PARK MATTERS!

Mainstreaming Physical Activity in Landscape Architecture Design

Sigit D. Arifwidodo

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Contents

Preface

The first question that many of my colleagues asked when they heard about this book is, *"Why is a landscape architect writing a book about public health?"*. I usually replied by stating the literature. That the fields of urban planning, landscape architecture, and public health were originally united and emerged in the 19th century as a joint effort to address poor health conditions linked to the built environment of cities. In reality, public health has been my passion since I pursued my Ph.D. in urban environmental management. It was started when I read a book written by a Nobel Prize economist named Amartya Sen called "Development as Freedom." His concept about the capabilities approach, which includes health and well-being as one of its essential aspects in fundamental human rights, convinced me as one of the big ideas that can change the world. I worked on health and well-being, quality of life, and urban development as the main topic for my Ph.D. dissertation. My main argument is that city should be planned, managed, and designed to expand the opportunity for its inhabitants to pursue better well-being and quality of life. In other words, I think that a well-designed city is a fundamental human right.

As a lecturer at Kasetsart University, I am fortunate to have involved in many research projects related to climate change and its impacts on urban health. My recent research projects funded by the Thai Health Promotion Foundation connect urban planning, landscape architecture, and public health through physical activity. When health costs have become one of the most significant household expenditures in Thai society, the central importance of physical activity in preventing and improving a wide variety of health problems has become more and more critical. Although evidence has shown the benefits of increased exercise and physical activity, many people in the world remain physically inactive and sedentary. In Thailand, less than one-third of

Thai population exercises regularly. 60 to 70% of the older Thais have been found not to meet the goal of the Thai health policy to perform 30 minutes of moderate physical activity 3-5 days per week, especially for people living in the urban area, where they have less conducive for exercise. Cities in Thailand are very car-dependent. The infrastructure in the city is not planned and designed to encourage people to be physically active. Roads are full of traffic congestions; sidewalks are not available or badly-maintained; public transportation options are limited. For many people, parks are the only choice that can offer opportunities to engage in physical activity.

There has been evidence on how parks help reduce air pollution, lower temperature, and urban heat island, and improve social cohesion. This book offers something else: parks improve our physical health. The book's main argument is that public health benefits should also be considered when planning and designing parks. The book also offers general strategies for the community, local government, NGOs, professionals, and other urban stakeholders to mainstream physical activity for parks in their neighborhood.

I hope that the book will broaden our perspective on the importance of physical activity in the park, as well as help us to advocate better policy actions in mainstreaming physical activity in our everyday lives.

Sigit D. Arifwidodo

Acknowledgement

The content for the book was mainly derived from studies and research projects on parks and physical activity funded by various organizations such as Thai Health Promotion Foundation (ThaiHealth), Asia-Pacific Network for Global Change Research (APN), World Health Organization Southeast Asia Regional Office (WHO-SEARO) and many other national and international donor organizations. This book would not have existed without contributions from many special people. I owe a special debt to Ms. Orana Chandrasiri, who helped me throughout the writing process. My sincere appreciation for my research lab members at the Center of Active Landscape and Activethai.org, who assist me with data cleaning and analysis. My heartfelt gratitude to Dr. Rutmanee Ongsakul, who helped me providing the draft of the case studies used in this book. I am humbled by the excellent feedback from Prof. Dr. Widjaja Martokusumo, Assoc. Prof. Dr. Ranjith Perera and Asst. Prof. Dr. Vudipong Davivongs, who reviewed the draft and improved the quality of the book. Lastly, I am grateful to the Department of Landscape Architecture and the Faculty of Architecture for allowing me to write the book.

Introduction

In 2007, half of the world population became urban. Some countries have managed urbanization well in terms of providing a reasonable level of public services and infrastructure. However, some other countries have not been successful, where fast urbanization brought about slums, pollution, traffic jams, and other health problems. This situation brings the consequences in urban design and how we design urban landscape. A proper understanding of urban environment dynamics is an essential requirement for landscape architects nowadays. In other words, we need to be more sensitive to urban issues around us.

It has been acknowledged that the built environment shapes our behavior. The way that cities, communities, and neighborhood are planned and designed have significant impacts on people. The placement of the urban fabric, in the form of transportation systems, built-up areas, and green open spaces have real consequences to where we live and work, how we travel, how we spend our time, how much pollution we produce, and what kind of environmental hazards we face. More importantly, these fabrics impact our health and well-being. The urban environment we inhabit and build can make us and our children healthy or sick. It can force us to drive a car instead of walking and cycling, choosing to stay home and watch TV instead of going to the park and exercise.

One of the most pressing health issues globally in modern society is insufficient physical activity. Over the past half-century or longer, major technological innovations—automation and the consequent decline of the requirement of physical strength in work, labor-saving devices in the home, and the dominance of the automobile for travel—have substantially reduced the physical demands of daily life. Besides, the steady decentralization of metropolitan area population and employment to low-density, widely dispersed suburban locations has increased travel

distances to many destinations (e.g., schools, neighborhood shopping, transit stops) and made the private vehicle the most practical and convenient transport mode. Lifestyle and cultural changes, such as increases in television watching and other sedentary activities, have also played a role in reducing physical activity.

According to the World Health Organization (WHO), in 2010, 23% of adults worldwide, and 81% of adolescents were insufficiently active. Insufficient physical activity is considered one of the ten leading risk factors for global mortality, causing 3.2 million deaths each year. In Thailand, less than one-third of Thai population exercises regularly. Children aged 11-14 years exercised the most, while people of working age (25-29 years old) had the lowest exercise rate. Sixty to seventy percent of the older Thais have been found not to meet the Thai health policy goal to perform 30 minutes of moderate physical activity 3-5 days per week, especially for people living in urban areas, where they have a less conducive environment for exercise. A recent study also found that sedentary behavior and obesity in children ages 2-10 years are more prevalent in the urban area in Thailand. The study also stated that the lack of a built environment conducive to physical activity is one of the main reasons for the sedentary behaviors in children.

In many countries, including Thailand, the built environment is considered as a hindrance because the city is not built for physical activity. The infrastructure of the city is not planned and designed to encourage its inhabitants to be physically active. For example, it isn’t easy to ride a bicycle or walk because not all roads and streets and aisles in Bangkok have designated bicycle lanes and walkways. Moreover, microclimate and air pollution discourage people from doing physical activity in public space. Thus, parks become the only public infrastructure in the city that can provide support to physical activity. However, parks and green spaces are considered secondary in infrastructure planning in Thailand, where roads and highways are more critical. Bangkok has

only around five square meters of green space per person. World Health Organization (WHO) recommends that cities provide a minimum of nine square meters of unpaved/ undeveloped green open space for every inhabitant. For example, Chiang Mai has only 3.28% of green space in the city. Based on a survey conducted by the Thailand Development Research Institute (TDRI) in 2012, it was found that 73% of Chiang Mai inhabitants thought that the city needs to build more parks and green space.

This book has a single argument: that mainstreaming physical activity through better park design is critical to promote an active and healthy lifestyle in cities. The objective of the book is simple, to disseminate the idea that the park is a vital health infrastructure that can affect the well-being of the urban population. In other words, park matters. The built environment – health nexus is mainly presented as part of public health discipline. But in this book, it was introduced from the landscape architecture lens. The contents of the book were primarily derived from research projects on parks and physical activity in Thailand. Some good design practices from other countries were also presented.

Chapters in this book are summarized from past studies, research projects, and literature reviews, especially in Thailand and Bangkok. In chapter 1, we explore physical activity as one of the risk factors of Noncommunicable diseases (NCDs) and how conducting regular physical activity can benefit our health and well-being. Chapter 2 examines the importance of the built environment as a predominant factor in influencing physical activity level from a global perspective. Chapter 3 discusses the role of parks in our everyday lives, especially in improving physical activity levels. It lays out the foundation for understanding parks and their contribution to physical activity promotion using good practices from other countries. Chapter 4 elaborates on the findings and planning and design implications of our studies in Thailand. Chapter 5 explores the general principles on how to plan, design, and assess parks for physical

activity and their impacts on urban planning and public health policies at the national and city levels. The conclusion chapter offers generalized lessons learned from our studies on how to improve our built environment.

The message from the book is that park planning and design should provide opportunities for urban populations for healthy and active living. It is essential to understand how the parks are designed and managed, so we can give proper feedback to local government and relevant agencies on what kind of parks that we need so they reflect our healthy and active living choices.

Chapter 1

Insufficient Physical Activity as a Global Health Issue

Health is a universal right, an essential resource for everyday living, a shared social goal, and a political priority for all countries. In the modern world, where healthcare is better, and life expectancy is rising, it is the first time in our history that people are more likely to die from obesity than from famine. Since the book is in the grey area between urban planning, urban design, landscape architecture, and public health, it is essential to understand two important concepts that will be used throughout the book. The first concept is "noncommunicable diseases," and the second concept is "physical activity." Understanding these two concepts is necessary to link one of the most pressing issues in public health agenda with the urban planning and landscape architecture discipline.

Noncommunicable Diseases (NCDs) and Insufficient Physical Activity

According to data from the World Health Organization (WHO) in 2017, the leading global killer was cardiovascular diseases (CVDs), which refer to a range of conditions that affect the heart and blood vessels[1]. These include hypertension (high blood pressure), coronary heart disease (heart attack), cerebrovascular disease (stroke), heart failure, and other heart diseases. CVDs were responsible for around one-third of global deaths. Cancers (given as the sum of all cancer types) were the second largest, claiming approximately 17% of deaths globally. Collectively,

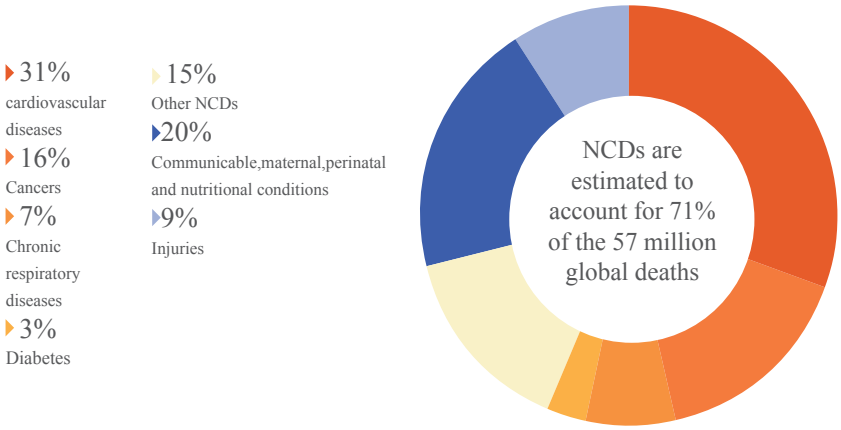


Figure 1.1. Global NCD deaths

Source: Noncommunicable diseases country profiles 2018. Geneva: World Health Organization; 2018.

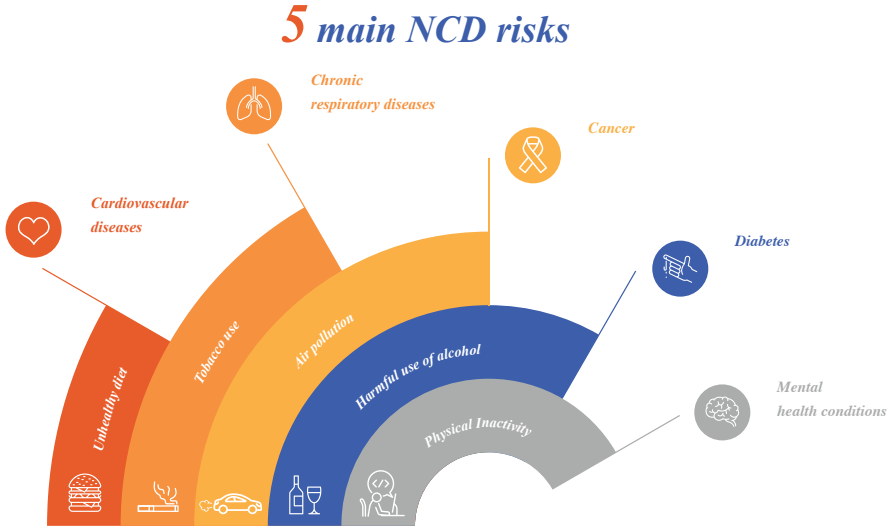


Figure 1.2. Five-by-five approach to tackling NCDs

Source: Time to deliver Third UN High-Level Meeting on Non-communicable Diseases. World Health Organization; 2018, page 8.

these diseases, with other chronic diseases such as respiratory diseases and diabetes, are often grouped and called Noncommunicable diseases (NCDs). Together, in 2016, NCDs accounted for more than 41 million deaths or more than 70% of the global population. According to the World Health Organization (WHO), NCDs or chronic diseases tend to be of long duration and are the result of a combination of genetic, physiological, environmental, and behavioral factors. The main types of NCDs are CVDs, cancer, chronic respiratory diseases, and diabetes[2].

Noncommunicable diseases (NCDs) are among the significant health and development challenges of the 21st century, in terms of both the human suffering they cause and the harm they inflict on the socio-economic fabric of countries, particularly low- and middle-income countries. More than 40% of NCD deaths were premature deaths under age 70 years. People of all age groups, regions, and states are affected by NCDs. Children, adults, and the elderly are all vulnerable to the risk factors of contributing to NCDs, whether from unhealthy diets, physical inactivity, and exposure to tobacco smoke or the harmful use of alcohol. The World Economic Forum highlighted that NCDs contribute to over 30 trillion USD economic loss in the next 20 years, or equivalent to approximately half of the global gross domestic products (GDPs) in 2010[3]. There are also socioeconomic costs of NCDs. For example, poverty and inequality are closely linked with NCDs. Almost three-quarters of all NCD deaths and the majority of premature deaths (over 85%) occur in low- and middle-income countries where poverty is high. Vulnerable and socially disadvantaged people are at greater risk of being exposed to harmful products such as alcohol, tobacco, and unhealthy dietary practices while having limited access to health services. NCDs are predicted to impede poverty reduction initiatives in low-income countries, particularly by increasing costs associated with healthcare.

Prevention and Control of NCDs: Managing Modifiable Risk Factors

The WHO notes that *"a large proportion of NCDs are preventable… and if no action is taken over the next three decades, the cost of NCD burden will cause cumulative economic losses of USD 7 trillion over the next 15 years and millions of people trapped in poverty"*[4]. empirical evidence shows that a meaningful way to control and prevent NCDs is to focus on reducing the risk factors associated with these diseases. The WHO and other international organizations have provided guidelines on a low-cost solution to reduce these risk factors, especially common modifiable ones. Studies have also pointed out that investing in managing modifiable risk factors such as tobacco use, physical inactivity, unhealthy diets, and the harmful use of alcohol are the most cost-effective interventions in preventing and controlling NCDs. According to data from WHO[5], Tobacco accounts for over 7.2 million deaths every year (including from the effects of exposure to second-hand smoke) and is projected to increase over the coming years. 4.1 million annual deaths are attributed to excess salt/sodium intake, and more than half of the 3.3 million annual deaths are attributable to alcohol use are from NCDs, including cancer[6]. At the same time, 1.6 million deaths annually are attributed to insufficient physical activity. WHO called the agenda in combating NCDs as the WHO's 4x4 NCD agenda.

More recently, there has been a shift in thinking outside the traditional 4x4 box agenda by adding air pollution as the fifth risk factors and mental health as the fifth NCD. In 2016, ambient and household air pollution caused 4.2 million deaths globally, which is in the same range as active smoking in terms if NCD deaths annually[7]. Ambient air pollution refers to the mean air pollution level a person is exposed to during the year as measured outdoors. Household air pollution is regulated by the use of unclean fuels and technologies for cooking. A study conducted by World Bank found that exposure to ambient and household air pollution in 2013 cost approximately 5.11 trillion USD in

welfare losses due to premature death globally. This is equal to around 7.5% of GDP in South Asia, East Asia, and the Pacific, respectively[8].

Mental and neurological disorders, including depression, anxiety disorder, bipolar disorder, schizophrenia, and dementia, are linked to NCDs. Epidemiological studies have found significant associations between cardiovascular diseases and mental disorder[9]. Evidence found that the odds ratios for the association of heart disease with a mental disorder were 2.1 for mood disorders, 2.2 for anxiety disorders, and 1.4 for alcohol misuse. At the same time, there were also associations between early-onset common health diseases, as well as between early childhood adversities and adult-onset heart disease[10].

In September 2018, head of state and government and representatives of states and governments assembled at the United Nations to reaffirm their political declaration of the third high-level meeting of the United Nations General Assembly on the prevention and control of noncommunicable diseases. The meeting formally recognized air pollution as a critical factor and mental health as a precursor to or a consequence of NCDs and expanded the focus on the big four NCDs and risk factors to a five-by-five model (figure 1.2)[11].

The model recognizes that risk factors for NCDs tend to cluster together and disproportionally affect the disadvantaged groups, such as people with common mental disorders, where they may have multiplicative effects[12]. Insufficient physical activity, unhealthy diets, tobacco, and alcohol have been associated with frequent and severe psychological disorders. 8-12% of deaths among people with common mental disorders are attributed to smoking, diabetes, history of myocardial infarction, and hypertension[13]. In parallel, the prevalence of depression among people with heart diseases is up to three times higher than in the general population[14]. The data so far suggest that addressing overlapping risk factors, and integrating the management of mental disorders and NCDs, would accelerate progress in tackling these conditions.

"Physical activity is defined as body movements of any type that resulted in energy expenditure, which includes walking, cycling, playing, dancing, gardening, and sports."

What is Physical Activity?

Physical activity is the fourth leading risk factor in global mortality, and insufficient physical activity is on the rise in many countries. It has been acknowledged that regular physical activity reduces the behavioral risk factors of NCDs. Physical activity is also linked with a longer and healthier life; it helps people to maintain an ideal weight and cardiorespiratory functions and well as muscular fitness.

Physical activity is considered as a new science. Although physical activity has been known as an essential component of a healthy lifestyle, the literature on the topic was mainly focused on sport and exercise. Not until 1996, when a report issued by the surgeon general entitled "Physical Activity and Health" represents a watershed moment in the history of the public health community in the US and around the world. Before this report, the general advice given by public health officials to maintain a healthy lifestyle was at least twenty minutes of high-intensity aerobic exercise or sport three or more days a week. The idea was that anything less than a sustained high-energy effort would be a waste of time and resulting in little or no health improvement over time. The report itself stated that significant health benefits could be obtained through moderate activities such as walking and bicycling. Since the release, the body of scientific literature continues to support and grow. In 2010, the WHO established a report entitled "Global Recommendations on Physical Activity and Health," which becomes the standard advice in maintaining a healthy lifestyle.

The WHO defines physical activity as body movements of any type that resulted in energy expenditure. This activity includes walking, cycling, playing, dancing, gardening, and sports[15]. Physical activity can be undertaken as part of work, such as lifting, carrying, or other active tasks, and as part of paid or unpaid domestic tasks at homes such as cleaning and other household chores. While some activities are done by preference and also provide enjoyment, additional work or domestic-related physical

Absolute intensity			Relative intensity		
Intensity	**MET**	**Examples**	**%HRmax**	**RPE** (Borg scale score)	**Talk Test**
Light	1.1-2.9	Walking <4.7 km/h, light house work.	50-63	10-11	
Moderate	3-5.9	Walking briskly (4.8-6.5 km/h), slow cycling (12 km/h), painting/decorating, vacuuming, gardening (mowing lawn), golf (pulling clibs in trolley), tennis (doubles), ballroom dancing, water aerobics.	64-76	12-13	Breating is faster but compatible with speaking full sentences.
Vigorous	≥6	Race-walking, jogging or running, bicycling >15 km/h, heavy gardening (continuous digging or hoeing), swimming laps, tennis (single).	77-93	14-16	Breating very hard, incompatible with carrying on aconversation comfortably.

MET (metabolic equivalent) is estimated as the energy cost of a give activity divided by resting energy expenditure: 1 MET = 3.5 mL O2 Kg-1 min-1 oxygen consumption (VO2).
RPE, rating of perceived exertion (20 value Borg score).
%HRmax, Percentage of measured or estimated maximum heart rate (220-age).

Table 1.1. PA levels and example of activity with METs

Source: the Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice. 2016 European Guidelines on cardiovascular disease prevention in clinical practice. European Heart Journal. 2016.

activities may be necessary, or even mandatory. They may not offer the same pleasure compared to, for example, active recreation. However, all forms of physical activity can provide health benefits if undertaken regularly and of sufficient duration and intensity. In 2010, the WHO generated recommendations on the type and frequency of physical activity for optimal health benefits for youth, adults, and older adults[16]. According to the recommendation, health benefits can be achieved by encouraging people to be active throughout the day. The more opportunities that people have to integrate physical activity into their day-to-day lives, the more likely it is that they will be able to maintain these beneficial behaviors. Studies have shown that participation in regular physical activity reduces the risk of coronary heart disease and stroke, diabetes, hypertension, colon cancer, breast cancer, and depression. Additionally, physical activity is a crucial determinant of energy expenditure and thus is fundamental to energy balance and weight control[17].

