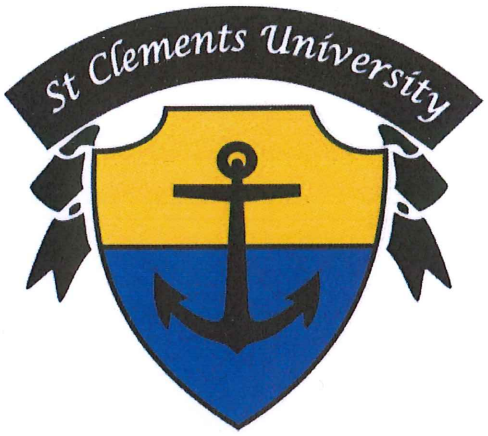
Social Urbanism in Cambodia

By Doctor Hue Chenda



St Clements University

Turks & Caicos Islands

Social Urbanism in Cambodia

By: Dr. Hue Chenda

This Dissertation Approved by:

Dr. David Le Cornu, President and Faculty Supervisor

Mr. Adrian Williams, President Assistant, St. Clements University

Table of Contents

I. Introduction

Urbanisation[1] is a major force of economic and social transformation of society—and hence of sustainability—as urban areas have become the hubs of cultural, economic, scientific, and social innovations [1,2]. Urbanisation has a particular implication for sustainability in the Asian economies, except for China: the unplanned urban growth in a few clusters of an Asian developing economy has triggered an urban sprawl undermining the ability of the nation to achieve the significant targets set for sustainable development by the United Nations. Such urban sprawls have pushed urban planning to the background with massive increases in air pollution, congestion, water contamination and depletion of groundwater stocks along with losses of wildlife and habitat. This paper examines the case of Cambodia for understanding the main drivers of urbanisation.

There are two critical facets of the current phase of human history impacting sustainability: first and foremost, the current period of our collective history is characterised by unprecedented globalism, or global interdependence as we have also learned from the COVID-19 pandemic. Secondly, the contemporary human history is essentially an urban era. As an example, in 2018, 4.2 billion people lived in the urban areas of our globe, which will rise to about 9.25 billion people (70% of the global population) by the 2050s [3]. Since North America, Europe and Oceania are already highly urbanised, the future path of urbanisation will take place in Asia with an urbanisation level of about 50%. Yet, Asian urbanisation has also contributed highly uncomfortable sustainability challenges such as concentration of urban poverty, urban pollution, urban sprawls, slums, and a myriad of ecological challenges.

In order to promote healthy urbanisation, one of the major targets of sustainable development is: “Make cities and human settlements inclusive, safe and resilient and sustainable.” (see Target 11, Stahel [4], https://unstats.un.org/sdgs/report/2016/goal-11/). Doubts have been gathering momentum as to whether Asian developing countries can create adequate “administrative, management, institutional and financial capacities” to productively harness urbanisation for avoiding serious and adverse socio-economic consequences of urbanisation [5]. Even more importantly, most urban scholars now admit that a single grand model of Asian urbanisation and its implications does not exist. The dynamics and

consequences of urbanisation are believed to vary significantly from one Asian country to another [5]. In this paper, we hence examine the determinants of urbanisation in Cambodia—to unravel the forces that propel the phenomenon of rural–urban migration driving urbanisation in one of the fastest-growing developing countries in Southeast Asia. The crux of the matter is that in the highly globalised and market-driven economy of Cambodia, market forces have come to the forefront only since the early 1990s and, hence, urban development is influenced by both local and international factors. By applying an advanced methodology in time series analysis, to the best of our knowledge for the first time for sustainability issues in Southeast and East Asia, we will highlight the importance of various factors in driving urbanisation in Cambodia.

Specifically, we explore the pattern of urbanisation in Cambodia, to examine the precise roles of various factors—like foreign direct investment (FDI), public investment, tourist arrivals and GDP growth—in triggering and propelling urbanisation in Cambodia. Urbanisation seeks to capture the process of transition of a society from predominantly rural to urban modes of production and cultures. Urbanisation in any society is driven by three major changes: (1) natural population growth, (2) migration, and finally (3) reclassification of rural areas as urban [6]. Cambodia offers a rare case history to urban scholars for understanding diverse forces of urbanisation absent from other societies due to somewhat unprecedented twists and turns in the urbanisation history of Cambodia, at least since the 1960s. We will provide a brief description of the historical process of urbanisation in Cambodia in the next section.

In contrast to older cities in developed countries (like London, Paris, and New York), where urbanisation took place over a century, urbanisation in developing Asian countries like Cambodia is taking place within few short decades. In the absence of institutional, managerial, and economic capacity to manage rapid and concentrated growth, authorities in such developing economies might fail to achieve critical sustainable development goals. In this paper we apply the Autoregressive Distributed Lag (ARDL) model to examine the long-run relationship between urbanisation and various internal and external factors—such as foreign direct investment, tourism and internal business activities in Cambodia—using data from 1994 to 2015. We further utilise the Nonlinear Autoregressive Distributed Lag (NARDL) model—recently advanced by Shin et al. (2011) [7]—to uncover the asymmetric impacts of increases and decreases in various drivers of urbanisation on the process of urbanization. To the best of our knowledge, the process of urbanisation in any country has never been examined using such an advanced econometric approach. The present study thus offers policy makers and authorities in Cambodia a comprehensive empirical analysis of factors driving urbanisation in the country,

which remains largely concentrated in select *hotspots*—where systems are at risk of collapse due to the unbridled influx of the domestic migrant population with limited choice. Such urbanization has compromised the sustainability of the urban regions of Cambodia. It is hence critical for Cambodia to undertake an immediate policy action, to alleviate burden from the current urban centres by fostering urbanisation of other areas in the country. Our research thus offers options for urban development policies, which can help Cambodia formulate strategies for a balanced and sustainable urbanisation.

For a well-structured urban development, urban spatial planning is a precondition for the development of sustainable urban infrastructure. Among Cambodia's secondary cities, only Battambang city finalized its Land Use Master Plan for urban development in 2015. Other cities are still undergoing spatial planning, zoning, mapping, and drafting of their masterplans. The challenge is that the process of developing master plans takes years, while the pace of urbanization is rapid. This slow process will lead to unstructured settlements, uncontrolled building constructions, unmanageable zoning for businesses and or residential development, and the possibility of mis-directed urban infrastructure development. For instance, the Kampong Cham city had to resolve all the impacts of their reinstallation of sewerage and drainage system, causing considerable socioeconomic costs. The city had to compensate owners of already built houses, buildings or roads to make way for the sewerage system. It can be observed that the longer the urban planning takes, the slower the urban infrastructure investment develops, hence, slowing down the potential economic growth and infrastructure services. Limited local capacity and lack of national government technical and budget support is one of the main concerns raised by local governments, underpinning the slow urban planning development.

Steady urban growth is a driver for economic development but needs to be more carefully managed in Cambodia.Cambodia is still predominately a rural country with the majority of people living in rural areas, and with most of the cities and towns beingrelatively small. However, urbanization is underway and Cambodia needs to plan for it. To date, the challenge of urbanization has largely been unplanned for and unregulated which is generating significant social, economic and environmental issues. The capital city and many Cambodian cities such as Battambang, Siem Reap, Sihanouk Ville, Kampong Cham, Suong, border town such as Bavet are also undergoing steady urban growthand are facinga severe lack of systematic urban spatial planning, and financial resources for sustainable urban infrastructure and services.

Without urban planning interventions that take the rapid pace of economic development into consideration, Cambodia will continue to experience widening spatial and economic disparities within its cities. Most of the cities and urban areas have already experienced the stress of urban growth and lack of urban infrastructure, and this already has impacts on the economy, society and environment. In consultation with city officials, the common challenges include inefficient solid waste management, lack of wastewater treatment plants and sewerage and drainage networks, lack of public spaces, lack of systematic urban commutation and parking spaces, and so on.

Phnom Penh has been one of Southeast Asia's fastest growing cities. Throughout the past decades the urban development processes throughout Southeast Asia have led to evictions, many of which have been violent. In many countries, evictions and the violent removal of entire communities has become a defining feature of modern urban development. Phnom Penh is no exception. This paper provides a condensed account of some of the essential urban policy decisions over the past four decades that help to understand the conflicts and fault lines that have shaped the contemporary urban landscape of Phnom Penh. Using the example of an inner- city community, which was home to many artists with close connections to the Ministry of Culture and Fine Arts, the article shows how entire urban spaces in Phnom Penh have been re-designed in line with the needs of an increasingly inter-connected and wealthy political and economic elite.

II. Literature Review

2.1 Case Study of Medellin

In 2012, the special issue of the Tourism Geographies Journal presented several papers under the topic "slum tourism", "with a reflection on the state of art on this new area of tourism research" (Frenzel and Koens, 2012, p. 195); arguing that the phenomenon is not a marginal activity anymore but a global trend practiced in the five continents.[3] However, "aspects such as the position of local people remain underexposed" (Frenzel and Koens, 2012, p. 195), which coincide to a large extent with the conclusions of a paper presented at the Second International Place Branding Conference in Bogota in 2011 (Hernandez-Garcia and Lopez-Mozo, 2011). Since the 1990s the second biggest city of Colombia, Medellin, is undertaking programmes and

projects in informal settlements, to physically upgrade them and integrate both physically and socially to the urban fabric. Possibly the first and more influential project was the over ground metro system introduced in 1995, but it was in 2004 when “the city implemented the world’s first modern urban aerial cable-car public transport system” (Brand and Davila, 2011, p. 648) to reach hillside informal settlements. Public space upgrade and community services such as schools and libraries designed by prestigious architects have enriched the atmosphere and to some extent the quality of life, in these impoverished areas. To the point that the barrios of Medellin are commonly visited not only by Colombians but also by international visitors (especially from Latin America) who want to see firsthand the projects and how the settlements and the city have changed. The municipality has called this initiative “social urbanism” and it is becoming a brand of the city (Echeverry and Orsini, 2010; The Architectural Review, 2011; Brand, 2010).

Medellin, perhaps without noticing or anticipating, has found a role for informal settlements (as we asked in Hernandez-Garcia and Lopez-Mozo, 2011) in branding the city, and promoting the tourism to those areas. This paper aims to explore this situation, how it works, and the implications for the city and the local people. It will also, taking Medellin’s case, discuss the relationship between slum tourism and city branding, and further, social urbanism.

Slum Tourism and City Branding

Informal settlements are a consistent part of Latin American cities. Bogota for example, more than 50 per cent has grown from informal patterns (Martin-Molano, 2000, p. 66), with unplanned developments in public and private invaded land or in illegal subdivisions of rural land which later on is added to the city. These settlements are to a large extent what residents have made up of them, by means of self-build and self help practices. These areas are gradually legalised, consolidated and fully integrated to the city; to the extent that after 20 or 30 years is no longer possible to track their informal origins (Kellett, 2005; Hernandez-Garcia, 2009). There are not reliable figures for Medellin, but it should be similar if not bigger, than in most cities in Latin America; making urban and architecture informality a common feature of the cities in the region. But informal settlements are much more than streets and houses; they have to be with social, economic and cultural characteristics, and politics and governance as well. For

some, urban informality “emerges under a paradigm of liberalization”, and cannot be understood outside the context of globalization as an alternative way of thinking and performing, “[...] urban informality not only as a political economy but also as a way of life” (Alsayyad, 2004, pp. 26-7). If informal settlements are majority in cities in Latin America, display a particular architecture and urban space, and exhibit especial social and cultural characteristics; why are they marginalised and to some extent “invisible” for some policies? (they are visible for eradication and relocation policies). For example, for tourism strategies and city branding projects?

In this sense, we (Hernandez-Garcia and Lopez-Mozo, 2011) asked if there is a role of informal settlements in branding cities. With evidence from barrios of Bogota, we came to the conclusion that informal areas have something to offer to a strategy in that direction, and what is more, barrios are also interesting enough for tourism. About this topic in 2012, the special issue of the Tourism Geographies Journal presented several papers under the theme “slum tourism”, “with a reflection on the state of art on this new area of tourism research” (Frenzel and Koens, 2012, p. 195); arguing that the phenomenon is not a marginal activity anymore but a global trend practiced in the five continents. With this in mind, this paper explores the experience of informal settlements in Medellin and the urban and social transformation of them by means of what they call “social urbanism”. And how this transformation is attracting interest and tourists to these areas, of people from the country and beyond. And furthermore how Medellin, perhaps without noticing or anticipating, has found a role for informal settlements in branding the city. Place branding continues to be an elusive term, with disagreement of what is and what is not (Kalandides, 2011). This makes the concept – and the practice – dynamic, controversial and with room for new ideas and questions, such us the contribution informal settlements can make. What it seems to be clear is that place branding comes from the place itself and its people. And this sense the definition given by Kavaratzis

(2004, p. 70) is explicit:

> City branding is understood as the means both for achieving competitive advantage in order to increase inward investment and tourism, and also for achieving community development, reinforcing local identity and identification of the citizens with their city and activating all social forces to avoid social exclusion and unrest.

Increase economic development but at the same time community development and local identity, which differs it from place marketing (Andersson and Ekman, 2009), and from just a slogan and a logo (Kalandides, 2011). But what it is also clear is that the literature on place branding is exploring different avenues: branding geographies (Pike, 2011); creation of a perceived value (Kavaratzis and Ashworth, 2005); the relation and the differences with place marketing (Kavaratzis, 2004); place image and place identity (Anholt, 2010; Kalandides, 2011, 2012); place management (Parker et al., 2001); urban planning and urban regeneration (Padddison, 1993; Dijk and Holstein, 2007; Eshuis and Edwards, 2012); to name some.

Research on the role of informal settlements in city branding can be another subject of exploration, as this paper suggests. In this sense, literature on slum tourism can be of interest (Frenzel and Koens, 2012), the same as the direct exploration of the topic in Latin America, as Hernandez-Garcia and Lopez-Mozo (2011) and Torres (2012) argue in their papers.

Hernandez-Garcia and Lopez-Mozo (2011) argue that branding cities is positive as an economic and social tool to enhance life and well-being of people; however, it can be the opposite if the benefits are only for some. In this regard, the discussion on the role of informal settlements becomes important, especially in the context of Latin American cities in which these settlements are size and social very significant. The authors therefore, suggest that there can be a link between informal settlements and branding, with interesting results for both if managed correctly and fairly. They also argue that there are at least three themes in which informal settlements can enrich a city branding strategy. First, informal settlements are a constitutive and consistent part of Latin American cities, displaying distinctive physical and social characteristics. In this sense, they are “differentiated” places (Kavaratzis and Ashworth, 2005), with strong identity associations (Anholt, 2010), which can arguably be communicated as authentic places with high symbolic value (Torres, 2012). Second, some cultural expressions found in these areas can be of interest beyond their own boundaries, showing the creativity and richness found in there, and contribute to enrich a branding initiative. “Cultural heritage of slums (informal settlements) as a resource to remake their images in face of deeply-rooted prejudices against slum (informal settlements) residents” (Torres, 2012, p. 209). Third, the architecture and urban space found in those areas, between vernacular (Kellett and Napier, 1995) and everyday appropriation and transformation of space (Hernandez-Garcia, 2009; Miles, 2000), is arguably another distinctive characteristic that can contribute greatly to a place branding idea.

The Transformation of Medellin

In the 1980s and 1990s Medellin had the highest rate of murders in Colombia and one of the highest in the world; and that violence was especially associated with informal settlements. Today, the rate of crime has dropped dramatically, the city is the most competitive of Colombia for business and tourism (Perez-Ayala, 2012), and many of the barrios are visited to see the physical and social transformation.

Medellin, with a population of 3,750,000 people (including the metropolitan area) is situated in a valley around the Medellin's River and over the Andes mountains in the north west of the country. It has a friendly climate with temperatures between 18 and 28 degrees centigrade along the year. As other cities in Colombia, it is socially strongly segregated with richer populations locating in the East and poorer in the West. Also, as a common feature of Latin American cities, Medellin has large areas developed informally, mainly located in the north and south peripheries of the Western over the mountains. Medellin was sadly well known in the 1980s and 1990s for the drugs barons and their crime activities, especially Pablo Escobar; these times were known as the "fear years".

For many, the transformation of Medellin started with the election of Sergio Fajardo as Mayor of the city for 2004-2007. Fajardo, who is currently the Governor of the Antioquia Province (with Medellinas the capital city), is a mathematician with a PhD from Wisconsin University and belongs to the green party. Social programmes, interventions in poor neighbourhoods and the use of high quality architecture were meant to be the fuel for the transformation. "Our most beautiful buildings must be in our poorest areas", said Fajardo when he received in 2009 the "Curry Stone Design Prize" for a: [...] bold and ambitious public works plan for the Colombian city of Medellin that helped revitalize its poorest neighbourhoods and transform what was considered the deadliest city in the world into a vibrant, urban hub (Curry Stone Design Prize, 2009).

One of the major shifts was to focus in poor areas, traditionally overlooked and marginalised. Informal settlements in Colombia are still to a large extent subject of a depreciatory view; places full of problems, poverty and despair, where ideas of eradication and relocation are constantly heard. In this sense, the implementation in 2004 of an aerial cable car as a public transportation system connected to the main line of the metro and to reach hillside barrios was truly a revolution. "It has attracted widespread attention from city authorities

throughout Latin America, as well as Europe and Asia" (Brand and Davila, 2011, p. 648). Brand and Davila (2011, p. 658) questions the effects in terms of mobility because it caters for less than 10 per cent of daily trips in the barrios, but they confirm the huge benefits in terms of symbolic value: These high visible infrastructures and the aesthetic experience they afford to both residents and visitors create a feeling of inclusion and integration into the modern city, help develop local pride and promote individual self-esteem.

Libraries, schools, and public spaces built in the barrios and elsewhere followed the same idea, strong impact landmarks designed by famous architects, providing a high symbolic value to the residents, which at the same attract attention of visitors But the transformation of Medellin is not only due to infrastructures, it has been "the result of a political maturation process along with a civil society engagement" (Perez-Ayala, 2012, p. 20). Fajardo's team started the process, but it had gained continuity with the following municipal administrations (Alfonso Salazar 2008-2011 and Anibal Gaviria 2012-2015), which it may be part of the answer for the success.

Initial policies and programmes were focused on transparency (fight against corruption), social participation, citizen culture (culturaciudadana), education, security and public spaces. These themes have been complemented with others along the years, such as mobility, recreation and sports, quality nursery centres and the urban integral projects (PUI), which are housing upgrading projects in informal settlements with a provision of quality urban facilities (schools and libraries) and public spaces (parks, "canchas"[1], streets and urban and mechanical stairs[2]).

Medellin has been engaged with several social, economic, and urban projects in last eight years which has resulted in a transformation that now is seen as an example in the country and in the continent. Medellin in less than a decade has changed the face, from an insecure and violent city to a place of hope and interest. The transformation is observable in the city with the landmarks they have produced, but also in the social improvements behind. Still it is much needed to be done, especially in fighting poverty, reducing social inequalities and providing full urban and social inclusion; but for the people of Medellin they believe they are in the correct path. This path has been the subject of interest of authorities, academics, and common people in the country and beyond who visit Medellin to see firsthand the transformations and learn from the experience (Alvarado-Renner, 2012, p. 17). This path has been called Medellin's model or Medellin's integral development model; but in the everyday it is known as "social urbanism". A highly controversial term because every urbanism is social, but to

some extent the term has been validated by the several papers produced (Echeverry andOrsini, 2010; The Architectural Review, 2011; Brand, 2010; Brand and Davila, 2011) and official documents in which it has been used. Social urbanism has been directly referred to the PUIs, and in this sense, to the social provision, high quality architecture and public space upgrading in informal settlements.

Social urbanism, a role of informal settlements in city branding

Social urbanism is becoming a brand of Medellin. Initially it was associated with housing upgrading programmes that the municipality was undertaken in the informal settlements. Gradually these programmes became the integral urban projects (PUIs) which are also housing upgrading projects but several other elements were included: participation of the communities involved, social services, public space provision, and high standard urban facilities. The PUIs are now part of the policy regarding informal settlements and how to regenerate deprived areas in Medellin, with full urban and social integration. This policy is commonly known as “social urbanism” and has been “recognized internationally as one of the most successful experiences for urban regeneration” (Velasquez-Monsalve, 2012) and it is attracting interest from authorities and common people of Latin America and beyond. It seems that Medellin without noticing or anticipating has found a role for informal settlements in branding the city.

