restore/upload/constructed-wetlands-design-manual.pdf
- water.epa.gov/type/wetlands/restore/upload/sub.pdf
- www.wetlands.org/Portals/0/publications/Book/Constructed_Wetlands-PDF.pdf
- www.wetlandworks.com
- www.wagga.nsw.gov.au/__data/assets/pdf_file/0018/4635/Lloyd_Study_Area2.pdf
- www.dews.qld.gov.au/__data/assets/pdf_file/0008/78128/qudm2013-provisional.pdf
- pacewater.com/services/stormwater-management/river-restoration/mountain-housemaster-drainage-plan-creek-restoration/
- www.water.wa.gov.au/PublicationStore/first/89891.pdf

6.3 EXAMPLES OF ENERGY GREEN CITY PROJECTS AND EXPECTED BENEFITS

- Include requirements for energy-efficient equipment and materials in new construction permits
 - ➔ **Reduces energy consumption and carbon emissions**
- Utilize renewable energy sources such as solar, biomass or waste-to-energy conversion
 - ➔ **Cost savings over long term and reduced carbon emissions**
- Conduct public awareness campaigns on residential and commercial energy-saving methods, materials and appliances (cooking, heating, cooling and lighting)
 - ➔ **Reduces energy consumption and carbon emissions**
- Provide guidance on retrofitting homes and commercial building with application of energy efficiency and conservation measures (see Figure 10)
 - ➔ **Reduces energy consumption and carbon emissions**



Figure 10. There is substantial potential for roof-top solar PV in Phnom Penh to service households, businesses and manufacturing (photograph by Bernardo Salce).

Sources of Additional Information

- www.star8.com.au/contact-us/
- www.worldbank.org/en/news/feature/2014/02/18/energizing-green-cities-solutions-to-meet-demand-and-spark-economic-growth
- www.kamworks.com/

6.4 EXAMPLES OF TRANSPORT GREEN CITY PROJECTS AND EXPECTED BENEFITS

- Create dedicated paying parking areas and implement street parking fees with meters
 - ➔ **Reduces traffic congestion and raises municipal revenues**
- Enforce traffic regulations and implement traffic signal coordination
 - ➔ **Reduces traffic accidents and fatalities, congestion, air pollution and carbon emissions**
- Implement dedicated Bus Rapid Transit traffic lane for public transit; separate lanes for motorcycles and automobiles
 - ➔ **Encourages the use of public transport, reduces accidents and air pollution**
- Pilot-test a fleet of solar-powered tuk-tuks (Figure 11) and buses for possible expansion throughout city
 - ➔ **Reduces dependence of fossil fuel, air pollution**
- Provide facilities for non-motorized transport modes including cycling and walking
 - ➔ **Reduces traffic congestion, air pollution and carbon emissions**
- Implement automobile-free zones in key congested and commercial areas
 - ➔ **Reduces carbon and pollution emissions, improves pedestrian mobility**
- Provide incentives for green cars such as hybrids or electric vehicles
 - ➔ **Reduces air pollution, carbon emissions and noise levels**

Figure 11. Solar tuk-tuks

Source: www.star8.com.au

Sources of Additional Information

- www.star8.com.au/contact-us/
- sustainabledevelopment.un.org/topics/transport/publications
- www.worldbank.org/en/topic/transport/brief/low-emission-transport
- www.newcitiesfoundation.org/smart-travel-sustainable-mobility-green-transport-cities/
- www.unep.org/resourceefficiency/Policy/ResourceEfficientCities/FocusAreas/SustainableTransportandAirPollution/tabid/101667/Default.aspx

6.5 EXAMPLES OF BUILT ENVIRONMENT GREEN CITY PROJECTS AND EXPECTED BENEFITS

- Monitor and enforce the new decree on urbanization which restricts the percentage of construction area with reference to total property area
 - ➔ **Ensures some open area is available for greenery and rain-water capture**
- Provide technical guidance for retrofitting homes and commercial buildings for increased energy efficiency, improved natural ventilation, rain water capture, and increased resilience to natural disasters and climate change (see Figure 12)
 - ➔ **Reduces energy consumption and carbon emissions; increases resilience to flooding**
- Pilot certification of a building under a Leadership in Energy & Environmental Design (LEED) certification scheme as a demonstration for replication in other constructions
 - ➔ **Reduced energy consumption and carbon emissions**
- In peri-urban areas, promote slum upgrading, the use of traditional building types using locally available materials, elevated living spaces, natural ventilation corridors and *feng shui* principles
 - ➔ **Reduced energy consumption and carbon emissions, and more resilience to flooding**