The WHO recommends that children and adolescents aged 5-17 years should do at least 60 minutes of moderate- to vigorous-intensity physical activity daily. For adults aged 18-64 years, it is recommended to do at least 150 minutes of moderate-intensity physical activity throughout the week, or at least 75 minutes of vigorous-intensity physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity physical activity. For adults aged 65 years and above, the recommendation is at least 150 minutes of moderate-intensity physical activity throughout the week, or do at least 75 minutes of vigorous-intensity physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity.

The metric to measure the level of intensity of physical activity is known as metabolic equivalent of task (MET), where one MET equal to the oxygen cost of sitting quietly or 3.5ml/kg/min[18]. MET is primarily used to provide general medical thresholds and guidelines to a population in epidemiological surveys. Based on MET, there are three physical

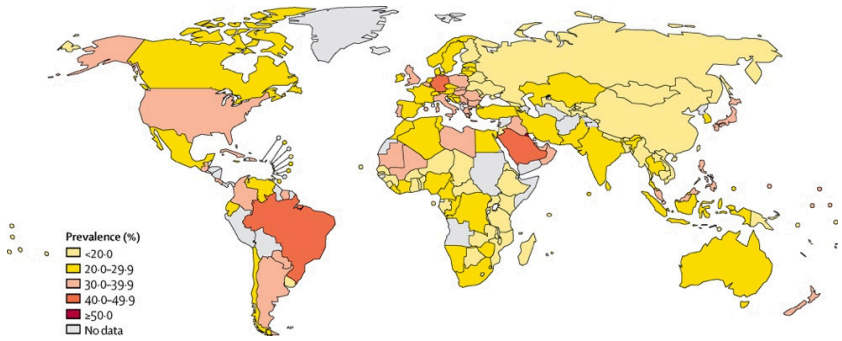


Figure 1.3. Country prevalence of insufficient physical activity in men 2016

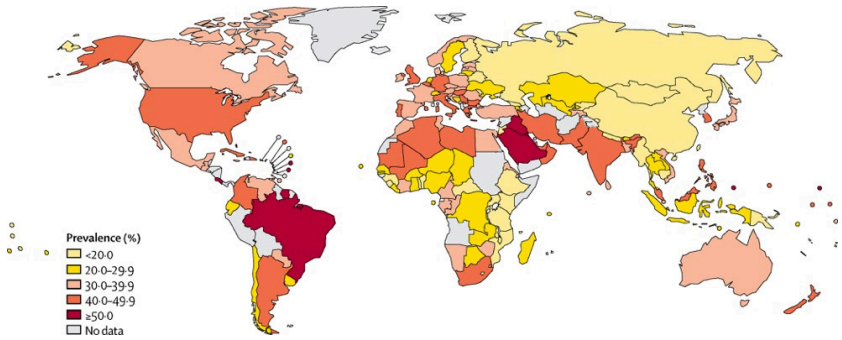


Figure 1.4. Country prevalence of insufficient physical activity in women in 2016

Source: Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. The Lancet Global Health. 2018.

activity intensity levels: light (less than 3 MET), moderate (3 – 6 MET), and vigorous (more than 6 MET) intensity activities. Desk working, walking, and strolling are examples of light physical activity[19]. Biking with a speed less than 2 km/hour, walking with speed 5 km/hour, and exercising using equipment are some examples of moderate physical activity. Vigorous physical activity examples include jogging, heavy exercise using equipment in the gym, and rope jumping (Table 1.1).

Another relevant term related to physical activity is sedentary behavior, which is defined as any waking behavior characterized by energy expenditure less than 1.5 metabolic equivalents (MET), such as sitting, reclining, or lying down[20]. Recent evidence indicates that high levels of continuous sedentary behavior (such as sitting for an extended period) are associated with abnormal glucose metabolism and cardio-metabolic morbidity as well as overall mortality[21]. Reducing sedentary behavior through the promotion of incidental physical activity such as standing, climbing stairs, and short walks can support individuals to permanently increase their levels of physical activity towards achieving the recommended levels for optimal health[22].

Despite the global acknowledgment of the issue, progress in improving physical activity levels remains poor. Insufficient physical activity is known as the fourth leading risk factor for global mortality, contributing to 3.2 million deaths each year[23]. In 2010, 23% of adults aged 18 years and over have insufficient physical activity, with women are less active than men, and older people are more active than a younger age group (19% of the youngest age group did not meet the recommended physical activity level, compared to 55% of the oldest group). 81% of adolescents aged 11-17 years have insufficient physical activity globally, where girls are less active than boys.

The Global Status Report on NCDs in 2014 states that insufficient physical activity in adults and adolescents increases according to the level of country income, where the prevalence in high-income countries is about double to that in low-income countries (33% compared to 17%). This pattern may be explained by high-levels of occupational and transport activity in these countries[24]. The report also states that globally, no clear pattern of insufficient physical activity can be further established due to data in most countries.

Enabling Environment: Policy Actions and Initiatives to Improve Physical Activity

The ultimate goal in physical activity promotion is to increase the number of people to be physically active. In order to do that, it is essential to create an enabling environment to make the healthy choice the most natural choice. In other words, the government needs to ensure that the communities where people live, work, and play can provide the options and opportunities to be physically active. This is important since evidence indicates that physical and social environments are mutually crucial in influencing physical activity. For example, the ownership and use of motorized vehicles, different occupation types, urbanization, accessibility to public transportation, and political situation seem to be essential determinants of levels and patterns of physical activity[25].

As the leading global agency in promoting physical activity, the WHO has been involved in many policy actions and initiatives to improve physical activity. In 2004, the World Health Assembly, a decision-making body of WHO consisting of delegations from all WHO member states, endorsed the Global Strategy of Diet, Physical Activity and Health (DPAS). This document emphasizes the need to increase the physical activity level of the global population through fiscal and regulatory policies, and costumers' education and marketing in 2011, WHO

developed the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020. In 2013, the World Health Assembly agreed on a set of global voluntary targets, which includes a 25% reduction of premature mortality from NCDs, and a 10% reduction in the prevalence of insufficient physical activity by 2025. A review of actions towards achieving these targets in 2015 concluded that progress in increasing physical activity has been slow and uneven across countries.

In 2018, the WHO developed a Global Action Plan for Physical Activity (GAPPA). The document now becomes an umbrella for national and regional policy actions. The plan emphasizes the importance of a system approach in handling the issue of insufficient physical activity beyond the health sector. The strategy then underlines the active involvement of actors in multiple sectors in promoting physical activity, setting the target of a 10% relative reduction in the prevalence of insufficient physical activity in adults and adolescents in 2030, using the baseline of 2010 data[26]. The action plan proposes an extension by five years to align with the SDGs 2030 agenda and provide countries 12 years (2018-2030) to restructure their policy action and implementation.

The plan provides four strategic objectives and 20 policy actions as a framework for countries to implement multisectoral and population-based efforts in increasing physical activity and reducing sedentary behavior. The four strategic objectives are:

1. Create active societies
2. Create active environments
3. Create active people
4. Create active systems

These four objectives capture the whole-of-system approach required to create a society that intrinsically values and prioritizes policy investments in physical activity as a regular part of everyday life.

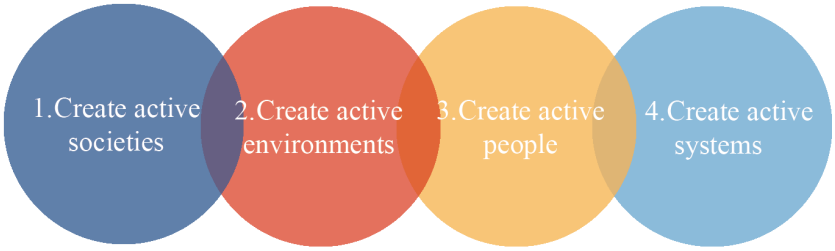


Figure 1.5. The four strategic objectives

"Insufficient physical activity is known as the fourth leading risk factor for global mortality, contributing to 3.2 million deaths each year."

It is interesting that the plan explicitly states the importance of the built environment in strategic objective 2: create an active environment. This objective aims to create environments that promote and safeguard the rights of people of all ages and abilities to have equitable access to safe places and spaces in their cities and communities to be physically active through walking, cycling, and other active recreation in the public space. There are five recommended policy actions under these strategic objectives:

1. Strengthen the integration of urban and transport planning policies to prioritize the principles of compact, mixed-land use, at all levels of government as appropriate, to deliver highly connected neighborhoods to enable and promote walking, cycling, other forms of mobility involving the use of wheels (including wheelchairs, scooters, and skates) and the use of public transport, in urban, peri-urban and rural communities.

2. Improve the level of service provided by walking and cycling network infrastructure, to enable and promote walking, cycling, other forms of mobility involving the use of wheels (including wheelchairs, scooters, and skates) and the use of public transport, in urban, peri-urban, and rural communities, with due regard for the principles of safe, universal and equitable access by people of all ages and abilities and in alignment with other commitments.

3. Accelerate implementation of policy actions to improve road safety of pedestrians, cyclists, people engaged in other forms of mobility involving the use of wheels (including wheelchairs, scooters, and skates) and public transport passengers, with priority given to actions that reduce the risk for the most vulnerable road users in accordance with the safe systems approach to road safety, and in alignment with other commitments.

4. Strengthen access to good-quality public and green open spaces, green networks, recreational spaces (including river and coastal areas) and sports amenities by all people of all ages and diverse abilities in urban, peri-urban and rural communities, ensuring the design is consistent with these principles of safe, universal, age-friendly and equitable access with a priority being to reduce inequalities and in alignment with other commitments.

5. Strengthen the policy, regulatory and design guidelines and frameworks at the national and sub-national levels, as appropriate, to promote public amenities, schools, health care, sports, and recreational facilities, workplaces and social housing that are designed to enable occupants and visitors with diverse abilities to be physically active in and around the buildings, and prioritize universal access by pedestrians, cyclists and public transport.

In other words, the policy actions related to the built environment in the plan focus on five things: urban planning policies, infrastructure to support physical activity, road safety, public space, and building. Acknowledging that physical activity an issue beyond the health sector is encouraging. Increasingly, the built environment is recognized as one of the most critical social determinants of health, with the potential for positive and negative effects for physical activity. This perspective is in alignment with the two crucial global initiatives in urban planning and landscape architecture: the Sustainable Development Goals (SDGs) and the New Urban Agenda (NUA), where both documents' main goal is to improve health and well-being of the global population.

In SDG 11, for example, target 11.2 states that are planning for better access to safe, affordable, accessible and sustainable transport systems for all, implies the need of inclusion of walking, cycling, and other non-motorized transportation (in other words, transportation physical activity) in cities infrastructure planning. In target 11.3 (enhance

inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlement planning and management in all countries) implies the need for compact urban development planning, which encourages physical activity in everyday life integrated into national and sub-national transportation planning policies.

New Urban Agenda (NUA) was adopted at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador, on 20 October 2016. It was endorsed by the United Nations General Assembly at its sixty-eighth plenary meeting of the seventy-first session on 23 December 2016. The New Urban Agenda presents a paradigm shift based on the science of cities; it lays out standards and principles for the planning, construction, development, management, and improvement of urban areas along its five main pillars of implementation: national urban policies, urban legislation and regulations, urban planning and design, local economy and municipal finance, and local implementation. NUA also acknowledges that health is at the heart of the vision to improve cities for a better and more sustainable future. It emphasizes the fact that national urban policies, urban legislation and regulations, urban planning and design, local economy and municipal finance, and local implementation should be aimed to improve the general health and well-being of the urban population. Complementing to the SDGs, NUA offers a more detailed guideline on how cities can plan towards a healthy and active lifestyle.

SDGs, NUA, and GAPPA provides a statement of physical activity and built environment as a cross-cutting issue in public health and urban planning and landscape architecture discipline. The current development of a global monitoring framework for physical activity based on these documents showed how to advance the science and policy discussion on physical activity and built environment at the global stage.

Countries	Minutes spent presented in mean (median) per day					Age group (survey year)
	Total PA per day	Work PA per day	Transportation PA per day	Recreational PA per day	Sedentary activities on average per day	
Bangladesh	177 (79)	116 (15)	45 (10)	16 (0)	168 (120)	Age 25+ (2010)
Bhutan	350.5 (330.0)	274.5 (n/a)	56.9 (n/a)	19.1 (n/a)	148 (120)	18-69 years (2014)
Dermocratic People's Republic of Korea	284.2 (n/a)	194.1 (n/a)	74.8 (n/a)	15.0 (n/a)	(n/a)	18-69 years (2016)
India (Punjab)~	232.3 (n/a)	(n/a)	(n/a)	(n/a)	228 (n/a)	18-69 years (2014-2015)
Indonersia	(n/a)	(n/a) (60.0)	(n/a) (25.7)	(n/a) (17.1)	(n/a)	18+ (2013)
Maldives (Malé)~	103.2 (34.3)	37.3 (n/a)	37.6 (n/a)	28.2 (n/a)	302.5 (300)	15-64 (2011)
Myanmar	259.4 (214)	198.3 (171)	50.7 (30)	10.5 (0)	206.4 (180)	25-64 years (2014)
Nepal	267.4 (240.0)	181.6 (154.3)	77.6 (60.0)	8.1 (0.0)	152.7 (120.0)	15-69 years (2014)
Sri Lanka	153.9 (77.1)	117.7 (n/a)	28.6 (n/a)	7.6 (n/a)	216.1 (180.0)	18-69 years (2014)
Thailand	249.4 (180)	197.4 (120)	30.1 (10)	22.3 (0)	134.7 (120)	18+ (2014)
Timor-Leste	130.7 (85.7)	114.5 (68.6)	11.3 (0.0)	4.9 (0.0)	100.5 (62.0)	18-69 years (2014)

Source: data were compiled from country reports on WHO STEPS, except for Thailand (data was obtained from the 2014 National Health Examination Survey) and Indonesia (data was obtained from the 2013 RISKESDAS survey).
~Subnational

Table 1.2. Minutes spent on physical activity daily in countries in the SEA Region (mean – median)

Source: WHO. Status report on 'Physical Activity and health in the South-East Asia Region. 2018.

Thailand as a Leader in Global and Regional Physical Activity Movement

Thailand is considered as a global and regional leader in physical activity movement. In 2001, Thailand established the Thai Health Promotion Foundation, which shares the goal of promoting physical activity at the population level. In 2002, the Ministry of Public Health upgraded its Exercise for Health Unit to the Division of Physical Activity and Health. In 2010, Thailand constituted the multisectoral action for physical activity promotion under the Thailand Healthy Lifestyle Strategic Plan 2011-2020. The plan aims to improve lifestyle and physical activity by conducting a public awareness campaign and creating enabling environments. The country's involvement in tabling the global resolution for GAPPA in 2018 and regional resolution in WHO-SEARO in 2017 shows the commitment to be the global and regional leader in physical activity promotion.

However, the situation in Thailand does not reflect the country's active leadership at the global stage. The latest report on Thailand's physical activity situation shows that 15% of children in Thailand are still obese, and 88.1% of adolescents have insufficient physical activity[27]. The report also states that although the prevalence of insufficient physical activity is low in Thailand (19.2%), however, it shows that it is mostly because of a high-level of work-related physical activity (Table 1.2).

To improve the physical activity situation in the country, the Ministry of Public Health identifies five necessary policy actions, including developing a national strategy, improve national guidelines, mobilizing the whole society as active-nation-active people, strengthening surveillance systems, and seizing policy opportunities to promote physical activity and healthy lifestyle[28]. Some of these actions are already implemented. For example, Thailand has developed a national strategy for physical activity in 2017. The document was constituted by the National

"Sustainable Development Goals, New Urban Agenda, and the Global Action Plan for Physical Activity provide a statement of physical activity as a cross-cutting issue in public health and urban planning and landscape architecture discipline."

Economic and Social Development Board (NESDB) to be implemented nationally in 2018. The national guideline is currently under development, and the Ministry of Public Health is currently collaborating with the National Statistical Office, improving national physical activity surveillance. Thailand also actively seizes the global policy opportunity from leading the way for the development of GAPPA and Southeast Asia Regional resolution on promoting physical activity in the region to initiating the first status report on physical activity and health in Southeast Asia Region in 2018. A recent memorandum of understanding between the Thai Health Promotion Foundation and the WHO secretariat in Geneva on developing a global monitoring framework for physical activity cements Thailand's role as a leader in global and regional physical activity promotion.

Chapter Summary and Remarks

The chapter introduces the essential terms that will be further explored in the book. The first term is the noncommunicable diseases (NCDs), which kill nearly 41 million people each year or around 72.3% of global deaths in 2016. The WHO estimates an economic return of US$7 per person for every dollar spent on WHO 'Best Buys' interventions and a 15% reduction in premature mortality by 2030 if these 'Best Buy' options are followed[29]. The second term is physical activity, which is defined as any type of body movement that resulted in energy expenditure and includes activities such as walking, cycling, playing, dancing, gardening, and sports. The data show that globally insufficient physical activity contributes to 1.6 million deaths annually. Recently, the issue is approached as beyond the health sector. Addressing physical inactivity provides a pathway to systematically address NCD risk factors and contribute to the reduction of global mortality. In other words, physical activity offers a strategic path to link NCDs modifiable risk factors in a systematic approach in NCDs prevention and control. Physical activity also provides a platform for non-health sectors to contribute to solving

one of the most significant global health issues while accelerating progress in achieving SDGs targets.

The chapter also introduced the connection between physical activity and built environment through current global policy initiatives that share a similar vision. SDGs provide an overarching umbrella for global initiatives, while NUA offers an interrelation argument between the built environment and physical activity as a co-benefit. GAPPA delivers the systematic approach in improving physical activity with active involvement from stakeholders beyond the health sector with an emphasis on creating an active environment conducive to physical activity. These close relationship between the built environment and health is further explored in the next chapter.

Chapter 2

Built Environment and Physical Activity

Mounting evidence in the literature suggests that physical and mental health problems related to the built environment, that the place people live and work determines our health outcomes. The previous chapter explores links NCDs with the built environment as one of its driving factors. This chapter further investigates how physical activity is related to the built environment, and how designing active environment is an excellent investment to increase physical activity and reduce NCD risk.

Defining Built Environment

Defining the built environment sometimes can be confusing. Scientists' understanding of the built environment has undergone many changes. The subjective nature of the built environment features makes it challenging to make an informed decision on the appropriate design and planning, and successful practice may not always be transferable. In the field of urban planning and design, classic literature such as Christopher Alexander's book "A pattern of Language" and Kevin Lynch's "Good City Form" provides a foundation of our understanding of how we define, measure, and design the built environment. Other authors such as Jane Jacobs prefer to set the built environment as a result of constant interaction between people and the physical environment, both economically and socially[1]. William Whyte's[2] observational studies of public plazas in New York City and Donald Appleyard's[3] mapping of relationships between neighbors on streets of varying traffic levels in San Francisco stand as seminal studies of the link between the built environment and human behavior.

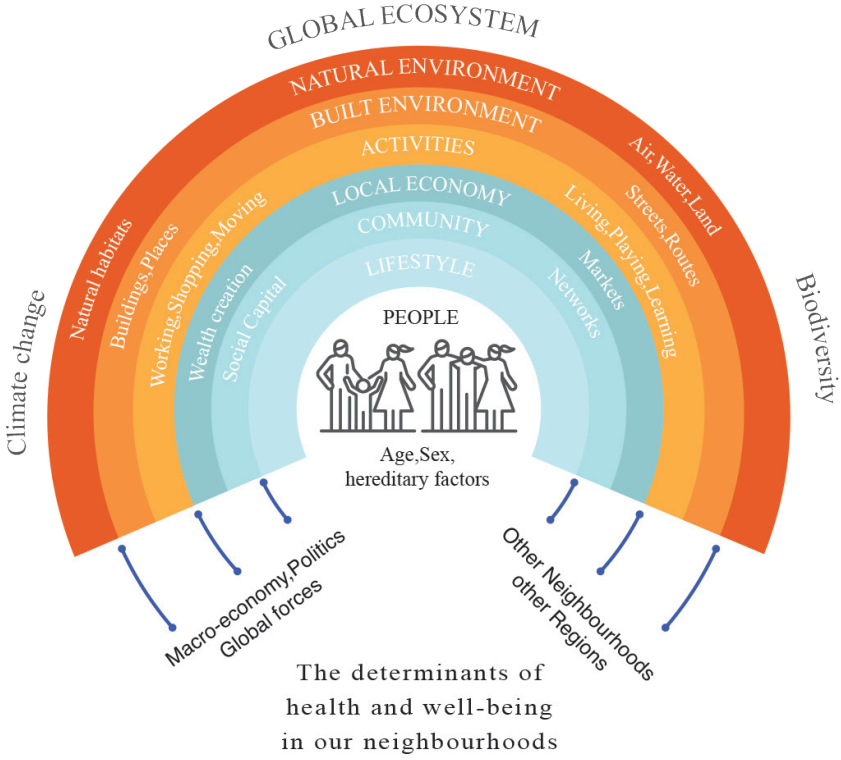


Figure 2.1. The determinants of health and well-being in our everyday lives

Source: Barton H, Grant M. A health map for the local human habitat. J R Soc Promote Health. 2006.