Although housing upgrading programmes were undertaken in Medellin since the 1990s (PRIMED, 1996), it was until 2004 with Sergio Fajardo as the city Mayor that the programme obtained outstanding results with the PUIs and became a policy with the social urbanism. The objective of the policy was “to reduce the huge social debts accumulated for decades, and the problems of violence” (Echeverry and Orsini, 2010, p. 138). It also aimed to “change the skin” of some of the poorest areas of the city, by means of programmes in education, culture, and entrepreneurialism; with a provision of infrastructure and high quality architecture (Echeverry and Orsini, 2010). Perhaps without noticing social urbanism was promoting an unique brand for Medellin (Echeverry and Orsini, 2010; The Architectural Review, 2011; Brand, 2010).

One of the first interventions of social urbanism, and the most well-known and visited so far is the one developed in the North West hillside informal settlements: the “communion oriental”; one of the poorest barrios and with the highest crime rates of the city at that moment. At the same time that the initial plans of the PUI for the commune were developed, an extension

of the metro by means of a cable car was under construction. The PUI had the stations and the space underneath the aerial lines as the main subjects for providing public space, and connections to educational, cultural, and recreational facilities. The PUI focused in bringing infrastructure and urban facilities of great impact to the barrio to motivate social transformation (Echeverry and Orsini, 2010), in a version of the “Barcelona model” (Monclus, 2003; Echeverry and Orsini, 2010; Brand and Davila, 2011).

An example of this is the library “Espan˜a”, honoring the Spanish Monarchy who partially funded the project designed by the prestigious architect Giancarlo Mazanti (Colombo-Italian). The library has three black independent blocks that outstand the mountain, the barrio and the whole area. The building is an icon in the barrio and in the city, and “it has become the main reference point of the community promoting at the same time the education and the culture” (Echeverry and Orsini, 2010, p. 142); apart from attracting many visitors.

The urban results of the project are remarkable and the social impact looks fine as well. The project also consisted in a relocation of houses very close to a small river (quebrada Juan Bobo) that comes down from the mountain, and the upgrading of some of the existing houses in the barrio. The residents seem happy with how the area looks and works today, and the interest that attracts. The crime rate has dropped drastically and the perception of security has increased (or the perception of insecurity has decreased), this is very much evident with the several visitors that comes to the area. People like this interest, this feeling of being part of the city, and actually what the visitors come with: some money to spend. Children wait for tourists at the cable car station and lead them around and to the main attraction, the library. In exchange for a tip, they tell the visitors the story of the barrio, and the changes that are now evident. New shops have opened in the last few years, and street vendors are seen in the main streets and close to the library and to other urban facilities. On weekends a lot of activities are observed in the streets, like a festive atmosphere with people and visitors alike walking around, children playing, some others having traditional food (like “arepas”), drinking (for more about activities in open spaces in the barrios, see Hernandez-Garcia, 2012) or just enjoying the beautiful views of the valley.

Municipality offices’ staff is also proud of what these barrios have been converted into, they speak properly about social urbanism and invite people to visit the interventions. In them, the libraries, schools, nursery care centres, parks, the cable car, the public space upgrading projects that have been implemented. In fact some offices such as the Agency for Cooperation and Investment of Medellin and the Metropolitan Area, the Municipal Tourism Office and the

Medellin Convention Bureau (office in charge of getting events to the city) receive delegations from cities of Colombia and other countries, and respond to queries from authorities and academics. However, in conversations with members of the staff of these offices who kindly gave the author interviews in September 2012, it seems that the full potential of social urbanism for a branding strategy is not considered. They acknowledge the transformation of the barrios, they point out specially the high-quality architecture of libraries and schools in these areas, and the "experience" of the journey in the cable car; but when asking about the contribution that barrios can make to brand the city, they prefer other areas, projects and services.

Social urbanism has not been going without criticism. Concerns about the costs of administration and maintenance of the infrastructures have been raised (Brand and Davila, 2011). The architecture have been also questioned arguing ostentation, lack of originality and to be out of the context: I am sorry for not sharing the enthusiasm for the winning architecture prize library of Medellin ('Espan˜a' Library), because I do not think that is the way [...] in Colombia many buildings are just formal shows out of fashion (Barney-Caldas, 2008). There are also critics about how early projects were highly participatory (Carvajal, 2009), but not recent ones. But the main question is about if social urbanism is actually aiming to transform reality and reduce inequalities or it is just interested in building an image (Brand and Davila, 2011, p. 657) and pacify the comunas.

Despite criticisms social urbanism has made an important contribution to improve the quality of life of people in informal settlements of Medellin. And perhaps without anticipating it has helped to build an image of Medellin more authentic and highly distinguishable from other cities in Colombia and in Latin America. It has been also bringing tourism to the barrios, something that ten years ago was unthinkable. Medellin has been constructing a model of urban and social development that is observed in other contexts and trying to be replicated in there. If city branding has to be with improving a place's image against bad reputation and discrimination (Kalandides, 2011), with the creation of perceived value (Kavaratzis and Ashworth, 2005), and with increasing competitiveness by bringing tourism and investment within achieving community development and reinforcing local identity (Kavaratzis, 2004); social urbanism and informal settlements are contributing for Medellin's branding.

Today, for the first time in history, more than 50% of the world's population live in urban centers, and it is estimated that before 2050 this percentage will reach 75% (ONU-Hábitat, 2006).[4] These figures illustrate the resounding extent to which urbanization is an irreversible process, and the way in which the city has become a primordial theme in the international

political agenda. In the coming decades, growing urbanization will be principally absorbed by the cities of developing countries.1 It is estimated that by 2030, 80% of the world's urban population, equal to 4 billion habitants, will reside in the cities of Asia, Africa and Latin America (2006). While it is true that a higher rate of urbanization implies the need for more stable economies, more competitiveness, employment generation and stronger institutions, there is also a need to take into account the enormous challenges that this phenomenon implies.

The urbanization process is necessarily linked to a growing demand for land, public services, housing and infrastructure, all elements which place strong pressure on national and local public institutions. For this reason, as well as due to the recurrent incapacity of the governments of developing countries to supply this demand and guarantee to every citizen what in Brazil has been defined as the right to the city (Fernández, 2001). From the mid-point of the past century, an alternative and spontaneous form of making cities began to appear, associated with the production of informal settlements. These types of settlements, distinguished, depending on the country, by names such as tugurios, villas miserias, favelas, katchi abadis, slums, etcetera, today represent a common element in our cities, if one thinks that in the world, one in every three habitants currently reside in informal-type neighborhoods (ONU-Hábitat, 2008). These housing solution, while on one hand, try to respond to the city and especially, housing, via methods of self-administration and construction; on the other hand, due to their formative processes, they present serious inequalities in terms of their physical, environmental and social character, all of which have a dramatic incidence on the quality of life of the cities' habitants.

According to the operational definition used by the ONU-Hábitat (2003), an informal settlement is characterized by the way it displays one or more of the following conditions: critical overcrowding, critically precarious state of the housing (in relation to the physical structure and its environment), absence of some of the necessary public services and illegality of tenure. Although these conditions allow one to comprehend the degree of informality of a settlement, they are limited to classifying the problem from within a purely physical and legal perspective, leaving aside the socio-economic dimension despite its importance for an integral interpretation of the phenomenon. If not all of the urban poor people necessarily reside in slums (2003), it is clear that there exists a direct correlation between informality and poverty, where both finally become cause and effect, one of the other. On one side, urban informality is born as a consequence of the economic inability of poor people to enter into the formal city. On the other side, as poverty is understood also as deriving from having a low level of education and

precarious health, a degrading habitat leads to, on its own, a worsening of the conditions of poverty (ONU-Hábitat, 2006).

Additionally, the informal sectors of a city generally tend to coincide with the areas that generate crime and violence, as a consequence of the high degree of social inequality that distinguishes these areas from the formal city (2006). From the favelas of Rio, to the slums of Nairobi, passing over to the katchi abadis of Karachi, without mentioning the comunas2 of Medellín, there are many cases that give testimony to how in these sectors there is a concentration and proliferation of armed illegal groups, dedicated to illicit activities such as narcotics trafficking, kidnappings, robberies, et cetera, all of which end up widening their radio of action to the entire city.

In this global context, Latin America has 30% of its population living in informal settlements. The rate of regional annual growth of this phenomenon is 1.2%, with a clear decreasing tendency in the last decades. If one thinks that between the 1960s and the 1970s, the percentage of informality in many countries of the region reached 60%, then the achievements in this sense are more than evident (ONU-Hábitat, 2005). Despite these figures, the challenges that remain to be resolved are many: the inequality index is among the highest on the planet and a significant proportion of the neighborhoods still present very high levels of abject poverty.

Under this regional panorama the Colombian case is exemplary in terms of how it typifies the problematic evidenced on the regional level. The country, with more than 75% of its population living in cities, has between 20 and 30% of its urban population living in precarious settlements (ONU-Hábitat, 2006). Colombia is, together with Brazil, the Latin American country with the highest index of urban inequality and insecurity (ONU-Hábitat, 2009). Despite this, it is also one of the countries that have been doing the best work in terms of countering the phenomenon of urban informality in the last decades, as shown by the growth index of informality in the country (ONU-Hábitat, 2003). Medellín is among the Colombian cities that have confronted most challenges in this regard. The objective of this article is to describe the characteristics and origins of this phenomenon at the local level and, afterwards, to concentrate on analyzing some successful examples of public policies implemented by the local administrations. This is done as a means of extrapolating from these experiences the principal achievements and mistakes, as well as highlighting the strengths and identifying the present and future challenges.

Marginality in Medellín

The process of “informalization”, understood as the formation of precarious neighborhoods, has been a characteristic of Medellín’s history throughout the entire past century as a consequence of the growing migrations towards the city, which took place continuously throughout the main part of the 20th century. These migrations originated in the final decades of the 19th century and came about due to the catalyzing effect of the industrialization process in the Aburrá Valley which had an irreversible and dynamic effect on its urban development, making Medellín the principle economic pole of the region (Coupé, 1996).

The effects of this demographic growth began to be perceived from the beginnings of last century, due to a considerable rise in the demand for housing. This rise in the demand was associated with the production of working-class residences, a consequence of the huge numbers of manual workers required by the emerging industrial sector (Poveda, 1996). In the 1920s, to cite as an example, approximately 500 new residences were needed each year, when the actual effective production only arrived at half that number (Botero, 1996). In this way, from this moment on, new neighborhoods of both public and private initiative began appearing, for the most part, towards the north-eastern bank and along the entire tram route and principal roads. The public residences were the product of the conformation of institutions that were created ad hoc, such as the Institute for Territorial Credit,3 and the Central Mortgage Fund4 while the private residences were representations of the hefty effort of local landowners who saw in this process an opportunity to appropriate the urban surplus value (Toro, 1988). The land surplus value result of these different actions is represented by the conformation of neighborhoods such as Villa Hermosa, Manrique, Campo Valdez, Berlín and Aranjuez, to cite but a few.

Despite the huge “public private” effort, the demand for housing continued to grow in the following decades. Due to a new migratory wave, the product of rural displacement caused by the political violence of the 1950s, the rate of the city’s annual growth climbed to 6% (Coupé, 1996). In ten years Medellin duplicated its population and informal settlements began to appear in the most inaccessible areas and in the most peripheral lands, under the figure of squatter settlements.5 and illegal neighborhoods.6 From this period we find, to cite a few examples, the neighborhoods of Popular, Santo Domingo, Granizal, towards the eastern bank, and Doce de Octubre and Picacho, towards the western bank.

These neighborhoods, constituted by illegal processes of subdivision, the sale of land and the progressive self-construction of housing, and characterized by the absence, in the initial stage, of infrastructure and public services, represented, for the low-income population, the only opportunity of building their homes. In this way, rapidly, the informal city, characterized by a diffuse growth outwards of the legally defined urban perimeter, came to occupy geographically complicated and fragile zones, and came to accommodate 50% of the total population (PRIMED, 1996).

The new urbanizing dynamic, increasing in intensity, began to generate a profound segregation of the city's physical, social and economic order. Towards the North and towards the high parts of the eastern and western slopes, the informal city began to position itself; it is in these areas that one finds the unfinished residences of the city's low-income people. Parallel to these areas, the middle and upper classes occupy the center and South of the valley, on top of the planned surface of the formal city. Medellín defnes its path in two realities, two opposing "cities", dramatically segregated by their conditions of location and their geographical relief.

Thirty years later, with a new wave of violence, rural displacement, and the emergence of narcotics trafcking, the phenomenon began to take on a dramatic political and social dimension, never before experienced. The neighborhoods of the northern slopes of the valley, commonly termed "comunas", were converted into the natural habitat of the illegal gangs, bands of assassins who acted according to the orders of narcotics´ traffickers and common delinquents. It is worth mentioning that State control and presence in these sectors was almost nonexistent. As a result of this process of informalization, Medellín today, in accordance with the classification of its land in the Land Use Plan,7 has 25% of its territory in neighborhoods with different levels of marginality, in a total of 2400 hectares. 900 of these hectares have been defned as Areas of Integral Improvement,8 with settlements in precarious conditions and socio-spatial segregation. 1500 hectares have been defned as level 3 consolidations, with a critical deficit in infrastructure, public space and furnishings, but with a higher level of consolidation that facilitates their articulation with the formal city. Te comunas located towards the northern, center-east and center-west zones, concentrate the socio-economic strata 1 and 2 (Alcaldía de Medellín, 2006), which correspond to those areas with the lowest quality of life and human development indexes (Alcaldía de Medellín, 2004) as well as coinciding with those sectors with the highest indexes of violence. Ever since the 1990s, the public administrations, the academy and non-governmental organizations, have been studying and implementing programs aimed at transforming the quality of life of the habitants of marginal neighborhoods, and recompense part

of this social debt accumulated during decades of inequality. It is evident that the drama of the informal city with its conditions of inequality, violence and segregation, was an integral part of its past. It still remains part of the present, but there is a bet for change and it is dependent on us whether it will be part of the future of Medellín.

Neighborhood Improvement

Neighborhood improvement emerges as a response to the failure of all those coercive actions and measures of control which saw the eradication of urban informality as the only possible solution (Rojas, 2009). Tis focus was shown to be ineffective as it did not attack the roots of the problem, concentrating instead, on spending time and public resources on repressive actions which not only failed to resolve the growing housing deficit but also produced conflicts of public order with severe social impacts.

The policies of neighborhood improvement, on the contrary, imply the implementation of actions that channel resources to perfect the physical conditions of a settlement for its progressive incorporation into the formal urban fabric. This, depending on the context, implies the allocation of public resources, improving the state and the coverage of infrastructure (roads, parks, and transport systems), guaranteeing the allocation of collective types of furnishings, as well as looking at how to motivate actions that are channeled towards the improvement of housing and the provision of formal property titles.

These measures, by mitigating the structural deficiencies originating due to the absence of a conventional process of planning and urbanization of settlements in their initial formative phases, look to make the “problem” part of the solution (Davis, 2006). By recognizing the right to the city of informal neighborhoods, their improvement becomes a valid complement to the production of social interest housing, thereby alleviating the pressure for new land. On the other hand, by limiting the processes of habitat relocation and the eradication of neighborhoods, and fomenting community construction, there is a decrease in the risks associated with the detriment of social capital, a fundamental factor in the struggle to reduce poverty. Finally, as has been suggested by Hernando De Soto (2000), by promoting processes that legalize property there is a triggering of assets formalization that brings potential economic benefits to the proprietors and the city as a whole.

On the national level Medellín is, together with Bogotá, the city that has had most success in implementing programs of this type “due to the general impact in terms of the life quality of its population” (Departamento Nacional de Planeación, 2009). Among the case studies that are most emblematic on the local level are: the Program for the Integral Improvement of Subnormal Neighborhoods (PRIMED)9 which was implemented in the 1990s, and as of 2004, the policy of Social Urbanism with actions such as the Integral Urban Projects (PUI) 10 and the Project of Habitat Building and Consolidation of Housing11 in the Juan Bobo Creek.

Primed

PRIMED began in 1993 as a pilot program of cooperation between the city of Medellín, the governments of Colombia and Germany (via the Ministry for Economic Cooperation and Development BMZ12 and the Governmental Bank for Reconstruction and Development KFW)13 and the United Nations Development Program (UNDP). It was conceived as a strategy for neighborhood improvement designed in two temporary stages and led by a local agency which was put together ad hoc (Betancur, 2007). The program lasted seven years, finishing in 2000 due to an incorrect political decision, which was a clear example of the lack of continuity of public policies. PRIMED represented a historic hit in the city as it introduced a new methodology of intervention that differed radically from previous experiences. Due to the integrity of the actions’ implemented, the program identified eight polygons of intervention, located in the high sections of the center-east, north and center-west comunas. The specific objectives of the program were subdivided into three large character areas: physical, social and management. These included processes of community participation, the improvement of basic infrastructure, the improvement of housing and the relocation of high-risk zones, the legalization of land tenure and the mitigation of geological risk (PRIMED, 1996).

One of the principle achievements of the program was the high level of efficiency in the implementation of the respective actions. If one thinks that PRIMED worked simultaneously on different areas of intervention, with a combination of actions that covered each aspect of neighborhood improvement, and that these implied the interaction of multiple actors, it becomes evident that the inter-institutional coordination represented a determining factor in the success. An independent management structure was set up as the PRIMED unit, ascribed to CORVIDE14 and with total dedication to the program. PRIMED had the role of coordinating all

the actors, channeling the resources, and articulating the physical actions carried out on the territory (Montoya, 2010).

The international entities (UNDP and KFW) provided technical consultation and resources. The national organs (Treasury Ministry,15 INURBE,16 SENA17 channeled the resources of cooperation, provided subsidies, and fnanced community training in the improvement of housing. On the local level, the municipal instances (Public Works,18 Treasury,19 Metropolitan Planning,20 EPM,21 etc.), provided financial, technical and human resources within the areas of their competence. Finally, the non-governmental organizations (NGOs), Base Communities, and private contractors all participated in the physical execution of the works (PRIMED, 1992).

As well as the inter-institutional management, the program placed particular attention on the relationship with the community (PRIMED, 1996), involving it in distinct ways, from the stage of identifying necessities and prioritizing problems, up until the phase of building the actual works. What more, there was a search to build local level capacity, via training in self-construction, in environmental education, in leader formation and in the formulation of project management, all with the objective of fomenting social development.

Obviously, there were limitations and difficulties. In territorial terms, little attention was placed on the structuration of the territory. Even if there was an improvement in the quality of some spaces, ordering them correctly was not achieved. On the other hand, the standard of interventions was low, which had consequences in terms of their durability (Montoya, 2010). There was a scarce number of projects of a social character that were channeled towards improvements in conditions of poverty, violence and unemployment, which was also the case for projects offering attention to juveniles and old people. There were difficulties in the legalization processes; of all the program's components, this was perhaps the most complex one, which was also due to the high goals that had been proposed (Betancur, 2007).

Finally, from a political-institutional perspective, the program displayed its weakness by not being inserted in an institutional manner within the city's territorial plans. It was always considered a special program, separate to the other programs and projects of the Mayor's Office. This ensured that upon the change in administration, when the political will to guarantee the program's continuity disappeared, the program was ended (2007).

To conclude, PRIMED managed to lay down the bases for a new form of tackling marginality, for its methodological design, the capacity for achieving management and

institutional coordination, and a strong political commitment during the seven years of its duration. What more, it was a very important reference point for the Social Urbanism strategy.

Social Urbanism

Under the leadership of the mayor, Sergio Fajardo, the city, in 2004, decided to bet on a public policy that was focused on reducing the profound social debts that had accumulated during decades, as well as the problems of violence. In this way, in a decisive manner, structural transformations that combined, integrally, programs of education, culture and entrepreneurship were implemented, together with a "face-lift" of some neighborhoods located in the most critical zones of the city. The strategy was defined by the concept "Medellín the most educated", which for the transformation of the comunas involved Social Urbanism, together with Integral Urban Projects, as one of the strategies of change. For this, in the selected territories, the best technical knowledge and designs were applied (Rodríguez, 2010).

The Strategic Urban Projects that were defned as priorities in the Municipality's Development Plan were located within Medellín's Empresa de Desarrollo Urbano (EDU),23 a decentralized entity that makes up part of Medellín's municipal structure, founded in 1993. Among these projects, the entities created the Library-Parks,24 the Schools of Quality,25 the City Center Plan, 26 the Poblado's Plan,27 the Projects for "a New North",28 and the Integral Urban Projects, as well as others. The EDU suffered an internal transformation, as a specialized and interdisciplinary team with exclusive dedication to each one of the Strategic Urban Projects was set up. As such, it was converted into a key instrument that planned and executed the urban projects in the prioritized territories. As the EDU assumed for a period of years, as an interim task, the sole technical leadership in this exclusive group of projects and territories, some of the keys to success, without doubt, were the political leadership and interinstitutional coordination. The teamwork conducted with the city's Direction of Planning, and the detailed and rigorous monitoring that was done for all the internal processes of administration and execution by the Private Secretary, allowed, in only a few years, for the conclusion of a wide group of high complex projects.