Figure 12. Energy Efficient Building in Phnom Penh



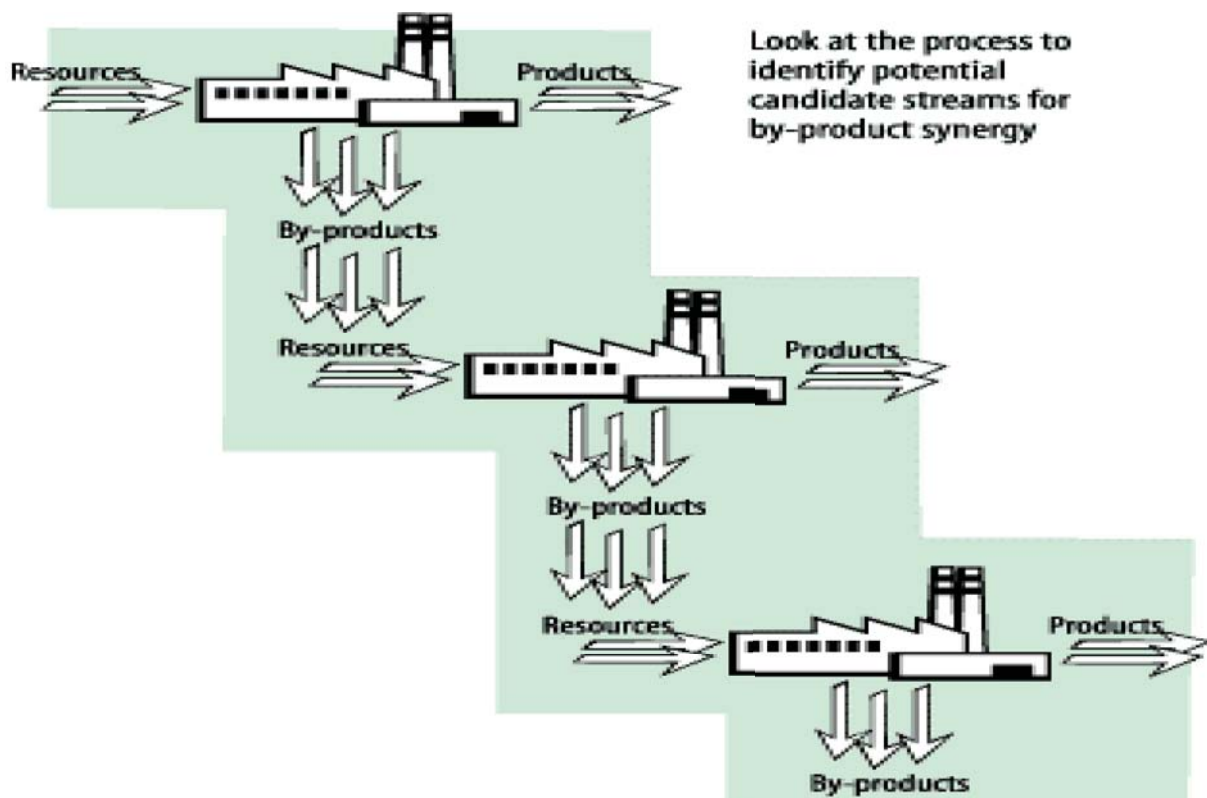
Source: <http://inhabitat.com/cambodias-new-stock-exchange-tower-has-dragon-scales/>

Sources of Additional Information

- www.star8.com.au/contact-us/
- www.tu-cottbus.de/projekte/de/megacity-hcmc/
- www.gdrc.org/uem/water/rainwater/introduction.html
- www.watercache.com/education/rainwater/
- www.akvopedia.org/wiki/Rooftop_rainwater_harvesting
- water.epa.gov/infrastructure/greeninfrastructure/gi_what.cfm#rainwaterharvesting

6.6 EXAMPLES OF MANUFACTURING GREEN CITY PROJECTS AND EXPECTED BENEFITS

- Conduct waste minimization, cleaner production, energy efficiency, and occupational health and safety audits with assistance from National Cleaner Production Office, Better Factories Cambodia, or Garment Manufacturers Association Cambodia
 - ➔ **Reduced environmental pollution and carbon emissions; safer working conditions and fewer occupational illnesses**
- Identify possible waste exchange opportunities, i.e. waste from one industry sector used as input in another sector (see Figure 13)
 - ➔ **Reduced waste dispersed in the environment, reduced consumption of raw materials**
- Identify possible funding for energy efficiency, waste minimization, and cleaner production through Corporate Social Responsibility programs of product customers and buyers
 - ➔ **Product brand name is recognized as being green and environment-friendly**

Figure 13. Approaches to cleaner production processes

Source: unido.org

Sources of Additional Information

- www.unido.org/fileadmin/user_media/Services/Research_and_Statistics/WP152011_Ebook.pdf
- www.worldbank.org/en/news/feature/2013/11/19/energy-efficiency-the-fuel-for-low-carbon-urban-development
- www.cambodian-cpc.org/index.php/en/
- www.unep.org/gpwm/Portals/24123/images/Working%20group%20meeting/Waste%20Minimization.pdf

6.7 EXAMPLES OF SOLID WASTE MANAGEMENT GREEN CITY PROJECTS AND EXPECTED BENEFITS

- Implement the 3R Principle (Reduce, Reuse, Recycle)
 - ➔ **Reduces waste to disposal site, natural resource consumption and carbon emissions**
- Require household to separate waste, along with identified reuse and recycle commitments
 - ➔ **Overall savings and environmental protection**
- Encourage waste reduction through banning of plastic bags and providing reusable bag options
 - ➔ **Protection of natural resources and animal life**
- Develop formal recycling industry which employs workforce from informal recycling sector (see Figure 14)
 - ➔ **Increases employment and improves health and safety of workers**
- Implement waste-to-energy conversion
 - ➔ **Reduces waste disposed to landfill, increases energy supply, reduces carbon emissions**
- Encourage private sector investment in waste management
 - ➔ **Increases efficiency and coverage of waste collection services**
- Introduce the Extended Producer Responsibility strategy
 - ➔ **Increases waste reuse and recycling, and reduces waste generation**