Recent literature defines the built environment as a human-made physical environment component of our lives, which includes our homes, schools, workplaces, park/recreation areas, business areas, roads, and highways. It extends overhead in the form of electric transmission lines and sky trains, underground in the form of waste disposal sites, and subway trains[4]. The built environment encompasses all buildings, spaces, and products that are created by people who can affect our health and quality of life. In other words, the built environment includes physical structures engineered and designed by people, including places in which people live, work, play, and socialize and the built and natural infrastructure that connects these places[5].

The relationship between built environment and health is complicated and operates through many mediating factors, such as sociodemographic characteristics, personal and cultural variables, safety and security, and time allocation. The built environment also includes social determinants of health such as housing, neighborhood conditions, and transportation routes, all of which shape the social, economic, and environmental conditions for which good health is dependent. This relationship is pictured in figure 2.1.

With 54% of the world's population, the built environment holds the best options for housing, education, employment, social interaction, and cultural and leisure activity. Built environment and cities, in general, are seen as a key for the future sustainable development agenda and have been highlighted in the Sustainable development Goals (SDGs) number 11: "Make cities and human settlements inclusive, safe, resilient and sustainable by 2030". Although not explicitly stated, the SDGs consider that it is vital to create a built environment that promotes the health and well-being of the city inhabitants.

Built Environment and Health

The built environment has a tremendous influence on our health, as an individual and as a society as a whole. At the individual level, the link between the built environment and health is usually investigated through two components: locating essential origins and destinations within space (housing, offices, shopping, and recreational destinations) and determining the ease and type of access to these spaces for different users (through streets, sidewalks, parks, and plaza). Studies that link built environment and health encompass various topics from climate change, water quality, air pollution, the burden of disease, gender to urban planning. Direct impacts of the built environment on health and well-being include those traditionally associated with infrastructure planning and environmental health, such as air quality, climate, water (in terms of flooding), and traffic-related injuries[6,7]. Let's quickly discuss these issues.

Air quality in many cities in the world is affected by the transportation sector, although industrial emissions are also significantly present. The WHO has linked transportation-related air pollution to numerous health impacts, including asthma, cardiovascular disease, cancer, decreased male fertility, and mortality[8]. Changing climate is likely to be felt through direct effects on the temperature and weather patterns changes causing extreme weather events such as droughts, flooding, storms, and temperature extremes. For example, in Bangkok, the highest yearly average temperature was recorded in the last five years due to urban heat island[9].

Flooding represents the enormous climate change-induced threat to health and well-being, especially in coastal cities like Bangkok, Thailand. The urban environment contributes significantly towards increasing the risk as a result of the increased use of impervious surfaces and residential development that encroaches floodplains. With the increase of water runoff, so too does the risk of flooding and contamination from microbial and chemical agents. Exposure to

contaminated floodwater increases the risk of respiratory illnesses, gastrointestinal illness, high blood pressure, and cancer. Flooding also significantly increases the prevalence of mental health symptoms in flooding victims, such as depression, post-traumatic stress disorder, and anxiety[10].

In Thailand, one person dies every 22 minutes on the roads. According to a recent WHO report, Thailand has the second-highest road traffic fatality rate in the world and 83% of the fatality is comprised of vulnerable road users such as motorcyclists, bicyclists, and pedestrians[11]. In scientific literature, traffic safety is often portrayed as a function of economic development. As a country undergoes rapid population growth and a rise in per capita income, the amount of vehicle ownership also increases rapidly, leading to a higher number of traffic accidents. In Thailand, the number of motorcycle registration outgrows the car and pickup (20 million records compared to 14 million). Hence, traffic fatality from motorbike is accounted for 80% in 2015.

Recently, empirical evidence on built environment and health has also paid more attention to indirect impacts of the built environment to health and well-being such as housing, neighborhood design, and physical inactivity[12]. Many studies have also pointed out that the indirect effect of the built environment on health has been more significant on lower socioeconomic status and vulnerable populations[13].

Housing conditions have always been an essential factor that can determine health outcomes. For example, substandard housing (leaking pipes, peeling paint) exposes them to pests, air pollutants, contaminants, and is associated with immune diseases[14]. Inadequate housing also has been associated with mental health problems, including anxiety, depression, attention deficit disorder, substance abuse, and aggressive behavior[15].

"Built environment and cities in general are seen as a key for the future sustainable development agenda and have been highlighted in the Sustainable Development Goals."

The issue of neighborhood design touches the heart of urban design and landscape architecture discipline. Landscape architects understand that good neighborhood design has a consequential impact on health but have little knowledge of how to measure it. In public health discipline, however, there is a considerable amount of evidence focusing on the relative impact of neighborhood design on health, well-being, and social cohesion[16]. Disadvantage neighborhoods such as slums and squatters are usually associated with higher crime rates, drugs, and substance abuse, vandalism, and a higher prevalence of mental health problems. A study in Bangkok concluded that in a better-designed community, the sense of belonging to the community is higher, which resulted in better social cohesion and participation in maintaining the environmental quality[17].

One of the linked impacts of neighborhood design is that poorly designed neighborhood can prevent people (mainly women in low-income communities) from using the built environment to undertake physical activity. Sidewalks, street connectivity, and proximity of local destinations are essential features in neighborhood design and correlate positively with health. And this is why we need to further discuss why the built environment is a vital aspect of physical activity and health.

Why the Built Environment is Important for Physical Activity

In the last 15 years, there have been growing interests in public health discipline into how the built environment can affect physical activity. The reason is that the creation of a built environment that can support physical activity is seen as a more sustainable strategy compared with other public health approaches. One of the particular interests of public health discipline is to understand the interactions between the built environment and physical activity at the neighborhood level.

The relationship between the built environment and physical activity is complicated and operates through many mediating factors, such as sociodemographic characteristics, personal and cultural variables, safety and security, and time allocation. However, with more than 30% of adults in the world are physically inactive, it is getting more and more essential for us to integrate physical activity into our daily life. And the built environment holds an indispensable role in it.

The trend of sub-urbanization creates urban sprawl, increases the distance between homes and workplaces, lowers densities, disconnects blocks and streets, and decreases the opportunity of walking and using urban amenities. Evidence has found that urban sprawl is negatively associated with physical activity[18]. For example, lack of access to local recreational and non-recreational destinations such as cafes, grocery stores, retail shops, and parks is negatively associated with cycling and walking[19]. A neighborhood that has fewer intersections attracts more motorized vehicle trips, and less population density discourages social interaction and the use of public amenities such as sidewalks and parks[20]. Studies found that four main factors can influence an individual physical activity level. These factors include personal factors (gender, age, marital status, education level, healthy behavior, etc.), social status (parents and friends, socioeconomic, community, etc.), natural environment (geographical condition, weather), and built environment[21].

Figure 2.2 shows the relationship between built environments and physical activity. It shows that the individual, which is the actor of physical activity, is embedded in a built environment and in a broader social environment of economic, political, and societal forces that shape the available opportunities and choices for physical activity. For example, those inner-city neighborhoods with high crime rates, boarded-up storefronts, and poorly maintained infrastructure discourage walking or cycling even though the greater accessibility of many destinations, connectivity (directness of travel), and mix of land use often found in

inner cities are significant correlates of physical activity. Similarly, the character of communities in which individuals live, their daily activity patterns, and their opportunities for physical activity are affected by social norms, such as teenagers' preference for driving to school; government policies, such as those affecting the availability of public transportation; and market forces, such as the demand for low-density living and the high cost of housing, that encourage the development of automobile-dependent communities far from city centers[22].

The question then is, how should we measure the association between the built environment and physical activity? It is crucial to understand how the built environment is defined and measured. Previous studies suggest that there are five dimensions of the built environment, which are commonly associated with physical activity at the neighborhood scale: density, land use mix, street connectivity, street scale, aesthetic qualities, and regional structure[23].

Density is a measure of the amount of activity that can happen in an area at a given time. It is usually defined in terms of population per square kilometer. Land use mix is a measure of a variety of uses in a given area. At the neighborhood scale, it is vital to have a degree of land use mix, since it will shorten the distance trip to conduct activities, such as shopping, working, and recreation. Shortening distance trips means reducing automobile commuting and increasing walking and cycling, hence increasing physical activity.

Connectivity is usually related to how direct the route from point of origin to destination and the availability of alternative routes within the street network. Street scale refers to the width of the street compared to the height of buildings and is usually described as "human-scale". In urban design and landscape architecture, the common approach is to design the street as human-scale as possible, since it will improve the safety and security of pedestrian[24]. Aesthetic qualities contributes to the attractiveness of the built environment that can help create a distinctive quality or sense of place[25].

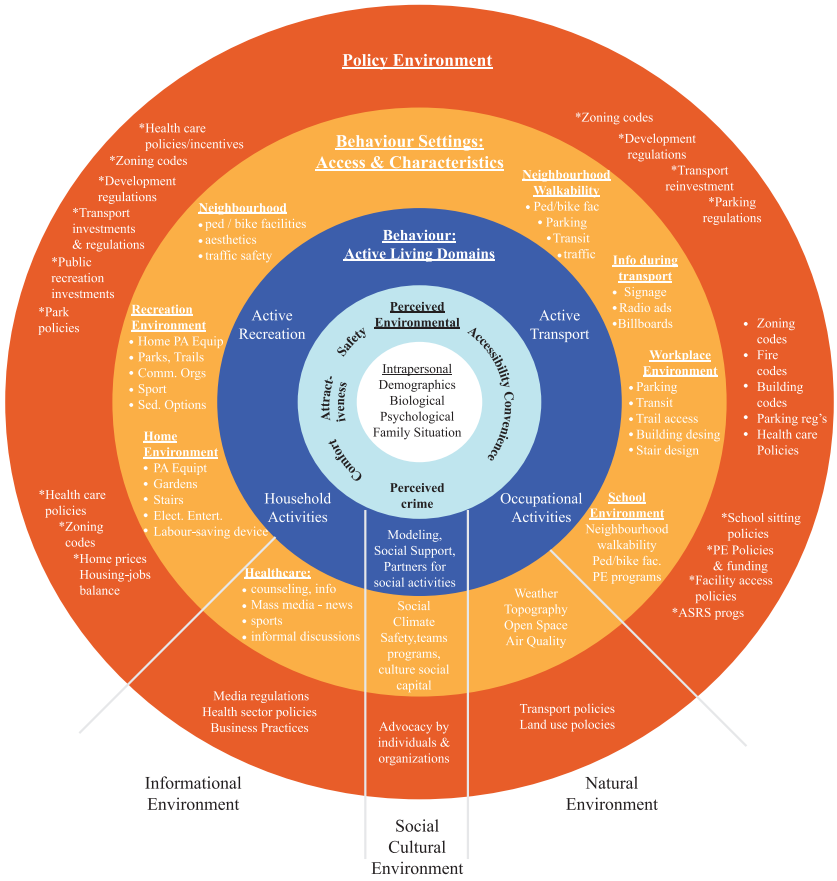


Figure 2.2. How built environment is related to physical activity

Source: The ecological model for physical activity. From Sallis J.F., Cervero R.B., Ascher W., Henderson K.A., Kraft M.K., & Kerr J. (2006). An ecological approach to creating active living communities. Annual Review of Public Health, 27 297-322.[53]

Domains of Physical Activity and Built Environment Design

There are four domains of physical activity that are customarily distinguished in the literature: household, work/occupational, active travel/transport, leisure/recreation[26]. These domains make distinct contributions to the overall physical activity level of an individual. While household and occupational physical activity are essential, this chapter will only discuss the last two domains, active travel, and recreational physical activity, which are mostly done in the built environment. Transportation physical activity such as cycling and walking requires well-designed bike lanes and sidewalks, while recreational physical activity requires facilities such as public parks, gymnasium, and green open spaces.

Transportation Physical Activity

There is a paradigm shift in the field of transportation planning. The old paradigm of transport planning defines transportation as physical travel and mobility to maximize travel speeds and minimize user cost[27]. It is then primarily based on automobile travel convenience, speed, affordability, and favors roadway expansion. At the most simplistic level, the decision related to transportation investment is based on facility performance called the level of service (LOS). It means that road is efficient when the flow of movement of cars is uninterrupted. The congested way is inefficient. Hence there is a need to improve its efficiency by expanding it. Such a paradigm encourages automobile trips and decreases the non-motorized transportation (NMT) trips such as walking and cycling. The government is much more interested in expanding road infrastructure to accommodate more automobiles. For example, if a two-lane road starts to experience congestion, it seems rational to widen it to four or six lanes.

The new paradigm of transportation planning focuses on accessibility than mobility, meaning that it emphasizes the people's overall ability to reach services and activities. The goal is to maximize transport system efficiency and equity through different types of modes such as walking, cycling, public transportation, and automobiles. The health and environmental impacts of transportation systems are essential factors in determining its efficiency. In the new paradigm, the LOS is not measured only roads for automobile, but also evaluated based on more sophisticated multimodal LOS.

Measuring LOS for active transportation is complicated because it does not reflect the perceived quality of the environment. While LOS for automobile assume that the reduction of volume or amount of traffic is sound, more people walking in pedestrian (the more congested the pedestrian) reflects the perceived quality of the walking environment. Measuring LOS for active modes of transportation is often overlooked in transportation planning because it requires extensive data, and the methods are widely debated. What gets measured gets done. Without proper cost-benefit assessment, it will be difficult for cities to consider allocating investment for building the infrastructure of active transportation.

Insufficient physical activity is considered as one of the significant health impacts under the lens of transportation planning. In general, there are three significant categories of health impacts that tend to be significantly affected by transport policy decisions. The first is traffic accidents. Traffic accidents are a major global cause of injuries and deaths. Each year nearly 1.3 million people die as a result of road traffic collision – more than 3000 deaths each day – and more than half of these people are not traveling in a car[28]. As discussed in the previous section, Thailand has the second-highest traffic fatality in the world. However, there has been little improvement despite substantial investment in safer roads, improved vehicle occupant crash protection, reduction in drink driving, and improved emergency response and trauma care[29]. The other health impacts of transportation

policies are air pollution. Motor vehicles produce various pollutants that can cause health problems even when there are technologies that can control emissions per vehicle-kilometer. This is because the reduced emission rates are partly offset by increased vehicle travel. In Bangkok, although regulations and incentives to reduce emissions are in place, however, the high volume of kilometer-traveled still significantly contribute to worsening air pollution. Bangkok is placed number 9 in the world's top 10 cities with the worst air quality in early 2019[30].

The third significant health effect is insufficient physical activity and fitness, which is our main discussion topic of this section. Evidence has shown that automobile travel is positively associated with sedentary living that can cause obesity and other health problems. Studies have also shown that one of the most practical ways to reduce automobile travel (especially for a short trip) is to encourage walking and cycling[31]. There are two types of transportation physical activity: utilitarian and recreational activity. Utilitarian activity is when you use walking and cycling as the mode of transport, such as when you commute to work, school, or even shopping. Recreational activity is when you walk and cycles in your leisure time, such as playing with your children on the street, walking your dog, joining cycling events, or other leisure-time activities that can happen on the road and pedestrian way. The common understanding is that to promote both utilitarian and recreational activities requires significant built environmental changes: safe and convenient streets, separated and protected bike lanes, safe and attractive public spaces, and protection from traffic accidents.

Although there is compelling evidence, the practices of walking and cycling as a mode of transport from countries around the world reveal sharp declines over time. For example, in Brazil, rates of walking and cycling for transport show a drop from 17% in 2009 to 12% in 2013 with approximately 30% recorded[32]. In China, bicycle mode shares have decreased by 3% per year between 2002 and 2017[33], and walking

"...there are five dimensions of the built environment which are commonly associated with physical activity at the neighborhood scale: density, land use mix, street connectivity, street scale, aesthetic qualities, and regional structure."

and cycling to school has declined from 96% in 1997 to 69% in 2011[34]. Integrating active transport/ transportation physical activity into transport planning is a complicated matter because it is beyond the scope of urban planning and design and landscape architecture, as well as public health. No single policy action will be sufficient, and the construction of the necessary comprehensive approach will require coherent policy alignment between transportation, economic development, urban and regional planning, and public health sector.

Recreational Physical Activity

Recreational physical activity is understood as the physical activity conducted in our free time. The term is interchangeably used with leisure physical activity or active recreation. It is usually defined as the physical activity that is not work oriented or that do not involve everyday life maintenance task such as house cleaning, working, or sleeping. Playing, running/jogging, cycling, swimming, dancing, and other recreational activities that produce energy expenditure for the purpose of relaxation, health, and well-being or enjoyment is considered as recreational physical activity.

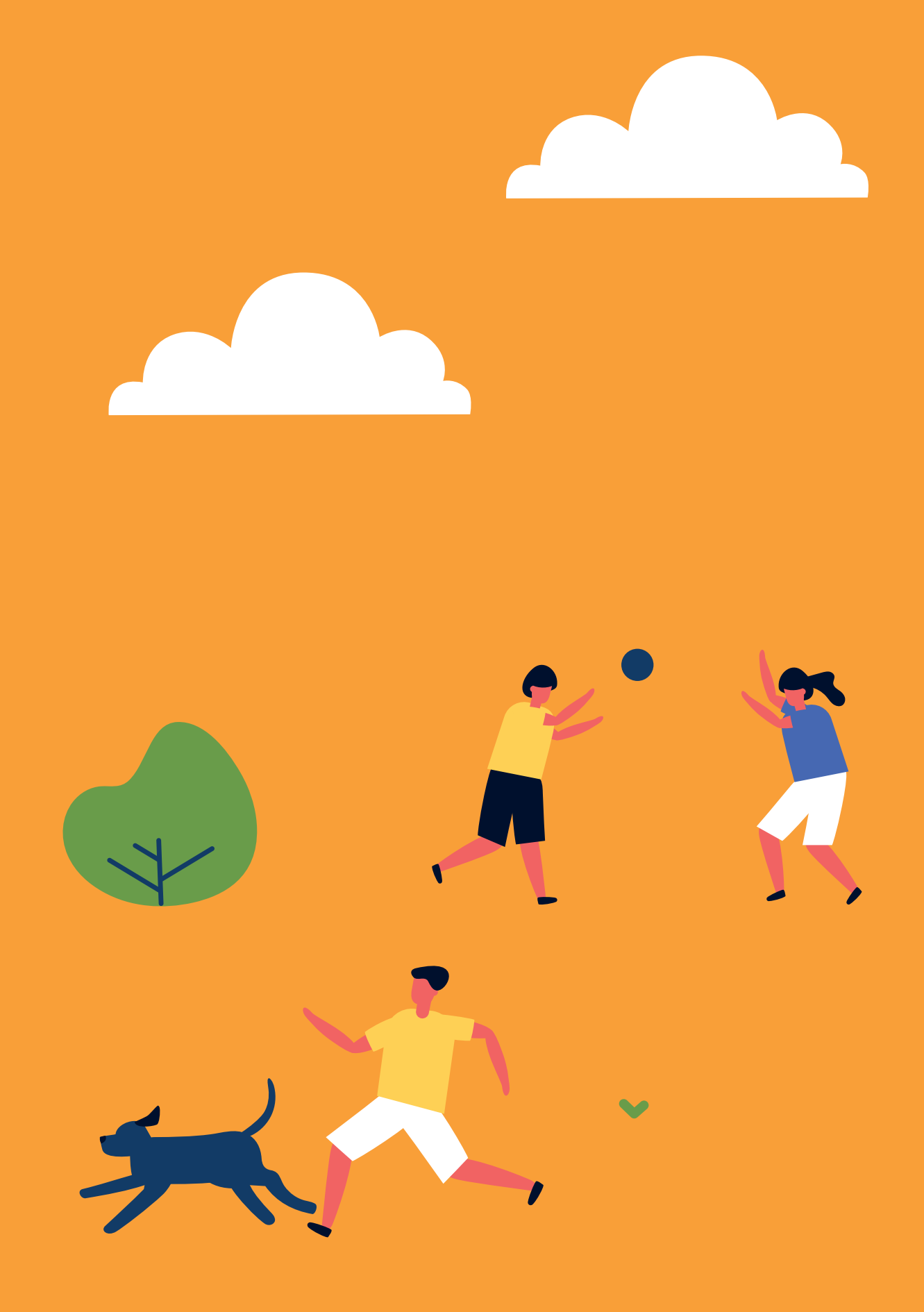
It is necessary to discuss recreational physical activity because it contributes to our health, well-being, society, and economy. Evidence has shown that recreational physical activity has more significant health benefits and accounts for more physical activity sessions, time, and energy expenditure than a sport by a substantial margin[35]. It also a significant contributor to the economy. In Victoria, Australia, this type of physical activity makes an $8.1 billion value-added contribution to the state economy and supports around 51,000 direct and indirect full-time equivalent jobs[36].

