

ORIGINAL ARTICLE

Green, Open Spaces and Transport for Healthy and Sustainable Cities in Asian Developing Countries

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ABSTRACT

Introduction: This paper presents the case studies of the green, open spaces and transport issues in three cities of the Asian region based on the work of participants from the Workshop of Health in Urban Planning. **Methods:** Three case studies were collected from the participants of Thailand, India, and Indonesia, and compiled under the theme. **Results:** The first case study presents findings from the Thailand's Survey on Physical Activity (SPA), and various strategies taken by the Thai government to improve physical activity levels among the Thai population and children, including improved accessibility, walkability; and reconstruction of school curricula. The second case study is an empirical study of the geographical extent and type of green spaces accessible to the urban population, and their usage in the city of Varanasi, India, in the wake of Yoga practice popularity. The third case study discusses the insufficient transport infrastructures, along with the influx of visitors from outside the city as the cause of severe traffic congestions and emissions in Bandung city, Indonesia. The governments' action plans and recommendations for improvements of the city environment are discussed. **Conclusion:** Integrating health into urban and transport planning needs co-operations from multiple stakeholders including the government, private sectors, and the communities, especially from the early phase of development.

Keywords: Green spaces, Transport, Physical activity, Developing countries, Asia

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INTRODUCTION

Urban land use encompasses all built and non-built surfaces that people construct or modify for human use. This includes residential, commercial, public, institutional, transport system, green spaces, and recreational spaces which are generally framed as built environment. The land-use and transport changes in the cities are entangled with the complex process of development, redevelopment and deep structural transformations. Lefebvre (1996) wrote that nature in the urban environment is being subjected to unprecedented ravages. The process of urbanization has always caused shrinkages of nature, and surprisingly the death of nature is substituted by the 'ideological naturalization' of space and the reproduction of nature in the form of parks, gardens and open spaces (1). On the other hand, traditional transport modes such as walking and cycling are quickly being phased out and replaced by motorized transport. In the recent decades, reproduced

nature in the city (green or blue infrastructures) and active transport has caught the attention of the researchers due to their beneficial health implications on the urban dwellers. Increased urban green spaces has been associated with reduced mortality, cardiovascular diseases and improved mood, attention and physical activity; while transport has been extensively related to reduced emissions and cardiorespiratory diseases (2). As the social determinants of health and wellbeing are very complex, health-related policies cannot be seen in isolation, and urban planning decisions are human health decisions (3). However, integrating health into urban planning decisions is daunting due to the nature of urban growth pattern in most of the cities in developing countries. The built environment of Asian cities is undergoing significant expansion that encroaches on the green, open and blue spaces inside the municipal boundaries and towards the agrarian hinterland. The edge of the cities or the urban peripheries is witnessing the dramatic change to achieve economic ambitions (4). Besides, uncontrolled increase in motorized transport is bringing unsustainable mobility in cities.

According to Malhotra (2011), the definition of public health as a matter of biological research has evolved in

recent years. The environmental, social and economic determinants of population health are being discussed in the land use planning framework. Proximity to green spaces and greenness in the neighbourhood have been greatly associated with better physical and mental health (6). The landscape architect Frederick Law Olmsted highlighted the recuperative effects of urban parks on the stressful life of urban society, through physical activity promotion, sunlight and clean air in the city (7). The Healthy City Index generated by Pineo et al. (2018) contained ten environmental categories and fifty-eight indicators. The green infrastructures formed an important category of healthy city indicators with three identifiers: green area per capita population, the variety of biodiversity, and proximity of houses to green spaces. Urban green spaces is also considered an identifier of urban sustainability and resiliency (9). Other research concludes that the health benefits from green spaces increase with their accessibility and usability. People living near abundant green spaces develop place attachment and form bonds which are conducive to well-being (10).