Figure 14: informal waste recyclers



Source: www.robertharding.com

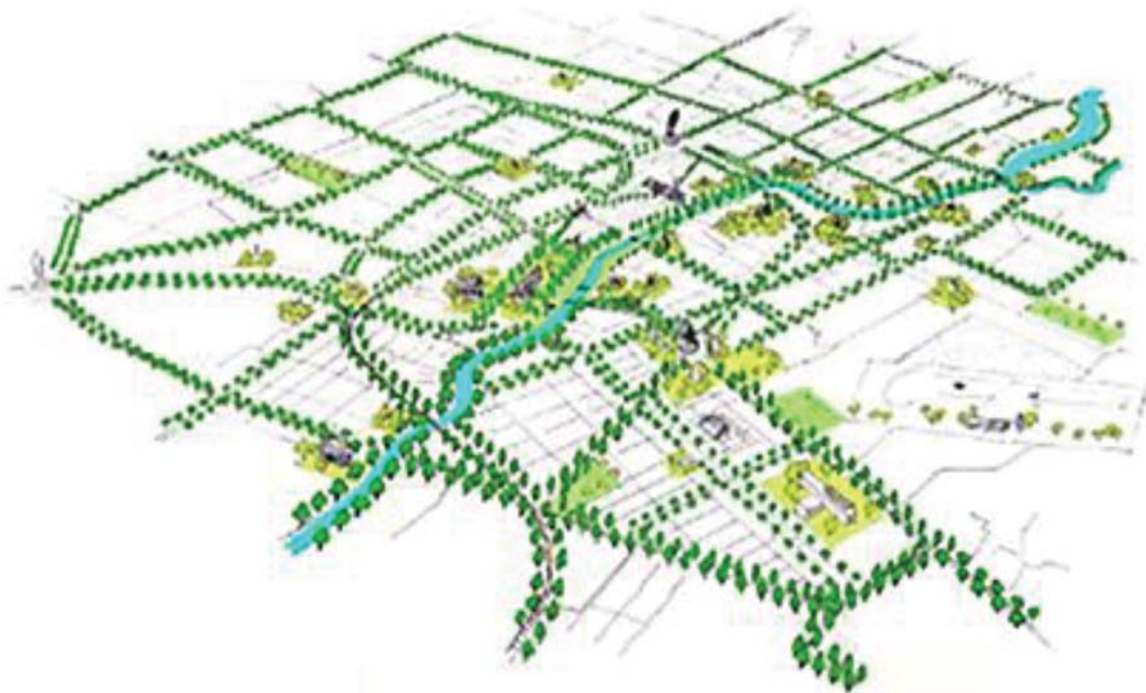
Sources of Additional Information

- www.epa.gov/waste/nonhaz/municipal/wte/
- www.brightknowledge.org/knowledge-bank/geography-and-environment/features-and-resources/waste-to-energy-pros-and-cons
- www.sita.co.im/energy-recovery/benefits-of-energy-from-waste
- www.epa.gov/waste/nonhaz/municipal/hierarchy.htm
- www2.epa.gov/recycle/recycling-basics

6.8 EXAMPLES OF PUBLIC SPACES, CULTURAL HERITAGE GREEN CITY PROJECTS AND EXPECTED BENEFITS

- Establish and enforce by-laws for cultural heritage preservation (see Figure 15)
 - ➔ **Maintains local cultural diversity and identity, increases tourism revenues**
- Introduce or maintain biodiversity corridors supported by green and blue belts (see Figure 15)
 - ➔ **Reduces urban heat island effect, air pollution and carbon emissions, and improves aesthetics of community**
- Introduce or maintain urban agriculture and cooperative gardens
 - ➔ **Reduces urban heat island effect and improves food security**

Figure 15: Green Network Strategy, Battambang in 2020; Phnom Penh Central Post Office building





Sources: ICEM GMS Report Series and Space for Architecture Cambodia

Sources of Additional Information

- www.depi.vic.gov.au/__data/assets/pdf_file/0003/300693/Guidance-Note-Feb-2015.pdf
- nac.unl.edu/buffers/docs/conservation_buffers.pdf
- <https://www.coe.int/t/dg4/cultureheritage/cooperation/Kosovo/Publications/Guidelines-ENG.pdf>
- www.gdrc.org/uem/water/rainwater/introduction.html
- www.watercache.com/education/rainwater/
- water.epa.gov/infrastructure/greeninfrastructure/gi_what.cfm#rainwaterharvesting

7. PRIORITIZING GREEN CITY DEVELOPMENT PROJECTS

Given that not all projects can be pursued immediately, the long list of green city development projects resulting from Step 6 will be subject to a **process of prioritization and short-listing**. This section outlines the process to be undertaken by the Green City Planning Group to prioritise green growth projects for implementation.

This framework applies for short-term investment projects and actions (projects A) and projects that involve sector-wide reforms (Projects B). Projects that involve the development of knowledge products (projects C) are not included in this prioritisation, primarily because they are not amenable to the same screening criteria. These projects typically cost much less than investment projects, and involve research work that needs to be conducted, and do not have the same requirements.

The screening criteria will need to fulfil the following objectives:

- Be relevant to the economic, environmental and social objectives of the city;
- Prioritize projects that are likely to be implementable in the short-term; and/or
- be a longer-to-medium term strategic priority; and
- Be transparent, objective and robust.

The suggested screening criteria for the Cambodia Green Urban Development Program are provided in Table 6 below.

Table 6. Proposed project evaluation criteria

<ol style="list-style-type: none"> 1. Perceived high need or demand or priority 2. Likely financial support from external sources (donor agencies and/or private entities) 3. Cost savings benefits 4. Supportive policy and institutional environment for project implementation 5. Tested technology and/or business model and/or project approach 6. Availability of local operators or suppliers for project implementation 7. High green growth demonstration effect 8. Poverty reduction or social inclusion benefits 9. Green job creation benefits 10. Environmental benefits

Deciding upon priorities will require the application of decision-support tools that can capture these diverse objectives. **The application of a Multi-Criteria Analysis (MCA)** presents a framework for guiding decision-making that can accommodate these diverse concerns, as presented in Table 7.

The scoring will be based on the information present in the project sheet prepared for each proposal (see Table 5). **A score of 0 to 3 will be given to each project** for each criterion with a maximum total score of 30. In the case where there is inadequate information on a project to enable even approximate scoring, for that criterion the project should score a 0, as the lack of information effectively poses a risk for the project. Table 7 provides project assessment criteria as follows:

- **Criterion** – gives the name or short description of the evaluation criterion.
- **Rationale** – describes the rationale for the adoption of the criterion, what it aims to assess and any indicator measures used to gauge the project performance in relation to the criterion.
- **Scoring** – gives guidance on the scoring of the criterion to better enable systematic application, also give guidance on any indicator measures scores related to these.

To enable scoring and prioritisation of projects, judgements need to be made about the likely performance of the projects. Design and conduct of the MCA process can be technically demanding and often requires the input of professional specialists.

Table 7. Criteria for assessing project performance, rationale and scoring guidance