Another reason why recreational physical activity is essential in landscape architecture and urban planning is that it is mostly conducted in public open spaces such as parks, plaza, beaches, waterfront, woodlands, or conservation areas. In an urban area, parks become one of the most critical settings for recreational physical activity. It has been acknowledged in the literature that parks and green open spaces generate socioeconomic benefits to the whole community. For example, parks can help to alleviate traffic congestion, reducing air pollution and urban heat island, flood control, improving biodiversity and wildlife habitat, improved water quality. For local government, parks are believed to generate economic benefits through higher property values and correspondingly higher tax assessments. Hence, parks also play an essential role in policy-makers' decisions about zoning, restriction on land uses, and government purchase of properties for urban infrastructure such as roads, and rapid mass transits. Parks can also help to facilitate an active lifestyle by providing opportunities for engaging in physical activity. Planning and designing these spaces to be able to cater to the need for physical activity will give socioeconomic and health co-benefits. For example, developing a riverfront space that can accommodate people for physical activity can provide environmental (reducing erosion and sedimentation) and health (increased physical activity) benefits. A study in England has found that at least one time per week visiting public spaces to conduct physical activity resulted in more than 3 million people meeting WHO physical activity recommendation[37]. These visits also contribute to an annual value of more than $ 2.5 billion.

Chapter Summary and Remarks

The chapter establishes the link between health, physical activity, and the built environment. The anthropocentric activities in designing built environment will have health and well-being consequences to our lives. Air pollution, traffic congestion, and road accidents are some of the direct effects, with climate change as our biggest threat in this century. On the other hand, the built environment also offers a setting for a healthy

life. A well-design neighborhood and green open space can provide an opportunity to be physically active. With more than 30% of adults are physically inactive globally, it is essential to rethink the relationship between the built environment and health and well-being. With less and less green open spaces are available in an urban area, the public park holds a vital role in providing the opportunity to have an active lifestyle. The next chapter will further discuss the role of parks in promoting physical activity.



Chapter 3

Parks and Physical Activity

Park, green spaces, and other types of open spaces are at the heart of landscape architecture discipline. This chapter explores the role of parks in our health and well-being, especially related to our physical activity.

What is Park?

What is a park? There are many different definitions of park. However, it is usually an area of natural, semi-natural, or planted space set aside for human recreation or used for passive and active recreation as well as educational purpose. In the urban area, the term is coined into a public park, where the park is managed by the public sector, usually the local government, where the urban population has equal access to use[1]. Standards for planning and designing public parks of each country vary based on the contexts of society. The smaller park usually serves a more modest population number and density. In Thailand, Department of Public Works and Town & Country Planning classifies public parks into six types: national park (1,200-2,500 rai), provincial park (250-500 rai), city park (100-250 rai), neighborhood park (6-12 rai), picnic area (4 rai) and zoo and botanical garden (250 rai) and classifies sports fields into four types: playground (5 rai), children sports field (7 rai), outdoor sports field (25-35 rai) and indoor sports field (5 rai). The following section discusses the direct and indirect health benefits of having public parks in cities.

Indirect Health Benefits of Parks: Reducing Pollution and Heat Island

Studies found that parks and green spaces are associated with indirect benefits to our health. For example, parks reduce air pollution in the surrounding neighborhood. Clean air in the area can help reduce the prevalence of respiratory illnesses and lung cancer. The followings are some of the indirect benefits of having parks and green spaces in our neighborhood based on previous studies.

Reducing exposure to air pollution

The role of parks in reducing air pollution is well-known. Trees and vegetations can decrease levels of air pollutants and reduce atmospheric carbon dioxide through carbon storage and sequestration[2]. A study in the US found that the capacity of carbon storage in the parks is estimated at around 1 ton per 1000 sqm of tree cover[3]. Trees and vegetations in the parks can also reduce approximately 7% of PM10 in the city's atmosphere[4].

Providing anthropogenic noise buffering

Evidence suggested that a well-designed urban park can buffer noise or the negative perception of sound, emanating from non-natural sources such as traffic, as well as provide relief from city noise. Park size and the total amount of tree canopy cover can significantly reduce noise levels, irrespectively of park location, and tree species composition[5]. An interesting case study in Amsterdam found that building a park around Schipol Airport lessen the noise pollution by 50%[6].

Reducing the urban heat island effects

Urban heat island (UHI) is a phenomenon where the temperature in the downtown area is higher compared to the sub-urban area due to anthropogenic activities. For example, in Bangkok, the temperature difference between urban and suburban areas can be up to 2.5^{o}C due to UHI

effects[7]. Studies around the world have acknowledged that UHI can cause negative impacts to our health[8]. Another study in Bangkok has found that having parks and green spaces can significantly help to reduce the effect of UHI[9]. Parks lower surface temperature and mitigate UHI effects in more extensive surrounding areas, with data suggesting an effect up to 1 km from the park boundary[10]. The inclusion of water bodies within parks also offer a more significant cooling impact.

Direct Health Benefits of Parks to Our Health and Well-Being

Studies have found that parks and green open spaces improve our physical and psychological health, strengthen our communities, and make our cities and neighborhoods more attractive places to live and work[11]. More importantly, parks hold an essential role in improving physical and mental health as well as our well-being. The followings are some of the direct benefits of parks and green spaces based on what has been established in the literature.

Reduced risk of having chronic diseases such as heart diseases and diabetes

Evidence has shown that there is a significant association between parks and reduced risk of chronic diseases worldwide. For example, a study in Australia found that the risk of having type 2 diabetes mellitus (T2DM) was significantly lower in the neighborhood with more parks and green spaces, controlling the demographic and cultural factors[12]. A similar result was also found in the Netherlands and the UK[13,14]. Visiting parks were also associated with the reduction of reducing heart rate and diastolic blood pressure than walking in a busy urban street[15]. The proximity of parks and green open spaces was also found to reduce the risk of coronary heart disease or stroke[16].

Improved mental health of the urban population

Contact with nature is linked with the more exceptional ability to cope with life stressors, improved work productivity, increased self-esteem, enhanced capacity to pay attention, and greater life satisfaction[17]. Having parks near your home can reduce stress, depression, and anxiety[18]. A study in Australia shows that visiting parks and nature areas improves the mental health condition of the population for people with autism[19].

Improved immune system

Visiting parks and nature can also benefit our immune system. When doing activities in the park, people are exposed to certain physical and chemical factors as well as diverse microorganisms in the ecosystem biodiversity, which can improve our immune system[20]. Visiting the park in the morning also increases sun exposure, which is essential for producing Vitamin D that is necessary for bone health, and possibly for preventing a variety of health conditions, including asthma, several different types of cancer, multiple sclerosis, and other diseases[21].

Increased physical activity levels and reduced sedentary behaviors

Studies in various countries have demonstrated that access to and use of parks are associated with recreational walking, exercise, and increased physical activity and reduced sedentary time in all age groups of population[22]. For example, children are more active during park visits[23], and living near the park is associated with less sedentary time and reduced risk of childhood obesity and overweight[24]. Proximity to green space also affects the physical activity levels of adult and elderly populations. A meta-analysis study involving 9298 studies found that having green areas surrounding our neighborhood contributes to reducing all-cause mortality[25]. Hence, intervention to increase and manage green spaces should be considered as a strategic public health intervention. The following section discusses this issue in detail.

How Parks Contribute to Physical Activity

Many empirical pieces of evidence have identified that park is the most critical setting in promoting physical activity in the urban area. This is true in the context of many cities in the world. Thus, parks become the only public infrastructure that can provide an equal opportunity for people to be physically active[26]. Regular physical activity has been shown to increase health and reduce the risk of a wide range of diseases, including heart disease, hypertension, colon cancer, and diabetes. Physical activity also relieves symptoms of depression and anxiety, improves mood, and enhances psychological well-being. Beyond the benefits of exercise, a growing body of research shows that contact with the natural world improves physical and mental health. Strong evidence shows that when people have access to parks, they exercise more, and close-to-home parks and recreation spaces result in more physical activity and better health for urban population[27].

As discussed in previous sections, parks play a critical role in facilitating physical activity in communities. To a fantastic extent, the role of parks and recreation in providing physical activity health benefits was ignored by the health community until recently[28]. It now becomes a standard recommendation that parks must be planned and designed based on the known physical activity health benefits they provide. The evidence is also clear that additional spending for the park can result in higher levels of physical activity benefits[29]. In general, parks contribute to physical activity by providing a setting and opportunity to be physically active during leisure time. Recent studies have found that leisure, not paid work or housework, is now the part of life where the most physical activity occurs[30]. Here are some of the arguments why local governments should invest in parks for promoting physical activity.

People are very often physically active when visiting parks

People commonly use parks in ways that involve physical activity and contribute to their mental and physical health. Several park surveys show that users are physically active during their park visits. Such findings

"In many cities in the world, parks are the only public infrastructure that can provide an opportunity for people to be physically active."

hold for people of different ages. The study conducted by The Center for Active Landscape on park users in Hua Hin, Thailand, found that more than 70% reported moderate or high levels of physical activity. An average visit to the park lasted about two hours, and users spent nearly half their time walking and running.

The public identifies physical activity benefits from participation of organized activities in the park

Research shows the public does not have to be convinced of the physical activity and health benefits provided by park and recreation services, and their belief seems correct. In addition to park use, recreation programs, organized activities, and other non-park opportunities can increase park visit and contribute to more people engaging physical activity. One of the main reasons why public visits the park is to exercise, and they realize that exercise is good for health.

Investing in parks and green open spaces increases physical activity benefits

There is a strong relationship between how much money is spent to provide such services and the amount of physical activity health benefits people receive. You get what you pay for. This is true since, on average, more spending means more recreation areas and facilities (as well as proper maintenance for those places), more recreation programs that involve physical activity, more close-to-home opportunities, more provisions for people with disabilities, and higher quality. A study in the US found that an extra 10 USD spent per capita on parks and recreation was associated with one-third of a day more per week of vigorous exercise.

The supply of parks is directly related to the amount of physical activity by people of all ages

The number of parks and playgrounds in a community and the physical area devoted to them is positively related to physical activity levels.

Studies of the impact of parks and recreation on the physical activity of young children in the US show that a 1% increase in park and recreation areas is associated with a 1.2% to 1.4% increase in physical activity.

Having park and green open spaces close to home increases use and physical activity benefits

How close a person lives in a park or recreation opportunity (proximity) has a dramatic impact on whether or not he participates and how frequently he participates. Closer is better, and more is better. Whether it is a park, recreation center, recreation program, playground, or other recreational amenities, distance from one's home is an essential factor in whether or not a person will use it and how often. Various studies show that people who live more than 2 kilometers away are less likely to participate in activities in the park. Those who live in 500 meters away are more likely to participate than those further away, and those who are within walking distance are more likely to participate than those who are not.

Tools and Methods to Assess the Contribution of Parks to Physical Activity

Assessing how parks can contribute to physical activity is essential for government, planners, and landscape architects in monitoring and evaluating park programming and improvements. For example, the result of park assessment can help the local government to determine the prioritization of budget in renovating and improving the park. The evaluation can also be used to plan and design a new park, such as identifying its primary purpose, types of activity in the park, and understanding the user's characteristics.

Studies assessing the contribution of parks to physical activity have emerged since the early 2000s, especially in the US. Reviews have been found to suggest that barriers to park use, such as lack of access,

safety concerns, and poor maintenance of facilities, were associated with increased sedentary behaviors[31,32]. On the other hand, the size of the park, availability of park amenities, organized activities, accessibility, and aesthetics are considered important factors in improving physical activity[33]. Parks have various facilities and features that can encourage people to engage in physical activity. For example, sports fields and courts, exercise stations, jogging, and cycling tracks are usually designed for physical activity. Previous studies suggested that the availability of these facilities is a strong predictor of increasing physical activity levels in the park[34].

There are two standard methods in evaluating the contribution of parks to the physical activity found in the literature[35]. The first method is a systematic observation using the System for Observing Play and Recreation in Communities (SOPARC), a widely used instrument designed specifically to measure park use and physical activity[36,37]. SOPARC excels in being able to collect contextually-rich information on the setting in which activity occurs. This method offers higher flexibility, high internal validity, and is relatively low budget compared to other methods, while useful to understand the pattern and characteristics of physical activity in the park. It provides immediate data on physical activity, gender, and age grouping, while simultaneously measuring contextual information related to the park accessibility and usability[38]. The second method is a survey questionnaire where researchers conduct their assessment or use secondary data from a national or regional survey. This method is particularly advantageous to understand the pattern of individual physical activity levels and the perceptions and preferences of respondents on park visits[39]. Recent studies assessing physical activity in the park prefer to combine the survey questionnaire and SOPARC method since it provides better insights on how parks can contribute to physical activity[40,41].

System for Observing Play and Recreation in Communities (SOPARC): A Simple Tool to Understand Patterns and Characteristics of Physical Activity in the Park

The System for Observing Play and Recreation in Communities (SOPARC) is a direct observation tool to assess the number of users and their physical activity levels in the built and natural environments. It specially used to provide contextual information on the setting in which the physical activity occurs. SOPARC has been validated and found to be a reliable tool in the assessment of park use[42]. The tool analyzes park use through momentary assessment, counting the number and types of park users and classifying their activities at a single point in time. With multiple assessments, the aggregated observations provide an estimate of park use over time.

There are four necessary steps in conducting SOPARC. The first step is to perform park mapping and identifying target areas. Before the observation and data collection, the studied park needs to be mapped in detail to identify 'target areas' that can be observed without encountering visual obstructions and that are of a manageable size so that all individuals can be counted accurately. The number of target areas depends on the park size and the features it contains. Each target area usually has a unique functionality (e.g., playground, picnic area, football field, etc.) and should be ordered so that observations are done exactly the same way each time a park is observed.

The second step is to train the observers. SOPARC is based on a momentary time sampling technique in which systematic and periodic scans of individuals and contextual factors within the parks' target areas are made. To ensure that data collection is accurate and reliable, field observers need to undergo training that includes background on physical activity and direct observation, instruments, and coding, particularly on how to differentiate various physical activity and

individuals' identities like gender, ethnicity, race, and age groups. Training videos on how to conduct SOPARC are available on the internet. In our research projects, we conducted multiple supervised practice sessions in the studied park, when recruiting inexperienced observers. Having trained observers who are familiar with the local communities could also aid their categorization of park users.

The third step is to conduct the observation. In our experience, we did what we called a 'pre-survey' before the actual observation. The main objective of this activity is to get an overview of the characteristics of the studied park. In Thailand, different parks have different activities, users, and time of use. For example, some parks may have foreigner users, while some other parks do not. Some parks may have football activities, while other parks do not have a football field. In some parks, we may have to start observation at 04.00, while at some parks, we may have to start at 06.00 due to different opening times. We can also use the pre-survey activity to train the observers. In scheduling the observation, it is vital to observe parks on weekdays and weekend days, at three to four specified times each day. It is recommended that SOPARC observations should include specified times in the morning, midday, afternoon, and evening. Some studies suggest that using 12–16 observations over a week appears to produce sufficiently robust estimates that approximate the same results obtained from 96 hourly measurements of park use and physical activity over a week, as long as at least one of the days observed is on the weekend. If the interest is in estimating park use over a more extended period, the same time sampling method can be applied over many months and seasons and would provide a more accurate measure[43]. In a study of 174 neighborhood parks in 25 major cities across the U.S., Cohen et al. made observations within each park on at least four days of one week during clement weather[44]. In this sense, SOPARC can be resource consuming.

More observation schedule means that it requires more resources for data collection. Hence, balancing the observation schedule is essential, especially when research fund is limited. For example, when studied a single park, we used a 7-days observation, with eight rounds of observation per day. When we expanded our study to assess parks in Bangkok, we used a 4-days observation, two weekdays, and two weekends. When we conducted the national survey, we used a 2-days observation representing weekends and weekdays. We were able to reduce the observation schedule because we already knew the common patterns and characteristics of the physical activity of parks in Thailand. For example, parks will have more visitors on weekends than on weekdays but will have a similar number of visitors from Monday to Friday, and on Saturday and Sunday. The number of observation rounds is identical for all parks in Thailand. Park will have more visitors in the morning from when the park opens (usually from 04.30 to 05.00) to 09.00, and in the evening from 16.00 until the park closes around 20.00 or 21.00. Our studies typically use 6-8 observations per day, depending on the size, budget, and the main objective of the observation. Conducting pre-survey and having experienced and trained observers will help to reduce the cost of doing SOPARC observation.

So, how is a SOPARC observation conducted? After target areas within a park and observation schedule are set, observers then visit the target areas for designated periods and in a set sequence and complete a coding form based on the intent of the study. The observation generally covers two parts: the contextual factors and coding physical activity. The contextual factors include the conditions in the park that can influence park use such as weather condition, accessibility of the target areas, availability of facilities and amenities, and the presence of organized activities (for example, whether there is a protest in the park that time or construction activities). The coding of physical activity is straightforward. Observers then conduct scans of the target area or making independent visual sweeps from left to right and enter counts of the coding into forms or mechanical recorders. The activity of each individual in the target area

is coded as one of the three levels: as sedentary (e.g., lying down, sitting, or standing), moderate (e.g., walking at a casual pace), or vigorous (i.e., intensity higher than walking increasing heart rates causing them to sweat, such as jogging and swinging). Separate scans are made for females and males and other intended characteristics as perceived age (i.e., child, teen, adult, senior) activity modes and levels. The original SOPARC coding form has a column for ethnicity/race grouping since it was developed in the US, where racial inequality in accessing the park is one of the significant issues[45]. However, we had to remove this column since it is not a substantial issue in Thailand. It is also difficult to differentiate ethnicity based on observation only. The observation is then recorded manually on paper or digitally on software developed for smartphones or tablets.

The fourth step of conducting SOPARC is the analysis. The counts from observation are aggregated based on the intended classification. For example, the researcher can aggregate how many people are engaged in sedentary, light, moderate, and vigorous physical activity. In general, SOPARC studies generally provide two groups of results. The first result is park user characteristics, such as gender, age groups, and ethnicity, engaging in different levels of physical activities and target areas. The second result reports how activity areas with different configurations attract and accommodate different groups and the number of people in the various period. Some studies went even further to calculate the amount of energy expenditure in the park[46] using Metabolic Equivalent Task (MET). As discussed in the previous chapter, MET or metabolic equivalent is the ratio of the work metabolic rate to the resting metabolic rate in which one MET is defined as 1 kcal/kg/hour, which is roughly equivalent to the energy cost of sitting quietly. Based on measures of energy expenditure, sedentary is approximately the equivalent of 1.5 METs, moderate physical activity is 3 METs, and vigorous activity is 6 METs. To assess how much physical activity a park produces, it is, therefore, possible to aggregate METs across park users as:

Total METs = (the number of persons with sedentary activities x 1.5 METS) + (the number of persons with moderate physical activity x 3 METS) + (the number of persons with vigorous physical activity x 6 METS)

Although the actual minutes per person is likely highly varied, aggregation provides a way to understand the total contribution of parks to their local populations. Quantifying the total number of park users and MET-hours expended in a park can be used for further analysis, such as determining which target areas in the park are more active or having more people or having problems. For example, in one of our study, we were able to determine that there was a conflict of activities among user groups, which caused inequality of access and use of the park[47]. SOPARC provides an assessment of park users' physical activity levels, gender, activity modes, and apparent age and race or ethnicity as well as information on park activity areas such as their levels of accessibility, usability, and activity organization. SOPARC results can also compare the use and improvements of a park over time and analyze usage and physical activity among different parks. For example, the result can be used to investigate the effect of a fitness equipment installation on the intensity of park users' physical activity through using SOPARC to record physical activity in a community park in pre- and post-intervention of each target area[48]. Another study in China has shown that SOPARC result can be used to understand how physical activity can be supported in different types of park[49]. To our understanding, SOPARC is an excellent assessment tool to measure park-based physical activity, and the results are useful to a landscape architect in planning and designing parks to promote physical activity.