The purpose of urban design as part of urban planning processes is to create a better, healthier and liveable city. A city that endeavours to promote and achieve health among its citizens by creating better structures in the built and social environment, and enable citizens to be active is a healthy city, and urban design can contribute effectively in making a city active and healthy (11). The built and non-built surfaces affect the mobility of people and their participation in physical activities. Mobility involves the movement of people and goods in a city, and physical activities include the type of activity (e.g., walking, cycling, exercise, etc.). Street layout greatly affects the mobility of people. For example, the streets conducive to walking or cycling activities allow people to travel on foot or by bicycle for their different activities. On the contrary, the non-conductive walkways restrict the movement on foot, thereby affecting the active living in the city. Similarly, the green and open spaces are important land use types which facilitate active recreation and physical activities. Crowded and dense cities generally lack these spaces (12). Protection of green spaces has been considered crucial to support liveability in cities. A large body of literature has suggested that communities with more physical activities are likely to be in a state of better physical and mental health (13). Engaging one in physical activities is not just an individual pursuit, it is affected by the place and the available transport infrastructures in which a community resides. The urban design can greatly facilitate and increase the level of physical activities among urban dwellers.

Although many studies have been done on green spaces and transport in relation to health in the developed countries, cities in the developing countries are underrepresented in this study area as more priorities are

being given to immediate issues such as the healthcare and economic developments (14). This paper takes the opportunity to share the situations of green spaces and transport issues in three different cities in the Asian region.

MATERIALS AND METHODS

Studies relevant to cities in the Asian region were called from the participants of the Workshop on "Integrating Health into Urban Planning towards Sustainable Development Goals in Developing Countries". Subsequently, three studies related to urban spaces and transport were identified and compiled under the theme. The first case study reviews the transformation of public spaces into active spaces to encourage physical activity engagements in Thailand. The second case study identifies the extent of green spaces and the wake of Yoga practices among the health conscious population in Varanasi city, India. The third case study discusses the transport emission issues and the potential strategies for tackling them in Bandung city, Indonesia. These case studies are invaluable examples for information sharing between cities, in order to apply potentially effective strategies and interventions within the same context of developing countries.

RESULTS

Case study 1: Enabling healthy public space to encourage physical activity in Thailand

Non-Communicable Diseases (NCDs) have been the top five leading causes of death for Thai population during the past decade which contributed to 14.5% of total adult mortality (15). The Thai government, through the 5-Year National NCDs Prevention and Control Strategic and Action Plan (2017-2021), has targeted 80% of Thai population to be physically active in 2020 as a measure of NCD prevention (16). Health promotion programs such as Active People, Active Place and Reducing Sedentary Behavior have been in place in order to encourage Thai people to engage in healthy behaviors. Life course approach and active play campaign for children have been implemented during the past 3 years in order to improve the level of physical activity (PA) among Thai youngsters, while built environment and healthy spaces have also been developed in enabling general population to be more physically active (16,17).

The Thailand's Survey on Physical Activity (SPA) reported that only 66.3% of Thai adults has met WHO recommendation of cumulative 150 minutes of moderate level or 75 minutes of vigorous level physical activity per week in 2017 (18). The insufficient amount of physical activity among Thai youngsters is also causing concern since the percentage of children and youth accumulating recommended average of 60 minutes of moderate to vigorous physical activity (MVPA) daily only increased slightly from 23.2% in 2016 (19) to 26.2% in 2018 (20).

Built environment as a consistent predictor of physical activity of Thai population

From the analysis of SPA results, sufficient PA is determined by individual (i.e. self-efficacy in PA, engagement in active work and transportation) and also community factors such as the proportion of built environment. The analysis also showed that, among other correlates, the built environment has the strongest effect in predicting physical activity. This finding is consistent with previous studies in built environment worldwide when high density neighborhood with good connectivity resulted in increased PA, strengthened by community engagement in utilizing the existing unused areas as healthy spaces (21).

The built environment itself has been defined differently by scholars from various fields. Generally, it is defined as man-made physical environment that supports daily human activities. However, among physical activity scholars, built environment refers to 'the totality of places built or designed by humans, including buildings, grounds around buildings, layout of communities, transportation infrastructure, and parks and trails' (p. 729) that are designed with health and wellness as the integral parts of the communities (22).

Accessibility

The SPA observed that the existing built environment could only cover about half of Thai population (55.7%) (18). Of the 55.0% of built environment that was accessible, 65.5% had good aesthetic, and 64.0% was supportive of the safety of the population; however, only 12.0% of the sidewalks or bike lanes were reported in good conditions (18). Urban Design and Development Center reported that only 11.0% of the Bangkok area was accessible by foot, of which 60.0% was in the inner city area. Similar condition was also observed in other regions.