Criterion	Rationale	Scoring
Stakeholder priority		
1. Perceived high need or demand or priority	Some sectors for project investment represent greater perceived demand or needs within the city than others. Sectors with higher perceived demand or need are given higher priority. The appraisal of sector priority is based upon a qualitative assessment of stakeholder priorities.	<p>0 – The project addresses a sector that is not a priority.</p> <p>1 – The project addresses a sector of moderate priority for stakeholders.</p> <p>2 – The project addresses a sector of high priority amongst stakeholders.</p> <p>3 – The project addresses multiple sectors, at least one of which is of high priority for stakeholders.</p>
Financial feasibility		
2. Likely financial support from external sources (donor agencies and/or private entities)	Urban areas in Cambodia face severe financial constraints relative to investment needs. Projects which are more likely to attract funding from sources external to the RGC should therefore receive higher priority. The highest score is reserved for projects with private-sector interest. The appraisal of likelihood of external support for projects is based upon a qualitative assessment of expressions of interest in similar projects.	<p>0 – No known donor or private sector interest in developing the project.</p> <p>1 – Some external interest in sector but no formal project development has taken place.</p> <p>2 – Some external interest in project or similar projects, with some project proposals developed by donors.</p> <p>3 – Some external interest in project or similar projects with private sector (and donor interest).</p>
3. Cost savings benefits	Some projects will offer potential cost savings. This criterion gives higher scores to projects with greater cost saving potential. The worst-performing projects will offer no costs savings. Better-performing projects will offer cost savings relative to alternative investment options (in terms of investment costs and/or operation and maintenance costs), but are still unlikely to be financially self-sustaining. The best-performing projects will offer positive cost savings or revenue streams that will enable them to be financially self-sustaining; where information is available this is indicated by an assessment of crude payback period.	<p>0 - Project offers negative or neutral cost savings.</p> <p>1 - Project offers limited cost savings, or offers cost savings relative to alternative schemes.</p> <p>2 - Project offers moderate cost savings (payback period between 5 and 10 years or qualitative assessment of cost savings).</p> <p>3 - Project offers significant cost savings (payback period of < 5 years or qualitative assessment of cost savings).</p>
Technical and operational feasibility/deliverability		
4. Supportive policy and institutional environment for project implementation	A supportive institutional environment is important in ensuring the success of an investment project. This criterion evaluates the extent to which policies and the institutional environment for the project are like to pose a risk to the	<p>0 – Necessary policy support lacking and institutional environment inadequate.</p> <p>1 - Necessary policy support and institutional arrangements for effective operation are weak or</p>

Criterion	Rationale	Scoring
	success of the project. It requires a qualitative assessment of relevant policies and the institutional environment.	<p>not enforced, and appear to reduce the viability of the project.</p> <p>2 - There is satisfactory policy support and institutional arrangements to enable this type of project, although it is unclear if they are sufficient to enable project viability.</p> <p>3 - There are strong well-defined and enforced regulations, clear policy support, clear institutional arrangements and proven capacity for the project, which increase the viability of the project.</p>
5. Tested technology and/or business model and/or project approach	Green solutions often involve the application of alternative, non-conventional technologies, innovative business models and project approaches. Introducing new technologies, business models and project approaches inevitably increases project risk. The assessment is based on a qualitative review of application of similar technologies, business models and project approaches. ¹	<p>0 – There is no known experience of technology/business model/project approach in Cambodia or similar context (i.e. in low- and lower middle income countries).</p> <p>1 – International experience of the technology/business model/project approach exists, but there is no known experience for this type of project in Cambodia.</p> <p>2 - Limited Cambodian experience, although technology/business model/project approach is proven elsewhere in similar circumstances.</p> <p>3 – Significant proven Cambodian experience with technology/business model/project approach.</p>
6. Availability of local operators or suppliers for project implementation	Technically and financially competent project operators/providers are necessary for the project to be carried out effectively. The assessment is based on a qualitative appraisal of the availability of suitably experienced operators or suppliers in the public or private sector.	<p>0 – There is no capacity/proven experience amongst potential operators or suppliers to deliver the project.</p> <p>1 - There are no known national operators or suppliers, although there is proven experience amongst regional suppliers.</p> <p>2 - There are some experienced operators or suppliers in Cambodia.</p> <p>3 – Experienced operators or suppliers are well established in Cambodia.</p>
Project impacts		
7. High green-growth demonstration effect	Many green investment projects will represent new ways of providing urban infrastructure and services or other goods. As such, they may provide pilot examples of technologies, approaches or business models which can be adopted more	<p>0 – No clear potential for further application of technology/ business model/ project approach nationally.</p> <p>1 - Technology/business model/ project approach has very limited</p>

¹ For technologies that are relatively easy to implement and operate, or are well established and understood (e.g. solar panels or solar lanterns), the feasibility of the proposed business model/project approach will likely be a more important consideration.

Criterion	Rationale	Scoring
	widely across the country. Projects which have greater potential for wider adoption should be of greater priority. The assessment is based upon qualitative evaluation of potential demand for similar projects and/or scalability of the delivery mechanism.	<p>potential for replication in Cambodia.</p> <p>2 - Technology/business model/ project approach has moderate potential for replication in similar circumstances in Cambodia.</p> <p>3 - Technology/business model/ project approach has clear potential to be widely adopted throughout the country.</p>
8. Poverty reduction or social inclusion benefits	Poverty reduction and social inclusion benefits are an important aspect of green growth. The greater the expected poverty reduction benefits or social inclusion benefits (e.g. meeting the needs of excluded groups such as women, minority groups and the disabled), the higher a project is ranked. Based upon a qualitative assessment of likely poverty reduction/social inclusion benefits.	<p>0 – Project offers no significant poverty reduction or inclusion benefits.</p> <p>1 – Project offers some indirect poverty reduction or social inclusion benefits.</p> <p>2 – Project offers some direct (and indirect) poverty reduction and social inclusion benefits.</p> <p>3 – Project offers significant and direct (and indirect) poverty reduction and/or social inclusion benefits.</p>
9. Green job creation benefits	Job creation is a key element of green growth. Job creation benefits are assessed based upon a qualitative appraisal of the likely quantity and quality of job creation over the life span of the project.	<p>0 – Project offers no job creation benefits.</p> <p>1 – Project will create a limited number of jobs in the initial stages of the project.</p> <p>2 – Project will create a limited number of jobs for the lifetime of the project or a significant number of jobs in the initial stages of the project.</p> <p>3 – Project offers significant job creation for the lifetime of the project.</p>
10. Environmental benefits	Green projects target a range of environmental benefits. The greater the range and extent of environmental benefits, the higher priority the project should be. Environmental benefits considered under this criterion include reduction of GHG emissions, reduction in local air pollution emissions, reduction in water pollution, reduction in solid waste, reduction in vulnerability and improvement in biodiversity. Environmental benefits are assessed qualitatively.	<p>0 - Project has no environmental benefits.</p> <p>1 - Project has limited environmental benefits for a single environmental performance indicator.</p> <p>2 - Project has significant benefits for at least one environmental performance indicator.</p> <p>3 - Project offers significant environmental benefits for a number of different environmental performance indicators.</p>

It will be very important for the prioritization and short-listing of the green city development projects to be conducted in an **objective, participatory and transparent way**, with the involvement of the Green City Steering Committee guaranteeing the fairness of the process. Information on the long-list of projects, on the criteria utilized for the shortlisting, and on the outcomes of the selection should be made publicly available through the Green City Planning Group’s communication tools.