Other Methods to Assess the Contribution of Parks to Physical Activity

As previously mentioned, there are other methods in assessing how parks can contribute to physical activity. One important tool is the Community Park Audit Tool (CPAT). It was developed in 2010 by the Active Living Research Group in the US. It is a tool designed to evaluate parks for their potential to promote physical activity. CPAT is a park audit tool. It assesses the availability and conditions of certain park facilities to promote physical activity. One of the main benefits of using CPAT is that it provides a reliable and user-friendly means of auditing parks for their potential to promote physical activity. Everyone can be an auditor. Park users can review the CPAT training guide and audit tool, then go to the park and fill out the audit tool. The tool contains four sections, i.e., park information, access and the surrounding neighborhood, park activity areas, and park quality and safety. CPAT Audit Tool and CPAT User Guidebook are available in the Active Living website[50]. In the US, CPAT is used to engage community participation for monitoring park quality[51]. Recently the tool has evolved into an electronic version called eCPAT. A study in the US showed that eCPAT was particularly useful when trying to engage with youth in promoting park-based physical activity[52]. Key improvements of the mobile technology format vis-à-vis the paper-based CPAT included enhanced interface attributes such as sensory appeal (e.g., touchscreen, colorful font/graphics), control (e.g., enhanced navigation), and interactivity (e.g., answer validation, messages). The eCPAT app also included additional technology functions such as built-in instructions and examples, the ability to take pictures, GPS/GIS data collection, wireless data transfer (which eliminates the need for manual data entry), and acknowledgment of successful completion of the audit[53].

A similar to the eCPAT method was developed in Australia called the Public Open Space Desktop Auditing Tool (POSDAT). It is an assessment method for park quality that combines web-based information and remote

"Three Easy Steps of Conducting SOPARC Observation Method:

1. Before the Observation:

a. *perform park mapping and identifying target areas.*
b. *Identify numbers of surveyors/observers required.*
c. *Conduct training for surveyors/observers.*
d. *Conduct pre-survey to understand the patterns of use.*
e. *Create a code for each activity in the park based on the result from the pre-survey.*
f. *Create a clear observation schedule (how many days of observation, how many rounds per day).*

2. During the observation:

a. *Follow the observation plan.*
b. *Schedule a substitute observation day if there is rain or an event in the park.*
c. *Accurately record the activities in the park.*

3. After the Observation:

a. *Clean the observation records.*
b. *Input the records into data analysis software (R, Stata, SPSS, or even Excel).*
c. *Analyze according to the objectives of the study."*

sensing data. POSDAT appears to be a valid and reliable tool for assessing the quality of parks without the need for site visits and thus facilitates researchers to efficiently auditing the quality of large numbers of parks. A study by the Western University of Australia found that using this method reduced the audit time by nearly 22 percent, excluding saved travel time and associated costs, when compared to other in-ground methods such as CPAT[54]. The process is straightforward. A trainer auditor visually inspects each park for its features using aerial photography, Google Earth, and Google Streetview, and local government websites were then referred for information, and where needed to verify the provision of park amenities[55]. One of the drawbacks of the method is that it requires high-resolution aerial photography or Google Earth picture of the observed park. This method is beneficial when researchers have to conduct a national survey with park samples from different parts of the country. Activethai.org used a similar approach when conducted a national survey in Thailand. However, Google Earth is only reliable for big cities such as Bangkok and Chiang Mai. For many small provinces, the quality of the map provided by Google was not satisfactory to conduct a proper audit.

Commonly, the observation tools such as SOPARC, CPAT, and POSDAT are generally supplemented with the other methods such as surveys, interviews, and focus group discussions to provide in-depth information for the assessment. Depending on the objective of the evaluation, combining the observations and survey questionnaire is considered the best approach when assessing the park. The common problem researchers face when conducting a survey questionnaire is the sampling method: who are the respondents? Should the study recruit the respondents from people who are in the park? Or should Surveyors ask people who live within walking distance of the park? And how about people who work around the park?

It depends on the objective of the assessment. There are two types of sampling methods: probability and non-probability. Probability sampling involves the random selection of the members of the population group. This method tends to be more time-consuming and expensive than non-probability sampling, while it is more accurate if researchers want to make statistical inferences about the whole group. On the other hand, the non-probability sampling method is more straightforward and tends to be cheaper and more convenient, and they are useful for exploratory research and hypothesis generation. One of the most used non-probability sampling methods is convenience sampling, where participants are selected based on availability and willingness to take part. Both ways are essential in assessing the park-based physical activity since they serve different purposes and are commonly used in studies evaluating park-based physical activity.

For example, in a study, the researcher may want to interview some of the park users during the SOPARC observation period, then select the samples from the busiest and least busy target areas, in which half in each target area were sedentary, and half were active[56]. This method represents the use of non-probability or convenience sampling since the study just conveniently selects the respondents. Other studies prefer to conduct probability sampling and conducting household interviews by randomly choosing a sample of addresses within 400 meter-radius of the park, and within 1 kilometer, and 2 kilometer- radius from the park[57]. Some other studies may focus on or aim to include particular sub-groups such as children and adolescents, elderly, women, or specific ethnicity and race[58]. The survey questionnaire tools can be used to complement and validate the information obtained from observation, depending on the research design. For example, it can be used as an intercept survey during the SOPARC period to collect information on the socio-economic background of park users. It can also be used to verify and enrich the SOPARC results data by adding more details on the reported number of park visits, the most common park activities, and its popularity among specific sub-groups such as the elderly, children,

and adolescents. Another potential use is to obtain suggestions for the improvement of local parks and the visitors' perception of safety. Unlike SOPARC, which captures moment-in-time observations, the survey questionnaire method could yield more detailed and meaningful information, including attitudes, motivations, preferences, as well as self-reported estimates of park use over longer temporal scales. One of its most significant drawbacks is that it is resource-consuming, in terms of costs, time, and efforts. It can also be challenging to administer and tend to have low response rates. However, as discussed above, combining observation and self-assessment methods is essential to provide a clearer picture in understanding the patterns and characteristics of park-users and park-based physical activity.

Chapter Summary and Remarks

This chapter explores the empirical evidence in the literature on how parks can contribute to human health, especially to physical activity and a healthy lifestyle. This chapter discusses three things: the direct and indirect benefits of parks to human health, how parks can contribute to physical activity in particular, and how to assess this contribution. Some good practices in parks assessment are available all around the world, and it can be summed up that parks hold a critical role in promoting physical activity. The chapter also provides a better understanding of the importance of park assessment. Measuring the contributions of parks requires appropriate tools and methods. Using observation and self-assessed methods can provide useful information for interpreting patterns of parks to use that important in designing and assessing interventions intended to improve the amount and intensity of physical activity.

Chapter 4

Parks and Physical Activity in Thailand

This chapter discusses the empirical evidence in Thailand. Although studies are found all over the world, studies on parks and physical activity are still very limited in Thailand. We have been fortunate to able to collaborate with national and international organizations in conducting research projects on parks and physical activity. In this chapter, we present findings from three research projects. The first one is the result of our study in ten significant parks in Bangkok[1]. The second one is the assessment of parks for physical activity using a national survey. And the last one is related to the effects of park renovation on the improvement of physical activity[2].

Parks and Physical Activity Situation in Thailand

Evidence regarding the influence of the built environment on physical activity behavior suggests that it can both enable and limit physical activity participation. Essential factors such as Land use patterns, transportation systems, and neighborhood characteristics, and the proximity of urban parks have been found play crucial roles in encouraging physical activity among different age, ethnocultural and socioeconomic groups[3].

Despite the growing number of studies examining the contribution of parks to physical activity, relatively few studies are available in the context of parks in Asian cities. Different climate and seasonality may reveal different patterns and characteristics of park use. Not only can weather conditions affect how a park is used daily, but some activities

happen only in particular seasons. For example, studies in the US have found that the number of daily park users was similar during the morning, afternoon, and evening observation periods[4]. Research in Thailand and Singapore have found that due to the hot weather in the afternoon, parks are mostly used in the morning and evening[5,6]. The degree of which different age groups and genders use parks is also different. While most studies on the topic in western context found that children and teens were dominant groups, most park users in Asian cities were adults and seniors[7].

Previous studies have identified that park is the most critical setting in promoting physical activity in an urban area. It becomes the only public infrastructure in the city that can provide support to physical activity[8]. In many cities, including in Thailand, the built environment is considered as a hindrance. This is because the infrastructure in the city is not planned and designed to encourage its inhabitants to do physical activity. For example, it is challenging to ride a bicycle or walking because not all roads and streets and aisles in Bangkok have designated bicycle lanes and pedestrian walkways. Microclimate and air pollution also discourage people from doing physical activity in public space.

On the other hand, the existing infrastructure provided by the local government is mostly underused. This is partly because there is not enough empirical evidence to provide input for the decision-making making process. The provincial government has been reluctant to support it or plan the infrastructure without a proper understanding of the users' need and their behavior, resulting in externalities such as underuse or vandalism to the facilities. However, parks and green spaces are considered secondary in infrastructure planning in Thailand, where roads and highways are more critical. Bangkok has less than 6 square meters of green space per person. The WHO recommends that cities should provide a minimum of 9 square meters of unpaved/ undeveloped green open space for every inhabitant.

Many urban parks are not explicitly designed to promote physical activity. Parks in Bangkok can allocate a maximum of 30% of the area for activities such as walking, running, biking, and recreation. This is because one of the main purpose of constructing public parks in Bangkok is for environmental protection, such as reducing air pollution, lowering the micro temperature and urban heat island effects, and water catchment for flooding. Some good practices of using parks for physical activity do exist, especially at the community park in residential areas in secondary (small) cities, where there are captive users. However, there is no clear empirical evidence on the current status of the effectiveness of the park in supporting physical activity.

On the other hand, in many cities other than Bangkok, urban and community parks planning are not integrated into urban development plans. The situation, as mentioned above, leads to the fact that urban and community parks are not suitable for doing exercise, especially leisure-time moderate to vigorous-intensity physical activity and have resulted in a higher volume of sedentary behavior in the parks. Thus, it is vital to re-conceptualize the urban and community parks as the center of promoting physical activity, especially in an urban area, where the city infrastructure provides almost none to support the issue.

If public health and planning sectors in Thailand are expected to adequately invest in promoting physical activity, an understanding of who uses parks and the characteristics of parks that encourage physical activity is essential. With rapid urbanization and urban development, there is a need for cities to understand that parks are also beneficial not only to reduce air pollution and greenhouse gasses but also to improve public health and well-being of urban residents.

Park	Type of Park	Park Size (m^2)	Puclic Transportation	Drstrict Population Density (person/km^2)	Facilities Available in the Park
1	Village park	32,000	train, public bus	10,328	1, 3, 4, 7
2	Village park	36,800	public bus	9,736	1, 3, 4, 7, 9
3	Village park	38,400	public bus	8,520	1, 3, 4, 6, 7, 9
4	Community park	46,400	train, public bus	8,176	1, 3, 4, 7, 9
5	Community park	101,300	public bus	3,924	1, 3, 4, 7, 9
6	Community park	123,200	public bus	5,950	1, 3, 4, 7, 9
7	District park	567,000	train, public bus	6,055	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
8	District park	800,000	train, public bus	3,224	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
9	District park	248,200	public bus	4,847	1, 3, 4, 7, 9, 12
10	District park	208,000	train, public bus	8,176	1, 2, 3, 4, 7, 8, 9, 12
		Mean: 221,030	Mode: public bus	Mean: 6,894	Mode: 1, 2, 3, 4, 7

Note: MRT = underground train, BTS = sky train, 1 = jogging track, 2 = bike track, 3 = fitness station, 4 = children's playground, 5 = basketball court, 6 = futsal court, 7 = multipurpose open space, 8 = roller skating rink, 9 = multipurpose sheltered space, 10 = swimming pool, 11 = tennis court, 12 = indoor gym.

Table 4.1. Characteristics of parks selected in the study.

What are the Important Factors of a "Good" Park to Promote Physical Activity in Thailand?

What makes a good park design to promote physical activity? Literature has established answers to this question. However, whether they can be applied to the Thai context, it is a different question. We then conducted a study using ten major parks with a high number of visitors doing MVPA in Bangkok and tried to understand whether they have similar factors with the ones in the literature.

The idea of the study was to understand whether different characteristics of the park would result in different contributions to physical activity. In Bangkok, parks are designed for various objectives. For example, some parks are intended as a retention pond for flooding, some are for recreation and sport, and some are for the preservation of natural resources and biodiversity. The Bangkok Metropolitan Administration's (BMA) definition of public parks includes river embankments, spaces under the highway, vertical green walls, paddy fields, indoor spaces, botanical gardens, and other green spaces under their jurisdiction. Hence, it is difficult to obtain the actual number of parks that can be used for physical activity. Under this definition, there were more than 500 public parks in Bangkok, which could be classified into three groups: village parks, community parks, and district parks. We identified a total of ten parks based on the results of pre-surveys and interviews. The parks selected represented different characteristics of parks and users in order to capture the parks that served the largest population in the city (Table 4.1). Since we purposefully selected parks with facilities that can promote physical activity, botanical gardens and indoor green spaces were excluded. If two parks were nearby, we chose the park with a bigger size or with the better facilities.

Park	Age Group (%)				Gender (%)		P.A. Level (%)			Total (n)
	Childen	Teenager	Adult	Elderly	Male	Female	Sedenrary	LPA	MVPA	
1	4.69	6.84	72.17	16.30	46.19	53.81	25.90	38.82	35.28	3583
2	2.28	1.95	50.83	44.93	60.71	39.29	21.35	52.57	26.08	2408
3	6.34	10.63	51.74	31.29	55.91	44.09	30.21	45.61	24.19	3688
4	8.02	5.76	67.99	18.24	51.28	48.72	36.79	45.37	17.84	5610
5	4.83	4.96	62.27	27.94	55.48	44.52	22.71	53.55	23.74	3003
6	5.57	3.89	65.85	24.69	57.32	42.68	20.64	51.26	28.09	3086
7	3.02	3.36	66.41	27.21	56.59	43.41	25.45	43.01	31.53	16,474
8	1.64	5.82	76.98	15.56	53.55	46.45	34.35	42.74	22.91	7063
9	6.06	6.14	67.15	20.65	52.75	47.25	18.96	52.14	28.90	10.906
10	3.37	10.40	72.77	13.46	57.67	42.33	10.85	41.55	47.60	6210
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	62,031
Mean (SD)	4.582 (2.001)	5.975 (2.799)	65.416 (8.524)	24.027 (9.449)	54.745 (4.037)	45.255 (4.037)	24.721 (7.660)	46.662 (5.298)	28.616 (8,247)	6203.1 (4425.3)

Table 4.2. Number of observed park users by gender, age group, and physical activity level.

"The characteristics of park users in Bangkok were different with cities in other countries."

This study assessed the association between park characteristics and park-based physical activity using the SOPARC observation method. The parks were then divided into zones or target areas, and trained assessors scanned and coded the physical activity levels in each target area. Each park was observed for two days, representing weekdays and weekends. Each period of observation was divided into four rounds in the morning (06:00, 07:00, 08:00, and 09:00) and the evening (16:00, 17:00, 18:00, and 19:00). During the observation, physical activity levels were recorded as sedentary, light, and moderate to vigorous physical activity. If park users were sitting, reading, eating at a picnic, or standing, we recorded the event as sedentary. Walking was recorded as light physical activity (LPA), while more intense activities were recorded as moderate to vigorous physical activity (MVPA). We also collected other variables related to the park characteristics such as park size, available public transportation, district population density where the park is located, and an index to score the facilities in the park. For the analysis, we employed the binomial logistic regression model (odds ratio = ORs, 95% confidence interval = CI), which explored the park characteristics and physical activity. The dependent variable for this model was the level of physical activity in the parks, which we dichotomized into "having a moderate to vigorous physical activity (MVPA)" and "not having MVPA" for analysis. We accounted for sample clustering in the park selection by calculating the robust standard of error for the model in the study. There were two interesting findings from our research. First, the characteristics of park users were different from previous studies conducted in other countries. In Bangkok, most of the park users were adults (65.4%), while very few children, teens, and elderly were found during the observation period (Table 4.2).

This finding is dissimilar to previous studies in other Asian cities, where most users were older adults[9]. This is probably due to the demographics of Bangkok, where 64.40% of the Bangkok population is of the working-age of 15–59 years[10]. Children were found to be less active than adults, although park facilities and amenities were available for this

Variable	OR	95% CI
SEX		
Female	ref	(1.474, 1.581)
Male	1.526**	
Age Group	ref	
Child		
Teen	2.532**	(2.310, 2.776)
Adult	2.137**	(1.963, 2.327)
Elderly	2.656**	(2.528, 2.790)
Period of Observation		
Weekday	ref	(0.958, 1.0026)
Weekend	0.992	
District Population Density	0.781	(0.743, 2.790)
Mass rapid transport		
No	ref	(1.037, 1.114)
Yes	1.075**	
Park Facilities		
Low	ref	
Medium	1.115*	(1.037,1.199)
High	0.692**	(0.667,0.717)
Park Size		
Small	ref	
Medium	1.467**	(1.425,1.510)
Large	1.579**	(1.579,1.638)

Table 4.3. Association between park facilities and moderate to vigorous physical activity (MVPA) based on System for Observing Play and Recreation in Communities (SOPARC) data.

group of users. This may be due to safety reasons. Our previous study revealed that families with children visited the park less because of safety and security reasons[11]. Consistently with past research, more males were observed conducting MVPA in the parks, which shared similarities with previous studies in the United States and Europe[12,13].

The second finding from our study in Bangkok was that the variables of park characteristics were generally found to be significantly associated with MVPA with the exception of density (Table 4.3). What does it mean? Let us look at each variable.

The availability of a mass rapid transit station was more likely associated with users having MVPA in the park.

Having better access to the park has been acknowledged in the literature to increase the opportunity to be physically active[14]. Proximity to parks had a significant positive association with park-based physical activity[15]. However, other studies found that having more access is not necessarily equal to proximity. Perceived accessibility, or the ease with which one can reach the park, is considered more important in predicting park use than having proximity to the park[16]. It implies that although the provision of new parks near homes is essential, creating better access to existing parks would provide multiple benefits, especially in cities like Bangkok, where increased land value and a loss of public open spaces is one of the externalities of its planning policies.

Park size matters. The larger park is associated with higher MVPA

In our study, park size was found to be associated with MVPA. A study in Australia has found that park size to be somewhat more critical than park attractiveness in explaining park-based physical activity[17]. The same study also found that controlling for park size, parks with more facilities attracted more users. This was because the more significant the area, the more facilities to support physical activity, such as running tracks, bicycle lanes, and walking trails, could be provided, and the more people could be accommodated.

Controlling for park size, park with better facilities is associated with a higher number of visitors conducting MVPA.

Then let us discuss park facilities. Previous studies have established that providing facilities will improve the opportunities for users to be more active in the park. However, we found that parks with higher scores for facilities were associated with decreased odds of MVPA. The dissimilarity of our findings with previous studies is probably related to the way we assess the variable. Our study only measured the total number of facilities related to physical activity without considering how they were used. For example, during observation, we found more people on the jogging tracks than in the tennis courts, and yet we assigned the same score for both facilities. Hence, the facilities measured in the study may not necessarily match in their use for physical activity. When we conducted sub-analysis, we found that controlling for park size, park with better facilities is associated with higher visitor doing MVPA. A study conducted in Canada found that particular park features were related more strongly to park-based physical activity than were others[18]. For example, jogging tracks and paved trails were more useful to accommodate physical activity than open spaces or pools. Other studies also found that the placement of facilities, as well as the design and quality of facilities, will have an impact on the use of facilities for physical activity[19]. We interpret this result as an indication that providing facilities is not the only factor that can affect park use for physical activity in Bangkok. Further investigations are required to determine the types of facilities that can improve park-based physical activity.

Parks in Bangkok serve more people than they should be.

In our study, the only district population density was not found to be significant in our result. A study in the United States found that population density was associated with limited opportunities to be physically active in the park[20]. Another study in Belgium and the United States found that parks are more prevalent, of higher quality, and more easily accessible in highly walkable neighborhoods[21]. The dissimilarity in the

results was probably because Bangkok already had a low number of green space areas per person due to the high population density in each district[22]. In other words, there are not enough parks per capita for each district. We interpreted the result as parks have to serve not only the population in the district but also people from other areas and communities. Park with better accessibility options will attract more people to come. Our study also found that park users were willing to travel more than 10 kilometers from their home to visit the park there were public transit options such as Mass Rapid Transit (MRT) or Bangkok Sky Train (BTS). Further investigations are needed to be able to establish a clearer picture of the relationship between population density in Bangkok and MVPA.

Do the Characteristics of Parks and Physical Activity Patterns Vary Across Thailand?