An Integral Urban Project is an instrument of planning and physical intervention in zones which are characterized by high indices of marginality, segregation, poverty and crime (EDU, s.f.). In agreement with these criteria, Medellín's north-eastern comuna was chosen as the ideal

scenario for the implementation of the first pilot program. Firstly, this zone was the city sector with the lowest levels of LQI and HDI29(Alcaldía de Medellín, 2004). Secondly, at that moment and in the same area, the inauguration of the mid-level capacity, transport system – the Metrocable – was fast approaching, which would connect by way of ski lift the informal city to the Metro.

The implementation of the cable transport system and its new stations was the essential base in the definition of the territorial strategy. The Integral Urban Project helped in selecting and making dynamic the location of the stations, with the objective of complementing and amplifying the impact generated by the Metrocable. A process of neighborhood consolidation was implemented, which permitted the structuring and ordering of the territory (not only improving its accessibility) via works and projects of a public character such as community furnishings, parks, streets, paths and pedestrian bridges to connect the neighborhoods, among others. The north-eastern Integral Urban Project focused on the provision and improvement of public infrastructure as the motor for social transformation, giving special attention to those areas that were densely populated that had first formed in the 1950s, mainly via illegal processes of urbanization (La Francia, Andalucia, La Cruz), and those formed via invasion processes (Popular, Santo Domingo 1, Santo Domingo 2, and Granizal) (Naranjo, 1992).

The magnitude and the complexity of the polygon of intervention, with a population of more than 150,000 habitants concentrated in more than 10 neighborhoods, all of which displayed complex topographical and morphological conditions, required a detailed analysis of the territory. In 2004, the desktop reconstruction of the process of evolution of the urban form of the neighborhoods was done, as was a typological analysis of their structural elements, supported by the methodology of Barcelona's Urban Laboratory (LUB).30 What more, there was a systematization of the different studies and proposals that had been done on the city, and technical teams were set up, originating in certain universities that had developed applied research that explored solutions to some of the problems in these territories. All this allowed for the categorization, in a short period, of what initially had seemed to be a chaotic urban grid, identifying problems and opportunities with precision. As a result of this process, a plan of action was elaborated, looking for an integral physical transformation and combining actions at different scales.

The urban project, its architectural design, and technical rigor, were the key instruments with which to begin the process of neighborhood recuperation and work with the community. The urban project became the dynamic force in processes of inclusion and social development

as alternatives to the violence and indifference that had ruled the roost for decades in the sector. In this way, bridges over creeks, for example, as well as simple connecting pathways, became means of integrating communities which had been, up until that point in time, divided by imaginary and impassable boundary lines; or the Santo Domingo library, due to its strategic location and its educational programs, became the community's principal reference point as well as a promoter of coming closer to knowledge and education as alternatives to arms.

From the phase of diagnoses and planning, up until the phase of execution, the community was invited to actively participate in the process, accompanying the technical teams, the social workers and the communicators in the realization of their tasks. Due to the breadth of the territory, neighborhood committees were set up, grouped in the areas of influence of each Metrocable station: Andalucía, Popular and Santo Domingo. These were not necessarily linked to the Boards of Community Action (JAC) 31 to ensure the prevention of possible political influences and broaden the level of participation. The result was, for example, the conformation of Imagery Workshops32 in which the community directly participated in the definition and design of the projects. The workshops were notorious for fomenting leadership, elevating the spirit of belonging and the level of compromise of the community towards the neighborhood.

As well as the participation processes, numerous projects and programs of a social order were developed and coordinated in the area, via the Integral Urban Project team, and under the management of the Mayor's Office and the public and civil sectors. These projects reached 650,000 million Colombian pesos, equivalent to 80% of the total investment undertaken in the sector (Pérez, 2010). Among other things, there was an improvement in the coverage of primary and secondary educational services, projects that were channeled towards protecting the vulnerable population were promoted, programs of recreation, culture and sport were promoted for the youngest population groups, as well as other specific programs aimed at citizenship formation with regards to the use of public space, respecting human rights, etc.

In order to coordinate and lead a strategic project of such complexity, a special management group was set up, comprising an interdisciplinary team with exclusive dedication for this territory, supported within the EDU organizational structure. The manager had periodical work committees with the mayor and his direct support team, and he became an integral part of the weekly meetings of the Government Council,33 which in Medellín is a first-level team of the city's secretaries and functionaries. The north-eastern Integral Urban Project was almost totally financed by Medellín's public administration. The resources, derived from the annual budget of different secretaries involved in the project, reached 144,000 million pesos in investment in

physical transformation during the first four years. Tis investment allowed the execution of a total of 125,000 m² of works that included 18 public parks of different hierarchies (zones and neighborhoods), the adaptation of streets for pedestrian and vehicular use, and the construction of numerous public edifices such as the España –Library-Park, the Santo Domingo School, the Granizal Sports Center and the Center for Entrepreneurial Development Zone (CEDEZCO).34 For the execution of these works, local laborers were contracted, coming to a total of more than 2300 people employed during the project's four-year duration (2010).

The construction and improvement of the habitat in these territories that had low levels of consolidation was an integral part of the policy of Social Urbanism. As a complement to the northeastern Integral Urban Project that focused construction of new spaces of encounter and public buildings, the Pilot Project for Habitat Consolidation in the Juan Bobo Creek was identified as the first model of housing intervention in "invaded urban ecosystems". This term is understood as all those natural systems, such as hills and creeks that have been occupied by way of invasion by highly precarious settlements. These ecosystems present a high concentration of high-risk housing, low levels of consolidation, low coverage of services, infrastructure and public space, illegality of tenure and high levels of poverty, as well as a worrying state of environmental degradation, among other problems.

Generally, these territories have been identified by the Land Use Plan as relocation areas. Nevertheless, the magnitude of the phenomenon makes such a policy quite unviable: on one hand, it is unthinkable to relocate all the natural systems that have been invaded; on the other hand, the scarcity of land fit for urbanization, as well as the high value of the market, evidence the impossibility of meeting the demand for new housing that would be generated by the mass relocation of these areas. Under such premises, with the objective of making viable a more sustainable model of performance from a social and physical-environmental perspective, and with the technical knowledge that some of these zones could be consolidated in adequate conditions without risk, the first pilot project for housing and the improvement of the surroundings of the Juan Bobo Creek came into being.

Due to the fact that the habitat was a substantial component of this project, an exclusive technical team was set up in the Housing Management wing of the EDU. This team had been an integral part of the formulation of the first lineament of the northeastern Integral Urban Project. An intervention plan was elaborated which comprised different types of complementary actions, among which the search for the total intervention of the territory of the creek's polygon was fundamental.

More than ten small recipient edifices were built for relocated families, the well-located and with acceptable levels of consolidation residencies were improved, and some residences were replaced on site, which allowed for the conformation of a more regular plot. Parallel to these initiatives, retaining walls were built to mitigate the risk of landslides and the territory was equipped with public service networks, which implied the need to sanitize the creek. As well as this, pathways, bridges and public spaces were built as a way of dignifying the surrounding area and improving its precarious accessibility, and protective zones were set up for the preservation of the existing vegetative layer.

Bringing the project close to the community in an intervention with such a strong housing component, with more than 300 households affected, was a determining factor. To enable this, among other measures, area committees were set up to facilitate the channels of communication and strengthen the leadership of the community members; pacts and agreements between the State and the community were outlined to build reciprocal trust and credibility, and in the phase of execution of the project, families were involved via practices of self-construction.

The final result was the integral recuperation of the creek and the dignification of a much-deteriorated sector, located in the area of intervention of the northeastern Integral Urban Project of the Comuna 2, until this time considered more a grovel than a true neighborhood. The project had an approximate cost of 8000 million pesos,35 and despite the constrictive nature of the intervention, it was successful in permitting the definition of a model to recover invaded urban ecosystems which was highly necessary for the present conditions of the city, and so that the only alternative would not be eradication, a practice that could be replaced in many cases by the recognition of the right to stay put. Notwithstanding the success of the project, which was worthy of recognition even by the international community,36 in the development phase a series of difficulties that are worth mentioning were identified. In particular, just as occurred with PRIMED, the legalization process of housing turned out to be very complicated as was, in general, the whole juridical component that was associated with the regulation of land use, due in part to the administrative impediments on the national level.

Another aspect to take into account is the small availability of the community to participate in the self-construction of its residences. In many cases the families, notwithstanding their disposable time, opted to contract a head builder who would undertake the task. This is contrary to the principles of self-construction which look for the active collaboration of the community as a way of forming them in the trade of building (which in Medellín represents one

of the motors of the economy) and empowering them, limiting the excessive paternalism on behalf of the State.

By way of conclusion, it is important to highlight how this project offers an appropriate manner of insertion into the broader strategy of territorial consolidation, implemented by the Integral Urban Project by way of articulating actions of consolidation and territorial ordering in phases of advanced densification, something that well describes the majority of the neighborhoods of the northeastern comuna, with other actions geared towards correcting incipient development in fragile areas with characteristics similar to the Juan Bobo Creek (where housing and the environment are the priority). The strategy developed in the creek represented an easily adaptable tool for the distinct situations present in the Aburrá Valley. These projects have served as models for change in the definition of local and national policies concerning settlement upgrading. The policy of Social Urbanism, implemented from 2004, looks to take a qualitative leap from the traditional manner in which improvement is understood. It makes use of tools such as the Integral Urban Project that has the goal of making structural transformations in an integral way in the strategic activities sectors of the poorly consolidated neighborhoods, and the projects of housing construction in these fragile natural systems as a means of achieving the definitive integration of marginal communities.

Lessons learned and future challenges

As we have seen, in recent decades, the Latin American city has experienced a strong decrease in the rate of growth of informal-type settlements. This is due to the fact that the urban population of the region has reached more than 80% of the total population, with a consequential reduction in the migratory processes towards the city. Despite this, more than 30% of Medellín's urban territory today presents some type of precariousness in terms of its physical and social character. Parallel to this, the production of social housing continues without being able to meet the existing demand, with repercussions in the rate of informality. For these reasons, since the 1990s, policies and programs centered on housing improvement have been implemented which, due to their generated impact, are today important national references.

Programs such as PRIMED and projects such as Integral Urban Project and Juan Bobo, display some of the common patterns which we could, initially, catalogue as being among the possible conditions for success, although the necessity of a more exhaustive analysis is more

than evident as a means of tracing more resounding conclusions in this sense. These factors belong to the technical, institutional, the public and the social spheres. In the first place, the cases analyzed coincide in that they opt for interventions which are territorially delimited, wherein the integral nature of the physical actions represent a constant. By articulating housing programs with interventions on public space and infrastructure in a particular sector, one looks to increase the impact generated on the territory, augmenting the levels of coordination and inter-institutional collaboration among all the actors. This allows for an increased degree of rationalization in terms of the use of public resources. On the other side, the diversity of the adopted strategies has been shown to be a highlight. By articulating programs of consolidation such as the Integral Urban Project with others that are focused on actions geared towards improvement, such as Juan Bobo, complementary practices have been developed, which demonstrate the way in which this initiative could be replicated. Each real situation is typified and is given a specific treatment according to its necessities. To this is added the significant attention given during the designing and planning phase, defining actions in line with the model of occupation the city requires and with quality standards of intervention.

Another common aspect is in the definition and implementation of management mechanisms which are set up ad hoc. Each one of the cases described here presented an organizational structure that was made up of multidisciplinary teams dedicated exclusively to the execution of the respective project, with evident advantages in terms of efficiency. Also, the support and political will turned out to be fundamental, as a guarantee of the continuity of any public policy of the programs of a public character, a condition without which a widespread impact could never be achieved.

In an analogous manner, the processes of community participation have proven to be more important each time. Such processes look to augment the level of commitment and empowerment of the community, motivating the creation of a more democratic and governable society in which a broad consensus becomes the basis to success. Despite this, in the cases analyzed, the implemented mechanisms still place limits on the capacity of the community for making decisions, evidencing the necessity of providing more incentives each time for the putting into practice of a planning process that is of a bottom-up nature, as also suggested by the international community.

Parallel to these characteristics, it is important to evidence certain aspects that, if they improve, would help to strengthen the degree of sustainability of these projects. In this respect, we shall demonstrate how policies of improvement guarantee, principally, the environmental

and social sustainability, limiting the production of new urban land in line with Medellín's dense occupation and allowing for the preservation of social capital with the right to stay put. In this context and due to the high cost of the interventions and the magnitude of the phenomenon, the implementation of mechanisms of financing that allow for the reduction in the use of local public resources is recommended. A possible solution is the utilization of mechanisms that capture the surplus value of the highest-income sectors, to transfer these resources to informal sectors, something that occurs in Brazil which, in difference to Colombia, utilizes the tools which its legislation contemplates with regard to land use policies (Sandroni, 2001).

It is also necessary to articulate even more the physical actions with socio-economic, cultural and educational development programs that transcend the temporality of the interventions and lead to the building of local-level capacity and permit the sustainability of the communities. This will help the communities improve their economic conditions via the generation of employment, providing access to better education and improving their health and hygienic conditions, among others. All of these factors are fundamental in mitigating urban poverty and combating the germ of violence that still permeates these sectors. In terms of the replicability of the identified models of intervention, it is important to pay attention not to bypass already developed methodologies. This means, in particular, to avoid modifying those criteria that have guaranteed their success. While it may be necessary to standardize processes; it is important to identify and preserve above all else those elements that constitute the value added of each model.

In the case of the Integral Urban Project, for example, it is worrying to note the relative ease with which such an integral model is being transformed, in some cases, into a simple construction of infrastructure, in which the planning and sequence of the interventions pass to a second level. Simultaneously, a risk exists in widening the scale of the perimeter of action, as it is fundamental that the integrity and the articulation of the projects in a contoured territory are guaranteed. It is recommended that in the case of projects like Juan Bobo one not waste such an intricate and meticulous movement that allowed for the integration of the new on top of the existent almost without leaving a mark: we are worried about the spatiality of some of the new interventions which alter the concept of the urban acupuncture which was so celebrated in its moment. Because of this, and considering that the institutional memory cannot remain in the hands of but a few individuals (institutions remain, functionaries change), it is timely to begin proposing processes of systematization, monitoring and evaluation of interventions. This allows for the fine tuning and consolidation of the experiences here described, to identify both good

and bad choices, progressively making these projects the basis to an urban policy of improvement and consolidation of marginal neighborhoods.

To conclude, it is clear that, notwithstanding all that has been done, there still remains much ground to cover. Medellín's comunas are far from being the ideal habitats that their habitants desire and deserve: inequality, the lack of opportunities, the degradation of the physical and natural environmental, just as the insecurity and violence, continue to be the common denominators that characterize them. The projects described here should be considered as the important first seed in the process of physical and social integration between the informal city and the conventional one; a process that represents one of the principle challenges facing Medellín and the other cities of Colombia in the search for a more equitable society.

III. Research

According to the estimation of the United Nations, the world's total population as of 2021 is reaching 7.9 billion. The proportion of the people living in urban areas in the world is estimated to be more than half of the total population of the world and this estimation is expected to increase to more than two-thirds of the total population. The urban population is the people living in "urban areas" defined in their own countries in the estimation. The definition of urban area varies from country to country. Therefore, this estimation is not based on the urban area according to internationally uniform criteria. Commonly, an urban area is featured by a certain degree of population cluster and is a place distinguished from farm land, grass land, forest and desert land. Urban areas may be called as cities or town but the term is not normally extended to rural settlements such as small villages or hamlets. Urban areas are created and further developed by the process of urbanization.

The designation of places as urban or rural is not just a matter of academic interest, but it is vital importance for various types of planning purposes in not only governments but also private enterprises. Location of industry, roads, highways and urban facilities are needed to base on the accurate knowledge of the extent and expansion of urban areas.

It is also generally found that variables such as age, sex, marital status, school attendance, level of education, type of economic activity, kind of industry, kind of occupation, fertility, mortality, residential conditions including housing status, etc. are different between

urban and rural areas. In planning for physical and social developments, the information described above is essential.

Based on the above background, NIS attempted the study on “Reclassification of Urban Areas in Cambodia” by help of UNFPA. The results were introduced to urban and rural presentations in the 2008 Population Census returns. In the 1998 Population Census the designation of places as urban or rural is based only on administrative criteria, which were unsatisfactory for planning for the needs of actual urban populations. The following areas were treated as urban:

i. All province towns (which were whole “districts”)
ii. Four districts of Phnom Penh municipality (the other districts were considered as rural)
iii. The entire provinces of Sihanoukville, Kep and Pailin, which were called Krongs or municipalities.

The definition of urban used in the 2008 Population Census which is applied to communes but not districts is as follows:

i. Population density exceeding 200 persons per km2
ii. Percentage of male employment in agriculture below 50 percent.
iii. Total population of the commune exceeding 2000 persons.

The “**urban agglomerations**,” in case where more than one adjoining commune are integrated into one urban area, are used for analysis in this report.

3.1 Comparison of Degree of Urbanization with Neighboring Countries

Urbanization is the process of change from rural area to urban area in a country or a region. Commonly, it is measured by the rate of urbanization, or urbanization rate which is the proportion of urban population against total population of a country or a region. According to UN’s estimates as of 2009, the degree of urbanization in Cambodia is very low among the nations of the world. It is estimated as 19.8 percent against Philippines (48.7%), Thailand (33.6%), Lao PDR (32%), and Viet Nam (29.8%), the neighboring countries of Cambodia. This is lower than the degree in the least developed countries as well as in less developed region in the world.

Observing the proportion of urban population by province as of 2008, it presents the largest (93.6%) for Phnom Penh, the second highest (40.4%) for Preah Sihanoukville. While it

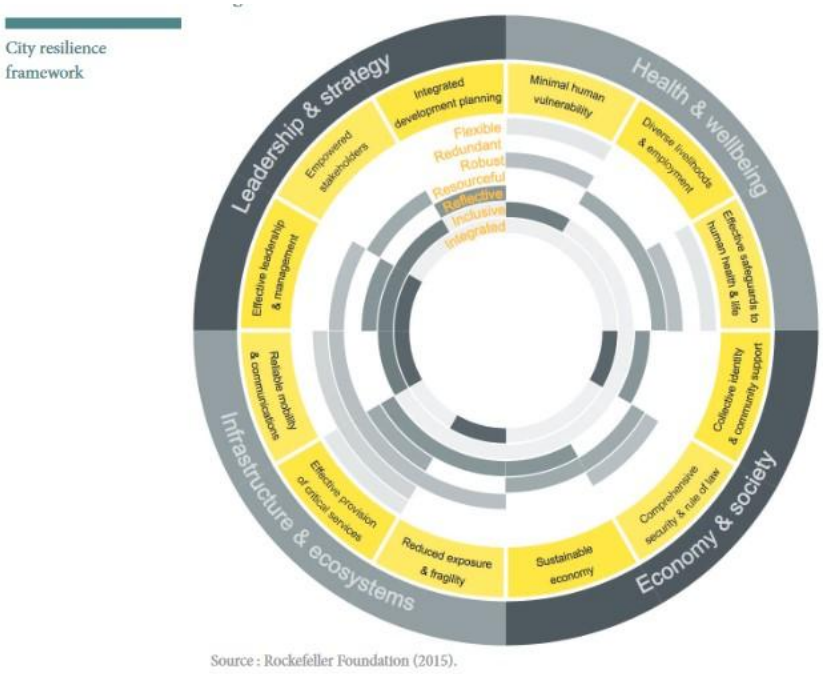
records the lowest (1.7%) for Takeo. In 1998, the same pattern of order in the degree of urbanization can be observed. Between 1998 and 2008 the rate of urbanization increased slightly from 18.3 percent to 19.5 percent for the nation. Among 24 provinces, 6 provinces showed the increase while 18 provinces did the decrease. The province recorded the largest increase was Siem Reap having place of tourism. Following after the province, Banteay Meanchey annexing to Thailand, showed the second largest. While, Takeo showing the lowest degree of urbanization as of 2008 did not change in the rate of urbanization.