The results of the prioritization process will be a short list of projects (between 8 and 16 projects) considered to be of the utmost priority for implementation. It will be up to the Green City Planning Group, with the approval of the Green City Steering Committee, to decide whether the short-list will include only short-term investments and actions (projects A) and comprehensive sector reforms (projects B) or if it will also include knowledge products (projects C).

8. URBAN GREEN GROWTH SCENARIOS

The purpose of scenario development is to help city planners understand the possible implications for urban green growth of alternative patterns of investment and development. The scenarios help to identify the longer term implications of policy and investment decisions for the prospect of green growth in the city. They allow the focus to shift from the immediate impacts of policy or investment decisions and focus more strategically on the cumulative and longer-term implications for the urban area as a whole.

Based on the analysis of sections 3, 4 and 6, the development of urban green growth scenarios seeks to build a coherent narratives elaborating how current development trends, and policy and investment affect green growth outcomes in terms of key performance measures.

Given the limited availability of consistent quantitative data for environmental indicators in the Cambodian context, and the difficulty in developing sufficiently robust numerical projections for environmental performance, scenario development is largely narrative and qualitative. Where reliable or accepted figures are available (reliable data estimates or proxies can be used), these can be integrated into the scenarios, but the scenarios largely serve to develop a coherent causal picture of the cumulative environmental implications of particular development pathways.

8.1 ECONOMIC, SOCIAL AND DEMOGRAPHIC PARAMETERS FOR SCENARIO DEVELOPMENT

Section 2 defined the likely economic, social and demographic development prospects for the city. These were generally based upon officially accepted plans and projections for the city, including:

- Demographics (e.g. population, household size and composition);
- Economic (e.g. urban GDP, sectoral composition, investment, trade); and,
- Socio-economic (e.g. GDP per capita, income levels, poverty rate).

These are treated as parameters because other interventions are not expected to alter these values – or at least not in the timeframe of the scenario analysis. In other words, factors such as population growth, economic growth and income growth remain the same across all scenarios. There are three major reasons to adopt these parameters:

- Projections are officially adopted and for the most part represent politically acceptable targets;
- Assuming that these values remain the same across the different scenarios allows a better focus on environmental performance, and how interventions can realise better environmental performance without compromising or challenging economic ambitions; and,
- In the development of longer-term scenarios, development pathways may be expected to diverge considerably as the longer-term environmental and social consequences of the development path start to feedback into economic and social performance indicators. However, within the time horizon of the plan (typically 10 years), green growth interventions at the city level are unlikely to have an impact on these large-scale structural changes.

8.2 SCENARIO DEFINITION

Three scenarios are defined, representing the realistic range of green growth activities that could be pursued during the planning period. These are:

- **Business-as-usual (BAU).** This scenario represents the continuation of current trends. In other words, effectively no public policy or institutional reform, no implementation of urban plans, and no green growth interventions other than those which might go ahead anyway.
- **Piloting Green Growth.** This scenario represents the implementation of currently adopted plans and policy reforms, as well as the implementation of all short-term investment projects

identified in Section 7. In other words, significant strides are made in the provision of basic infrastructure and services along conventional lines, and green growth approaches are piloted in selected niches.

- **Mainstreaming Green Growth.** This scenario represents the citywide implementation of green growth, including the adoption of current plans and policies that are in line with green growth goals, the adoption of significant policy and institutional reform across urban sectors critical for green growth, and the city-wide roll out of the green growth approaches identified in Section 7.

Each scenario should be given a clear definition of what assumptions are made as regards sectoral policy, institutional arrangements, plans and projects to be developed, prior to scenario development.

Scenario development

The scenarios will develop a consistent narrative outlining the expected implications of the development pathway taken for green growth performance measures. The discussion of the scenario is structured as follows:

1. **Resource use** – including a review of likely trends in urban resource use, with a focus on energy and water. Other material flows are not included as information is lacking and energy and water use represent the most pressing concerns in the Cambodian context.
 - a. **Energy** – sets out trends in energy use, highlighting likely changes in energy supply and consumption. This section should also consider energy-related GHG emissions.
 - b. **Water** – sets out trends in water consumption, including supply considerations and changes in patterns of consumption and their drivers.
2. **Pollution** – focuses on the key negative environmental externalities associated with urban activity.
 - a. **Local air pollution** – cumulative impact of urban activity on the composition and quantity of air pollution emissions, implications for urban air quality, and consequences for the urban environment and public health.
 - b. **Water pollution** – cumulative impact of urban activity on the composition and quantity of wastewater emissions from industrial and municipal sources, implications for water quality and availability, and consequences for the urban environment and human health (with particular focus on the implications for water bodies within city).
 - c. **Solid waste** – cumulative impact of urban activity on the composition and quantity of solid waste and hazardous waste, and implications for water pollution and quality, the urban environment and public health.
3. **Urban form and function** – this section looks at the interaction of spatial development trends and urban function, with environmental performance and spatially realized environmental threats (flooding and temperature). This is developed, for example, by identifying areas of the city where different patterns of development occur and how the activity conducted in these areas cumulatively affects environmental performance and urban function. Typically, this analysis will divide the city into zones which have a different form and function, such as the city center and peri-urban areas.
4. **Poverty and socio-economic development** – this section reviews the trend in socio-economic development, social inclusion and poverty reduction within the city. Particular attention is paid to access to affordable housing, sanitation, solid waste collection and sustainable energy. Gender disaggregated data and projections should be utilized to analyze trends in gender distribution of access to services. The cumulative impact of green growth interventions for low-income groups will be analyzed.
5. **Summary** – this presents a short summary of the scenario and its implications for broader considerations of economic growth and sustainable development in the long term.