Previous studies have indicated that sociodemographic, park size, facilities, aesthetics, and proximity are essential contributing factors to park use[23,24,25]. However, most research was local and had limited generalizability. Our study in Bangkok, for example, although it used samples of the park to represent the city population, it could not be generalized as a national result. The idea was that we would like to have a better understanding of the role of parks in promoting physical activity in Thailand. We also would like to know whether there were any differences in the characteristics of the park and physical activity patterns across cities corresponding to the sociodemographic of park users in Thailand. Currently, this is an on-going research project, and what we presented in this book is the preliminary findings. The findings can be used to provide policy input for both local and national governments on the co-benefits of investing in park systems for environment and population health.

Figure 4.1 Public park in Bangkok, Chatuchak Park.

Figure 4.2 Public park in Chiangmai, Suan Buak Hat.

Figure 4.3 Public park in Khon Kaen, Bueng Kaen Nakhon.

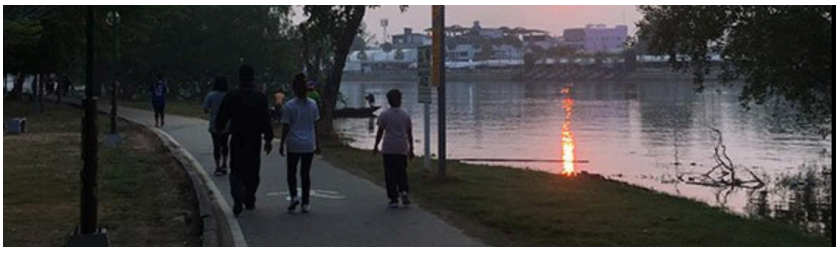


Figure 4.4 Public park in Surat Thani, Ko Lamphu Public Park.

Source:

1. https://au.hotels.com/go/thailand/great-bangkok-parks

2. http://ttnotes.com/suan-buak-hat.html

3. https://www.facebook.com/photo/?fbid=359389524224779&set=o.477315298945626

4. https://www.tripadvisor.com/Attraction_Review-g297917-d17341197-Reviews-Ko_Lamphu_Public_Park-Surat_Thani_Surat_Thani_Province.html#photos;aggregationId=101&albumid=101&filter=7&ff=389171120

Across Thailand, there may be more than 1,000 parks green open spaces. However, according to the latest report from the Ministry of Public Health in Thailand, there are only 593 parks that can accommodate physical activity[26]. We then conducted a quota sampling to represent all four regions in Thailand. We selected 77 parks with different levels of services, from the community to provincial. Due to resource limitations, we then conducted pre-survey to understand whether our selected parks were suitable for full investigations. We ended up with assessing 27 parks for our study after filtered out some parks from pre-survey. We combined a SOPARC observation and survey questionnaire method for two different purposes. We employed a similar procedure of SOPARC observation with our studies in Bangkok. On the other hand, although we also used an identical procedure, the primary purpose of the survey questionnaire was to understand the economic value of the park using the willingness-to-pay (WTP) method[27]. Using this method, we wanted to understand how users valued the park and how much they were willing to pay to ensure the sustainability of the space. We will discuss the economic values of parks in the next section of this chapter.

The characteristics of the twenty-seven parks from different provinces are summarized in table 4.3. The survey lasted for two months, and we had to stop the additional data collection for the project due to the COVID-19 pandemic in Thailand earlier this year. There were three findings that we would like to share in this chapter. The followings are a summary of some of the initial results of our study.

There are similarities among the sociodemographic characteristics of park users in Thailand

On average, more than 47% of park users in Thailand were adults, while the elderly and children age group users only accounted for 18% and 19%, respectively. Teenagers were the least park users that we encountered during our study (16%). Female park users only accounted for 44%, while male users were 56%. These characteristics were similar

Name of Project/ Space	Province	Population	ParkArea (M2)	Population Density	Province Area (KM2)	Daily User (person/day)
1	Chiang Rai	1292130.0	16765.0	112.2	11517.0	319.0
2	Chiangmai	1763742.0	270400.0	87.7	20107.0	277.0
3	Nan	478989.0	13186.0	41.8	11472.0	428.0
4	Nakhon Sawan	1063964.0	25592.0	110..9	9597.0	172.0
5	Nakhon Sawan	1063964.0	502400.0	110..9	9597.0	7529.0
6	Phitsanulok	866891.0	240000.0	80.2	10815.0	1654.0
7	Kamphaeng Phet	727807.0	272000.0	84.6	8607.0	699.0
8	Surin	1397857.0	317940.0	172.1	8124.0	1986.0
9	Buriram	1594850.0	241652.0	153.5	10393.0	1312.0
10	Khon Kaen	1805895.0	964800.0	161.6	11172.0	3334.0
11	Nakhon Ratchasima	2646401.0	558087.0	129.1	20494.0	5335.0
12	Ubon Ratchathani	1874548.0	74579.0	116.3	16112.0	1852.0
13	Chonburi	1535445.0	177579.0	334.1	4596.0	263.0
14	Chonburi	1535445.0	111503.0	334.1	4596.0	2714.0
15	Rayong	723316.0	101025.0	203.6	3552.0	43.0
16	Ratchaburi	873518.0	22278.0	168.2	5194.0	652.0
17	Ratchaburi	873518.0	30275.0	168.2	5194.0	931.0
18	Nakhon Si Thammarat	1560433.0	403601.0	157.0	9942.0	590.0
19	Surat Thani	1063501.0	111679.0	77.1	13793.0	2116.0
20	Pathum Thani	1146092.0	121067.0	754.0	1520.0	97.0
21	Nakhon Pathom	917053.0	33448.0	423.0	2168.0	24.0
22	Nonthaburi	1246295.0	47966.0	2003.7	622.0	85.0
23	Nonthaburi	1246295.0	55840.0	2003.7	622.0	55.0
24	Samutprakan	1326608.0	347633.0	1321.3	1004.0	146.0
25	Bangkok	5676648.0	35844.0	3618.0	1569.0	118.0
26	Bangkok	5676648.0	6105.0	3618.0	1569.0	263.0
27	Bangkok	5676648.0	4943.0	3618.0	1569.0	605.0
	Average					**1244.4**

Table 4.3 summarizes the characteristics of the parks that were selected for the study

% of MVPA	% of LPA	% of sedentary	% of children	% of teen	% of adult	% of elderly	% of male	% of female
34.8	15.0	50.2	6.6	24.8	52.7	16.0	64.3	35.7
21.7	29.6	48.7	14.4	5.1	66.1	14.4	62.1	37.9
6.5	30.8	62.6	18.5	8.4	38.1	35.0	44.4	55.6
58.1	9.9	32.0	15.1	25.6	27.3	32.0	29.7	70.3
38.9	16.9	44.2	3.0	16.8	51.7	28.5	58.7	41.3
36.7	6.1	57.2	4.6	11.7	70.6	13.1	59.1	40.9
16.5	50.4	33.2	12.3	19.9	40.1	27.8	53.4	46.6
39.9	8.1	52.0	4.0	20.7	50.3	25.0	57.9	42.1
26.8	9.3	63.9	5.0	15.8	59.2	20.0	52.2	47.8
32.8	8.9	58.3	4.1	8.0	63.0	24.9	52.8	47.2
32.2	9.5	58.3	5.2	7.3	60.7	26.9	43.5	56.5
30.0	13.0	57.0	16.9	13.5	46.7	22.9	51.4	48.6
62.7	27.8	9.5	63.9	19.0	14.4	2.7	82.5	17.5
29.8	14.6	55.6	8.1	3.0	67.6	21.3	57.6	42.4
41.9	30.2	27.9	53.5	9.3	27.9	9.3	53.5	46.5
32.7	10.0	57.4	6.0	8.3	52.3	33.4	55.7	44.3
16.1	11.3	72.6	6.2	16.6	52.1	25.0	52.7	47.3
7.1	35.6	57.3	37.1	5.6	43.1	14.2	52.0	48.0
43.1	6.1	50.8	3.1	6.6	62.0	28.3	55.6	44.4
46.4	35.1	18.6	35.1	0.0	63.9	1.0	75.3	24.7
25.0	20.8	54.2	45.8	16.7	29.2	8.3	54.2	45.8
12.9	52.9	34.1	16.5	47.1	23.5	12.9	29.4	70.6
7.3	76.4	16.4	12.7	18.2	52.7	16.4	61.8	38.2
39.0	37.7	23.3	50.7	3.4	32.9	13.0	67.1	32.9
38.1	39.0	22.9	55.9	10.2	30.5	3.4	67.8	32.2
69.6	10.6	19.8	12.5	52.5	35.0	0.0	32.7	67.3
70.1	7.8	22.1	13.9	38.5	44.3	3.3	78.8	21.2
34.0	**23.1**	**43.0**	**19.7**	**16.0**	**46.6**	**17.7**	**55.8**	**44.2**

Table 4.3 summarizes the characteristics of the parks that were selected for the study

to our previous study in Bangkok, while, on the other hand, very different with the sociodemographic of park users found in other countries, such as Hong Kong, Vietnam, and the US.

Parks in different provinces and regions show less MVPA than parks in Bangkok.

In many provinces, parks were not considered as the main venue for physical activity as other places could offer similar opportunities. The national survey on physical activity in 2015 stated that the most used sites for physical activity were government institution spaces, such as schools, universities, and government offices[28]. This may be due to the facilities provided in these types of space were more attractive when compared to parks. The same survey also showed that there was no significant correlation between the demographic characteristics such as urban-rural provinces and the level of physical activity. Our study found that sedentary activities were more visible and accounted for 43% of total daily activities in the park. On average, only 34% of park users conducted MVPA in the park. Further studies are required to understand the the patterns of use of parks in rural areas in Thailand.

Park size determines the number of users, and park facilities determine the frequency of visit and time spent in the park.

Bigger park size was associated with the number of users, frequency of visit, and time use. It means that the larger park area can accommodate more users, and with the availability of proper facilities, more activities can be accommodated. Park facilities were associated with frequency of visit. It means that if there were two parks of the same size, people were more likely to visit the park with better facilities. Park facilities were also crucial in determining the time spent in the park. In other words, the better the facilities, users would spend more time in the park. These findings confirm the importance of park size and park facilities in determining the use of parks for physical activity.

Putting Monetary Value on the Benefits of Recreational Physical Activity

Literature has established that conducting physical activity has various benefits. The same also can be said to having parks for physical activity. However, we never knew how much precisely the benefits in terms of monetary value. Using our study on the national survey on parks and physical activity, we were able to understand the economic benefits of conducting recreational physical activity in the park. The idea was to put the monetary value of the recreational physical activity in the park and the park itself from a physical activity point of view. In other words, we were putting a monetary value on two things. First, we assessed the health benefits of conducting recreational physical activity in the park, and second, we extracted the economic value of the park from the perspective of physical activity. In other words, parks have additional economic costs through the physical activity of visitors.

Park users gain health benefits of 275 Baht for each visit when conducting MVPA

The health benefits of park users were calculated by using a measure called the "Quality Adjusted Life Year (QALY)." Quality-Adjusted Life Year (QALY) is a method of valuing medicines' cost-effectiveness by considering both the patient's lifespan and quality of life. By definition, one QALY means one year of living a quality life, both physically and mentally. QALY is used to measure health technology by considering whether medicine or technology assessed is more cost-effective when compared with other health technologies. A study conducted by the Health Intervention and Technology Assessment Program (HITAP); Ministry of Public health of Thailand found that the value of a Quality-Adjusted Life Year (QALY) used to screen medicines for inclusion in the National List of Essential Medicines (NLEM) in 2013 was 160,000 baht per QALY. A conversion coefficient from another study, which found that QALY for meeting WHO physical activity guidelines

Mean % of MVPA in the park per visit	**34%**
Mean of MET/person/visit	**177.9386193**
Average time spent in the park/visit	**125 minutes**
The economic value of conducting recreational physical activity in the park in Thailand* (THB/QALY/person/visit)	**275.22 THB**
The economic value of conducting recreational physical activity in the park in Thailand (THB/QALY/person/minutes of visit)	**2.2 THB**

Assumption: 1 QALY = 160,000 THB; QALY for physical activity = 0.058 of total QALY = 928 THB; 1 QALY = 1 year;

* = assuming the population visits the park once a week.

Table 4.4. The economic value of conducting recreational physical activity in the park

"…visiting and doing MVPA in the park has the equivalent for 275.22 THB per visit and account for 2.2 THB/QALY/minutes of visit."

are 0.058 of the total QALY for one person were used to calculate the economic value of physical activity[29]. Using this formula, the economic value of physical activity in Thailand is 928 THB. The specific health benefits of conducting recreational physical activity in the park then were calculated, which account for around 275.22 THB/QALY (Table 4.4). In other words, visiting and doing MVPA in the park has the equivalent of 275.22 THB per visit and account for 2.2 THB/QALY/minutes of the visit.

The economic value of the park from the physical activity perspective is around 2,500 Baht/sqm/year or more than 150 million baht /park/ year.

In our academic exercise, the total economic value of the park was defined as the health benefits received by each person from visiting the park plus the willingness to pay of users to visit the park at one time. Willingness to pay (WTP) is defined as the maximum amounts individuals would be willing to pay for policy impacts that they view as beneficial, and the minimum amounts individuals would be willing to accept as compensation for policy impacts that they see as harmful[30]. In other words, we can use WTP to know the maximum amount of money a person is willing to exchange to acquire a good or service that he considers desirable, which in this case using the park for physical activity.

The total economic value of the park = WTP per year + economic benefits from conducting PA in the park

It is argued that from the physical activity perspective, parks have double economic values. First is the economic benefits of people conducting physical activity in the park, and the second is from the willingness to pay for park users to perform physical activity in the park. Table 4.4 summarizes the result of our calculation. It was found that the average total economic value of the park per year was around 154 million baht. When we controlled for the park size, the total economic value of the park was 2,539 baht/sqm per year.

Mean % of MVPA in the park per visit	**34%**
Mean of willingness to pay to visit the park	**19 THB**
Mean of economic value based on WTP/week	**116,765 THB**
Mean of economic benefits of conducting MVPA in the park/week	**2,849,434 THB**
Mean of total economic value of the park / year	**154,242,356.2 THB**
Mean of total economic value per sqm / year	**2539.4 THB**

Table 4.5. The economic benefits of parks from physical activity perspective

"The economic value of the park from the physical activity perspective is around 2,500 Baht/ sqm/year or more than 150 million baht /park/year."

What do the figures mean? It means that the benefits of having a park exceed its investment cost. And this is only from physical activity. In other words, if we consider the economic benefits of the park from the health sector, the amount would be much more substantial. And if we include the co-benefits of parks from other areas such as environment, social and economy, the economic contribution of parks would be enormous to our lives. A study in the US found that the total direct and indirect benefits of parks from environment and conservation, health and well-being, and social equity in 2017 was more than 166 billion USD[31].

Our academic exercise, although very limited and lack of reliability, provides essential information to calculate the physical activity benefits of parks in Thailand. Further investigation is required to understand the economic benefits of parks not only from a physical activity perspective but also other co-benefits in health sectors such as physical and mental health.

Is Better Park Design Associated with the Increase of Physical Activity Levels?

As an architect, landscape architect, or an urban designer, we often ask ourselves, does our design work? Does our intervention in improving the physical conditions of the park have positive impacts to park users? In 2015, we had the opportunity to conduct a park renovation in Bangkok and assessed the impact of our design intervention. The case for the project was Benjakitti Park, one of the largest district parks in Bangkok, with a high number of daily visitors (figure 4.3). The park is located in the commercial district in downtown Bangkok with a diversity of user groups. The project was then divided into three phases: the pre-intervention phase, the design intervention phase, and the post-intervention phase.

Figure 4.5. Benjakitti Park in Bangkok

source: Author

The pre-intervention phase activities were to understand the characteristics and problems in the park and determine types of design intervention. We conducted a SOPARC with seven days observation, a survey questionnaire, and a focus group discussion with the stakeholders including community who live around the park, the Bangkok Metropolitan Administration (BMA) office, to understand what kind of design interventions that can address the needs and requirements of the park users. It was found that the park had several problems that could be solved by design intervention. We then focused on two issues: the small number of children visitors due to a lack of playground facilities and the high frequency of accidents among runners and cyclists in the park. Hence there were two main objectives of the design intervention: increasing the number of children in the park and reducing the accidents in the park.

The design intervention phase was mainly involved with preparing the design for the park and constructing the agreed items on the design proposal. Series of discussions with BMA and other stakeholders were carried out to determine the types of design interventions that can reflect the objective of the park renovation. It was decided that the project conducted four design interventions: (1) redesigning the bike lane, (2) redesigning the jogging track, (3) Designing and constructing the playground, (4) improving the wayfinding and signage in the park. The construction took about five months. During the process, continuous communications and discussions were held to ensure that the design reflected the changes of the needs and requirements of park users.

Redesigning the bike lane.

The objective was to reduce the speed of cyclists. Before the design intervention, the average speed of cyclists in the park was around 25-30 km/hour, which was not suitable for Benjakitti bike lane. This was because the bike lane had so many curves and intersections, which could be dangerous for both cyclists and other users. During the pre-intervention survey, we found at least one accident per day happened in the park. Post-survey had seen that zero accidents happened.

"Having better access to the park has been acknowledged in the literature to increase the opportunity to be physically active."

Redesigning the jogging track.

There were two objectives of conducting this intervention. First, to separate running and walking. We found that one of the conflicts in the park is between runners and people who walk, especially elderly and children. Second, to create a sense of direction in the jogging track. Before the intervention, conflicts happened because some users walk or run clockwise around the track, and some others did the otherwise. Both problems were solved by the design intervention.

Designing and constructing the playground.

One of the reasons why we included it in our design intervention was the lack of children in the park. Based on the result of our pre-survey, current playgrounds were considered not safe and not attractive enough for parents to let their children play. We adopted the active play and brain-based learning concept in our design, which developed by the Thai Health Promotion Foundation (ThaiHealth) to promote physical activity for children.

The post-intervention phase involved the activities in evaluating the design, whether what we have constructed improve the physical activity of users in the park. We conducted similar activities with the pre-intervention phase, only this time we did it six months after the construction was finished. We did another SOPARC observation and questionnaires to understand the changes in patterns and characteristics of use in the park after the design intervention. It was found that the design intervention has achieved the project objectives: increasing 21% of children, 34% of elderly, and growing 10% of total daily users of the park (figure 4.5). Using the data from the pre- and post-survey questionnaire, we also found out that after the design intervention, one park visit will increase 5 minutes per week of recreational physical activity.

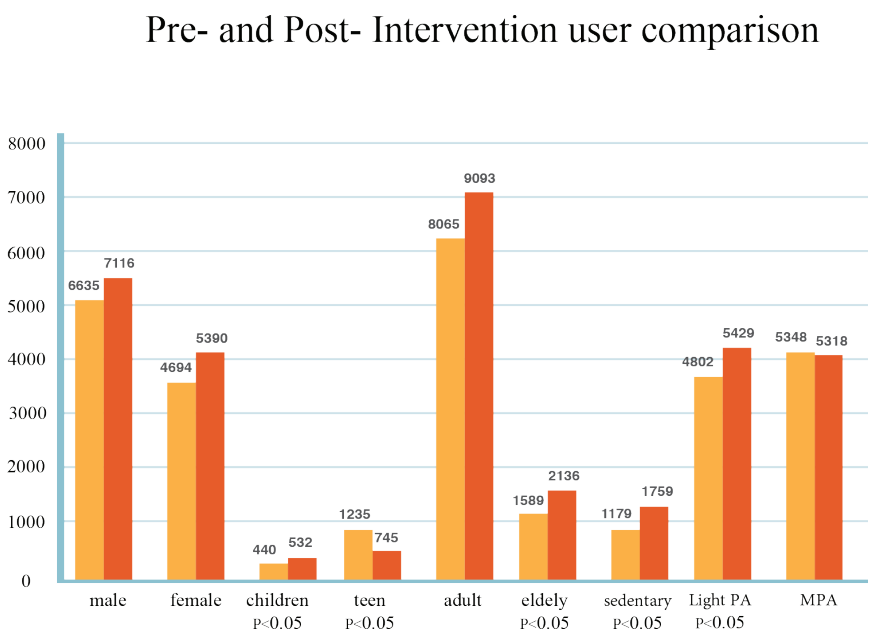


Figure 4.5. Changes of number of users and physical activity patterns after the design intervention

Figure 4.6. Perspective images of the redesigned bike lane and jogging track

source: Author

Chapter Summary and Remarks

As Thai cities become more urbanized and have a higher dependency on motorized transportation and sedentary jobs, parks provide safe, cheap, and convenient places to engage in physical activity. On the other hand, due to the lack of sufficient supply of parks in the city, many village parks have to serve more population, and they cannot accommodate such a high volume of users. Although the standard solution is to increase the number of public parks, it is currently difficult for the local government to build new parks due to urban densification in the city. Investing in better accessibility and physical quality of existing parks as well as improving the equal opportunities for park use would be a more sensible option. Addressing physical and practical constraints for particular groups may help to promote park use. For example, parks should have equipment designed for seniors and those who have physical impairments. Providing organized activities designed specifically for females, such as aerobic dance and yoga, may also improve park visitation for women. In our studies, parks may have been a less attractive venue for children, which resulted in a low number of users. Incorporating school-organized sports programs as well as improvements in physical quality and safety of the play areas may increase the participation of children in physical activity in the park.