Studies found that public park plays an important role in physical activity promotion. Lumpini Park is an example of transformation from an inactive park to a park where increasing number of families and communities are able to enjoy the green space for their leisure following the road closures (Fig. 1 (a)). Likewise, the redesigning of Benjakitti Park has also increased the number of children (21.0%), and elderly (33.0%) visitors with increased percentage of park use for biking (4.1%) and running (17.6%). Most of those engaged in MVPA in the park were adults (72.4%), who visited the park after working hours for exercise (23).

Previous studies have shown that the level of physical activity differs by the socioeconomic status of an individual or family. Population with higher socioeconomic position was found have more leisure physical activity, while lower socioeconomic groups engaged more in occupational PA (24). Likewise, accessibility to supportive built environment also



Figure 1: (a) Lumpini Park before and after reconstruction (b) Active Place Program

skewed towards the middle high income families who mostly lived in the city center (25). Community with a higher socioeconomic status had a significantly greater relative odds of having access to one or more PA facilities compared to the lower socioeconomic minority groups (24). The Active Place program was designed to increase the accessibility to public spaces for low income families/ communities in Thailand by transforming the unused and wasteland into open spaces. Fig. 1 (b) shows the government and community engagement in utilizing the unused land under a flyover as a public space where all community members can have leisure physical activity.

Walkability

As physical activity promotion should address population of all ages, built environment for the working age group could be facilitated by the walkability of the city to enable people to walk to and from places. Walkability includes considerations of of pedestrians' comfort and safety, pedestrians-vehicles gap, and pedestrian pathways with sufficient connectivity (26). Transit-Oriented Development (TOD) has been adopted by incorporating high density mixed land use development within accessible distances of transit stations, i.e. Bangkok Mass Transit System (BTS), Metropolitan Rapid Transit (MRT) and Airport Rail Link (ARL) transit lines to encourage walking to transit stations instead of using motorized vehicles, and reduce traffic congestions (27,28).

The development of high-rise buildings for residential purpose within 1 km-radius from stations has increased 12 times within five years, which means many working age groups are now residing in the TOD areas and consider it as the best alternative to access their workplace. However, Bangkok's walkability index remain low where pedestrians feel unsafe or inconvenient to walk to the stations because of street

food vendors and motorcycle taxis that park or ride in the sidewalks (27).

Built environment in school setting

Children and youths aged 5–17 are recommended to have at least 60 minutes of moderate- to vigorous-intensity physical activity daily to obtain optimal growth and development, and prevent NCDs (29). To increase physical activity among Thai young population, the Thai government has called upon policy makers, donors, and stakeholders, which include the WHO, the United Nations, and all relevant non-governmental organizations to increase investment in policy implementation. Despite all the efforts, only a fourth (20.9% - 26.6%) of Thai children and youths have met the WHO recommendation between 2013-2017 (18).

The low level of physical activity among Thai children was generally caused by the nature of Thai curricula that do not provide sufficient opportunities for children to move during the classes (18). The reconstruction of curricula and built environment therefore, has been developed in school setting to enable the pupils to move more during classes and recess. 4 PCs (Active Policy, Active Program, Active People, Active Place and Active Classroom) have been implemented as the key approaches in promoting physical activity for children and youth at school during the past three years.

Case study 2: Urban green and open spaces in Varanasi city, India

Varanasi is a dense and historically significant cultural city in the northern part of India. The main city spreads over an area of 84.55 km² and is inhabited by 1.19 million people (30). The city has five zones and ninety wards. According to the Master Plan 2011, the proposed area for the Greater Varanasi is 179.27 km². The population growth in the city has been rapid due to its historical evolution as a centre of culture, spirituality, and learning in Gangetic plain. It is undergoing a process of rapid land use transformation in response to government policy inclinations such as the Smart Cities Mission. On the other hand, the Indian government is promoting Yoga (ancient physical and spiritual practices) throughout the country for the promotion of health through lifestyle management in an attempt to protect traditional Indian knowledge (31). Yoga is being practiced by people who are health conscious. Recently, the awareness towards physical exercise and yoga practices has substantially increased in Varanasi city. Groups of people can be seen walking, exercising, practicing yoga, and playing in the open and green institutional spaces, public parks, neighbourhood parks, pavements of residential colonies, public playgrounds, and the sidewalks developed along the rivulets in Varuna and the Ganga Ghats.

