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An Applied Research Experiences: Green Pedestrian Facilities in Indonesia

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Abstract: The paper discusses an applied research on green pedestrian facilities in Indonesia that based on walkability index. In general, the Government of Indonesia initiates the research as part of commitment to support the agenda of Durban Platform. As an applied research that focuses on green pedestrian facilities, the study attempts to improve the quality of walkability in the urban area in Indonesia. Many cities in this country are failed to provide walkable pedestrian facilities that support the concept of the green city. Therefore, the research tries to answer fundamental research questions regarding on walkability and green pedestrian facility. What are significant factors that influence walkability? How to improve walkability for green pedestrian facilities? The study applies mixed methods approach that combines qualitative and quantitative methods to gather data and further information on the topic. Since the research tests walkability concept in Indonesia, it refers and analysis method of Global Walkability index. Furthermore, to ensure that the theoretical discussion fit for implementation, the research uses a design competition to check parameters from walkability and translate the concept of the green city into physical development. Innovative design from the competition will be implemented in a few cities in Indonesia as a pilot project. Output from this research provides a new idea regarding walkability approach and green pedestrian facilities in Indonesia. Besides that, finding from this research is also expected to enrich theoretical debate on walkability index.

Keywords: walkability; green pedestrian facilities; applied research.

1. Introduction

In past decades green has correlation to politics, environmental, economics, and social factor, which influence the quality of built environment. From the environmental and social factor perspectives, the concept of green stress the action to manage and solve environmental problems such as global warming, pollution, natural resources exploitation, and insufficient energy. Discussion on these topics is quite broad for implementation; therefore, they should translate into concrete approach or arrangement. At the urban level, discussion on green might refer to eco-city, low carbon city, green economic city, or sustainable city (Kim, 2011). The city government could select one of those concepts that is considered fit for the region and could support green development.

With a rapid growth in urban regions, the environmental topic becomes significant for Indonesia since many urban areas are facing environmental degradation. Discussion on this topic could identify problems and possibility to improve the quality of built environment. Problems such as pollution, limited green area, poor waste management, limited energy, poor access to clean water and lack of public transportation are few examples that worry many cities. Therefore, to improve the quality of living environment, the Government of Indonesia introduced the green city policy to assist and encourage local government manages development activity based on the green concept. Furthermore, this policy is expected could upgrade local plan and integrate development demand with an environmental approach.

Among the discussion topics is the green transportation, which attempts to provide sustainable transportation based on public transport and encourage mobility of non-motorized vehicle and walking. Lately, walking becomes one of the concerns to support mobility and reduce emission in an urban area. However, the quality of sidewalks and pedestrian facilities are poor, which discourage walking activity in most of the cities. In this condition, consideration to improve and provide the facility for walking seems crucial. To ensure the pedestrian facility is walkable and accommodate basic requirements, the planning and design of the facility should apply the green concept as well as walkability index. The walkability index focuses to identify and measure physical and social factors that affect to pedestrian activity (walkable) (World Bank, 2008). This index is useful to identify and assess some factors that could support and challenges the improvement of pedestrian facilities as well as affect the quality of walking. It is expected that these approaches could encourage walking activity and reduce emission from vehicles. By combined green city and walkability index, the research attempts to develop understanding and identify some factors that significant to support the provision of green pedestrian facilities in the urban area.

This study applies the mixed-method approach for analyze and develop concept between walkability and green city to support the planning and design for green pedestrian facilities. Using the qualitative method, the research attempts to gather information and data using focus group discussion, interview, case study, and design competition. Meanwhile, in order to prevent subjectivity, the study applies quantitative method that identifies each parameter of the walkability index. The questioner and statics data analysis are used to support the research argument. Information and recommendation from this study would be useful as guidance for planning and implementation of green pedestrian facilities.

2. Walkability Index and Green City Index for Pedestrian Facilities

This section discusses the concept of walkability index and green city index to support the provision of pedestrian facilities in the urban region. The first part elaborates the concept of walkability that attempts to seek a link between the concept of walkability and green city. Meanwhile, the second part of this section talks about the green city index to gain information regarding some indicators that use to assess or measure performances of some cities in Europe and Asia. Later, information from these discussions will be used to develop parameters for green pedestrian facilities.