8.3 SOURCES OF ADDITIONAL INFORMATION

- www.greengrowthknowledge.org/sites/default/files/downloads/resource/Green-Growth-in-Practice-GGBP_0.pdf
- www.greengrowthknowledge.org/sites/default/files/downloads/resource/GGKP%20Moving%20towards%20a%20Common%20Approach%20on%20Green%20Growth%20Indicators.pdf
- www.unescap.org/resources/green-growth-indicators-practical-approach-asia-and-pacific-sustainabledevelopment.un.org/content/documents/916guidebook4.pdf
- openknowledge.worldbank.org/handle/10986/6058
- cdkn.org/wp-content/uploads/2011/07/CDKN-Guide-to-Green-Growth.pdf

9. PREPARING THE PRIORITY GREEN CITY PROJECTS

The projects that have made it to the short-list via the prioritization process will have to be **subjected to financial and economic analyses**, in order to make sure that the related investments will yield sufficient and satisfactory economic returns. The Green City Planning Group will have to carry out these analyses either with its own economic valuation competences or with the help of qualified experts (which may be provided by the NCSO or by donor agencies willing to lend technical support).

9.1 FINANCIAL ANALYSIS

All development projects are typically subject to financial analysis. This involves an assessment of the financial costs and revenues accruing to the project owner as a result of the project. While essential in understanding the investment case for a project, financial analysis cannot incorporate social or environmental considerations other than as they occur as potential sources of costs or revenues (e.g. carbon market credits can be sold to realize revenue). It cannot therefore be used to indicate whether a particular project which addresses an unremunerated environmental or social externality is a good use of resources from the broader welfare perspective.

Nevertheless, a rudimentary financial analysis in terms of payback period or expected return on investment is a criterion for public projects which may be expected to be financially self-sustaining, or attractive to private sector investors (and therefore “bankable”).

9.2 COST-BENEFIT ANALYSIS (CBA)

CBA is a means of **valuing the expected outcomes of a project in monetary terms**. In principle, CBA accounts for all the economically significant cost and value streams that accrue to a project. Importantly, this can include the monetization of all environmental and social impacts. There are many well-developed valuation techniques designed to enable this monetization, including valuations based upon willingness to pay, hedonic pricing models and transfer pricing. The big advantage of CBA is its promise to allow the comparison of different types of projects with different types of impact and outcome in comparable terms (typically a figures giving the net present value [NPV] of the project, and/or the internal rate of return [IRR] of a project) that are easily understandable to policy makers.

In practice, however, the time and resources needed for such valuation are often lacking. CBA also tends to be data-intensive, which precludes its effective use in data-poor environments. There are also issues related to the incorporation of social impacts into CBA, which tends to ignore the distributional implications of projects. Finally, in the context of potential green growth investment projects, while an established range of carbon prices is available to enable an assessment of the benefits accruing to energy and emissions projects, projects targeting resilience and avoided future damages are extremely difficult to cost.

9.3 COST EFFECTIVENESS ANALYSIS (CEA)

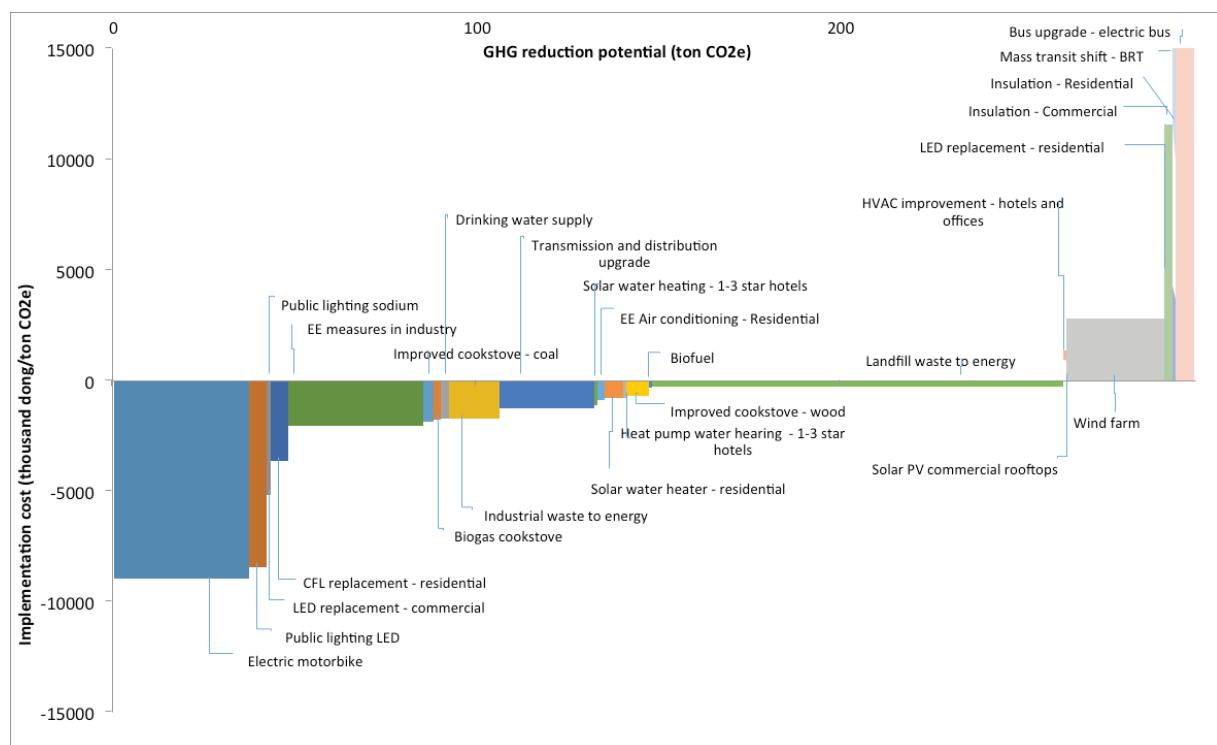
CEA is typically used to **assess investment projects where there are alternative options to achieve a particular objective** but the objective itself is not amenable to valuation. For example, regulations may require that a bridge withstand a 1-in-100-year flood event; this does not represent an economically optimal level of resilience but one that is a statutory requirement. CEA can allow a comparison between the costs of alternative engineering solutions for meeting this requirement. Other costs such as environmental costs can be incorporated into the analysis. However, CEA is of limited use when seeking to compare projects with different objectives, or in the case of projects contributing to a green growth strategy, objectives that are likely to be broadly conceived (e.g. emissions reductions), or multiple objectives.