With the launch of various urban development schemes such as the Smart Cities Mission and AMRUT (Atal Mission for Rejuvenation and Urban Transformation) scheme by

the central government, the Municipal Corporation has identified five public parks (Shashtri Park, Gulabh Bagh Park, Ravindrapuri Park, Machchhodari Park and Benia Bagh Park) of Varanasi city for a regeneration plan, and invited public opinions on their design and concepts (<http://nnvns.org/noticedetails/48>). Jogging paths and exercise zones are the common features in all the parks, while only one park features a dedicated space for Yoga and meditation activities. Inviting public opinion on the design of parks can be considered the beginning of the involvement of stakeholders in developmental projects. Researchers have advocated the inclusivity and opportunity for people to engage in institutional plans so that desired benefits can be realized (32). However, to involve local community in the reforms and governance under the Smart Cities Mission in Indian cities is a challenging task, due to dominations by large corporate sector, and a lack of strategies to enhance the involvement of communities from different sections of society (33). As far as health is concerned, the government has been focusing on achieving better and affordable health care facilities in the city, and public health for disease prevention has been neglected in the developmental plans (34).

This study argues that serious attention is needed to conserve and extend green and open spaces in the city to protect the health and wellbeing of the residents. This investigation is especially important when the health awareness is rising among the local people through ‘yoga’ practices and physical activities, and voices are being raised to give weights to inhabitant-centric strategy in smart city project.

Extent of green spaces in Varanasi city

Various studies have used proximity measures of green spaces to residential neighborhoods as a determinant of health, in addition to their quality and quantity which boost the utilization of green spaces for physical activities (35). This section presents an empirical examination of the spatial extent of urban green spaces in the Varanasi city by using high-resolution Google Earth images for the year 2019.

Fig. 2 (a). shows the Varanasi city inside municipal boundary and the adjoining planned setups (the Cantonment, Diesel Locomotive Works (DLW) and railway colony), and the location of parks and green spaces in the Varanasi city. The green spaces (including cultivated land) in Varanasi city covers 1909 hectare, constituting 22.5% of the total area inside the municipal boundary (Table I). The adjoining planned setups have higher amount of green covers than the inner city, where green covers mostly concentrate in BHU (Banaras Hindu University) (southern part of the city) and in Sarnath (northern part of the city) areas. Most local people are attracted to institutional green spaces, DLW, Nehru Park, Shaheed Udyan and others for physical activity, at 15.9 square meters green spaces per capita.

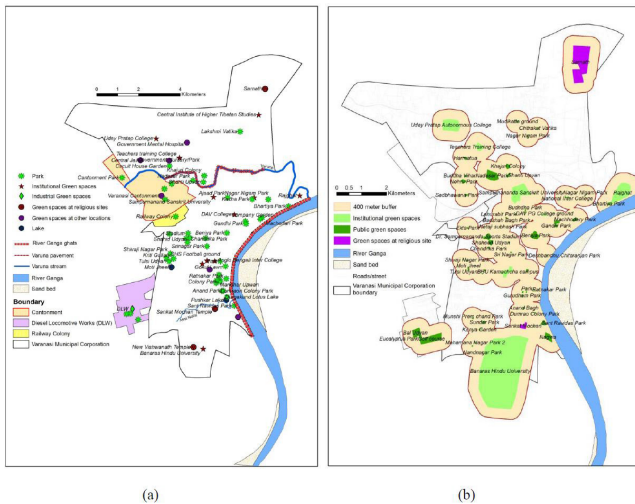


Figure 2: (a) Municipal boundary and the adjoining planned setups of Varanasi city, (b) Location of green spaces and public parks in Varanasi city

Table I: Urban Green spaces in Varanasi city and its adjoining planned setups

Sites	Varanasi Municipal Corporation	DLW	Cantonment	Railway Colony
Area (ha)	8455	319.8	519.4	83.5
Urban Green Spaces (ha)	1909	195	367	25
Percentage of total area	22.57	60.97	70.57	29.94
Population	1198491	-	-	-
Per capita green spaces (square meter)	15.9	-	-	-