On the other hand, urban population recorded the increase between 1998 and 2008 for all of the provinces excluding four provinces. Kaoh Kong, Kratie, Prey Veng and Pursat indicated the decrease. This means that the change during the decade in the degree of urbanization varies among provinces.

Many frameworks have been developed for the measurement of urban areas, including the UN Habitat disaster measurement system, the Rockefeller Foundation's 100 Resilient Cities measurement framework, a New Zealand based method, the system produced by the Strategy Alliance and the method developed by the Global X Network (Ilmola, 2016). This author further indicates that there is no good or bad in these approaches; they were established for specific purposes, different objectives, principles, methods, and data. In this regard, this study employs the Rockefeller Founation’s 100 Resilient Cities framework for the analysis of Phnom Penh city’s performance in building urban resilience because the available information best fits this framework; Phnom Penh was include in 100 Resilient Cities project.

This resilience framework was established in 2014 (updated in late 2015) by the Rockefeller Foundation in partnership with the global design firm Arup (Rockefeller Foundation, 2015). This framework is an outcome of the 100 Resilient Cities project aimed at assisting individual cities to be more resilient and, at the same time, to facilitate the construction of a global practice of resilience among individuals, governments, private sectors and NGOs (Ilmola, 2016; Rockefeller Foundation, 2015). The Rockefeller framework combines four key dimensions of urban resilience: leadership and strategies; health and wellbeing; economy and society; and infrastructure and environment. Each of these key components is split into three more-detailed elements: Leadership and Strategy focuses on the promotion of leadership and effective management, the empowerment of a broad range of stakeholders and the promotion of long-term and integrated planning. Health and Wellbeing looks at the urban capacity to meet basic needs, support livelihoods and employment, and to ensure the availability of public health services. Economy and Society analyzes the promotion of cohesive and engaged communities,

the insurance of social stability, security and justice, and the fostering of economic prosperity. Infrastructure and Environment observes the provision and enhancement of protective natural and man-made assets, the insurance of continuity of critical services, and the provision of reliable communications and mobility.



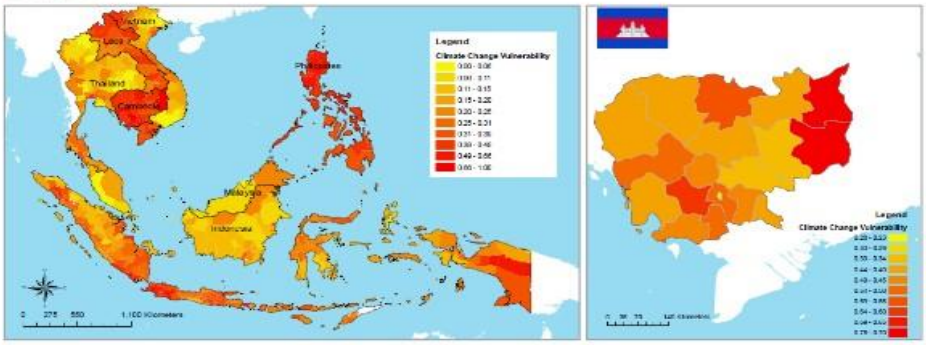
Source : Rockefeller Foundation (2015).

Cambodia is one of the countries most vulnerable to climate change in the region according to an analysis of Southeast Asian countries. However, analysis is not detail enough to capture the variation of vulnerability among Cambodia's communes (Yusuf and Francisco, 2009). These provinces/districts falling in the fourth quartile were considered the vulnerable areas and further classified as mildly vulnerable, moderately vulnerable, or highly vulnerable. We used two different ways of ranking the areas: first, across Southeast Asia, and second, within each of the selected countries. This was done simply to rank priority areas for adaptation interventions. Vulnerability mapping of climate change in Southeast Asia and Cambodia show the vulnerable areas by region and country standards.

The vulnerability mapping assessment, which was carried out for each of the 19 provinces of Cambodia, found that seven provinces belonged to the top 50 most vulnerable regions in Southeast Asia, out of the 590 regions that were assessed. Of these seven, the top three are the provinces of Mondulkiri, Rattanakiri, and Kampong Speu which were classified as vulnerable mainly to the low adaptive capacity of their inhabitants. The five vulnerable provinces lie in the east (Rattanakiri and Mondukiri), north (Preah Vihear), and south part of country (Kampong Speu and Takeo). The dominant feature of their vulnerability to climate change is their low adaptive capacity. However, in 2014 the vulnerability assessment indicated that 279 or 17.2% of Cambodia's communes were highly vulnerable and over 31.5% (512 communes) were quite vulnerable, bringing the total to around 49%. The percentage is expected to decrease to 47% in 2015, and slightly fall to around 34% in 2016. The communes 'quite' vulnerable to multiple climate change hazards.

Figure 8

Climate Change Vulnerability Map of Southeast Asia and Cambodia, 2009



3.2 Urban Primacy in Cambodia

All of the communes located within Municipality Phnom Penh, or Capital Province was designated as urban according to the sub-decree. Accordingly, whole territory of Phnom Penh can be regarded as urban. The proportion of population of Phnom Penh presented 9.9 percent of the total national population in 2008. In 1998 it was 8.7 percent. It can be said that during the decade the increase of the proportion contributed to the increase of national urbanization rate. Also, the proportion of urban population occupied by the nominal by the nominal urban

population of Municipality Phnom Penh is 50.8 percent, while the proportion of urban population occupied by the substantive urban population of Phnom Penh is 47.5 percent.

Those proportions are called as "**urban primacy rates"**. Compared with 1998, it can be known that Cambodia's urban primacy rates, or urban primary increased in 2008. In such case, Capital Phnom Penh is called as "**Primate City"** of Cambodia nominally and substantively. According to this table, urban primacy rate (52.2%) of Phnom Penh shows the second highest following after Ulan Bator, the capital of Mongolia (57.6%), exceeding the primacy rates of Vientiane (43.6%), Tokyo (42.4%), Dakha (31.9%), and Bangkok (31.0%). In 20th century, urban primacy of Bangkok, Thailand was very famous as an example of prototype of primate city. In 21st Century, it can be said that Phnom Penh became the prototype of primate city. As described later, the large cities following after Phnom Penh in terms of size of population, are the urban areas of Siem Reap and Battambang with around 150,000 inhabitants. Municipality Phnom Penh exhibits its prominent position as primate city in Cambodia.

Research evidences[6] that intact ecosystems within cities considerably improve the quality of citizens' lives. Cambodia's rapid economic growth over the past decade accelerated urban growth in and around the capital Phnom Penh. According to the Cambodia Socio-Economic Survey, the urban population has increased from 1.36 million to 1.95 million between 2010 and 2017 alone. Phnom Penh's population is expected to double by 2030.

The growing number of citizens drives the continuing replacement of the natural environment by urban built-up quarters and infrastructure, leading to a massive transformation: from a city dominated by gravel roads, a low-rise urban morphology, and historical villas surrounded by private gardens in the early 1990s to a modern metropolis dominated by a set of skyscrapers and encircled by satellite cities.

Natural environment and open spaces within city boundaries have been decreasing continuously. The most prominent example is the filling of the Boeung Kak Lake, a former lake that today forms the base for a new Central Business District close to the historical city centre.

Urban green spaces belong to global ecosystems which supply ecosystem services, such as biodiversity and climate regulations. They offer multifaceted features of quality of life for local residents such as options for local recreation, cleaner air, lower temperature, and a more pleasant scenery. Recently, scholars have drawn parallels between urban green spaces (UGS) and general human well-being and people's health – physically, socially, and mentally. Despite

these benefits relatively little attention has been paid to the issue of urban green in Cambodia and Phnom Penh's new Master Plan for 2035.

A research project funded by the German Ministry of Education and Research (BMBF) now investigates the extent of urban green and the potential benefits for citizens, urban climate, and eco-systems. Thereby, urban quality of life is regarded as the connecting scientific-conceptional, analytical, and superior normative bracket that underpins all research activities of the Build4People project. Environmental psychologists will therefore particularly focus on the subjective dimension of urban quality and investigate the residents' satisfaction levels with their city, for example with regard to their access to urban green.

Hence, both extent and quality of urban green space define parts of the overall function of the quality of urban life. Focussing on the Urban Green aspect of the research project, the University for Sustainable Development Eberswalde (HNEE) conducts research activities with a focus on remote sensing techniques.

Spatial environmental data analysis using GIS and remote sensing methods allows segmenting quantifiable spatial information about green spatial structures such as the distribution and the spatial density of UGS in Phnom Penh.

3.3 Sustainable Neighbourhoods are Key to Enhance the Quality of Urban Life

The research team considers sustainable neighbourhoods, including UGS, as key elements for the enhancement of the urban quality of life in Phnom Penh. Furthermore, such neighbourhoods are crucial for climate protection, climate adaptation, and resilience. The project brings together heterogeneous researchers from German and Cambodian universities as well as local implementation partners such as the Phnom Penh Capital Administration to work on plans and criteria for sustainable developments.

People-centred urban planning is considered as a crosscutting task that requires interaction and more than legal regulations. The research results of the project can feed into more sustainable urban planning and governance practices of the Phnom Penh municipality. UGS, including parks and gardens, are subsistent components of urban environment systems. Spatial research shows inner city parks and other artificial green spaces in Phnom Penh – like Temple (Wat) compounds or cultural urban green space around the Royal Palace – with high vegetation consisting of cultivated trees, bushes, and urban gardens.

A comparison of satellite images indicates that those traditional UGS are not under significant threat from urbanisation. Less densely vegetated urban fallow land however, especially in areas of intense city sprawl, is facing severe land use competition and is thus threatened to be converted into built-up areas or sealed surfaces in the near future. To improve urban planning, B4P researchers also investigate the needs, attitude, and expectations of Phnom Penh citizens towards urban green. Green spaces are used for relaxation as many interviewees stated: “I can relax here or come here to exercise early morning or after work” are common answers.

The interviews also highlight the social function of green space in Phnom Penh allowing interaction among people: “I can enjoy and see a lot of people and many different people.” or “I bring my kids here to ride their bicycle”. In the interviews, many Phnom Penh citizens stated their appreciation of green spaces but have also expectations to improve parks and gardens. Citizens would like to see more lights so the parks can be used in the evening. Benches, gym equipment, and high trees would improve the recreational value according to the interviewees. A perfect green space, an interviewee said, is a park where “the trees are tall and there is plenty of green space and clear walkways and bicycle lanes for other people to exercise.”

3.4 Urban Green as a Goal

The municipal “Green City Strategic Plan for Phnom Penh” from 2018 provides a roadmap for Cambodian policymakers and local administrators for implementation of economic development, poverty alleviation, and social inclusion. Thereby, the “Green City Concept” serves as an umbrella term that covers various notions of sustainable urbanism addressing adaptation to climate change, climate resilient cities, and ecological city concepts pursuing, among others, resource efficiency, low carbon impact, and improvement of the environmental living quality for the next decades.

The “Green City Concept” embraces comprehensive spatial planning for the maintenance and creation of new urban green spaces and an urban green infrastructure. The multi-layered roadmap poses a number of challenges to urban planners, including sustainability, environmental impact, and participatory planning approaches. “Urban Green” is only one of the pivotal planning challenges.

Already in 2018, the Royal Government of Cambodia identified the high importance of investing in urban infrastructure – particularly in the improvement of urban planning procedures and UGS. The predicted urbanisation of Phnom Penh increases the need for the monitoring of the spread of impervious surfaces and the simultaneously occurring but inverted decline of urban vegetation.

The Build4People project can support capacities in this regard. Besides its usage for the general maintenance of urban green and the wastewater management, the spatial information it collects is one substantial data layer in early warning systems concerning natural hazards, their mitigation (flood control), and climate impact research. Such up-to-date spatial information is essential for comprehensive and sustainable urban planning that can support the realisation of the “Green City Strategic Plan for Phnom Penh”.

Cambodia is one of the fastest growing Asian economies suffering from sustainability problems driven by massive spurts in urban growth. One large city—Phnom Penh—leads urbanisation in the country and is estimated to house over 2 million Cambodians. Other emerging secondary cities such as Siem Reap, Battambang and Poipet have populations ranging from just over 100,000 to under 250,000 [34]. The unplanned urban growth in a few clusters of the country has resulted in an urban sprawl undermining the ability of the nation to achieve the major targets set for sustainable development by the United Nations. In this paper, we examined various internal and external factors influencing the pace of urbanisation in Cambodia to assess strategies which can foster a more balanced and sustainable urbanisation in the country.

The ARDL models, exploring the long-term determinants of urbanisation in Cambodia from the cointegration analysis, underscore two important lessons: first and foremost, though urbanisation bears a long-run relationship with both external and internal drivers, the chosen external drivers—like rising *FDI* and *TA* (tourism variable)—are noted to have little impact on urbanisation without the internal drivers. The prime mover of urbanisation is the domestic financial development measured by domestic credit (*DCREDIT*) creation in Cambodia. The impact of *FDI* on urbanisation is unclear while tourist arrivals (*TA*) are found to have impacts on urbanisation in the long run if we consider both internal and external drivers. Secondly, this long-term relationship is found to be stable and meaningful as the system is found to converge

on the long-term equilibrium implying causality running from internal and external drivers of urbanisation to urbanization.

The existing literature has assumed a linear and symmetric relationship of urbanisation vis-à-vis explanatory variables: when an explanatory variable increases by 1%, say, urbanisation increases by a%. When this explanatory variable decreases by 1%, the existing models predict that urbanisation declines by a% without considering the possibility of asymmetric relationships. Such asymmetric relationships can also arise between long-run and short-run models. In this paper, we introduce the possibility of asymmetries by utilising the NARDL model. Since the ARDL methodology, like other models, assumes a symmetric relationship between dependent and independent variables, this methodology cannot detect hidden and non-linear cointegration and hence, we suggest that NARDL is a more convincing model.

The NARDL methodology offered us some interesting insights hitherto unknown: first, we found that all postulated models except one are meaningful. We noted that FDI flows have significant short-run and long-run asymmetric effects: in the short-run, if FDI increases by 1%, urbanisation increases by 0.36% in Cambodia. If FDI decreases by 1%, urbanisation still increases by 0.34%. The ARDL methodology failed to detect this asymmetry in the effects of changes in FDI flows on urbanisation. In the long-run, similar asymmetries are observed: the cumulative and long-run impact of a 1% increase in FDI is 0 0.57% increase in urbanisation while the effect of a 1% decrease in FDI increases urbanisation by 1.80%.

The rational for this finding is that an increase in FDI is expected to boost the *pull factors* for rural–urban migration while a decrease in FDI will impoverish the economy to promote the *push factors* for rural–urban migration. FDI has emerged as a critical source of livelihood for Cambodians, prompting rural and semi-urban households to invest in the formation of human capital. As an increase in FDI stimulates the demand for skilled labour, increases in FDI work as a ‘pull-factor’ for rural–urban migrants as skilled workers relocate to urban regions to earn premium wages. On the other hand, a decline in FDI forces skilled migrants to return to their rural bases, which works as a ‘push-factor’ for unskilled and semi-skilled workers who migrate to urban areas in search of better work opportunities and recoup the loss of family income, due to the return of a skilled family member.

We found similar elements of hidden cointegration and asymmetric effects of GDP, tourist arrival and bank credit on urbanisation in Cambodia. It is well-established in urban

economics that urbanisation is impacted by both natural increases in population and the internal migration of labour, especially from rural to urban areas [35]. It has also been noted that about 40% of urbanisation is triggered by the rural–urban migration, as Chen et al. (1998) found in their study of 55 countries—17 from Africa, 22 from Latin America and 16 from Asia [35]. Due to the lack of data, it is not possible to decompose the effects of these two factors on urbanisation in Cambodia. Yet, by using a set of relevant variables, we are able to extract the precise effects of important drivers/determinants (FDI, tourist arrival, public investment and domestic credit creation) of urbanisation. In future work, with detailed data on the flows of internal migration, we will seek to decompose the effects of population growth and migration on urbanisation in Cambodia. The existing literature assumed a symmetric relationship between urbanisation and other determinants [34–37], and our work is the first one to examine the asymmetric impacts of some of the drivers of urbanisation. The existence of such asymmetries can have a far reaching consequence for future research to re-evaluate well-established drivers of urbanisation: OECD (2009) [36], Lucas (1998) [37], and Chan et al. (2003) [38] noted that the effects of internal migration, though playing a very important role in early stages of development, gradually peter out slowly as development reaches a critical point. Our approach of NARDL models can be extended in future work to incorporate threshold effects for re-assessment of the received doctrines of urbanisation.

3.5 Phnom Penh Sustainable City Plan 2018-2030

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

Phnom Penh is the capital and largest city of Cambodia. It is a center of security, politics, economics, cultural heritage, and diplomacy. Phnom Penh is undergoing rapid urbanization with a population of over 2.5 million (including daily inflow/outflow of tourists and local traders from outside Phnom Penh). Therefore, the development of Phnom Penh must acknowledge its environmental impacts and pay full attention to climate change. This means development must go hand in hand with environmental by protection, ensuring a clean and

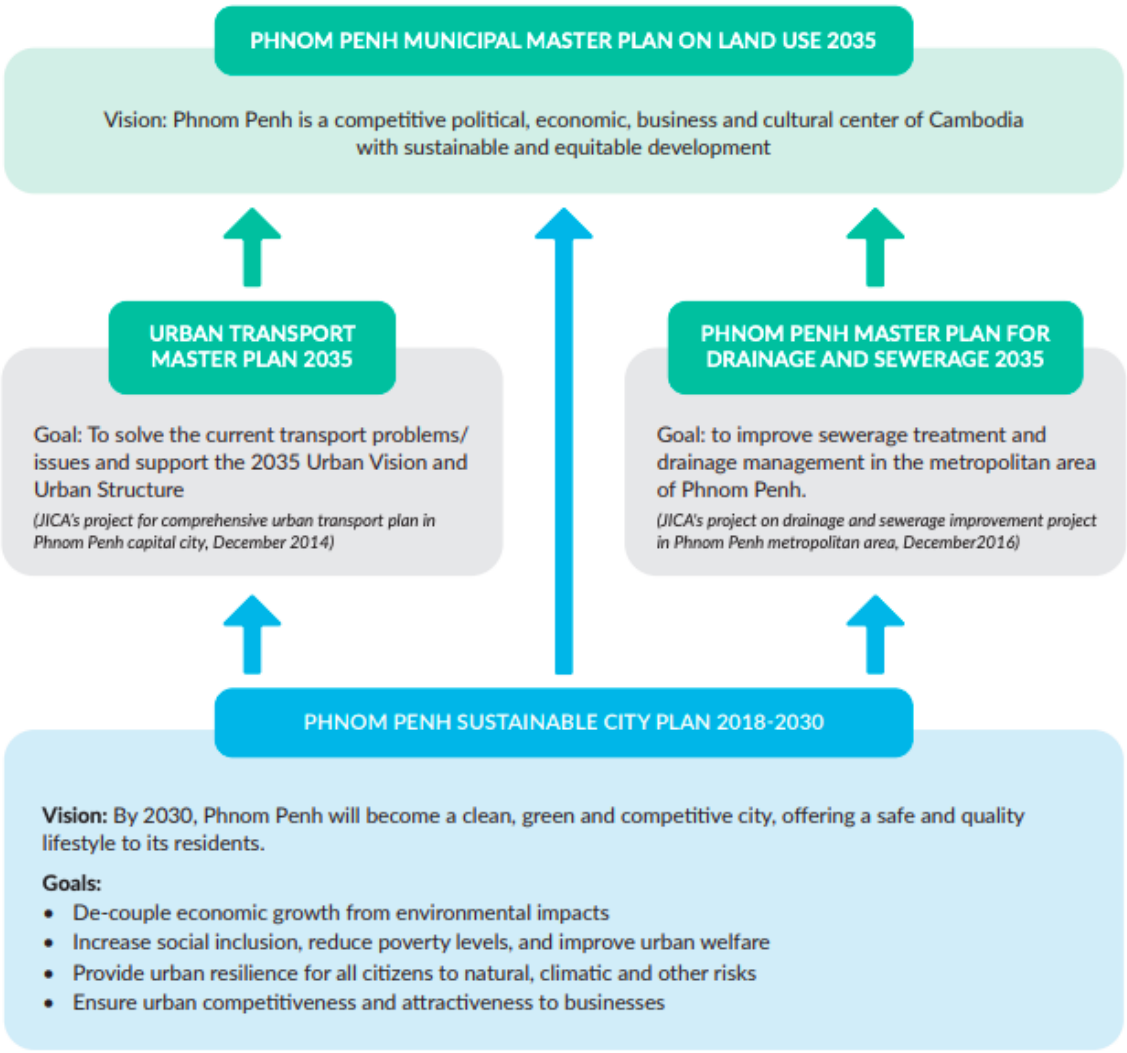
green environment in the city. For this reason, we carefully develop city infrastructures with an environmental mindset-e.g. infrastructure for urban transport and road networks, flood management, waste management, poverty alleviation, climate change, and many other developments with high environmental and social quality. Phnom Penh Capital Administration intends to map city development by addressing flood management, wastewater treatment, pollution control, climate change and environment protection.