Figure 4.7. Inspection of construction process in the park

Chapter 5

Park Matters! Criteria and Considerations to Mainstream Physical Activity in Design

The previous chapter explores the evidence related to the park and physical activity in the Thailand context. In this chapter, we will discuss how to translate the evidence into the know-how to guide the park planning and design to promote physical activity. Such practical knowledge is not new in the field of landscape architecture, and in fact, the major premise of this book is "everything related to the park has been invented." In other words, this book compiles the existing criteria and considerations in the literature and adjusts them to suit the Thai sociodemographic, economic, and cultural context. Combining both the lesson learned from the literature and case studies in Thailand, here are some of the "cherry-picked" design considerations and criteria to promote physical activity in the park.

Accessibility is the Most Important Consideration in Park Design for Physical Activity

Literature has shown that accessibility to park is an essential factor in determining physical activity in the park[1]. It means that park should be placed in a strategic location. Ideally, if we are going to build a new park, the site is the most crucial consideration. Central Park in New York and Lumphini Park in Bangkok are excellent examples. Both parks are located in the downtown area, high-density neighborhoods, and it can be accessed by people from different parts of the city through various transportation modes.

The location determines access. There are two types of accessibility: physical and psychological access. Physical access means that the public should be able to enter and use the park. Hence, a park located in private property or privately-owned public spaces is not an excellent option to promote physical activity[2]. The second type of access is psychological or perceived access. Usually, when we say a "good location," most of the time, what we mean is that it has "good accessibility" from the user's perception. In other words, users can easily access and use the park with minimal obstacles. "Good accessibility" may be defined as proximity, where studies found that park proximity was associated with the frequency of park visits and self-reported physical activity[3].

Perceived access is also linked with access to public transportation. For example, parks located near to mass rapid transport stations are more likely to have users conducting physical activity[4]. In other studies, perceived or psychological access is also related to the inequality of access and opportunity for physical activity for particular subpopulation groups[5]. For example, a poorly designed playground can limit children to participate in physical activity. Park without universal design principles will leave out users with special needs. In other cases, it can also be understood by users as safety and security. Parks in a high level of crime rate areas will attract fewer users, especially women and children[6]. Perceived accessibility, or the ease with which one can reach the park, is considered more important in predicting park use than having proximity to the park[7]. So how do we design for accessibility? Here are some guidelines for planning and design.

Integrate parks and open spaces as part of large-scale developments.

It is almost impossible for Bangkok or any other cities in Thailand, but this is an important point, as proximity to parks will increase park visits and participation of physical activity in the parks. Multiple studies in the US have found that parks within a ten-minute walk from home or work will have a higher number of users engaging in physical activity.

For example, a shopping mall or condominium development should be required to have an open space requirement to promote physical activity. A massive shift in urban planning practices, including in zoning codes, may be necessary.

Design for inclusivity.

Park should be designed to complement the social and cultural preferences of the local population. It needs to be an inclusive space that can accommodate a range of user groups from children, adults, seniors, and people with special needs. With Thai society grows as an aging society, it is important to consider the future use of parks should also serve the elderly population.

Maximize access of parks to public transportation corridors, open space networks, and denser populations.

Evidence shows that certain aspects of urban infrastructure such as public transit, greenways network, sidewalks, and bicycle paths are associated with more walking and bicycling to offer more significant physical activity benefits and lower obesity rates[8]. Park will provide destinations for such urban infrastructure networks. Improving perceived access to the park, especially in high-density and low-income neighborhoods, would reduce disparities in park use and physical activity.

The Bigger, the Better: The Case for Park Size

Studies found park size to be somewhat more critical than park attractiveness in explaining park-based physical activity[9]. In our research, we found that the park area was associated with the number of park visitors and the level of physical activity in the park. In other words, bigger parks can accommodate more users and allows for more facilities to be planned for different types of activities, which

in turn, provide more opportunities for park users to engage in physical activity. What should we consider in park size in design? Here are some considerations.

Aggregate parks in one large area rather than dispersing into smaller pieces.

Creating a large space that accommodates multiple forms of physical activity allows park users to choose activities that are suitable for different ages in one location.

Design a network of smaller parks to connect activities.

In a very dense neighborhood where it is impossible to design a large park, the best approach is to create a network of parks where different activities can be concentrated or dispersed, where it can be perceived as a large area of parks. For example, a jogging track or a bike route can start from park A and end at park B. Singapore uses this approach to create an image of connected green space networks that can accommodate various activities and provides social, economic, and environmental benefits.

Appropriate Facilities and Features Encourage Participation in Physical Activity

The presence of facilities and features can enable physical activity in the park. Jogging track, bike routes, playground, and exercise equipment are more important for physical activity than other park amenities[10,11]. Areas with different configurations and purposes attracted a different number of people. In general, vigorous physical activity range lowest in picnic zones and highest in multipurpose areas. Sports fields such as basketball, futsal, and takraw courts will have higher physical activity levels but attract a smaller number of people since there are a maximum

number of people who can use these types of fields. On the other hand, the multipurpose area can attract many people when there are organized aerobics exercise or social dance training. Nevertheless, although park amenities such as seating, water fountains, barbeques, picnic tables, and toilets are less associated with physical activity, they are still crucial in encouraging park use[12].

Different park facilities and features are associated with physical activity for specific park users. For example, a playground is more critical for children under 12 years old and their caregivers than sport courts[13]. They also prefer to play equipment that is age-appropriate, well-maintained, and safe[14]. Skate park, jogging track and bike route, walking paths, barbeques, picnic tables, public access toilets, lighting around courts and equipment, and a number of trees were associated with a higher level of park use for physical activity among adolescents[15]. Constructed walkway or natural trails with the presence of shade is essential for senior adults in the park[16]. A study among older women found that the lack of shading-providing areas and resting places can limit this age group to be physically active[17]. Not only trees and greenery are essential as attractors for older people to use the outdoor environment, but also seating and facilities such as toilets are needed to enable older people's access to and enjoyment of public green space[18].

In terms of gender, studies have established that more men engaged in park use and physical activity than women. In Thailand, the ratio of male and female park users is around 55:45, which is better than in the US or European countries. Female users are more likely to be found in areas like playgrounds where they could supervise children rather than on basketball courts and soccer fields where they could engage in vigorous exercise[19]. Disparities can also be observed between boys and girls in the park. Providing women and girls with opportunities for exercise while simultaneously supply services of care for their children or providing more tracks and walking paths where women and children

can engage together will be useful to close the gender gap in physical activity. Here are some design criteria for promoting physical activity in the park.

Provide a variety of facilities to support play and recreation, for example, paths, trails, running tracks, playgrounds, and sports facilities.

The number of features and facilities is a significant predictor of physical activity in the park. Providing such facilities and features can directly contribute to a higher number of users engaging in physical activity in the park.

Provide a multipurpose area for mass participation events and organized activities.

There has to be a balance in the providing regions for exercises such as running tracks, basketball courts, and multipurpose areas. If there is limited space, prioritize the multipurpose field. This area can contain more users per square meter and accommodate various levels of physical activities. In some parks, this area can also be used to hold a mass participation event such as marathon running events or aerobic dance. However, an ideal public park should have both types of space.

Provide park amenities that indirectly support physical activity.

Indirect park amenities such as seating, water fountains, picnic tables, and bathrooms can support more extended park visitations and, therefore, can increase physical activity levels. For example, the drinking fountain encourages water consumption for rehydration, and support longer play and other activities.

Ensure the facilities and features are age-appropriate, diverse, and inclusive.

Conducting equity reviews for planned facilities and features in the park is vital to ensure all citizens, particularly the vulnerable populations,

have equal opportunity to participate in sport and physical recreation programs regardless of sex, age, race, income, or ability. For example, playground features should also encourage guardians to engage in play and be physically active.

Aesthetics, Maintenance, and Organized Activities

As designers, aesthetics is important. However, how do park users perceived park aesthetics? What is an attractive park for them? Aesthetic, attractive, and pleasant park surroundings were linked to increased physical activity levels in the park[20]. The aesthetically pleasing park does not always mean that it needs to have an avant-garde design with fancy design features and materials. For example, a study in Copenhagen, Denmark, found that Superkilen, a famous park that won multiple awards in architecture and landscape architecture, had fewer users engaging in physical activity than a nearby local park[21].

Previous studies have shown that park aesthetics is understood by visitors differently. In many circumstances, park aesthetics is perceived as the presence of natural setting[22,23]. In the tropical climate, the presence of tree covers and canopy density is essential for park users because they can increase the time spent in the park[24]. Playground with a higher number of big trees is considered more appealing for children and older adults[25]. Another study found that park greenness, measured with a high level of NDVI (the Extract Normalized Difference Vegetation Index), is associated with higher park use among adolescents[26]. The presence of distinctive smells of greenery and good air quality is also associated with park aesthetics[27].

Park users also perceive park aesthetics as well-maintained facilities and features. Proper maintenance of the park means functional facilities and features, as well as clean and pleasant surroundings. Parks with

dirty and broken paved trails are less attractive to visit[28]. Proper maintenance also concerns with safety. Badly-maintained facilities and features are dangerous and can limit participation users to be physically active in the park[29]. The presence of hazardous waste, rocks, debris, and off-leash dogs are usually perceived as badly-maintained parks. Perception of attractiveness is also linked with park security from crime. Park features such as the presence of lighting and the availability of security and surveillance are identified as essential factors in determining park attractiveness[30]. The presence of slums and squatters surrounding the park is considered as a necessary factor in determining the park attractiveness and safety[31].

Organized activities or intervention programs were identified as essential to encourage physical activity in various user groups. Such activities can be part of a one-time mass participation event such as running and walking competitions or a regular recreational weekly activity such as yoga or other group sports. In the US, multiple studies found that higher-level physical activity was associated with the number of organized activities in the park[32]. In Singapore, park users were found to be more active when structured exercise sessions such as Yoga, Pilates, aerobics, or Tai-Chi were available[33]. Organized activities can also enhance the social environment in encouraging physical activity. Having social support in the forms of positive role models, family and friends were significantly associated with the increased in MVPA and improved participation in physical activity programs and campaigns[34]. Parks with higher physical activity also found to have a higher number of groups of users[35]. Children were found to visit the parks with family, adolescents were engaging in activities with friends, and adults were joining in physical activity in groups and communities.

In mainstreaming physical activity, aesthetics/attractiveness, maintenance, and organized activities are perceived by park users as interchangeable constructs. Hence, it is crucial to understand that the following considerations are minimum requirements in park design.

Preserve or create a natural environment to support activities in all seasons and weather conditions.

Preserve and increase greenery that can provide a canopy to create a pleasant microclimate. It is also vital to reduce hardscape materials as much as possible, especially for the passive recreation zones. If possible, the multipurpose area should be designed with proper shading that can protect users from a hot and humid climate.

Design for safety.

Facilities and features in the park need to be designed by national and local safety regulation standards. For example, playgrounds can be designed to increase physical activity as well as to prevent injuries. It is also vital to provide lights on sidewalks and active play areas to extend opportunities for physical activity into the evening and increase the feeling of safety to park users.

Apply the principles of crime prevention through environmental design (CPTED) to increase security and social interaction.

The clustering activity area can provide informal surveillance among users and increase social interactions. Necessary park facilities such as toilets, seating benches, and water fountains should be placed to encourage surveillance. Perceptions of security increase if people can see ahead and around them, and if other people are visible. The presence of shrubbery, fences, walls, sharp corners, storage sheds, or buildings can hinder visibility and thus reduce perceived and actual security. Park pedestrian lighting should be designed to identify a person's face from around 10 meters away.

Design for sustainability.

Parks usually have a limited budget for design and maintenance. Hence it is essential to choose design elements and materials that easily maintained, have long life-cycles, and promote sustainability. Green

design practices such as natural heating and cooling, energy savings, water conservation, recycling, and waste reduction methods, reduce impervious surfaces, and use local construction materials where possible to minimize material transportation, should also be considered when possible. If possible, park design should also show the leadership in applying environmental sustainability principles by using, among others, xeriscapes (the process of landscaping that reduces or eliminates the need for supplemental water from irrigation), bioswales (channels designed to concentrate and convey storm-water runoff), wind farms, solar installations, green roofs, community gardening, water harvesting, smart irrigation controllers and drip systems.

Schedule organized activities and events to attract park visitors.

Providing regularly organized activities will increase park visits and physical activity levels. Our study found that delivering organized activities designed specifically for females, such as aerobics and yoga, may improve park visitation for women[36]. Incorporating school-organized sports programs also increases the participation of children in physical activity in the park. Marketing park programs, sports events, and other regular organized activities using conventional marketing materials, as well as social media platforms, can increase the participation of park users.

Create a sense of belonging through design.

Collaborations with local communities can create a sense of belonging to park users and improve park maintenance through voluntary participation. A better sense of belonging also improves perceived safety and security in the park. Creating partnerships with the private sector and civil society organizations to sponsor regularly organized activities such as running events can ensure the annually organized activities in the park without relying on public financing by the local government.

Case Studies from Other Countries

Hayes Valley Playground, San Francisco, the United States

The Hayes Valley Playground is a city playground located in a diverse neighborhood of San Francisco, California, the United States. In 2009, the Trust for Public Land (TPL) in San Francisco, a national non-profit organization that creates parks and protects land to ensure healthy and livable communities, raised money to renovate the playground. To support physical activity in the park, TPL then partnered with the RAND Corporation and the San Francisco Department of Public Health (SFDPH).

The RAND corporation and SFDPH conducted a pre-design assessment to capture a comprehensive view of park use and perceptions. A SOPARC observation method and survey questionnaire were used to assess how different design features impacted moderate and vigorous physical activity in the parks and within the local community. The TPL also conducted an extensive 6-month participatory design process and held workshops to involve key stakeholders and community members. The park was then designed to reflect the community's vision, promote use, and support higher levels of physical activity. Renovation designs for the park included larger play areas with equipment that supports active play; a fitness zone (a cluster of outdoor adult fitness equipment); a community garden; a plaza for dancing and Tai Chi; enhanced lighting, visibility, and overall park layout; and a recreation clubhouse with green building features. The post-design assessment in 2012 revealed a dramatic increase in the number of users. The total number of observed park users increased 415 percent, mainly children were observed 1,376 percent increase[37]. Also, almost 45 percent of all people observed in the renovated areas of the park were involved in moderate or vigorous activity while found only 10 percent in the pre-renovation period.

Figure 5.1 Hayes Valley Playground, San Francisco, the United States

Source:

1. Shulaker B., Isacoff J., Kjer T., Hart K. (2015). Park Design for Physical Activity and Health. The Trust for Public Land and the American Institute of Architects San Francisco: Trust for Public Land.

2. https://www.tpl.org/our-work/hayes-valley-playground

Active People Active Park Project for the Queen Elizabeth Olympic Park, London, the United Kingdom

Active People Active Park was a flagship participation project of the London Legacy Development Corporation (LLDC), an organization that promotes and delivers physical, social, and environmental regeneration in Queen Elizabeth Olympic Park and the surrounding area. The objective of the project was to provide activities in and around the Queen Elizabeth Olympic Park in East London to encourage local residents to participate in sport and physical activity and to maximize the legacy of the London 2012 Olympic and Paralympic Games to encourage local residents to participate in sport and physical activity.

LLDC then worked with a pre-determined group of partners selected through the initial bid application period as well as new partners that have been brought in to fill gaps in local provision. Through partnering with such a diverse range of providers, the project could thus offer a vast array of activities from health initiatives to meet the differing ability levels of all the residents that live in and around the Queen Elizabeth Olympic Park. The project also worked in partnership with local health services and established a referral system for patients who were looking to become more active. The LLDC also promoted the program by engaging with local groups such as housing associations and schools.

In the second year of the project activities, it had registered over 85,000 participants had more than 40,000 attendees and delivered an average of 30 events per week. The park space was optimally utilized, and activities were offered in the right place in the park. The project also operated in the one-mile radius surrounding the park to ensure the generation of new spaces for activities. It created a snowballing effect for the community, where participation has helped create a sporting habit and convinced participants' friends and family members to take part in the project activities. The project also helped build community cohesion and tackle social isolation amongst communities.

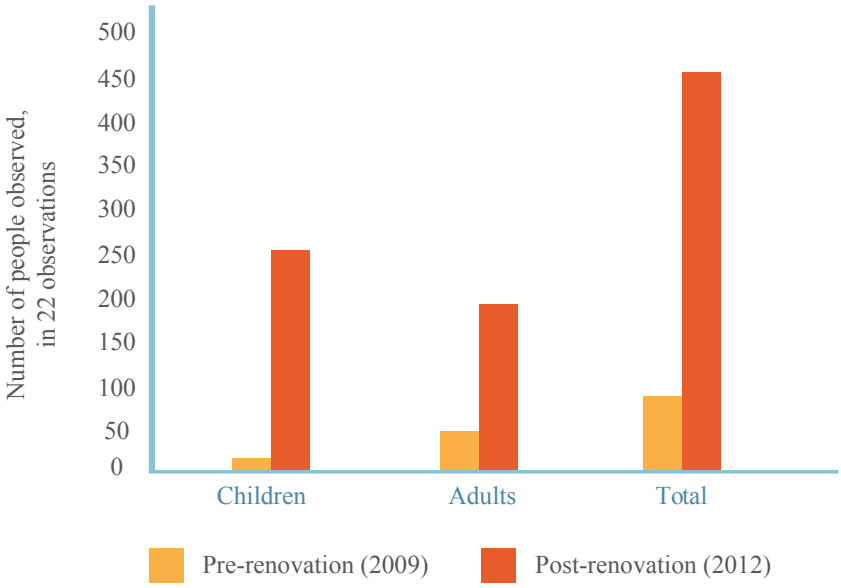


Figure 5.2 Total number of park users observed pre-renovation and post-renovation

Source:

1. Shulaker B., Isacoff J., Kjer T., Hart K. (2015). Park Design for Physical Activity and Health. The Trust for Public Land and the American Institute of Architects San Francisco: Trust for Public Land.

2. https://www.tpl.org/our-work/hayes-valley-playground

Pizzey Park, Gold Coast, Australia

Pizzey Park is one of the largest and most popular sporting and active lifestyle hub in the City of Gold Coast. To ensure its sustainability of use and popularity among citizens, the city developed a 15-year Master Plan that will allow the park to continue in this capacity and guide further development to cater for the increased demand the growth of the city creates. The draft plan, which was developed in close consultation with the community, outlined staged park upgrades over the next 15 years. The master plan aimed to deliver infrastructure solutions that respond to community needs, improve accessibility, and inspire activity. The society trends were also considered, including catering for the rise of women's sport and the need for unstructured sporting and physical activity opportunities to fit into people's busy lifestyles. Being inclusive of these changes will ensure that all residents receive the health and social benefits that participation in an active lifestyle delivers.

After a series of consultation with the community and other stakeholders in November – December 2019, the critical design features of the new master plan should include:

- improved traffic flow and parking options with safer access to the precinct for all users;
- accessible pathways and connections linking all areas of the park;
- creation of a green recreational spine running through the center of the park;
- creation of the central hub and celebration lawn to establish a sense of place and identity;
- development of integrated sport and recreation facilities that maximize opportunities for collaboration and sports participation;
- activation of parklands through regular activities and events to increase the physical activity and wellbeing of community members;
- communication of the park's identity citywide and creation of a signage scheme; and

Figure 5.3 Promotional materials of the Active People Active Park Project for the Queen Elizabeth Olympic Park

Source:

1. Sport England (2015). Active People Active Park. CFE Research (part of the national evaluation of the Community Sport Activation Fund). Retrieved from: https://public.sportengland.org/CSAFworkshops/SharedDocuments/EvaluationReportandCase-Studies/7CSAFcasestudy-ActivePeopleActivePark.pdf (accessed on 25 March 2020)

2. https://www.queenelizabetholympicpark.co.uk/

- incorporate environmental design principles.

Brooklyn Bridge Park, Brooklyn, New York, the United States

Brooklyn Bridge Park is an 85-acre urban park along the Brooklyn waterfront of the East River in New York City. The area was formerly an inaccessible cargo shipping site owned by the Port Authority of New York and New Jersey (PANYNJ). When PANYNJ announced plans to sell the piers in 1983, the surrounding community began to consider the site's value as a local resource. In 2002, the New York State and the City of New York agreed to develop the park extends along the East River from Jay Street, north of the Manhattan Bridge, to Atlantic Ave/ Pier 6 in the south, and will eventually include five retrofitted piers. The development was overseen by the Brooklyn Bridge Park Corporation, a not-for-profit organization that operates and maintains the park, as well as oversees its construction.