Note: the area of the planned setups may vary from the actual area; ha- hectare

Lack of green spaces has been identified as one of the key environmental issues in the city development plan. The City Master Plan 2031 and Zonal Regulation have proposed the development of many local parks, playgrounds and open spaces inside the city. Green belts have been proposed to be built on both sides of the rivulet Varuna (100 meters each side); within 20 meters under high tension wires; 50 meters on each side of National Highway (NH)-2 bypass; and 25 meters on both sides of Assi nalla which will cover 7.59% of the urban area. Green strip of 300 meters wide have also been proposed in the riverfront heritage zone between the Ganga river and the settlement area in the east. The City Development Plan 2041 aims to increase green spaces to mitigate air pollution and to improve the quality of life (36).

The types of green spaces in the form of polygons are derived manually (Fig. 2). There were very few public parks of small sizes, mostly found in the central part of the city (Table II). For spatial analysis, only those green spaces accessible to people were derived. These include public parks, institutional green spaces (the polygons for the institutional green spaces indicate the entire boundary of the institutions), neighbourhood parks, green spaces at religious sites and tourist sites. The patches of private green spaces were not included for

Table II: Types of green spaces

Types of Green spaces	Numbers	Size (Minimum-Maximum) (ha)	Mean size (ha)	Total area (ha)
Municipal public park/ Community/ Neighbourhood Parks	59	0.1-22.2	1.69	76
Institutional green spaces	8	1-450	69.7	558
Industrial green spaces (Inside DLW campus (accessible to local people))	3	6-22	11	33
Green spaces near religious sites	1	-	-	4.8
Inside Cantonment (accessible to local people)	3	0.9-2.2	1.36	4
Tourist sites	1	-	-	78
Greenbelt	0	-	-	-
Other/private green spaces mostly restricted	-	-	-	-
Total	75	-	10	750

analysis due to their inaccessibility by the local people. Although the total green spaces occupy an area of 1909 hectare in the city, the parks/green spaces which were accessible to local people covered only 750 hectares (8.87% of total area).

As distance from home is an important factor in determining usage of green spaces (37), 400 meter buffers were delineated from the polygons and dissolved. Accessibility to green spaces was estimated as the proportion of area within the 400 meter buffer of green spaces over the total area of the city. As a result, it was estimated that 50.34% of total geographical area of Varanasi city have access to these spaces.

Facilities of green and open spaces and their usage

Green spaces are perceived and interpreted differently by people of various age groups and gender. They are the spaces for games and sports activities for children, and the spaces for social and community gatherings for youth and elderly (38). Observational studies of park usage have been applied as an effective method to understand people-park interactions (39). In this study, field observations were made and documented on the types of physical activity performed by the park users in the morning (6–8 AM) at six different locations from June to August 2019 (Table III).

It was found that people of the city do not depend entirely on the public parks for recreational or health-related physical activities. Industrial unit (DLW) and educational institutions such as Banaras Hindu University, UP College and Sampurnananda Sanskrit University (SSVV) allow people to access their green and open spaces freely. During the observations, all the six locations were found to have vegetation covers (grass) and open ground. It was apparent that industrial and institutional green spaces were more well maintained compared to public parks. The tree covers and manicured landscapes

Table III: Basic characteristics of selected green space dominated localities and their associated services and functionalities

Functions	Subcategories	BHU*	DLW	UP College**	Cantonment parks	Shaheed Udyan***	Neighborhood parks
Amenities	Vegetation coverage	✓	✓	✓	✓	✓	✓
	Open ground	✓	✓	✓	✓	✓	✓
Accessibility	Open for the public	✓	✓	✓	×	✓	✓
	Connectivity	✓	✓	✓	✓	✓	✓
Physical activities	Walking	✓	✓	✓	×	✓	✓
	Sporting activities	✓	✓	✓	×	✓	✓
	Cycling	✓	✓	✓	×	×	×
	Green space leisure	✓	✓	✓	×	✓	✓
	Yoga practices	✓	✓	✓	×	✓	✓
Maintenance	General	✓	✓	✓	✓	✓	×
Aesthetic experiences	-	✓	✓	✓	✓	✓	×
Modified urban landscape	-	✓	✓	✓	✓	✓	✓