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

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

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

Phnom Penh is the first city in Cambodia to apply this Green City Strategic Planning Methodology and has developed its Sustainable City Plan. The Phnom Penh Sustainable City Plan is designed to support the implementation of the Phnom Penh Master Plan for Land Use 2035, through the design of specific green growth actions related to the strategic priorities identified in the Master Plan. Moreover, it will support the achievement of the strategic goals set within the Phnom Penh Urban Transport Masterplan and the Phnom Penh Masterplan for Drainage and Sewerage. The Phnom Penh Sustainable City Plan was successfully developed through a joint effort and multi-stakeholder engagement. The Plan also includes a list 48 potential green investment projects and each project has its rational and contextualized description including a detailed analysis of the risk factors and opportunities to support project prioritization and implementation.



To achieve the vision for Sustainable City Development, the following broad goals and objectives are proposed. Specific targets and indicators will be developed by the Technical Working Groups (TWGs) as described in the implementation arrangement section of this plan. The overall sustainable city goals are to (1) decouple economic growth from environmental impacts; (2) increase social inclusion, reduce poverty levels, and improve urban welfare; (3) provide urban resilience for all citizens to natural, climatic, and other risks; (4) ensure urban competitiveness and attractiveness to businesses.

The Sustainable City Sectoral Objectives are as follows:

1. **Urban Planning Objectives**

   • Implementation of the Phnom Penh Municipal Master Plan on Land Use 2035 (percentage implemented)

   • Detailed Land-use map and land-use zoning (percentage of the city coverage)

   • Sustainability of the seven satellite city projects scheduled for completion by 2030 (solid and liquid waste management systems in place, and compliance with green building standards)

2. **Urban Vulnerability Objectives**

   • Protect the population of Phnom Penh from extreme flood events (percentage of the population negatively affected)

   • Improve natural lakes and wetlands in the city, which serve as natural flood control and wastewater management systems (just like in 2003) (surface of natural lakes and wetlands in hectares or acres)

   • Create or restore green corridors throughout the city (number of corridors)

   • Secondary treatment of wastewaters generated in inner city areas (millions of cubic meters, as percentage of the total)

   • Households in peri-urban areas use improved and secure sanitation systems that will prevent pollution dispersion during high rain and flooding events (number of peri-urban households with improved and secure sanitation systems with wastewater treatment, as percentage of total)

3. **Energy Sector Objectives**

   • Increase the share of solar energy in electricity supply (percentage of increase from the current < 1%)

   • Reduction of electricity consumption in commercial and service companies through the introduction of energy efficiency measures (percentage of reduction vs. current consumption baseline)

   • Reduction of electricity consumption in households through the introduction of energy efficiency measures (percentage of reduction vs. current consumption baseline)

• Municipal and other government buildings with suitable roofs have solar PV installed (number of buildings retrofitted vs. total)

4. **Transport Sector Objectives**

• Reduce transport sector greenhouse gas emissions (percentage reduction over current baseline)

• Bus-based public transportation system in place, covering key transportation corridors in the city (percentage of total modal share)

• Reduce traffic accidents (percentage of reduction vs. current yearly baseline)

• Reduce traffic congestion (increase in average vehicle speed vs. current baseline)

5. **Built Environment Objectives**

• Adoption of green building standards for buildings to be constructed from 2020 onward (number of green building projects vs. number of building permits requested)

• Reduce energy use in existing buildings (percentage reduction vs. current baseline)

• Low-income housing units designed or retrofitted to be resistant to natural disasters (number of upgraded units vs. total urban housing stock)

6. **Manufacturing Objectives**

• Develop industrial zoning provided with supportive green infrastructure (number of industrial zones retrofitted)

• Reduce water pollution from the manufacturing sector (percentage of total volume of waste water treated)

• Increase energy efficiency in manufacturing industry (reduction of KW consumed per value of outputs)

• Carry out energy efficiency audits and put in place energy efficiency management plans for large manufacturing plants (number of audits and management plans vs. total number of large plants)

• Large manufacturing companies have water use audits conducted and water use management plans put in place (number of audits and management plans vs. total number of large plants).

7. **Solid Waste Management Objectives**

   • Expand quality solid waste management collection services (number of districts covered)

   • Reduce organic waste going to the landfill or incinerator (percentage of total organic waste)

   • Waste separation to enable recycling by households, markets and commercial enterprises (percentage of separated waste vs. total)

   • Implementation of the 4R principle (reduce, reuse, repair, recycle) (percentage reduction in volume of collected waste).

8. **Public Spaces and Cultural Heritage Objectives**

   • Increase the green canopy coverage of the city (number of new native trees planted)

   • Increase public green space in the city (number of hectares from current baseline of 70 ha)

   • Develop a strategic plan to preserve urban cultural heritage (number of historic buildings inventoried and protected)

   • Increase in tourism as a result of improved cultural heritage management (number of tickets sold at key urban sites).

In December 2015, the Council of Ministers approved a new master plan for managing urban development in Phnom Penh over the next 20 years. Phnom Penh Master Plan on Land Use 2035 aims to deal with population growth and a continued construction boom as the capital's population grows by more than a third to a projected 3 million by 2020. According to the plan, Phnom Penh's vision for 2035 is "TO BECOME A COMPETITIVE POLITICAL, ECONOMIC, BUSINESS AND CULTURAL CENTER OF CAMBODIA WITH SUSTAINABLE AND EQUITABLE DEVELOPMENT".

The Master Plan on Land Use 2035 articulated three overarching goals to realize the vision: 1) To set the land use direction to ensure its potential for efficiency, sustainability, and equity that will contribute to Cambodia' socioeconomic development, food security, and clean environment, 2) To set the development direction for Phnom Penh, balancing with the

development of other smaller cities and provincial towns, 3) To empower the city's identity and develop its competitiveness with other cities in the region, which will provide Phnom Penh with more technical and financial access.

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

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

Action Plan 1: Dissemination of the Master Plan on Land Use 2035	• Organize workshops to disseminate the Master Plan to technical working groups, investors, and Cambodian people as a whole • Make the Master Plan available for the public through PPCA's website.
Action Plan 2: Potential projects that need to take immediate actions	• Set regulation and zoning, reserve for enlargement of road, railway, and urban sewage system • Create zoning for railway station reserve specifically for merchandise, and zoning for a big dry port at Samroung Por Sen Chey area • Approve the railway projects to connect from Phnom Penh to Ho Chi Minh city • Increase the size of the runways of the Phnom Penh International Airport • Build a dam and concrete shores of the Bassac river • Standardize buildings in some areas such as Chbar Ampov, Boeung Kroper (Crocodile Lake), Boeung Pong Peay and area in front of Tonle Bassac and Boeng Kok • Identify a new site for waste dumping, improve the current waste dumping site at Dangkor area by investing in waste recycle factories, and to design a

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

	vocational trainings.

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

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

Transport Master Plan 2035 proposes five strategies:

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

Proposed Urban Transport Master Plan 2035

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

4.1. Policy Framework For Sustainable City Development In Cambodia

Cambodia's National Policy on Green Growth was approved by the Council of Ministers in March 2013. The policy is envisaged "to strike a balance of economic development with environment, society, culture and sustainable use of national resources through integration, matching and adaptation, as well as harmonization between a green growth principle and national policy".2 The policy aims at enhancing the wellbeing and livelihood of all people in

harmonization with ecological safety through green growth, basing on green economy, blue economy, environment protection, social safety nets system, and uphold of national cultural identity. The National Strategic Plan on Green Growth 2013-2030 was also approved by the Council of Ministers in March 2013. The plan focuses on nine related strategic directions:

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

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

4.2 Assessment of the Urban Context in Phnom Penh

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

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

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

Population: The population of the Phnom Penh approximately tripled from around 0.57 million in 1998 to 1.5 million in 20155. The expansion of the city and creation of three additional districts added further to the population growth. Within the new administrative boundaries of the city, the population is projected to reach about 2.86 million in 2035, according to the population growth projection in JICA' study on the PP Transport Master Plan.

Economy: Most of Cambodia's economic growth has been centered on Phnom Penh over the last decade. Double-digit economic growth rates in recent years have triggered an economic boom in Phnom Penh, with major investments in the construction sector, including in hotels, restaurants, bars, and high rise residential and commercial buildings. High industrial growth rates have has been driven largely by manufacturing, with the garment sector contributing 75% of the manufacturing output at a national level. The city accounts for approximately 75% of inward investment in the industrial sector and approximately one million tourist arrivals in 20158. Growth in the services sector has been driven by growth in trade, finance and other services, primarily in Phnom Penh, including with a fast-growing financial sector (19.4% in 2018).

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

Urban development challenges and climate change: Due to rapid urbanization, Phnom Penh is facing a number of challenges including unregulated construction, traffic congestion, unregulated parking, waste management, pollution and flooding. These challenges are further exacerbated by the threats of climate change impacts. Among lower Mekong Basin countries, Cambodia, together with Lao PDR, has been identified as the most vulnerable in part because

of its relatively low elevation, proximity to the ocean and the Mekong River and its limited capacity to cope with climate related risks. Flooding and changing precipitation patterns may also adversely affect the quantity and quality of water supplies to the city and result in negative consequences for millions of people. Other threats include the impact of tropical cyclones, which have already increased over the last few decades and are projected to further increase in frequency and intensity. Rising sea levels will also affect Phnom Penh's fresh water availability by increasing saltwater inundation of low-lying areas and contributing to coastal erosion.

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

4.3 Review of Key Urban Sectors for Urban Green Growth

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

- Rising infrastructure costs and lack of access to basic services for poor households
- Rapid urbanization (i.e. rural to urban migration) and limited enforcement of spatial planning
- Limited transport infrastructure and rising levels of traffic congestion and associated pollution
- High energy costs and low deployment of renewable energy and energy efficiency technologies

- Increasing pressure on the cities' natural systems, including its green spaces, lakes and wetlands
- Increasing vulnerability of the city to the impacts of climate change, including severe floods and drought
- Increasing levels of poverty in the city, despite decreasing levels of inequality
- Constraints on the equitable access to resilient housing, particular for poor households
- Rising levels of pollutants from industrialization, particularly from the manufacturing sector
- Constraints on the protection of tourism values of the city, including its heritage values.

i. Urban Planning

In December 2015, the Council of Ministers approved a revised Phnom Penh Master Plan on Land Use 2035, which has the vision of "transforming Phnom Penh to become the heart of Cambodia, located at the intersection of four rivers, as a competitive center for politics, business, and culture with equitable and sustainable development by 2035. The Phnom Penh Master Plan for Land Use 2035 states the ambition of seeing the capital area growing from the current population of under 2 million to 6 million by 2035, due to rural to urban migration towards the capital area. This evokes urban management strategies options, ranging from integrated urban planning between Kandal Province and Phnom Penh Municipality, to the expansion of the municipal boundaries with the incorporation of about half of Kandal Province. The Ministry of Interior coordinates this integrated planning process and any required updating of the administrative boundaries of Phnom Penh.

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

- Land-use map and land-use zoning
- Urban planning for development in the Northern and Western parts of Phnom Penh
- Urban planning for development in Southern part of the city and for the water treatment plant plan at Boeung Cheung Ek
- Public space planning (lake, canal, roads, railway, ports, airport and green areas)

- Prioritized/special development area maps
- Map for identifying high-rise building and height auditing for airplane flight safety
- Map for urban heritage buildings
- Map and regulation on master plan of urban landscape, protecting landscape of tree planting and landscape management as well as public sector facilities.

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

Capacity development for urban development. Addressing institutional capacity gaps that are apparent in the context of the decentralization and deconcentration reforms. The urban sector requires institutional and policy support at the national and local level, where the newly established municipalities are now playing an increasingly important role. Capacity development will be integrated into supported investment initiatives and will attempt to ensure not only smooth project implementation but also development of sustainable institutional capacities

Outstanding challenges and constraints. Prior to the adoption of the Masterplan on Land Use 2035, Phnom Penh was susceptible to a range of private redevelopment schemes and had limited provisions for the protection of its overall urban structure, zoning, heritage,

natural resources, and its most vulnerable residents. It has been estimated that since 1999 about 150,000 people have been displaced from central locations within Phnom Penh to make room for such re-developments. Continuation of privatized development remains a risk for Phnom Penh's urban land-use and the vulnerability of its urban poor.

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

Steady urban growth is a driver for economic development but needs to be more carefully managed in Cambodia.Cambodia is still predominately a rural country with the majority of people living in rural areas, and with most of the cities and towns beingrelatively small. However, urbanization is underway and Cambodia needs to plan for it. To date, the challenge of urbanization has largely been unplanned for and unregulated which is generating significant social, economic and environmental issues. The capital city and many Cambodian cities such as Battambang, Siem Reap, Sihanouk Ville, Kampong Cham, Suong, border town such as Bavet are also undergoing steady urban growthand are facinga severe lack of systematic urban spatial planning, and financial resources for sustainable urban infrastructure and services.
For a well-structured urban development, urban spatial planning is a precondition forthe development of sustainable urban infrastructure. Among Cambodia's secondary cities, only Battambang city finalized its Land Use Master Plan for urban development in 2015. Other cities are still undergoing spatial planning, zoning, mapping, and drafting of their masterplans. The challenge is that the process of developing master plans takes years, while the pace of urbanization is rapid. This slow process will lead to unstructured settlements, uncontrolled building constructions, unmanageable zoning for businesses and or residential development, and the possibility of mis-directed urban infrastructure development. For instance, the Kampong Cham city had to resolve all the impacts of their reinstallation of sewerage and drainage system, causing considerable socioeconomic costs. The city had to compensate owners of already built houses, buildings or roads to make way for the sewerage system. It can be observed that the longer the urban planning takes, the slower the urban infrastructure investment develops,

hence, slowing down the potential economic growth and infrastructure services. Limited local capacity and lack of national government technical and budget support is one of the main concerns raised by local governments, underpinning the slow urban planning development. Without urban planning interventions that take the rapid pace of economic development into consideration, Cambodia will continue to experience widening spatial and economic disparities within its cities. Most of the cities and urban areas have already experienced the stress of urban growth and lack of urban infrastructure, and this already has impacts on the economy, society and environment. In consultation with city officials, the common challenges include inefficient solid waste management, lack of wastewater treatment plants and sewerage and drainage networks, lack of public spaces, lack of systematic urban commutation and parking spaces, and so on.

ii. Urban Vulnerability

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

Due to rapid urbanization, Phnom Penh is facing a number of challenges including unregulated construction, traffic congestion, unregulated parking, waste management, pollution and flooding. These challenges are further exacerbated by the threats of climate change impacts. Among lower Mekong Basin countries, Cambodia, together with Lao PDR, has been identified as the most vulnerable in part because of its relatively low elevation, proximity to the ocean and the Mekong River and its limited capacity to cope with climate related risks.11 Flooding and changing precipitation patterns may also adversely affect the quantity and quality of water supplies to the city and result in negative consequences for millions of people. Other threats

include the impact of tropical cyclones, which have already increased over the last few decades and are projected to further increase in frequency and intensity. Rising sea levels will also affect Phnom Penh's fresh water availability by increasing saltwater inundation of low-lying areas and contributing to coastal erosion.

Two of the surveyed communities are situated in peri-urban areas where rapid urban development has generated new sources of flood risk. The construction of residential and commercial units in Phnom Penh's peri-urban districts involves the filling of marshlands, which provide critical floodwater and wastewater regulation and storage services to the city. This development is private sector-led, subject to minimal regulation, and has not been supported by the expansion of municipal drainage infrastructure. This pattern of development has had severe consequences for the communities we visited. Over the years, marshland development has had a ratcheting-up effect: developers build their land sites progressively higher to drain water, resulting in the increasing accumulation of water in the lowest-lying areas of the city. The lowest areas are occupied by the poor, living in informal settlements, who cannot afford to raise the level of their land or to drain it.

Situated on the banks of Tonle Sap, Mekong, and Baasac rivers, Phnom Penh and its surrounding areas consist of a typical alluvial and flood plain area for Cambodia. Like many other parts of Cambodia, Phnom Penh is vulnerable to floods – both daily rainy season events as well as episodic larger-scale floodplain events. The lack of a comprehensive drainage management system worsens the impact of these flooding events. In 2011 and 2013, Phnom Penh experienced extreme flooding caused by a combination abnormal level monsoon rains, successive typhoons, and rising water levels in the Mekong River, impacting over 17,000 families in the 2011 floods, and over 3,500 families in the 2013 flood.

Phnom Penh is served by a combined drainage and wastewater collection network, which is ill-equipped to meet current demand. The filling in of natural lakes, rivers and streams to make way for hard infrastructure and new developments has reduced the city's ability to rely on natural systems for drainage. Since 1998, JICA grant assistance (Phase 1, Phase 2, and Phase 3) as well as ADB loan projects (2000-2003) has helped to improve flooding in central parts of the city with high density. The four central khans have had significant improvements made to the drainage system and technologies (such as network of drainage channels, sluiceways, pumping stations and retention basins), and are protected from flooding effects by a series of dykes. In contrast, the eight peri-urban khans and outlying areas currently lack a comprehensive drainage and flood protection system and remain at great risk to more

frequently occurring flooding. Furthermore, rapid development of large scale satellite cities in the peri-urban areas poses additional challenges. Drainage systems in these satellite cities have not been appropriately planned or constructed according to any unified standards. While the Sub-Decree No.86 regarding construction permits and the National Environmental and Natural Resource Code of Cambodia (draft approved in December 2016) require large-scale developers to be responsible for storm-water drainages, enforcement and technical standards for flood prevention infrastructure (such as onsite regulating resources, bio-swales, green spaces, and permeable surface area requirements) are yet to be implemented.

Data from the Ministry of Environment's real-time air quality monitoring station in Tonle Bassac indicates an average airborne particle level of 10.24 μg/m3 compared to the PM2.5 standard of 50 μg/m3 within 24 hours from June 3 to June 9, 201813. If these levels are representative of pollutions levels across the city, that would indicate no major respiratory or health risks from air pollution yet. With regard to wastewater, many locations in the city's system of rivers and lakes face extremely polluted water since Phnom Penh has no sewerage treatment system. Wastewater from homes and commercial enterprises flows directly into the storm drainage system, which eventually discharges into lakes or local streams.

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

In 2015, the Department of Public Works and Transport of Phnom Penh, prepared a Study on Drainage and Sewerage Improvement in Phnom Penh Metropolitan Area, with JICA support, to underpin a draft Master Plan for Drainage and Sewerage. The scope of the Master Plan covers sewerage treatment for the entire area of Phnom Penh. Sewerage treatment options consider both off-site and on-site wastewater treatment, depending on location and population density. It is expected that a combined drainage and off-site wastewater treatment facility will be

constructed for the densely populated parts of Phnom Penh. Cheung Aek Lake and Tamok Lake are the two identified sites and studied for construction of sewage treatment plant in off-site area. Trabek Lake and Tumpun Lake are also identified as potential for the off-site sewerage treatment plants. The wastewater treatment facilities are planned for construction in phases, subject to the securing of finance to support this STP investment project.