9.4 MARGINAL ABATEMENT COST CURVES (MACCS)

MACCs present information on different opportunities for GHG (or other emissions) abatement in terms of the cost per unit of emissions reduction and the amount of emissions reductions achievable. Essentially it is a visual comparison of abatement CEA and scalability for different options. These are typically ordered from least-cost opportunities at the left hand side of the scale, to the highest-cost opportunities at the right hand side of the scale. Figure 16 presents a MACC for Da Nang city (Viet Nam), conducted for appropriate emissions reduction technologies. MACCs can incorporate a range of measures, including technologies and regulatory / policy approaches to emissions abatement.

MACCs have important shortcomings, in particular relating to assumptions underlying the calculation of unit abatement costs attributable to different technologies. Assumptions regarding the cost of energy, the discount rate and the extent to which negative and positive externalities are included in the cost of particular options are not made explicit and can alter the outcome of the analysis substantially. This may be particularly relevant when considering positive externalities to the diffusion of new technologies in a given context, which reduce costs over time. Nevertheless, if used with care, they are a useful tool for presenting a range of options and are easily understandable by decision makers.

Figure 16. MACC for energy and emissions technologies in Da Nang city, 2014



Source: ICEM 2014

9.5 ADAPTATION COST CURVES

Approaches similar to MACCs have been adopted to enable the consideration of adaptation options. However, whereas the CEA for abatement options allows all options to be presented in common units (emissions reductions per unit cost and emissions abatement potential), such is not the case for adaptation. Adaptation objectives differ from sector to sector, and thus a comparison cannot be made across projects in different sectors. Similarly, investment options cannot be characterized by a generic technology or policy type as with emissions abatement, but are frequently location-specific (e.g. flood mitigation measures), and will have particular cost-effectiveness characteristics dependent upon the geographical characteristics of a particular area.

An approach to circumvent this difficulty is to present investment options in terms of the results of a CBA, with a fully monetized cost-benefit ratio (or IRR) given on the y-axis and the potential overall benefits (or NPV) given on the x-axis. However, such an approach would require rather sophisticated CBA, taking into account the avoided costs for some indeterminate future. Nevertheless, for interventions within a sector, appropriate CEA metrics that would allow a comparison between projects are available.

9.6 FEASIBILITY DEFINITION OF PRIORITY PROJECTS

Those short-listed projects that are validated through the financial and economic analyses described above will then be subject to **a more detailed level of preparation, which can be defined as project feasibility**. From the 1-page project sheet (table 5), the project descriptions will thus grow into larger documents, incorporating the results of the financial and economic valuations, but also of technical assessments and references, and more information on the proposed implementation scenarios.

This will also require that **more in-depth consultations are conducted with the various parties that will be involved with the specific project**. These parties include stakeholders that are expressing the demand for the project, representatives of the sources of financial support, public sector departments that will be responsible for implementation, maintenance and running of the project, and the providers of technology or construction services required. Table 8 provides a proposed general template for a more detailed project description note.

Through the process of feasibility definition, it will also be possible to **identify the parties that will act as champions to the project**, and will be ready and willing to push it through the inevitable difficulties and complications of implementation. In creating the support for the project, it will be important to insure that gender and youth inclusion considerations are taken into account. The validation by the Green City Planning Group of all projects at their feasibility stage will be one of the last steps in the preparation of the Green City Strategic Plan.

Table 8 Project description Form for priority green city projects

Project Description Form	
A. Project summary	
Name:	<i>[Name of the project]</i>
Project ID:	<i>[Unique identifying number for the project]</i>
Project Description:	<i>[Narrative giving a basic overview of the project]</i>
Project History:	<i>[Project history including who initially proposed the project, when it was proposed and what the development history of the project is if any. Importantly, the history also identifies road-blocks to the project encountered in previous iterations of the investment planning process.]</i>
Good or service provided:	<i>[Narrative description of proposed good or service and target market]</i>
Green Growth Rationale:	<i>[Narrative describing the green growth benefits of the project.]</i>
Sector:	<i>[Relate the project to one of the GCSP sectors.]</i>
Potential Project Participants and Role:	<i>[This section describes bodies which are directly involved in the project as counterparties or off-takers. Other bodies or agencies which may be key to the process should also be mentioned, such as any project proponents in government or the private sector.]</i>
Project Type:	<i>[Narrative description of possible financing modality such as public, donor, blended finance, PPP or private sector financed. If available greater detail could be given on the possible structure of financing (e.g. BOO, BOT, lease contracts, management contracts etc.).]</i>

Project Size:	<i>[The estimated investment capital needed for the project. Note that different project sizes trigger different approval procedures with different levels of government.]</i>
Project schedule:	<i>[Likely feasible implementation schedule of the project and project duration]</i>
Project Location, and land and resettlement considerations:	<i>[This gives the proposed physical location of the project (if applicable). It also outlines land requirements and described the availability of land for the project. If land for the project has already been identified it describes any resettlement requirements relating to this land.]</i>
Supporting Laws, Programmes and Policies	<i>[Outline relevant laws, policies, programs that could either provide financial support to the project or are important in market formation. Include draft provisions noting when adoption is expected.]</i>
Licenses and Approval Process:	<i>[List of licenses/approvals needed for the project and where they are to be obtained. Also note which if any of these have been granted.]</i>
Potential Risks	<i>[List potential risks to different parties and the investment.]</i>
Next Steps	<i>[Next steps needed to develop the project including data needs and stakeholders to consult. If the project is developed to a sufficient extent this can include suggested next steps in the project development cycle.]</i>
Contact People:	<i>[Key individuals to contact regarding the project and contact details.]</i>
B. Green growth benefits	
Resource use	<i>[Description of significant resource use savings relative to BAU (e.g. water, energy etc.), quantitative estimates if available]</i>
Pollution abatement	<i>[Description of any significant pollution abatement that can be ascribed to the proposed project, quantitative estimates if available]</i>
Green jobs	<i>[Description of any significant green job creation]</i>
Inclusion/poverty reduction	<i>[Description of any social inclusion or poverty reduction benefits]</i>
C. Financial and Investment Parameters	
<i>[This section describes the key financial parameters of the project. Before a Pre-Feasibility Study or Feasibility Study, figures to calculate these parameters will not be available, although broad estimates may be available from similar projects in Cambodia and elsewhere. This is more relevant for investment projects and projects seeking private sector funding]</i>	
Capital Expenditure:	<i>[Estimates capital expenditure in both USD and Riel with a description giving a breakdown of items if available. Including any comment relating to uncertainties over cost.]</i>
Operating Expenditure:	<i>[Estimated operating expenditures and a description, including annual costs and any other regular expected costs (e.g. refurbishment costs etc.). Including any comment relating to uncertainties on costs.]</i>
Revenue:	<i>[Estimated average annual project revenue over the project life span. Include details of calculation here and account of uncertainties]</i>
Payback Period:	<i>[Estimated payback period based upon parameters in section C.]</i>
Potential Private Financing Sources and Structure:	<i>[Description of potential private financing sources, costs and proposed financing structure.]</i>
Public and Donor Financing Sources and Structure:	<i>[Description of potential public financing sources, costs and proposed financing structure.]</i>
Estimated Return on Investment:	<i>[Estimated return on investment based parameters in section C.]</i>