*Banaras Hindu University, ** Uday Pratap College, ***Shaheed Udyan Nagar Nigam Park
(Source: Adopted and modified from McCormack et al. 2010 (51); Madureira et al. 2018 (52))

were more common in educational institutions. Many people were found to be walking, cycling, playing, and doing yoga in early morning at these green spaces, as these locations are well connected by transport network and easily accessible by the people. The Shaheed Udyan was found to be crowded both in the morning and evening due to its location in the city center. Many people were found to be resting in the open ground of the park, which is the only option in the neighborhood. The neighborhood parks were mostly dominated by grass cover and barren soil, and were used by children for playing and by youth for hanging out. The visitors used green spaces for multiple purposes, and walking and sitting were found to be the most common activities. Parents who brought their children for sports activities spent time watching them in the area. For elderly, the UP College and other educational institutions have provided specific spaces for social interactions. At UP College, it was found that a group of 20 women from nearby residential areas was practising yoga.

Apart from the green spaces, the river Ganga ghats are the preferred places for health-related physical activities especially for the people living along the river. Recently, pavements have been built along the Varuna stream under the Varuna rejuvenation program, of which people have started walking on it.

Case study 3: Transport in Bandung city, Indonesia

Bandung Municipality is the third largest city in Indonesia. As the capital city of West Java Province, the population is about 2,503,708 people with a growth rate of 4.54 per year, and a population density of 14.96 per km² (41). Geographically, the city is located in the western part of Java Island, which is approximately 180 km south-east from the Capital City of Republic of

Indonesia – Jakarta. Meanwhile, the economic growth rate of Bandung city in 2018 is 7.08%. Retails and wholesale and vehicle repair are the most significant contributors to the gross regional domestic products, followed by the manufacturing category.

Air pollution from the transportation sector has become one of the urban environmental issues in many developing cities, including Indonesia. The city of Bandung is facing rapid urbanization and uncontrolled population growth. This section provides a brief view of the transport situation and urban air pollution issue in Bandung City, Indonesia. Using the DPSIR (Driving force-Pressure-Status-Impact-Response) approach (40), the secondary data reveals that the air pollution in Bandung city is driven by the rapid economic growth and unplanned urbanization. They produce the pressures of the increasing number of motorized vehicles on the road. The number of registered vehicles increased from 2015 to 2018 by 6.7%. In 2018, the total number of registered vehicles (including car, motorbike, truck and bus) was 1,732,672 vehicles, with the highest registration from the motorbikes (72%, 1,244,433 vehicles), followed by cars (392,051 vehicles) (41). The majority of the vehicle registration was private vehicles (98%) with the remaining being public transport (2%). This situation was exacerbated by a heavy traffic flow between Bandung and Jakarta, the capital city of Indonesia, especially during weekends and public holidays. Such a situation has caused high emissions of transport air pollutants, which affect the population health through the manifestations of cardiorespiratory symptoms. In response to this issue, various public campaigns and policy changes have been initiated, such as the Blue Sky Program and the adoption of mass transit system Trans Metro Bandung (TMB) (42).

Transport emissions

Based on statistical data (41), the number of registered vehicles in Bandung is 1,738,672, units with the majority being motorcycles (72%). The number of vehicle ownership in the city between years 2014 and 2018 is shown in Fig. 3. The quantity far exceeds the capacity of the existing roads in Bandung City. While the ideal proportion of road to the total land area is about 15%-20%, the percentage stood at only 2.32% in the year 2005. Also, due to its strategic geographical location, Bandung city is a famous destination for domestic travelers from other cities, especially during weekends and holidays. During this time, the traffic condition in the city becomes worse with vehicles coming from other cities, causing severe congestions. Besides, although public transportation (such as paratransit minibus (angkot)) is available in the city, they are underutilized due to insufficient route coverage and unsatisfactory service quality such as comfort, safety and time accuracy (43). It causes the usage of private vehicles to continue to climb. Besides, the patterns of mixed land use in Bandung City center and sparse residential areas in the urban fringe have encouraged traffic volume towards the urban center. Due to the lack of vehicle parking infrastructures in the commercial and trade zone in the city center, the use of road shoulders as parking lots is one of the major causes of congestion.