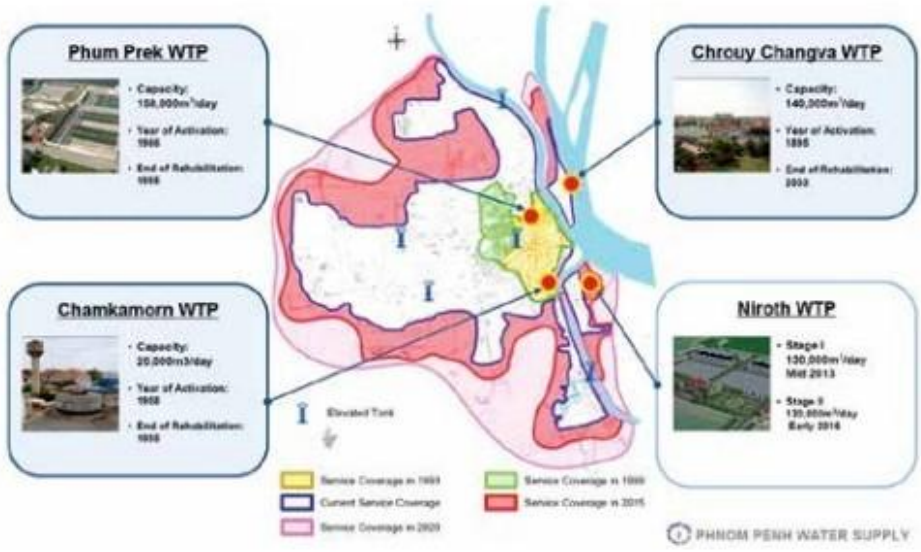
Currently, there is no formal wastewater treatment system in Phnom Penh. Sewage and other wastewater from households, commercial enterprises and industries combines with rainwater in a series of covered and open canals, which then flow into the city's rivers, lakes and wetlands . The poor (or lack of) drainage and water treatment infrastructure and the lack of appropriate regulation and enforcement has resulted in the build-up of raw sewage in water bodies. The conditions pose a threat to the urban environment, particularly for residents in low-income areas around canals and lakes.

The urgency of the development of a modern Wastewater and Sewerage Treatment Plant (STP) at Cheong Aek area and installation of sewage system has been identified in JICA's Study on Drainage and Sewerage Improvement Project in Phnom Penh Metropolitan Area with various on-site and off-site sewerage treatment options explored. The urgency of wastewater treatment in Phnom Penh has further been reiterated in the GGGI "Phnom Penh Green City Strategic Plan 2017-2026" which includes the development of a Water Pollution Control Fund for manufacturers in its proposed long list of green projects.

While various donor assisted studies have addressed the urgent need of wastewater and sewerage treatment in Phnom Penh, limited progress has been made in the provision for funding wastewater treatment. The absence of regulation and enforcement has been a major bottleneck, and the formulation and adoption of a Wastewater Management Law by MPWT or MoE in the immediate future is critical. Furthermore, there is a high priority in establishing guidelines for sewerage and drainage management in large-scale development areas as growth in large-scale satellite cities exceeds the treatment capacities of the city.

Water supply. The provision of potable water supply services in Phnom Penh, is one of the few sectors which has experienced success. The Phnom Penh Water Supply Authority (PPWSA) was founded in 1895 and gained autonomy in 1997. With three phases of sub-sovereign financing from donors including JICA and AFD, the four Water Treatment Plants

(WTP) in Phum Prek, Chroy Chang War, Chamkar Mon, and Niroth, as well as the extensive distribution network supplies potable water to the whole city of Phnom Penh.



Through the commitment of leaders as well as the empowerment from the autonomy, operation of PPWSA is healthy, with a profit margin ranging between 25-26% and a fee collection ratio above 99%. Customers are able to pay their water bill through designated payment towers (located in convenient areas within the city), mobile or bank cashiers (customers cannot make direct cash payments to meter collectors in order to mitigate corruption). 8-10% of the fees collected are pooled to PPCH and budgeted to drainage and sewerage operation. While water supply has been relatively successful Phnom Penh, expansion of the distribution network is required to service new developments in the peri-urban area which still lack access to clean water supply, as shown in Figure 1.19. However, changes in accessibility to sub-sovereign financing (now financing goes through the Ministry) has caused delay in project implementation .

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

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

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

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

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

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

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

Wastewater and surface drainage generated from central Phnom Penh drains to catchment lakes to the north or the south. Drainage flowing north is channelled to Boeng Pung Peay Lake before being discharged to the Tonlé Sap river. Most of the city's wastewater (about 80%) flows south and is partially naturally treated in a network of wetlands, marshes and lakes. In both Boeung Tumpun and Boeung Choeung Ek lakes, nutrients from wastewater nourish the growth of morning glory fields, which are harvested by the local populations and sold in city markets. It is estimated that 20% of total vegetable consumption in Phnom Penh comes from

harvesting gardens from these lakes. If not properly washed and cooked, vegetables grown under such circumstances could pose a public health problem.

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

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

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

iii. Energy

While Cambodia relies predominantly on traditional biomass and imported petroleum products, Cambodia's energy supply mix is changing rapidly to meet the demands or urbanization, and structural change in the economy. In 2016, Cambodia consumed 7,033.15 GWh of electricity, with 77.96 percent of that generated within the country. Vietnam supplied 16.74 percent of the kingdom's electricity, Thailand 4.77 percent and Laos 0.53 percent. Cambodia's reliance on its neighbors has been declining. The 22 percent of electricity supplied from imported power in 2016 is a large reduction from the 64 percent imported in 2011.23 By 2018, Cambodia's electricity supply totaled 9,307.44 GWh, including 7,953.64 GWh (85.45%) of domestic sources and imported from neighboring countries such as Vietnam, Thailand and Lao

PDR totaled 1,353.80 GWh (14.55%). For domestic sources, the largest contributor was from hydropower and coal which accounted for 48.47% and 34.50% respectively. The contribution from renewable energy stood at only 0.46%24.

At the national level, the transport sector is the biggest consumer of energy, responsible for 46% of total final energy consumption (TFEC) and 91% of consumption of petroleum products, followed by the residential sector (31%), the industry (16%) and commercial and public services (7%). Out of the Phnom Penh's 916 villages, only 2 villages that do not yet have an electricity grid, but the authorities are planning to build a distribution network for both villages. Access to electricity in Phnom Penh is relatively good, with more than 90% of households connected to the network. The Phnom Penh's power system is supply by national grid via 230 kVsubstations with the total capacity of about 900 MW and additional injection of about 194 MW generated from local fuel oil power plants (data 2016). In 2016, the maximum demand for the Phnom Penh's power system is around 757 MW. The Phnom Penh's power system has extracted from national sources 4,596 GWh in 2016 compared to 4,113 GWh in 201526.

Energy consumption in Phnom Penh is dominated by the residential sector, commercial activities and industry (see figure 4). Phnom Penh, as Cambodia's centre of industrial activity, is a major consumer of commercial energy services. Among the energy-consuming industries, the garment sector is the leading consumer, followed by brick-making, rice mills, rubber production and the food sector27. The industrial sector consumes most of its energy from biomass (58% of industrial TFEC), followed by petroleum products (21%) and electricity (18%). Particularly for Cambodia' Small and Medium Enterprises (SMEs) report to frequently use diesel or heavy fuel-oil (HFO) generators as backup to avoid disruption to their production processes whenever the grid goes offline.

System losses in the Phnom Penh electricity distribution system have been running at between 8.2% and 9.6% between 2009 and 2014.31 The power sector is also beset with inefficiencies in its administration, and transmission and power generation infrastructure. Quality of supply remains low, power outages and voltage fluctuations are common. In 2015, the average number of power outages in Phnom Penh a customer could expect was 24, and the average duration of outage was 720 minutes (the worst rate in ASEAN); domestic and foreign firms identify the high costs and electricity supply shortages as a main constraint to doing business in Cambodia.

Existing policies and regulatory framework. The Electricity Law of the Kingdom of Cambodia (2001) regulates the operations of the electric power industry and service providers.29 One of its objectives is to encourage the private sectorto invest in the energy sectorto supplement EDC's capability. Cambodia's National Energy Policy has four objectives: 1) To provide an adequate supply of energy throughout Cambodia at reasonable and affordable price; 2) To ensure a reliable and secured electricity supply at reasons price, which facilitates investment in Cambodia and development of national economy, 3) To encourage exploration and environmentally and socially acceptable development of energy resources needed for supply to all sectors of Cambodia economy, and 4) To encourage the efficient use of energy and to minimize the detrimental environmental affects resulted from energy supply and consumption.

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

The National Energy Efficiency Policy, Strategy and Action Plan, drafted in 2013, is scheduled to be finalised and adopted in 2017. It set targets of reducing the national energy demand by 30% and national CO2 emissions by 3m tons by 2035, compared to BAU projections.30 Furthermore, Cambodia's draft Natural Resources and Environmental Code includes incentives to promote renewable energy efficiency. In January 2018, EAC issued a Prakas on the general conditions of connecting solar generation to the electricity distribution system or the electricity consumption system that is underthe distribution system ofthe National Grid. This Prakas allows consumers under certain conditions to install solar power for additional self-consumption.

Outstanding challenges and constraints. System losses in the Phnom Penh electricity distribution system have been running at between 8.2% and 9.6% between 2009 and 2014.31 The power sector is also beset with inefficiencies in its administration, and transmission and power generation infrastructure. Quality of supply remains low, power outages and voltage fluctuations are common. In 2015, the average number of power outages in Phnom Penh a

customer could expect was 24, and the average duration of outage was 720 minutes (the worst rate in ASEAN); domestic and foreign firms identify the high costs and electricity supply shortages as a main constraint to doing business in Cambodia.

Cambodia has considerable renewable energy potential, including solar, biomass and waste-to-energy. However, their application in Cambodia remains low.33 Municipal solid waste and sewerage are other potential sources of bio energy.34 Generation of biogas for heating purposes and electricity generation has significant potential in Phnom Penh at water treatment plants and manufacturing plants in the city. 35 Grid-connected renewable energy faces a number of challenges in Phnom Penh, including: high interest rates for small loans, which make the upfront costs difficult to overcome; reluctance of cost-sensitive industries to make unnecessary longer-term capital investment; a lack of regulatory support, for example through net-metering or a feed-in tariff; a lack of awareness of systems amongst potential customers; and a lack of maintenance service providers.

To date, there has been uneven implementation of Cambodia's policies to promote renewable energy. Cambodia is yet to adopt any renewable energy targets, and its future forecasts for electricity generation usually show only large hydropower and fossil fuels as major sources. Without a policy framework or programs to promote non-hydro renewable energy, the development of renewable energy industry has largely been left to the private sector.37 With high energy costs in Cambodia, energy efficiency measures present an economic opportunity. Possible energy efficiency savings in Phnom Penh include:

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

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

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

iv. Transport

Phnom Penh's transport is dominated by roads and the use of private vehicles. In 2015, the total number of registered vehicles country-wide was estimated at 2,300,000 for motorbikes, 159,000 for cars, and 72,000 for vans/trucks/ buses44. Phnom Penh has seen rapid growth in transport demand over the last decade, driven by rapid population growth and increasing economic activity. At the same time, improved incomes and cheaper imported vehicles have led to increased motorisation and vehicle ownership. While Phnom Penh's population grew by approximately 2.3% per year between 2001 and 2011, vehicle registrations grew by over 11.7% per year, more than tripling the number of registrations over the decade.

The rapid expansion of the use of private transport in the city has resulted in increasing traffic volumes as Phnom Penh's infrastructure development and traffic management has been outpaced. The net result of this has been slowing traffic and increased levels of congestion, increased road accidents and high levels of air pollution. Average driving speed in the city decreased from 22.9 km/h in 2000 to 14.6 km/h in 201246. At peak times traffic speeds can be extremely low in central areas, at around an average of 10 km/hr.

Freight transport is growing in the city, along with its economic expansion. Road freight is extremely important in Phnom Penh, with freight traffic volumes increasing dramatically in

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

Cambodia has seen a steep increase in its traffic accident rate, with a number of 2,231 fatalities in 2015, almost double the number in 200649; motorcycle users and tuk-tuks accounted for 77% of the casualties and 68% of the fatalities, and the majority of motorcycle accidents occurred in Phnom Penh. The two leading causes of fatalities were speeding (51%) and alcohol abuse (18%).

Rapid increase of population moving into urban areasand the growing GDP per capita pose tough challenges of urban transport in Cambodia. The rapid expansion of the ownership and use of private transport in cities have resulted in increasing traffic volumes and increased congestion as infrastructure development and traffic management measures have been outpaced. The net result of this in the city has been slowing traffic and increased levels of congestion, increased road accidents and high levels of air pollution.

Air pollution in the city is due in large part to the high levels of traffic. This has not increased dramatically between 2008 and 2012. One-hour averages for carbon monoxide (CO) at between approximately 6 and 10 ppm and for nitrogen dioxide (NO_2) at between 0.02 and 0.035 ppm are lower than many cities in OECD countries, and are below the limits set by the World Health Organisation (WHO, 2005). However, no figures were available for particulate matter (PM_{10} and $PM_{2.5}$) or O_3 concentrations which may pose more of a threat in Phnom Penh. Figures for SOx concentrations were also not available. In this regard fuel quality standards in Cambodia give cause for concern. Standards for sulphur content in transportation fuels allow Sulphur content of 1,500 ppm for diesel and 1,000 ppm for petroleum, this is much higher than is typically the case in the region, in which 50 ppm is a more typical value (UNEP, 2015).

Existing policies and regulatory framework. Phnom Penh's Urban Transport Master Plan 2035 has been drafted to help solve the current transport problems and support the Urban Vision under the Master Plan for Land Use 2035 (see section 4.2). The Mission of the Urban

Transport Master Plan 2035 is two-fold: 1) to shift from a private-oriented urban transport system to a well-balanced system of public and private transport through a combination of road, public transport and traffic management for improving the mobility of citizens, and 2) to materialize the urban potential of Phnom Penh City.

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

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

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

There are several challenges identified with Phnom Penh's traffic management: problematic intersections; inadequate travel signage systems; a lack of road markings and uncontrolled parking. The inadequate parking spaces in the city centre, is becoming an acute problem, resulting in drivers parking on the road or on the sidewalk and obstructing pedestrians. Furthermore, Phnom Penh's pedestrian sidewalks have been eroded by street widening in

favour of cars. Enforcement of the parking regulations is a significant challenge. Freight transport is also facing problems, including damage to the roads, which slows the trucks down, some narrow routes, and a lack of off-road space for loading and unloading.

v. Built Environment

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

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

Existing policies and regulatory framework. The Sub-Decree No. 43 on Urbanization of the Capital City, Towns, and Urban Areas. This sub-decree regulates land use within a construction plot, and places limits on the construction footprint within a parcel of land to ensure that adequate open spaces remain for trees and gardens. The benefits of this sub-decree include the following: cooler and more attractive built environment; opportunity for onsite

rainwater capture / infiltration to curtail flooding; less densely packed housing; and more open space to create natural ventilation corridors.

The Ministry of Land Management, Urban Planning and Construction (MLMUPC) is currently revising the Construction Law to incorporate requirements on health and safety.52 The RCG has also recognized the lack of affordable housing as a problem and has adopted the National Housing Policy (2014). The goal of the policy is to provide low- and medium-income households and vulnerable groups with access to decent housing, or improvement in existing housing. The policy is inclusive and calls for collaboration with development partners, civil society, charitable organizations, private sector, and sub-national and national authorities. More recently, the MLMUPC has also sought to address the needs of vulnerable households through its Climate Change Action Plan 2015-2018. The Climate Change Action Plan has promoted proper shelters for low income and vulnerable households and envisages that green building design and low-carbon technologies will be considered in future building codes.

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

While the construction boom is taking place, there is limited documented evidence that the concept of green building design56 is being integrated into architecture and property development plans. With the current updating of the Construction Code, there is an opportunity to integrate the concepts of green building design into the code.

vi. Manufacturing

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

Garment manufacturing is the largest manufacturing subsector in Cambodia, accounting for 10.5% of GDP in 2015, and the growth rate of the subsector is projected to remain higher than the GDP growth rate until 2019.59 Both the number of garment factories and the number of people employed in the sector increased in 2012-2015. Nationwide this industry also employs around 80% of the non-agricultural labor force, 86% of who are women.

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

Existing policies and regulatory framework. The Law on Administration of Factory and Handicraft (2007) regulates the establishment and operation of factories. The law stipulates the following: Factory floors should be free of smoke, dust and other pollutants; All industrial waste should be discharged in accordance with standards and regulations 'of competent institutions'; Discharging of toxic industrial wastes or hazardous substances without prior treatment is prohibited; Management of industrial waste is the responsibility of the factory owner.

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

Water emissions standards are in place under the Sub-Decree on Water Pollution the Sub-decree #27 on Water Pollution Control (1999), which provides the thresholds (standards)

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

Ensure Continuity of Critical Services. Preserving natural and man made resources to withstand disasters has been taken into account in the process of implementing urban upgrading and green growth projects. Study found the through urban development projects, government agencies and stakeholders have worked together to improve urban ecosystem management. For example, as part of real estate investment projects, private sectors are required to establish liveable environment by following the city guidelines. This includes the construction of appropriate roads, sewage system, parking spaces or parks for the residents. At the same time, all stakeholders are encouraged to contribute to preserving natural assets such as lakes acting as reservoirs collection stormwater or wastewater.

However, KII participants highlight that even though the economic boom in 2003 enabled dramatic urban development and led to rapid urban sprawl, there is insufficient infrastructure such as road structures and systems, drainage or sewage systems and other emergency facilities in place. What has happened was that road structures follow the residents. This implies that the physical infrastructure has usually been developed and extended after the establishment of the residential areas. Critiques further raise that cost of constructing urban physical infrastructure is usually high due to unsystematic constructions of roads and culvert systems. This means that many culvert systems were built or renovated after completion of road construction activities. This urban development trend concerns most people because the city cannot be well organised and resilient with the absence of clear urban infrastructure planning. At the grassroots level, it is found that in responding to the issue of flooding, urban communities have applied different strategies to deal with the problems. Aa suggested by Flower and Fortnam (2015), some poor community members have built temporary floating walkways connected to the roads, whereas other communities have had to temporarily relocate their houses to the higher available land areas. Some communities have built flood defences and increased the height of local roads to turn them into safer areas where communities can evacuate to during flood events.

At the grassroots level, it is found that in responding to the issue of flooding, urban communities have applied different strategies to deal with the problems. Aa suggested by Flower and Fortnam (2015), some poor community members have built temporary floating

walkways connected to the roads, whereas other communities have had to temporarily relocate their houses to the higher available land areas. Some communities have built flood defences and increased the height of local roads to turn them into safer areas where communities can evacuate to during flood events.

Despite such, many urban communities, especially the poor, have not been sufficiently supported by a clear mechanism from the state agencies in coping with the shocks and stresses; they need to depend on their own capacities and strategies to address these issues and to improve the resilience of their areas. Apart from the burden of addressing the complex issues of land ownership, insufficient instruments to deal with issues of flooding and solid waste remain a problem for Phnom Penh. Irvine et al. (2015) stress that while the volumes and duration of flooding could be reduced through increasing pumping activities, some urban areas remain flooded as a consequence of drainage system constraints. Moreover, lack of competent professional staff and inadequate functional authorities have led to many problems in developing, negotiating, managing, monitoring and enforcing a sound contract mechanism for solid-waste collection in the city (Kum et al., 2005). Consequently, the objective of building a less polluted city seems tobe hardly achieved, and urban residents remain exposed to pollution, leading to several health issues.

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

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

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

location of manufacturing industry in areas with unsuitable transportation access can cause traffic congestion problems for the surrounding area.

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

vii. Solid Waste Management

It is reported that domestic waste generation in Phnom Penh is about 1,868 tons per day (Data in 2015). A study concluded that about 72% of domestic waste is organic.66 More in-depth technical analyses have measured Phnom Penh domestic waste characteristics with the following results: combustible content = 90% (due to high waste food content); moisture content = 64%; calorific value = 1,598 Kcal per kg; and • carbon / nitrogen ratio = 20:1. These statistics indicate that the domestic wastes are suitable as an energy generation source or for composting.

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

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

Solid waste that is uncollected often accumulates in drainage channels and natural watercourses. During heavy rain events, the drainage capacity is limited due to the blockages

from the wastes. It is forecasted that, due to climate change, more severe and frequent rainfalls will occur, and that solid waste collection will need to be improved to ensure that drainage channels can function properly.

The domestic waste that is collected is transported to a dumpsite in Dangkao district, which is located 15 km from city center. At the waste dump, the transported waste is scattered. As many as 500 waste scavengers, of which 80% are women, make their living through informal recycling at the dumpsite.68 Children often accompany their mothers to the dumpsite. In October 2009, PPCA attempted to institutionalize the role of waste scavengers by defining their roles with respect to waste management, but this initiative did not result in any formal registration of waste pickers.69 In the Phnom Penh municipality, a private company Cintri Ltd manages domestic waste collection and transport. In 2002, Cintri entered into a contract with the Phnom Penh Municipality, which gave Cintri exclusive rights for municipal waste management, continuing from PSBK for municipal waste collection, transport to the dumping site up until 2048.