According to the landscape architects Michael Van Valkenburgh Associates, the park design is meant to serve as a site ecology that can thrive and evolve in a heavy-urban setting. The park is not about scenery and beauty but about changing people's mindset on how to use public space in dense urban areas. A series of community planning workshops were held, and a conceptual framework was developed for a waterfront park.

The design of the park introduces a variety of uses for the neighborhoods, especially for physical activity. Amenities span from high-intensity sports courts and dynamic children's jungle gyms to flexible-use lawns and relaxing waterfront gardens. Combined with a robust schedule of cultural events, environmental education, and fitness classes, the park's wide range of amenities and programming allows people to customize their visit to meet their preferences and needs. As of July 2018, the park is 90 percent complete, and already receives an average of more than 120,000 visitors on an average summer weekend.

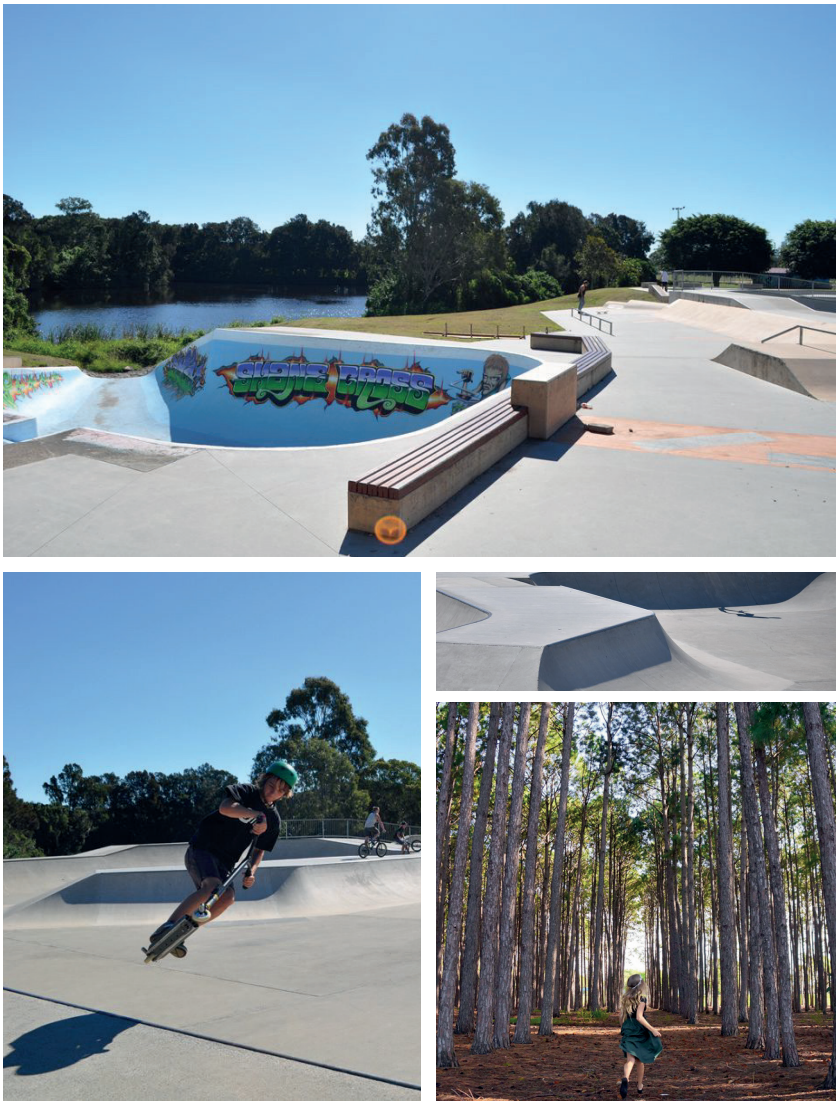


Figure 5.4 Pizzey Park, Gold Coast, Australia

Source:

1. http://completeurban.com.au/project/pizzey-park-community-skate-park-and-youth-precinct/

2. Maloney K. (2019). A Thriving Hub for Sports Lovers and Outdoor Enthusiasts. Retrieved from: https://wearegc.com.au/articles/pizzey-park/ (accessed on 21 March 2020).

3.https://www.goldcoast.qld.gov.au/thegoldcoast/pizzey-park-27443.html

Chapter Summary and Remark

The chapter discusses the design criteria and considerations to plan and design the park to promote physical activity. Four themes are discussed in this chapter. Accessibility to park use is the most important considerations. Improving park access means increasing equal opportunity for everyone in accessing and using the park for physical activity, especially for vulnerable groups. Park size is one of the critical design criteria as it follows a simple logic that more significant park area can accommodate more park users and activities. Facilities and features are essential criteria as studies found that parks with better facilities will have higher levels of physical activity. Lastly, aesthetics plays a vital role in design as it can be interpreted in many ways by park users. It can be understood as the availability of greenery, or well maintenance of facilities or the availability of organized activities. In other cases, aesthetics is perceived as safety and security. Some other criteria and considerations need to be understood by planners and landscape architects on providing facilities and features in the park. Further evidence in the Thailand context is required for landscape architect professionals to mainstream physical activity in park planning and design.

Figure 5.5 Brooklyn Bridge Park, Brooklyn, New York, the United States

Source:

1. Centre for Active Design (2020b). Brooklyn Bridge Park (BBP). Retrieved from: https://centerforactivedesign.org/brooklynbridgepark (accessed on 25 March 2020).

2. https://www.brooklynbridgepark.org/park

Chapter 6

Conclusion

This book has a single argument; that mainstreaming physical activity through better park design is critical to promote an active and healthy lifestyle in cities. Previous chapters in this book elaborate the role of parks as health infrastructure in the towns of developing countries where there are conflicting interests amongst revitalizing economic development, protecting the environment, and improving the health and well-being of urban residents. In urban planning and landscape architecture discipline, the health and well-being benefits are commonly considered as an afterthought, with economic considerations as the main, and sometimes, the only success indicator. This book tries to tell us otherwise. Studies have shown that designing for health will also bring economic benefits. In other words, creating a built environment, in this case, park, can provide both environmental, economic, social, and health benefits at the same time.

In many cities in the world, including in Thailand, where promoting walking and cycling as part of a healthy lifestyle requires a significant systematic change of built environment, parks can provide a better option for promoting physical activity. Evidence has also shown that the park offers enormous direct and indirect health benefits. In chapter 3, we discussed in detail how parks could contribute to improving our physical activity levels. People are more active and healthier when there are parks nearby. We also discussed how to measure the physical activity contribution of a park using the SOPARC observation method and survey questionnaire. Chapter 4 discussed the patterns and characteristics of parks and park-based physical activity in the Thai context. In chapter 5, we elaborated the findings into planning and design criteria for mainstream physical activity. The following sections discuss valuable lessons learned based on the discussions in previous chapters.

The Benefits of Having Parks to Promote Physical Activity Exceed the Investment Cost

Investing in parks increases physical activity benefits. In chapter 3, we discussed how studies in other countries found a strong relationship between how much money spent on parks and physical activity benefits people receive. For example, in the US, extra spending of 10 USD per capita on parks was associated with one-third of a day more per week of moderate and vigorous physical activity. Our study in Benjakitti Park in Bangkok found that even a small improvement can increase 5 minutes more per week of moderate and vigorous physical activity. Our national survey of parks in Thailand found that the average economic benefits of conducting physical activity in the park per week are almost 3 million Baht. We also found that the mean of total economic benefits of the park from physical activity per year is more than 150 million Baht. And this is only from physical activity measurement. If we add the economic benefits from other assessments, such as reducing air pollution and heat island, improving mental health, and other social benefits, the value will be much bigger than this.

The same notion of 'the benefits of having park exceeding its investment cost' is also true in Thailand's context. The findings from our studies echo what has been established in the literature that parks provide significant co-benefits not only for health but also for other sectors such as socioeconomic, and environment. In addition to this, in Thailand, the park offers a captive market for PA promotion. For example, in Bangkok, there are at least one thousand park users per day, with more than 70% of them are already engaged in physical activity. It means less investment will be needed to promote physical activity. Park is also a part of the public domain, which means that creating policy intervention for parks will be much easier since it is under the local government's management.

There is Still an Insufficient Empirical Evidence Related to Park and Physical Activity in Thailand

Although the body of knowledge in other countries is available, empirical evidence related to parks and physical activity in Thailand is still scarce. On the other hand, efforts to measure and integrate physical activity in policies are made without proper methods and understanding, resulting in externalities such as conflicts between different agencies, inequalities resource allocation in different regions, and unconducive built environment to support physical activity. Therefore, it is usual that the government pays little attention to physical activity policies. It is not also uncommon to find that studies from other countries with different socioeconomic and cultural contexts are cited as references to inform policies. In other cases, policies related to parks, physical activity, or an even broader scope of public health are crafted based on discretions or personal judgments. Without proper input in the decision-making processes, the local government has been reluctant to fund the park development to support physical activity and a healthy lifestyle, resulting in externalities such as inappropriate use or vandalism to the facilities.

There are three reasons why evidence in the park and physical activity in Thailand is limited. First, it may be started from how the term physical activity is translated into the Thai language. In English, physical activity and exercise are entirely two different terms since the ’90s. On the contrary, physical activity and exercise are used interchangeably in the Thai language for many years. Just recently the term physical activity is translated into a new term “กิจกรรมทางกาย” to differentiate with exercise (“การออกกำลังกาย”). Ministry of Public Health had to change the Thai name of its division that responsible for promoting physical activity from “the Division of Exercise” (กองออกกำลังกายเพื่อสุขภาพ) to “the Division of Physical Activity and Health” (กองกิจกรรมทางกายเพื่อสุขภาพ). In our experience, the term physical activity is not fully understood outside the health sectors. Even within the health practitioners, there is confusion about which term should be used, exercise, or physical activity.

The second reason is the difference in defining physical activity in various disciplines in Thailand. Many studies still perceived physical activity under the paradigm of exercise and sport science. In the field of transportation planning, when discussing "non-motorized transport," it is actually what in the public health called the "transportation physical activity." This issue has made the dissemination of the term physical activity, and its scientific evidence somehow became difficult. When conducting literature mapping on research in Thailand, we found very few studies that used the term physical activity. Studies using keyword parks and physical activity were even more limited. Many of these studies had contradictory findings because researches employed different definitions and methods to justify the physical activity.

The third reason is due to limited funding in physical activity-related research. Physical activity and the park can be defined as the cross-cutting issues and multidisciplinary, or the grey area, where it is less prioritized in particular disciplines. This can lead to less funding for research. In Thailand, research funding for physical activity is limited. Only donor organizations in the public health sector provide research funding under the NCDs budget. Research funding related to parks and green open spaces is usually under urban planning or environment agencies. When researchers ask these institutions to fund a research project on parks and physical activity, most likely, they will direct the proposal to the health sector. And when asking from the health sector, they will lead us to the environment or urban planning sector.

Integrated Policies and Multisector Collaborations are Essential in Mainstreaming Physical Activity

The reluctance of the government to prioritize parks and physical activity in policies is probably due to several reasons. First, there is still no responsible agency to plan, design, and maintain parks at the local levels.

In Thailand, natural conservation parks are under the National Parks Office, Department of National Parks, Wildlife, and Plant Conservation. On the other hand, public parks are under the responsibility of local governments, such as the Tambon Administration Office (TAO). Without multi-governance on parks, there is no budget directed to plan, design, and maintain parks. There is also no monitoring system and evaluation of parks. When compiling data for the national survey, we found that the national database on parks does not exist. We had to collect from different local and national agencies and made adjustments based on our observations.

Integrating physical activity in park planning and design seems to be the logical implication of what has been discussed in this book. What is remarkable is that creating a park conducive for physical activity promotion requires multisector collaboration towards the same goal. It also needs the full involvement of all the related stakeholders. However, attempts to develop an integrated system may cause conflicts and rivalry, especially between local government agencies, when the delegation of authority and allocation of resources are not specified. For example, provincial environmental agencies may want to develop the park as an urban forest to support biodiversity. The Department of tourism requires the park to be a center of civic, economic activities. At the same time, the Department of health needs the park to promote physical activity.

Our studies, although with limitations, have shed light on the importance of parks in physical activity promotion and a healthy lifestyle in Thailand. Recently we created an open database and knowledge platform to disseminate physical activity in Thailand called "activethai.org." Our purpose is to reach a broader audience, not only academia but also policymakers and practitioners in the health and non-health sectors. In a nutshell, activethai.org offers updated information, articles, and data about physical activity promotion in Thailand. The site currently

covers three different environments related to physical activity: (1) policy environment, (2) built environment and (3) social environment. Although it is not complete in the current state, the website is currently the only knowledge management platform in Thailand that serves to disseminate the evidence related to physical activity promotion to policymakers, academia, professionals, and the public in general. The website is also part of our efforts to conduct a situational analysis of Thailand's physical activity. The summary from the website's data will be reported as the first national status report of physical activity, which will be published by the Thai Health Promotion Foundation.

What It Means for Landscape Architecture: The Need for Evidence-Based Design and Interdisciplinary Approach

In the era of big data and post-truth, evidence-based design becomes more and more crucial for landscape architects. When we design for the public interest, the design process should be based on facts and empirical methods so it can be held accountable by the public. It is necessary to realize that planning and design are not only a creative and analytical process but also a political one. Understanding the needs of the general population and the political dynamics is crucial in our planning and design process. Landscape architects need to be informed about the current global and local trends. In the case of physical activity, we need to know what are the current global initiatives that can support our ideas and concepts. For example, linking our ideas to the Global Action Plan of Physical Activity or the New Urban Agenda, or Sustainable Development Goals can provide an appropriate analytical and creative framework for our design process.

As a designer, we also need to act as an advocate for change. As discussed in the previous chapters, we need to work with other stakeholders who may not be familiar with physical activity or non-design actors such as

health professionals and sports scientists to create a successful design. In other words, a multisector collaboration is an essential part of our design process. We need to adapt to new knowledge beyond our discipline and integrate them into research and practices in urban planning or landscape architecture.

Awareness building and improving understanding of all stakeholders involved in park planning and design is essential for multisector collaboration. Mainstreaming physical activity in urban planning and landscape architecture design practices demands a similar perspective of all stakeholders and the capacity and capability of policymakers. Through improved understanding, collaboration efforts and practical actions can be established and maintained. Academia needs to provide more rigorous empirical evidence to mainstream physical activity in the green open space planning and design. Local government agencies should work with civil society organizations, professional associations, and communities to increase public awareness on the importance of physical activity in everyday life.

Epilogue

Park, Physical Activity and Pandemic

Currently, the coronavirus disease 2019 (COVID-19) outbreak has spread across the world, and the World Health Organization (WHO) has characterized COVID-19 as a pandemic (WHO declared COVID-19 a pandemic on 11 March 2020). Confirmed cases and deaths are increasing around the world, including in Thailand. As of 27 July 2020, there is 3,925 number of confirmed cases and 58 deaths. The pandemic has a significant impact on people's lives, from economic, social, environmental, and health and well-being. It also impacts our built environment, both positively and negatively. For example, while there is a sharp decline in urban activities resulting in losses in economy, there is also evidence of reduced traffic and industrial activity, which have resulted in reduced air pollution up to 20-30% in China[1]. A similar trend also has been observed in many major cities in Italy[2].

COVID-19 affects physical activity. Prolonged stay home to limit the spread of the virus can increase behaviors that lead to inactivity and contribute to anxiety and depression, which can lead to a sedentary lifestyle known to result in a range of chronic health conditions[3]. A study conducted by Fitbit concluded that there was a significant reduction in physical activity levels (measured by the step counts) around 10-30% depending on the severity of COVID-19 pandemic in the countries[4]. Government measures such as staying at home, lockdown, and the closure of parks and gyms and sports centers to reduce the spread of the virus have affected the physical activity levels of the population. Thailand also faces a similar situation. Since the first state intervention on 18 March 2020 to implement a lockdown and closing many public facilities, there have been significant changes to patterns and charac-

teristics of physical activity. A study conducted by Mahidol University found that physical activity level reduction is up to 50%. Activethai.org online survey also found a similar amount of reduction with up to 30%, with working age women were the most affected group.

The COVID-19 pandemic also affect park use for physical activity. In Spain, there was a 90% reduction in park visits during the COVID-19 pandemic. In Thailand, we found that the park use was reduced up to 90% since the lockdown was implemented. People can still visit parks that were not under the management of the Bangkok Metropolitan Area. But such privilege only belonged to the high-income neighborhood with excellent green open spaces and facilities. In general, most people cannot access the park during the lockdown. This situation raises the question: Will the role of public spaces and parks in particular change in the "new normal"? A study conducted in Copenhagen found that there were changes in patterns and characteristics of use and users in the public spaces and parks[5]. In Thailand, when parks and other public facilities and amenities were reopened in May 2020, we observed two exciting changes.

Parks are being used for new forms of activities.

In our ongoing study, we find there are no significant changes in physical activity patterns during the lockdown compared to when parks are reopened. The number of people visiting the park for physical activity was still low compared to before the pandemic. It was probably because people were required to use masks during conducting activities in the park, including exercise, which might not be comfortable and against the health experts' recommendations. We found that one of the main reasons to visit the park was for social interaction (with social distancing) and passive recreation. A recent study on the impacts of COVID-19 on mental health found that visiting the park may reduce the anxiety from lockdown[6]. A recent study found that people who spent in nature for at least two hours per week were more likely to report higher levels of health and well-being[7].

There are emerging active uses in other types of public spaces.

On the other hand, we also observe that there are more active uses outside parks. Lockdown and work from home have decreased the need for commute and, in turn, reduced traffic congestion. This situation opens up the street, plaza, and other types of public spaces, to a new pattern of activities. More people ride bicycles or walking and running on the pedestrian around their neighborhood for recreation purposes. People need more space due to social distancing, and public spaces offer new opportunities during the lockdown.

As the pandemic is still going on, innovative approaches to the use of parks are urgently needed. Current measures such as limiting the number of visitors, prohibiting mass gathering events, providing communication to park users to keep physical distancing, and mandatory mask-wearing while conducting activities in the park are the short-term solution to reduce outdoor transmission of the virus. However, there is a need to re-think how parks and public spaces are used during and post-pandemic. Future research may have to be directed at understanding parks and recreation in the new normal. Parks and inequality is another possible direction. Inequalities in green spaces have existed around the world even before COVID-19. For example, a study in London found that the wealthiest areas have 10% more green spaces compared to the most deprived areas[8]. During the pandemic, people with better access to green spaces were found to cope better with the lockdown. The pandemic has definitely exacerbated the inequality. There have been movements to keep parks and green spaces open during the pandemic to help reduce stress and mental health issues[9]. Investigations on these issues may reveal different patterns and broaden the current body of knowledge on parks and physical activity, which can be used to plan and design better parks post-pandemic in the near future.

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"Along with the thrilling moment of the global pandemic of COVID-19, the most urgent urban challenges today have been shaped by exponential urbanization, stress and lifestyle-related illness, and biodiversity deprivation. Critical thinking on green space has been vigorously put forward, based upon the importance of the built environment as a predominant factor in influencing physical activity level from a global perspective. I believe that the author is clearly trying to examine a strong nexus between the quality of urban space, health issues, and well-being. A better understanding of the most important qualities in the environment can support human health and well-being over time. The author eloquently explains that parks really matter in the making of the built environment. This book is worth reading not only for students and academia in the field of architecture, urban, and landscape planning but also to the wide-ranging audience with various backgrounds."

Prof. Dr.Ing. Widjaja Martokusumo, Chair of Architectural Design Research Group, School of Architecture, Planning and Policy Development, Institut Teknologi Bandung, Indonesia

"The book offers a deeper insight into landscape-health-wellbeing nexus. The strength of the book is in the methodological approach that it suggests for measuring the (health) benefits of parks. Therefore, the book can be quite useful for students and p rofessionals engaged in landscape architecture as well as in public health and social welfare."

Assoc. Prof. Ranjith Perera, Ph.D., Department of Architecture, Faculty of Engineering, Sri Lanka Institute of Information Technology, Sri Lanka

"The Park Matters! book explicitly filled the gap between health science and built environmental planning & design disciplines, since there are some practical methods on how we can understand parks and make them better to serve for physical activities as an assurance for people's wellness. This book is strongly recommended for both landscape professionals and policymakers who are the 'park creators.'"

Asst. Prof. M.L. Vudipong Davivongs, Ph.D., Department of Landscape Architecture, Faculty of Architecture, Kasetsart University, Thailand

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