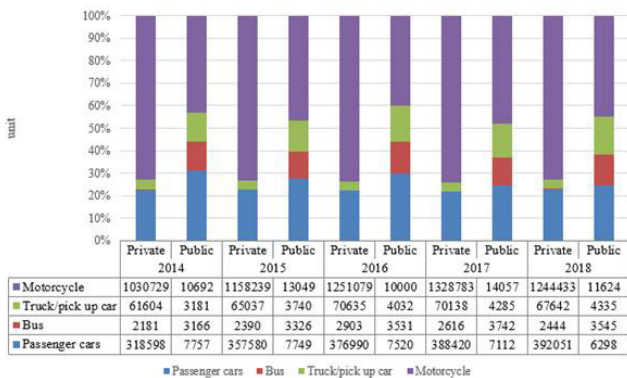


Figure 3: Number of Vehicles in Bandung City 2014-2018 (41)

The increased number of motorized vehicles in Bandung City is undoubtedly a significant factor in air pollution in the city. The previous study stated that the transportation sector contributed more than 50% of the total air pollutant emissions in Bandung city (44). The vehicles contributed to 2,680 Gg/year of carbon dioxide emissions (92.16%) in the Bandung city, where the 20-year global warming potential (GWP) of the emissions was estimated at 6770 Gg/year CO₂ eq. Additionally, the annual transport emissions of air pollutants for carbon monoxide (CO), nitrogen oxide (NO_x), particulate matter (PM), ammonia (NH₃), methane (CH₄) and sulfur dioxide (SO₂) were 168 Gg/year, 16 Gg/year, 1.8 Gg/year, 0.68 Gg/year, 5.8 Gg/year and 0.42 Gg/year, respectively (45). The particles that are generated from vehicle exhausts, mainly due to traffic congestion, significantly affect the physical and mental health of the Indonesian population,

especially among the children (46). Air pollution has placed a significant threat to public health in Bandung city, especially respiratory illnesses (47). According to data (41), the top five diseases of the city are influenza, respiratory tract infections, hypertension, myalgia, and intestinal infections (Fig. 4.)

To curb transport air pollution, the local government

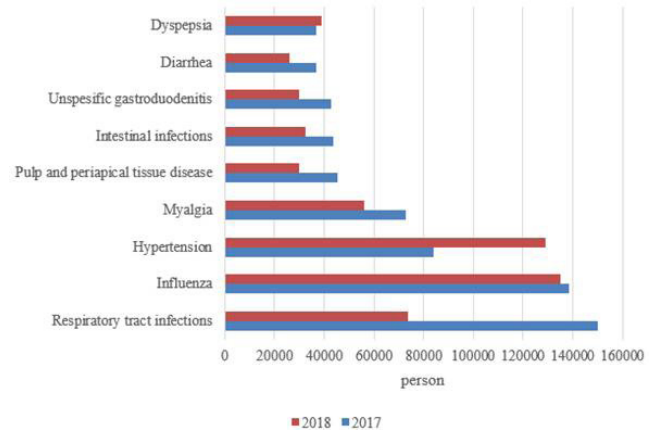


Figure 4: Number of Diseases Incidents in Bandung City 2017-2018 (41)

has responded through programs by relevant institutions such as emission testing of motorized vehicles. Based on the Mayor Regulation of Bandung Municipality No. 572/2010, the emission standard of vehicles differs by the year of vehicle production and the type of fuel (e.g., diesel fuel and gasoline). For gasoline cars, the emission standard is 4.5% (before 2007) and 1.5% (after 2007) for carbon monoxide (CO) and 1200 ppm (before 2007) and 200 ppm (after 2007) for hydrocarbon. For diesel-fueled vehicles, the standard opacity of 70% (before 2010) and 40% (after 2010) are used. Since 1997, the local government has introduced the Blue Sky Program, which is a national program initiated by the Ministry of Environment of Indonesia to improve the air quality (42). In align with the program, the local government started the development of monorail in Bandung city in 2012. Besides, the government has also started the program of Car Free Day on every weekend at certain roads to reduce the traffic density.