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

The Phnom Penh Department of Environment has prepared eight plans for improving solid waste management in Phnom Penh. These plans include the following: Waste management database; Waste separation; Waste discharge and waste collection; Landfill waste disposal according to waste separation plan; Waste recycling and reuse; Waste treatment; capacity building; and Enforcement and penalties.

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

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

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

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

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

technically sound and environmentally friendly manner. For example, proper waste compaction is not routinely practices resulting in inefficient use of landfill capacity.

viii. Public Space and Cultural Heritage

Historically, Phnom Penh was rich in parks, green areas and cultural heritage buildings and sites. However, the redevelopment of the city since the 1990s has led to much of the green areas and the city's cultural heritage buildings and sites being either destroyed to make way for new development projects or being left to deteriorate. The amount of green space and open areas in Phnom Penh has decreased markedly in recent years. According to the Phnom Penh's Urban Transport Master Plan 2035, Phnom Penh has much less green area per capita than many other densely populated major cities in the world. Phnom Penh has only 1.1 m2 green space compared to New York City at 29.2 m2 , and Tokyo at 5.5 m2 per person. As for the state of public space in Phnom Penh, it should be noted that the Sisowath riverside promenade in the central district has been refurbished into an accessible, landscaped public space, which generates opportunities for urban recreation for residents and many visitors of the area. Various urban public parks, which had run into disrepair, have now been refurbished with landscaped designs.

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

Currently there are no clear zoning by-laws or building preservation regulations to protect these historic structures. Cultural Heritage is managed by the Law on Protection of Cultural Heritage 1996, and by Sub-decree #98 on respecting implementation of cultural heritage protection. According to definitions of cultural heritage listed in the law and its regulation, it is unclear whether architectural structures such as New Khmer Architecture or

French Colonial Architecture qualify as cultural heritage sites. There is a need to define regulations for preserving cultural heritage buildings, and to establish mechanisms for financing rehabilitation of cultural heritage.

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

Promote Cohesive and Engaged Communities. The attempt to promote participatory approach can be reflected as a process of fostering cohesive and engaged communities. KII participants note that in the process of building peace and solidarity among urban areas, government agencies attempt to create spaces for stakeholder consultation where relevant actors can express their concerns regarding local development issues. This has also been publicly announced by the Prime Minister as one of the tools for effective institutional reform. For example, the rights of official ethnic groups in the city are protected by giving them space to practice their cultures and involving them in local development activities as part of building harmony and peace in the communities. As mentioned by Diepart et al. (2016), in addition, city governments are committed to promoting information sharing, consultation, and active participation of stakeholders as an instrument to create social harmony.

The result from FGDs also reveals that active participation is also encouraged in NGOs' or development partners' projects based on the belief that effective stakeholder collaboration

can bring about peace and strengthen communities. Their involvement in the planning stage can also reduce potential controversies between stakeholders which can lead to undermining the result of planning. The involvement of both service providers and receivers in the planning process reflects that spatial planning is a democratic tool for long-term development. Literature also suggests that NGOs have played mediative roles to build stronger connections between community members and government agencies. Phonphakdee et al. (2009) claim that, through the activities of NGOs, the relationship between poor communities
and local government has become closer because both parties have often been invited to participate in meetings in which they can discuss and exchange ideas in setting up, planning and collaborating in making positive changes in the communities.

While there are attempts to build solidarity and collaboration, the actual outcomes remain far below expectations. Study found that in the course of modern development, many urban residents tend to care more about their personal interests and care less about the common good. Because of this, enhancing mutual understanding and trust among them seems to face a lot of challenges. This is consistent with Nop (2018) who suggested that sense of community in the contemporary development

4.5 Sustainable City Development Priority Actions

The Urban Planning Priority Actions are as below:

- Dissemination of the Master Plan on Land Use 2035 to determine the future structure of the urban agglomeration, the location of its functions, the density of its built environment, the direction of its growth, and the zoning of its neighborhoods.
- Define protection areas where no infrastructure or building activities may take place (protected natural resources, public spaces, cultural heritage and monuments).
- Direct urban expansion away from areas that are subject to natural and climatic risks such as flooding or coastal erosion.
- Plan for compact, low-carbon urban forms providing for high agglomeration density and for an optimal use of urban infrastructure.
- Avoid lock-in to costly, energy-inefficient and polluting transport and energy urban systems.

- Provide land for low-income residential areas and concentrate factories away from housing.
- Improve data collection and management as a basis for evidence-based urban policy-making.
- Improve coordination and transparency of the planning process, with participation of all stakeholders and the public (particularly those directly affected by planning decisions).
- Implement public information campaigns by the local authorities on the planning process.
- Improve local governance and enforcement of urban regulations by all stakeholders.

The Urban Vulnerability Priority Actions are:

- The city's natural lakes, streams and wetlands are protected and not used for further commercial development.
- Green corridors are restored or created throughout the city.
- To capture rainwater, reduce flooding and increase biodiversity, the existing green space per person ratio of 1.1 m2 will be doubled.
- Natural hydrological systems will be restored with the intent of multiple uses (fisheries, aquaculture, recreation, and biodiversity enhancement).
- Drainage systems in flood-prone areas are made more robust using an integrated system of rain-water retention, rain water harvesting, restoration of natural hydrological systems, green areas, and engineering structural measures.
- Where feasible, bioengineering using native plant species is used to prevent erosion and capture rain or flood waters.
- Wastewaters generated in inner city areas are treated using at least secondary treatment.
- Decentralized wastewater treatment systems will be operating in poor and vulnerable peri-urban communities.
- Property destruction, loss of life, and economic damages resulting from flooding are reduced in all parts of the city.
- Residents living in highly flood prone or erosion areas are favourably relocated to safer and more secure locations in the city.

- All households in peri-urban areas are using improved and secure household sanitation systems that will prevent pollution dispersion during high rain and flooding events.

The Energy Priority Actions are:

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

The Transport Priority Actions are:

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

- A system of inducements to encourage the use of low-emission vehicles in place (i.e. those with better emissions performance standards in terms of gCO2/km or similar, hybrid or electrical vehicles).

The Built Environment Priority Actions are:

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

The Manufacturing Priority Actions are:

- Monitoring and enforcement pollution emissions standards in the manufacturing sector
- Access to funding for energy efficiency and pollution control – Capital facilities in place for lending to energy efficiency and pollution control projects in the manufacturing sector.
- Energy service company (ESCO) – establishment of an energy use service company in the city to enable energy and resource use efficiency at manufacturing enterprises.
- Waste water treatment plants – All water pollution emitters in the manufacturing sector must be connected to a waste water treatment plant.
- Resource use assessment – Resource use assessments conducted for major industrial sectors in the city, looking in particular at material flows and opportunities for using waste flows from some industries as inputs into other industries.
- Increase green jobs – in the manufacturing sector, including in the production of green handicrafts.

The Solid Waste Management Priority Actions are:

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

The Public Spaces and Cultural Heritage Priority Actions are:

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

4.6 Green Growth Scenario

Given the lack of reliable data, it has not been possible to develop a completed quantitative projection. Nevertheless, these scenarios are deemed to give an overview of the expected benefits of adopting green growth approach for the development of sustainable city. Three scenarios are presented hereunder for the 2030 horizon:

a. Business-as-usual – representing a continuation of currently established trends;

b. Piloting Green Growth – representing the implementation of basic sector reforms already proposed along with the piloting of new greener technologies; and,

c. Mainstreaming Green Growth – representing the implementation of sector reforms and mainstreaming new green growth technologies and approaches to urban development.

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

- Energy consumption – Energy use will increase rapidly. Growth in transportation demand coupled with an increasingly inefficient transportation system will drive rapid growth in demand forfossil fuels. Demand for electricity is expected to continue growing extremely rapidly from all sectors.
- Water consumption – Water use will continue to rise rapidly. Household water consumption will rise with population growth, the extension of supply in peri-urban areas and increased incomes. Growth in manufacturing and structural shifts to more water intensive manufacturing sub-sectors will also lead to increased demand for water.

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

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

industries and open water bodies filled with solid waste and undergoing eutrophication will be undesirable. Overall, the city's national function, and the quantity and quality of economic growth will be compromised.

i. Piloting Green Growth Scenario

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

- Energy consumption – Energy use will increase rapidly, with increases in measures of energy intensity (energy use per capita and energy use per unit value added), but less so than under the BAU scenario. Together with a declining average off-take tariff – falling to 0.10 USD/kWh by 2020 (in line with current policy) – large consumers who formerly relied on isolated generation will switch to grid-based power, and there the need for back-up generation is diminished.At the same time, demand in manufacturing industry, residential and commercial demand will continue to grow quickly.
- Energy Efficiency and Renewables – The progress in energy efficiency technology deployment will lead to some increased energy efficiency. Similarly, renewable energy will make some headway in power generation within the city. Solar PV will be used as part of hybrid systems in some isolated manufacturing plants. For buildings with significant energy demands, particularly from cooling loads, solar PV will be increasingly common. Similarly, waste processing plants will seek to cover some of their own energy needs though waste-to-energy technologies.
- Transport management – Growth in transportation demand will be the most important driver of greater fossil fuel use. However, better public transport provision, better integration of land-use planning with road provision, the development of a more effective parking and traffic management systems will ease congestion despite increased

transportation demand. Vehicle energy efficiency will also be improved overall with the implementation of a vehicle-testing regime.

- Water consumption – Structural drivers will also lead to rapidly increasing water demands. The introduction of more water efficient practices and processes in the manufacturing industry relative to the BAU will be an important contributor to relative reductions in water use.
- Local air pollution – Local air pollution will be significantly reduced relative to the BAU scenario, but increased substantially relative to current conditions. The improvements in the energy efficiency of the transport sector (referred to above) will contribute to these relative reductions.
- Water pollution – Given the relatively modest changes in water consumption relative to BAU, wastewater discharges will remain a challenge. Progress will be made on treatment plants for municipal waste-water, although this will be partial, and it is likely that discharges of untreated municipal wastewater will exceed what is currently the case.
- Solid waste – As with the BAU scenario, the overall volume solid waste will increase dramatically by 2025. Within districts serviced by the new waste reduction and collection regimes, solid waste is drastically reduced, and remaining waste is collected efficiently. However, unregulated dumping will remain a problem, particularly in peri-urban areas, and the lack of adequate solid waste disposal in the form of sanitary land-fills – with knock-on implications for water quality.

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

the city will see some environmental improvements which may allow it to remain competitive for low cost production and maintain its present national function at a larger scale.

Planning processes driven by high level government leaders, with strong mandates and objectives, and which employ deliberate stakeholder engagement, sound institutional governance, and credible analysis are of utmost importance in establishing enduring green growth programs. While governments have employed a wide variety of approaches to green growth planning and no one size fits all, the most successful ones are characterized by:

- Strong, high-level leadership, which links long-term national goals with environmental risks and opportunities and builds winning coalitions. The development of robust coalitions can also ensure that this high-level support is maintained during political transitions and overcomes conflicting interests when the leadership changes. Such matters may hinder the progress of
- Clear economic, environmental, and social objectives reflected in formal outcome-based mandates which can range from presidential or inter-ministerial decrees, legislation or high-level policy documents and are supported by strong institutional governance.
- Robust and adequately resourced planning and coordination process, designed to generate compelling evidence and overcome barriers. These processes should be designed as a sequence of steps and rules of the road, while allowing for adjustments along the way.
- Active processes of stakeholder engagement with clear roles and procedures to manage and resolve conflicting interests and contestation.
- Well-governed institutions able to manage a predictable long-term cycle of planning, implementation and review, aligning green growth policies with national development and protecting against political volatility and interference by interest groups.

Transition to green growth depends on large-scale shifts in capital mobilization. Successful financing strategies for green growth create the market conditions for these mostly

private sector investments to take place and overcome barriers such as investment risks, insufficient rates of return for some green technologies and practices, competing subsidies and policies, insufficient capacity, information gaps, and regulatory and institutional barriers. Effective green growth financing strategies combine three primary roles in mobilizing private green growth investment through: i) creation of an effective enabling environment for long term green investment; ii) allocation of public budgets and investments, including through dedicated funds and/or financial intermediaries to encourage green growth; and iii) tailored application of financial instruments to mitigate risks and increase returns on investment to mobilize private green investment. These strategies are most successful where they have the following features, creating an enabling framework that provides green price signals, investment grade policies, removes market barriers, aligns economic drivers, and supports early market projects and green products and entrepreneurs. Effectively allocate and manage public investments, including budget support for green growth programs implemented by national and sub-national agencies, dedicated funds for green growth, loan and equity investment programs, and support for dedicated market and project development institutions. Such public funding support should be fully integrated with current fiscal frameworks and strategic plans and have strong governance systems. Employing instruments to mitigate the financial risk and improve the return on private green investment, such as concessional loans, green lines of credits, guarantees, and insurance mechanisms, and ensure they are transparent, coupled with policy instruments, and provide appropriate levels of support and do not crowd out private capital. Team with central banks, financial regulators, development finance institutions, institutional investors, and others to attract long term green financing through financial regulatory and reform measures; expanded consideration of environmental benefits and risks by banks, investors, and fund managers; and promotion of socially sound sustainable banking and investment practices.

Climate change potentially impacts and threatens socio-economic development, people, livelihoods, health risk and ecosystem. To meet the need for integrated approaches to planning climate change interventions in coherence with a relevant sustainable development way towards poverty reduction Cambodia is taking measures to cope with frequent climate hazards and to reduce the country’s vulnerability to loss and damage not just in the current short term but in the medium to long term. The key priority actions respond to climate change impacts by integrating climate change measures into national policies, strategies, planning, and the implementation of climate change implications in national strategic development plan update, climate change action plan of Cambodia's climate change strategic plan implementation, sustainable development goals integration, national development sectoral policy, and

synergized with Mekong adaptation strategy and action plan. Therefore, the implementation plan for climate change financing framework includes national adaptation plan under changing climate. This paper presents the current climate change activities implemented as an effort to integrate climate adaptation into sectoral policy, strategies, planning and budget planning. These have also prompted a process of responding to climate change issues to support sustainable development by strengthening technical and institutional capacity, and increasing knowledge and raising awareness.

ii. Implementing Clear visions, target, and baselines

Governments achieve greatest success when they define their green growth objectives in terms of a 'vision' for a desired end-state, at the end of an ambitious and long-term pathway of transformative change. This is usually accompanied by more concrete short and medium term goals related to economic growth, poverty reduction, employment, emission abatement, industrial growth, and natural resource protection. In many cases 'business-as-usual' scenarios are used as a baseline against which these stories about the future can be told. Examples of high level visions established by Cambodia.

Governments have achieved greatest success with the use of visions, targets, and baselines for green growth when they:

- Establish a vision for long-term green growth transformation driven by support from high-level political leadership and supported through consensus building processes across stakeholder groups to achieve ownership.
- Establish integrated performance targets aligned with domestic economic, environmental, and social priorities, such as economic output, poverty reduction, employment, emission reductions, industrial growth, and natural resource protection.
- • Establish both long and short-term economy wide targets, and short-term sector specific targets including for multidimensional poverty reduction and related social dimensions. Use long-term targets to ensure strategic direction and short-term targets to guide concrete actions and achieve immediate benefits.

- Underpin visions and targets with objective baselines where necessary. As part of the design and monitoring of integrated, coherent policy responses, it is important for these baselines to reflect as much as possible the linkages between key social, environmental, and growth indicators. Special attention is often required to identify green growth targets and baselines for poverty reduction and related social dimensions efforts to ensure green growth does not overlook social development objectives.
- Build close links between the vision and targets and the allocation of budgetary resources and policy mandates needed to achieve targets.
- Use metrics and methodologies that balance purpose with practical considerations related to cost, data availability, and capacity

A green growth development pathway can offer a broad range of economic, environmental, and social benefits. Governments that are successful in pursuing green growth focus on leveraging the synergies between these three dimensions, while managing the trade-offs efficiently and seeking to facilitate transformational change, especially the de-coupling of growth from natural resource depletion and improving climate resilience.

There is no uniform model of green growth, nor a set of universal aims or benefits. The appeal of green growth will be stronger in some countries than others and must be defined locally based on domestic preferences and circumstances. Governments need to conduct credible analysis of priority benefits to build a strong case for green growth and communicate these benefits in a comprehensive, robust and balanced way. Key lessons from experiences of identifying, assessing and communicating the benefits of green growth are:

- Evaluate a range of economic, environmental and social benefits in a manner that addresses their inter-dependency and links these benefits to current development goals and plans.
- Seek to maximize synergies (such as attracting investment in innovation, creating green jobs and industries, conserving natural capital, advancing sustainable rural livelihoods, etc.) between development outcomes and manage the costs, trade-offs and uncertainties.
- Balance the value of addressing a broad set of benefits and associated synergies, costs, and trade-offs, with the pragmatic value of focusing on a key

sub-set of priority benefits and identifying and communicating short-term benefits along with longer term ones.

- Translate the high-level vision on green growth into a concrete set of analyzable variables on benefits and a robust benefits analysis framework.
- Utilize a broad, though not necessarily complex, analytic framework that integrates a number of complementary approaches. For example, Ethiopia (Case 3) has employed 'extended' cost-benefit analysis in addition to other approaches such as macroeconomic assessments and isolated assessments of individual benefits.
- Use comprehensive benefits messages to address the variety of audiences affected by green growth, including tailoring of messages to different 'value groups' who will have different entrenched interests.
- Engage credible and trusted messengers in presenting robust, tailored, and balanced messages to offer evidence based argument for deviating from business-as-usual.

Priortize measures and technologies and contruct credible pathways towards formulated targets requires selection of technologies and policies to achieve a desired outcome requires robust evaluation of options through consultative processes. Key lessons from effective approaches are:

- • Top-down approaches to green growth analysis and planning need to be supported by bottom-up analysis of concrete actions and options. The analysis should consider options across a broad range of sectors (including agriculture, energy, forestry, transport and water), economy-wide goals (such as poverty reduction, natural asset protection and resource efficiency and employment), and their impact on different groups, including the poor.
- Use alternative pathways to explore the scale and pace of change required in different sectors and highlight the choices and actions that need to be made over time, along with uncertainties.
- Apply an iterative process to analyze options, identify priorities and combine them into pathways for near and long-term green growth transformation. The

analysis can start simple and increase in complexity over time, and with the input of stakeholders.

- Choosing priorities and pathways for green growth requires clear assumptions, reasonable data and active stakeholder engagement.
- The choice of analytical tools and approaches should be deliberate and driven by the local context of key economic, environmental, and social drivers, without letting the tool drive the analytic direction.
- Combining outputs from different types of analysis can improve the consistency and robustness of results and address limitations of individual tools.

Transition to green growth depends on large-scale shifts in capital mobilization. Successful financing strategies for green growth create the market conditions for these mostly private sector investments to take place and overcome barriers such as investment risks, insufficient rates of return for some green technologies and practices, competing subsidies and policies, insufficient capacity, information gaps, and regulatory and institutional barriers. Effective green growth financing strategies combine three primary roles in mobilizing private green growth investment through: i) creation of an effective enabling environment for long term green investment; ii) allocation of public budgets and investments, including through dedicated funds and/or financial intermediaries to encourage green growth; and iii) tailored application of financial instruments to mitigate risks and increase returns on investment to mobilize private green investment. These strategies are most successful where they have the following features:

- Create an enabling framework that provides green price signals, investment grade policies, removes market barriers, aligns economic drivers, and supports early market projects and green products and entrepreneurs.

- Effectively allocate and manage public investments, including budget support for green growth programs implemented by national and sub-national agencies, dedicated funds for green growth, loan and equity investment programs, and support for dedicated market and project development institutions. Such public funding support should be fully

integrated with current fiscal frameworks and strategic plans and have strong governance systems.

- Employ instruments to mitigate the financial risk and improve the return on private green investment, such as concessional loans, green lines of credits, guarantees, and insurance mechanisms, and ensure they are transparent, coupled with policy instruments, and provide appropriate levels of support and do not crowd out private capital.