10. IMPLEMENTATION ARRANGEMENTS FOR THE GREEN CITY STRATEGIC PLAN

The development of the Green City Strategic Plan is a process that could take between 9 to 12 months. When completed, and when the Plan will have been approved and validated, the first results will be the **confidence built and the better understanding among stakeholders, public authorities and communities**. Another important outcome will be the public expectation to see real change take place in moving the urban center towards greater sustainability.

For such expectations to be met, the Green City Strategic Plan will have to move into the implementation phase. This will require **institutionalizing and making permanent some of the arrangements that had been put in place for the preparation of the plan**. An Advisory Board and Technical Working Groups should be established to help the lead organization (i.e. the municipality or district) to effectively champion and coordinate the implementation of the Strategic Plan.

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

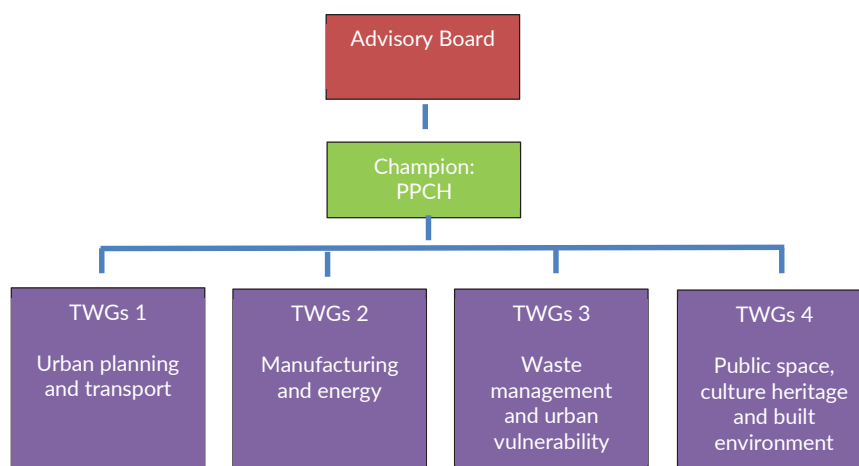
The Advisory Board will have the following responsibilities:

1. Provide strategic oversight and direction to the implementation of the Strategic Plan and ensure that the plan's vision and mission is realized, the goals are met and the overall strategic 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
3. Endorse and support the delivery of activities of the champion organisations (i.e. the municipality or district)
4. Meet regularly to review and monitor the implementation progress and achievement.

The main objective of the TWGs is to support the champion Organisation with the implementation of the Strategic Plan by providing technical advice and support in order to achieve the plan's set goals, objectives and priority actions. 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 the champion on a regular basis.

Figure 17. Proposed implementation arrangements of Green City Strategic Plan for Phnom Penh



Implementing the short-listed projects will first and foremost depend on **identifying and securing the necessary financial resources**. Potential sources of finance for green growth actions and priority projects include the following:

- National public finances – national public funds, including direct budget support and financing allocated for specific projects and programmes;
- Nationally administered investment funds – any public investment funds that can make grants or loans available for green actions;
- Donor programmatic funding – bilateral cooperation funding available for urban green growth programmes nationally and at the municipal level;
- Domestic commercial banks – commercial banks lending to urban infrastructure development projects in the country;
- Other domestic private sector – project and balance-sheet investment from private corporations;
- Carbon finance – such as Clean Development Mechanism, Joint Implementation, international trading mechanisms for emissions abatement;
- International financial institutions – supply loans, grants for capital investments, technical support and a variety of insurance and risk mitigation instruments for other potential investors;
- International private sector project developers – typically infrastructure and service provision companies and private equity companies; and
- Foreign commercial banks – these typically lend to project developers for public-private-partnership infrastructure projects.

These sources of financing will differ in the type and amount of financing they are able to offer, and the terms on which they are able to make finance available. The extent to which these sources can be mobilised will depend upon a range of factors relating to perceived risks, expected returns and institutional issues relating to ease of investment.

The **responsibility for the implementation of specific projects** will depend on their sector of relevance. The government departments in charge of the specific sector will be called upon and equipped, if necessary, to ensure full implementation and subsequent maintenance and operation. Financial flows of the project-related resources will have to be organized accordingly.

The implementation of the Green City Strategic Plan and List of Priority Green City Projects should be subject to **rigorous monitoring and evaluation**. In addition to the annual monitoring, there should also be mid-term evaluation to be carried out in 2020 and end of implementation evaluation in 2025. As part of the annual monitoring, each TWG will be requested to submit a report to the champion organisation which outlines the progress and challenges in the implementation of the priority actions, projects and resource mobilization. The champion organisation 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 external experts, under the direction of champion organisation. The results of the monitoring and evaluation will be also made publicly accessible.

Finally, it will be very important to maintain a **full program of public communication and awareness throughout the implementation phase**, to ensure that the results of the green city projects are made known and to confirm that the expectations built in the phase of preparation of the plan are being met. The communication and awareness program should include mechanisms for feedback from stakeholder groups and the public, and for the submission of suggestions and proposals.