DISCUSSION

In the recent years, the interest in understanding the distribution and functionalities of urban green spaces in the built environment has increased with encouraging interest in area-based studies. Such interest is also rising due to health benefits associated with the natural spaces in the fast urbanizing cities. The various efforts done by the Thai government to increase physical activity through the built environment is applauded. Although urban planning in promoting health has been widely promoted worldwide, these strategies should not only be confined to policies, but put into actions as well. Based on a recent report, physical inactivity among Thailand's adolescents reported the greatest reduction (4%) compared to other

countries in the East and Southeast Asian region (range: -1.7% to +1.4%), which clearly demonstrated the results of the government efforts (48).

The case study on Varanasi city responds to the need to emphasize the role of green space planning for the well being of city dwellers. Green spaces and health is a new theme of research in Indian cities, which still lack planning and management in the urban planning framework. It is crucial to understand the ways people engage themselves in the green spaces, and how these spaces can improve their health and well being to justify their prioritization in spatial planning. The study suggests that the green spaces should be managed and enhanced at neighbourhood level in urban planning in Varanasi city, and collaboration with health experts should be initiated to promote public health. Assessment of the residents' needs and demand for these spaces in future research can better guide the urban planning process for the well-being of society (9). Varanasi is a religious city where people keep themselves active in religious practices. This study did not document the traditional and cultural lifestyle of people which encourage them to be active. However, it adds to the emerging as well as compelling dimensions of urban land uses and promotion of health through people-centric urban design. Further research may help in understanding the effective interaction between people and green spaces through self-reported activities and interviews.

For Bandung city, more can be done to improve the current transport situation. Firstly, the technical consideration to reduce traffic emission as suggested by Oanh et al. (2018) (45), such as fuel shifting and the enforcement of Euro standard with prioritizations on private vehicles (including car and motorbike) and angkot is necessary. Secondly, the adoption of transit demand management is important. The concept of mixed development could be enforced through zoning regulations, with incentivization and sanctions for the developers by the local government. Compact mixed land use or transit oriented development allows people to live and work or study in one place, thus reducing the need to travel using motorized vehicles and increasing non-motorized vehicles. Affordable housing needs to be prepared to facilitate this concept for all levels of income, such as the Rumah Susun for low-middle income groups, and apartments for high-income groups. Thirdly, the local government has to provide adequate and convenient mass public transport system with necessary facilities such as pedestrian pathways, and proper bus shelters before encouraging people to use public transportation. Finally, the local government needs to work closely with all stakeholders, including the municipal government, private sectors, and community, to understand their needs and incorporate them in the strategies implemented to acquire success in reducing transport emissions in Bandung city.

Although the local authority of Bandung City has introduced the instruments (such as bus rapid transit - Trans Metro Bandung (TMB), and car-free day scheme, and emission standard for vehicles) to improve the air quality, some challenges have occurred. In terms of the TMB operation, a study showed that TMB has contributed to the increased emissions of carbon and air pollutants in Bandung City due to the usage of fossil fuel in the vehicles (49). On the other hand, although the car-free day scheme has reduced the traffic flow levels in the surrounding areas of the scheme, the vehicle flow is diverted elsewhere to other routes, which may worsen the congestion and air quality in the city (50). Within this context, the local authority of Bandung City needs to re-evaluate the existing policies and pay more attention to the concept of sustainable urban mobility. Several proposed strategies are to enhance technology and alternative eco-energy, increase public awareness support, and encourage political commitment among related stakeholders.

CONCLUSION

In summary, the case studies in this paper have discussed the problems faced by each city on land use, green spaces, and transport issues. Various potential strategies and actual implementations have also been suggested and shared from the perspective of population's health and well being in the cities. Integrating health into urban and transport planning requires co-operations from multiple stakeholders including the government, private sectors, and the communities, with thorough understanding of the human-environment interactions. In particularly for the developing countries, the development phase itself is a good opportunity to avoid all the caveats made by the developed countries in order to realize healthy and sustainable cities. Nonetheless, each city as an urban living laboratory may need more research to find out the most effective strategies in addressing the respective urban issues in its own unique way.

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