- Team with central banks, financial regulators, development finance institutions, institutional investors, and others to attract long term green financing through financial regulatory and reform measures; expanded consideration of environmental benefits and risks by banks, investors, and fund managers; and promotion of socially sound sustainable banking and investment practices

The impact of climate change has taken a toll on the population, livelihoods and food security of the those most vulnerable to potential risks with limited the adaptive capacity, posing another challenge for the sustainability of economic growth and social development. Cambodia is strengthening technical and institutional capacity to promote the mainstreaming of climate change responses into the policies, laws, strategies and plans at national and sub-national levels, in order to ensure socio-economic development sustainability and poverty reduction in response to the aspirations of the people, and both national and international new context. In order to cope with climate challenges and to reduce the vulnerability that are in urgent need in the medium-to long-term, Cambodia is working towards the integration of climate change measures into strategies, development planning of NSDP update, SDGs, MASAP and national policies at all levels in Cambodia. It is also putting in place institutional and financial arrangements for the implementation of the CCCSP, and implementing Plan for NAP Financing Framework. The aim is to promote climate resilience by improving food, water and energy security, increasing knowledge and awareness, improving adaptive capacity in reducing loss and damage from climate change impacts, and strengthening institutions, coordination and collaboration networks.

iii. Mainstreaming Green Growth Scenario

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

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

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

The priority activities are contributing to sustainable socio-economic development in Cambodia, in particular, ensuring the sustainability of agricultural productivity and food security and rural infrastructure improvement. In addition, most priorities respond to climate change as a way of promoting the implementation and updating the National Adaptation Programme of Action to climate change. An effort is underway to integrate climate adaptation into policy and budget planning, and the government has also launched a process to develop and implement its National Adaptation Plan.

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

Proposed Implementation Arrangements

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

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

- Provide strategic oversight and direction to the implementation of the sustainable city plan and ensure that the plan's vision is realized, the goals are met, and the overall sustainable city plan is successfully implemented by the end of the deadline
- Appoint an officer(s) from their respective ministry to be members in one or more of the sector-based TWGs
- Endorse and support the delivery of activities of PPCA

- Meet regularly to review and monitor the implementation progress and achievement.

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

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

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

PPCA will report to the Advisory Board on the progress made by the four TWGs. The following four TWGs shall be established to lead the implementation of the eight sectors mentioned in the sustainable city plan.

1. TWG 1: Urban planning and transport. This TWG will cover topics such as land use planning, zoning, planning of new industrial zones and clusters, creation of urban land reserves for low-income housing, public transport, traffic management, vehicle control, air pollution, parking, etc.

2. TWG 2: Manufacturing and energy. Topics covered include renewable energy, energy efficiency, green manufacturing process, water use in SMEs and Special Economic Zone, etc.

3. TWG 3: Waste management and urban vulnerability. This TWG is responsible for leading the technical work on solid and liquid waste management, household sanitation, decentralized waste water facilities, flood prevention, drainage, etc.

4. TWG 4: Public space, culture heritage and built environment. Topic to be discussed in this TWG may include cultural heritage preservation and restoration, multi-functional

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

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

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

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

Converting transport corridors into economic corridors. The urban sector will play an increasingly important role in implementing the Greater Mekong Subregion (GMS) cooperation and integration programs. As the GMS transport corridors thrive and are converted to full-fledged economic corridors, towns and urban areas along the most active corridors will receive priority attention. This support area aims at developing towns along the Southern Economic Corridor and, possibly, the North–South Economic Corridor that connects the Lao People's Democratic Republic with Sihanoukville.

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

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

Cambodia has made significant progress in the past 15 years in public financial management reform and decentralization. The last mandate of the government has also seen major initiatives for public administrative reforms. Government resources, both financial and human, have greatly improved and national systems for the delivery of public services are much better established. These strengthened governance arrangements will undoubtedly be a key factor in the delivery of the sustainable development agenda.

However, it is important to recognize the challenges that still lie ahead. The Royal Government of Cambodia is aware of the need to bring services closer to the citizens, and a major effort is underway to review existing deconcentrating arrangements and strengthen the local presence of government agencies, particularly at district level. District and provincial governors have also seen their role strengthened to better coordinate government services at their respective levels, and ensure the needs of the population are met.

These reforms come with significant capacity challenges, especially at the local level where most of the concrete interactions between the government and citizens occur. Stronger cooperation between local authorities and line ministries and a major capacity development effort will be required to deliver government reforms in an effective manner, particularly as the scope of these reforms become more complex to integrate social, economic and environmental aspects. Those capacity constraints should be factored in from the start, when defining CSDG targets, to avoid unrealistic expectations. One piece of good news is there has been tremendous upgrade in the technological infrastructure in Cambodia, and the rising understanding of the use of computers and other personal devices provides an additional medium through which communication, coordination, and capacity building can be channeled.

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

Sustainable city development, if implemented effectively, is an approach that can help achieve that goal. Sustainable cities move towards long-term environmental protection, social inclusion and economic sustainability. More specifically, sustainable cities are the ones that are resource-efficient, climate-resilient, socially inclusive and equitable. Green growth in cities has the potential to offer many benefits including green job creation, improved connectivity between cities and markets, infrastructure development, inclusive services provision, urban adaptation, and low-carbon development. To achieve these goals, GUDP proposed the following

recommendations:

1. Develop sustainable urban infrastructure, integrated urban land-use planning and strengthened urban environmental management, to provide high quality public services, preserve natural capital and reduce environmental pollution and climate change impacts
2. Improve the local economy by strengthening the city's comparative advantages and exploring opportunities to promote circular economy, public-private partnerships, and green technology
3. Promote social inclusiveness and access to services and job opportunities for all
4. Improve the city's governance by building strong, accountable institutions, developing local human resources and promoting knowledge and experience sharing among cities.

With its steady economic growth of 7% annually in the last decade, Cambodia is moving to lower middle-income country. With this economic growth, Cambodia is one of rapid urbanization countries in Asia and this puts pressure on the sustainability of natural resources. Many major cities and towns across the country is facing rapid, unplanned and unsustainable patterns of urban growth and development. This makes the cities, the focal points for many emerging environment and social issues including inefficient land use, insufficient provision of basic services and infrastructure, loss of natural resources, increased congestion, pollution, unemployment and inequality. These problems can be attributed to poor urban management, little strategic spatial planning, poor connectivity between urban planning and environmental management, and insufficient investment in public services and infrastructure. Current urbanization is overwhelmingly concentrated in and around Phnom Penh, with some urban clustering in the Northwest around the Tonle Sap Lake and the Plain region. There is less urban development in the coastal zones, which can potentially become growth poles.

There is an over concentration of industries, employment and services in some of these urban centers, particularly Phnom Penh. The availability and quality of public services, such as water supply and solid waste collection, is also unfairly distributed with conditions in Phnom

Penh being much better than those in many smaller cities, towns, and rural areas. The future priorities to continue raising public awareness and knowledge in implementing the relevant legislations for biodiversity conservation and the Convention and the importance of biodiversity; Increasing and promoting stakeholders' awareness and knowledge on the Convention and their working programs. Improving and building capacity for government and institution management regarding biodiversity at central and local levels. Developing structure, systems and mechanisms to ensure that the programs and plans in relevant sectors are in line with implementation of the Convention. Enhancing the Convention and its program of work from national to local levels (provincial and district/city) at the appropriate level, time and scale. Building skills and capacity, including an exchange of experiences and knowledge among the Parties to the Conventions.

Cities are now being recognized as engines of growth and economic development. Unless cities and national urban development are carefully planned and managed, economic growth may remain limited to the few larger urban areas. The need for improved urban planning and development management (and urban governance) is now becoming critical if the growing urban areas are to be compact and “liveable”, as well as economically and environmentally sustainable in the medium to long term.

IV. Recommendations and Conclusion

The process of urbanization in Cambodia is closely bound with urban-rural development challenges and inequalities. Urbanization reflects the living quality, living standard, income distribution, and social service provision; that is, the economic structure and condition of a country. Having gone through fast-faced urbanization, Phnom Penh inhibits many new internal migrants who are mostly employed in factories, informal businesses, and the construction sector. Urbanization introduces certain growth and provides opportunities to these people, but concurrently it induces many challenges and makes urban divides more visible.

Understanding the limitation and problems can help future scholars and researchers better in tackling for solutions. Because the core problem are serious gaps between rapid urban growth and lagging institutional and financial capacity especially at municipal level. The cause to

it for historic reasons, Cambodian development late by regional comparison (in GMS)—radically new start, after the genocidal period. Dysfunctional urban settlement patterns, dire housing and infrastructure needs of poor urban dwellers, urban land registration progress too slow (but fast in rural areas), growing economic disparities (rich urban and rich rural elite but poor rural masses), and lastly, adoption of liberal market principles without sufficient checks and balances. Unsustainable urban development is in need of strong external support to help aid the future planning of urbanisation.

Reforms in the labor law and wage system, including the minimum wages and universal basic income, can help reduce the gap of economic disparities among the population. Thus far, the Cambodian government only excels in the national policies to raise the income of the garment workers; however, the percentage of wage increase is still quite insufficient compared to the gradual inflation in the market. Therefore, the wage increase should reflect inflation and market price. Moreover, the opportunities to receive public services, especially financial support, health care, sanitary system, and education, should be effectively and efficiently distributed to all urban residents.

Moreover, local officials, such as mayors and public officials, ought to embrace tackling inequality as one of the prioritized frameworks for development by addressing all three dimensions: economic, spatial, and social disparities. There are indeed no one-size-fits-all solutions to urban inequality. Therefore, as long as the government works hand in hand with all stakeholders, sets sights on addressing the urban issues with a clear vision, and solves the immediate challenges of the residents who live at the bottom of the ladders, urban poverty will be reduced, and social cohesion will be increased.

The Ministry of Land Management, Urban Planning and Construction has been stepping up its planning and policy efforts to overcome the constraints of a low degree of urban planning and the lack of financial and human resources for plan implementation across the country. This ministry and the Ministry of Economy and Finance have still not agreed on land valuation and taxation, as proposed by the donor-supported Land Management and Administration Project. The absence of adequate revenues makes it difficult for the Ministry of Land Management, Urban Planning and Construction to implement routine activities of urban development control and planning. The Supreme National Economic Council uses the development of economic and urban clusters as a central concept. Designated growth regions are the GMS Southern Economic Corridor; Greater Phnom Penh; and the corridor between Phnom Penh and Sihanoukville, which is part of the GMS North–South Economic Corridor. The council has

expressed a regional development vision for corridor development, even though this is not shown in the NSDP update.

While emerging evidence is demonstrating the value of green growth, this information is fragmented and is not yet adequate to determine the long-term economic, social, and environmental impacts of green growth and whether it is achieving the desired scale of transformation. Additional attention should be given to ongoing rigorous assessment of these longer-term impacts across countries and regions.

Greening growth represents a pathway for economic and social development that can sustain wealth creation and prosperity across society in a world threatened by global environmental risks and resource constraints. Governments in all regions face the challenge of fostering a transition to green development that enables durable economic growth and social development, while avoiding risks to public goods, natural assets, and social equality from the status quo. While not all encompassing, this Green Growth Best Practice assessment provides a strong foundation to inform and guide national and subnational governments as they address this vital challenge and seek to achieve sustainable development goals. It offers inspiring examples of green growth leadership around the world that can motivate others and create momentum towards more inclusive and sustainable economies.

Another import factor that can help reduce future problems in developing district is water reservoirs. Because over the past decades in Phnom Penh, more natural water reservoirs have been filled for development purposes. Such reservoirs are not only important parts of the eco-system but they help minimize flooding risks and could have provided greatly needed recreational areas for urban dwellers. A major consequence of filling up these water reservoirs in a city with an already poor drainage system, that is, to replace areas with infiltration capacity with hard, impermeable surfaces, is the greatly increased risk of flash flooding in the city streets following heavy rains. Flooded roads and streets worsen traffic congestion and affect the livelihood and business activities of urban populations. Back in 2006, renowned Cambodian architect Vann Molyvann had already warned that Phnom Penh’s drainage system was so inadequate, heavy rains could lead to flooding in a third of the city and necessitate the evacuation of hundreds of thousands of people.

As a developing country, Cambodia has relatively invested and attracted national and international investors with urbanization and industrialization sectors. Urban environmental issues in Cambodia, are recently becoming critical and having a great effect on living conditions

of local people in the nation. Majority of the investment areas are settlements in the coastal zone of Cambodia. Several investment areas have been identified such as the operational cement factories, breweries, handicraft manufacturing, petroleum storage, local and international port services, hotels, and restaurants. The increase of development activities in the coastal areas of Cambodia have caused many environmental issues due to the absence of clear mandates for incorporating environmental inputs into the planning and zoning activities, as the same as, integrated planning, research and monitoring. Without this integration, physical coastal ecosystem will be affected. However, these unmanaged activities also affect coastal water quality and water pollution, which led to the fragility of marine and coastal ecosystem in Cambodia. Moreover, that major problem of sea pollution in Cambodia, recently occurred due to poor management of wastewater treatment in major city along the coastal provinces, including Preah Sihanouk, Krong Khemmarak Phumin (Koh Kong province), Kep and Kampot. Same survey has indicated that urban development – including building hotel or running hotel business is major source of sea or marine pollution in Cambodia, representing about 32% after the pollution from household.

The progress is proving to be improving yet we have to understand that poverty also plays an important role in future plans to develop the areas of the city and provinces. Because based on the National Poverty Reduction Strategy in short NPRS, Poverty in Cambodia has largely resulted from high population growth, inadequate opportunities, low capabilities, insecurity, exclusion, and vulnerability. The majority of the poor (79%) are those with household employed in the agricultural sector. Although more than 70 percent of Cambodia's population are employed in agricultural production, between 12 and 15 percent of them have no agricultural land. 36 percent of the Cambodian population lives below the poverty line of US$0.46-0.63 at the current exchange rate. The access of the poor to other natural resources such as forest- and fishery-related resources is constrained. In the period between 1998 and 2000 the average growth rate of agricultural employment only 1.6%. Employment opportunities in secondary and tertiary sectors are still limited (only 8% and 18%, respectively). Average employment growth for the service sector was only 1.08%, while that in the industry sector was a substantial 43.29% during 1998-2000. In spite of such industrial growth, only 8.4% of the population has benefited. Poverty rates are higher for households in which the head of the household has had either no formal education or only some primary schooling. The share of education in household consumption expenditure of the poor is less than 1.1 per cent. The poor have little access to basic social services and facilities. About 21 percent of people in the poorest quintile have to travel more than 5 kilometres to reach a health clinic. About 6 percent of the poorest two

quintiles live more than 5 kilometres from the nearest road. Women in Cambodia do not enjoy equal access to education, paid employment, land ownership and other property rights. Women also suffer from poor to non-existent reproductive health services. They are generally in a disadvantaged position in both family and society. Importantly the lack of access to law and rights is a serious issue, since the poor are not able to understand the law, unaware of their rights and vulnerable to exploitation.

It is recommended that furthering the understand of multiple factors can help contribute to a better development within this sector since the last ten years, rapid growth has taken place in and around Phnom Penh, the capital city of Cambodia and the center of it but rapidly expanding economy. In Cambodia there is limited relationship between urban development and urban poverty alleviation. In sharp contrast to rural development, which is explicitly intended to benefit the rural poor, urban development has been perceived essentially as the physical modernization and expansion of the city through the installation of infrastructure and the construction of housing, commercial buildings, industrial zones, schools, hospitals, government offices, gardens, amusement park and other facilities. The resulting buildings, infrastructure, facilities and services are mainly intended to serve the better off sections of the city's population, particularly the business sector and to express Phnom Penh’s beauty to the world. The urban poor, who are predominantly squatters, or even worse, street dwellers, have been seen as an obstacle to urban development because they often hinder the development of infrastructure by occupying state public land and because their rural appearance and habits are out of step with modern city life.

With greater demand for housing in urban areas, especially Phnom Penh, land and housing prices have increased. These soaring property prices have driven the construction boom and encouraged real estate speculation. Government’s investment in public housing is negligible. In most urban areas the private sector is the main supplier of formal housing supply in most urban areas. This is problematic because private investors cater primarily for middle- and upper-income. As many urban poor communities are not yet formally recognized by the government, it is imperative to study the feasibility and suitability of formally recognizing and organizing those communities. Formal recognition would allow access by urban poor communities to security of tenure, increased government service/assistance, and would increase advocacy power and chance to take part and have ownership in the development of their communities. Authorities should be empowered to work with urban poor communities in local planning and development of the communities, so that sufficient financial, human, and

technical resources to realise local development plans with active participation from local communities and stakeholders.

Factoring that little attention has been given in the literature to the impact of urbanization on the environment. However, it has been noted that the rapid and unplanned concentration of people in urban areas, especially in Phnom Penh contributes to environmental degradation, which in turn reduces the livelihood and well-being of city dwellers.

Learning from neighboring countries mistakes can help Cambodia as a country to better plan for the future in urban development. The lesson that Cambodia can learn from the neighboring country Thailand is that Bangkok's uncontrolled growth has resulted in many problems and in many ways provides an example of what not to do. As an example, in relation to traffic, it demonstrates the need to develop a comprehensive urban plan very early on to avoid having to retrofit cities at a much higher cost. Bangkok quickly became one of the most congested and polluted cities in the world. The cost of reducing congestion in Bangkok is now higher by one or two orders of magnitude from what it would have been had adequate rights of way been secured earlier.

Various case studies from Thailand explain environmental projects that are conducted in relatively small urban centers with under 25,000 inhabitants, where the mayor initiated the idea and led the community: one involved the cleanup of a river and the others dealt with waste management and recycling, which is also a problem when it is done improperly. The rehabilitation of a polluted river involved youth groups who monitored pollution levels while the municipality cleaned up the pollution and installed anti-pollution systems.

What Cambodia can learn from this is that Thailand involves a much larger project developed in response to a housing crisis due to rapid increase in the population of urban poor. The Baan Mankong or "secure housing" scheme provided a means for communities to secure and upgrade their housing. The scheme relied on cooperation and good coordination between lowincome communities, government authorities, architects and planners, and NGOs. The first step consisted of setting up community saving groups, which, as they grew, allowed residents to access government loans. These saving groups were managed by community management teams and supported by a public organization, the Community Organizations Development Institute, which managed revolving funds for microcredit purposes and provided a bridge between government and civil society groups. Communities needed to negotiate tenure with the government or landowner in the form of short-term renewable or long-term leases to the

community. Upgrading of housing took many forms from complete demolition and rebuilding of communities to upgrade of onsite infrastructure. Once tenure was granted and a loan obtained, communities with the assistance of planers and architects drew up a plan and contracted suppliers and builders to conduct the building work.

In conclusion Cambodia, over the past 15 years, has experienced sustained economic growth, the result of the flourishing of national and international investment and innovative economic development initiatives. The diversification of key sectors including agriculture, garment exports, tourism and, more recently, construction and real estate has brought about huge economic growth and offered new directions for development. Institutional arrangements and procedures, particularly the process of decentralization and de-concentration, have brought more political and administrative responsibilities. This has increased the functions and roles of sub-national governments in managing resources and in promoting infrastructure and other development activities, which is beneficial for the entire population. Along with the positive trend in economic growth, rapid urbanization has occurred noticeably, leading to an increase in the density of people in the centre and surrounding areas of Phnom Penh City, Shihanouk Ville and Tole sap Great Lake. The Cambodian people lives in this area, which covers a total land area of less than 40% of the total land area in Cambodia. The huge growth rate of urban population has been associated with natural cause and with rural to urban migration of people seeking job opportunities in various sector, including the garment industry, and the construction, tourism and the entertainment sectors. However, while the motivation of many rural to urban migrants is to seek employment, job opportunities and Incomes are poor, leading to high rates of urban poverty, with approximately 55% of unban families living in slums in Cambodia in 2014. Multiple risks are that the support program fails to achieve its objectives because the government's commitment to policy issues waivers or severe resource constraints hinder implementation. Particularly difficult risks include capability of the local authorities in handling projects and in committing limited resources to regular maintenance and operation, inadequacy of user fees and their collection, and lack of motivation among the local communities due to inappropriate handling by local governments. Project design must include proper risk mitigation and management strategies. Donor-funded projects have also to deal with those universal risks stemming from the difficult political economy conditions and insecure property rights. Work with the NIS to develop an accurate and scientific framework for classification of urban and rural areas and to use this framework consistently to ensure the availability of consistent and

systematic data on urbanization, demographic profile, socio-economic data, and gender and health related issues disaggregated by geographical and rural-urban areas for planning purposes. National, sub-national, and local governments should increase cooperation with each other and with relevant civil society organizations, UN agencies, and development partners to ensure the development and effective implementation of a more propoor and inclusive urban planning and to increase investments and efforts for the development of urban poor communities. Work in partnership with relevant stakeholders to identify and address risk factors that contribute to unwanted pregnancy, unsafe abortion, and GBV; and to scale up prevention programs and socio-economic initiatives aiming to increase gender equity and income-generation capacity, especially of youth and women in urban poor communities. Raise awareness among the general public and policy makers of the need for the development of urban poor communities and how the effort would in turn benefit the overall development of urban areas.