Walkability index

Discussion on walkability emphasizes the walking activity that influenced and affected not only by physical factors, but also by other factors such as environmental quality and social factors. By this means, walkability has broad meaning since it connects all basic factors (environmental, physical, and social) that are essential for mobility in the urban area. Although the walkability seems have similar concept, there is difference in perceiving walking activity in developed and developing countries (Krambek & Shah, 2006). According to this study, walking is considered as a healthy activity as well as to shift mode from motorized to the non-motorized vehicle (from origin to destination) in developed countries. Meanwhile, in developing countries, walking is addressed as cheap or affordable option for travelling especially for low-income (Krambek & Shah, 2006; ADB, 2011). Distinction on this perspective influences the government approach to develop policy and provide facilities to support the idea of walkability.

The walkability concept has been developing for several years to support walking activity through physical and non-physical support. Many studies have discussed this topic and introduced some indicators that useful to identify and assess the walkability index. A study that conducted by Krambek and Shah (2006) introduced the Global Walkability Index (GWI) to assess the quality and performance of walking as well as some factors that influence the activity. In general the GWI introduced three components to assess walkability, which are (1) safety and security, (2) convenience and attractiveness, and (3) policy support (see Table 1). The safety and security component focuses to identify accident that affects pedestrian activity, conflict, crossing safety, security from crime and quality of motorist behavior. Meanwhile, the convenience and attractiveness component discuss the physical quality of walking paths, facilities for blind and disable persons, amenities, and permanent and temporary obstacles on walking paths. The Last is the policy support component that arranges funding and resources for pedestrian planning, develop urban design guidelines, implements pedestrian safety laws and regulations, and encourage driving safety and etiquette. This index would be helpful to assess the performance of walkability in an urban area and information from this is useful to make improvement through physical development, policies, or social arrangement.

Another study on walkability elaborates combination between the opportunity of walk and behavior of walking (Weinberger & Sweet, 2012). This study revealed that quality of pedestrian facilities and pedestrian behavior are influence each other. Combination of these factors is useful to identify and develop land use planning and walking mode to manage urban development. Furthermore, using this method, the research could assess movement of various functions from origin to destination area and provide facilities to support walking activity as well as improve walking behavior. It also helps to

identify changes in the built environment that might affect the walking behavior (ibid). Many European cities have good pedestrian facilities to support walking activity. The facilities is part of the city planning and deliver walking-friendly sidewalks that are safe and secure to give convenience feeling (Reyer et al., 2014; Nawrocki et al., 2014; Stonor et al., 2002). Apparently these cities have legal support to ensure that the development and maintenance process could facilitate walkability. Besides cities in Europe, in the New Zealand the government also develops a walking-friendly sidewalks that integrate to the city planning (New Zealand Transport Authority, 2007). The government introduces the Pedestrian Planning and Design Guide to support implementation of walkability concept. This guideline gathers information and understanding on quality of service of pedestrian facilities based on efficiency and safety using review (rating), auditing (identification), and rating (scoring) methods. This information helps to develop policy and design reference of quality of space, road crossing, safety standard, etc (ibid). Meanwhile, in Abu Dhabi, the government is gradually improving the quality of sidewalks in urban areas. The government also introduced the Urban Street Design Manual that accommodates the idea of walkability as part of the street composition (ABD, 2011). In general, these short discussions showed concern of urban government to provide and improve walkability in urban areas as well as encourage walking activity that could make better environmental quality as well as the performance of pedestrian movement.

Table 1. Global Walkability Index – A Summary (Source: Krambek & Shah, 2006).

Component	Variable
Safety and security	1. Proportion of road accidents that resulted in pedestrian fatalities (most recent year available). 2. Walking path modal conflict 3. Crossing safety 4. Perception of security from crime 5. Quality of motorist behavior
Convenience and Attractiveness	6. Maintenance and cleanliness of walking paths. 7. Existence and quality of facilities for blind and disable persons. 8. Amenities (e.g., coverage, benches, public toilets) 9. Permanent and temporary obstacles on walking paths.
Policy support	11. Funding and resources devoted to pedestrian planning. 12. Presence of relevant urban design guidelines 13. Existence and enforcement of relevant pedestrian safety laws and regulations 14. Degree of public outreach for pedestrian and driving safety and etiquette.

Meanwhile, in Asia, walking considers important especially for low-income people that has limited access to finance and public transportation. Implementing the walkability concept not only provide better facilities for a walk, but also could encourage walking activity (behavior). Sadly, pedestrian facilities have limited facilities in this region; most cities are preferred to provide facilities for the motorized vehicle instead of walking mode (ABD, 2011). Limited facilities and poor quality of sidewalks have

caused many of pedestrian shifts into the motorized vehicle and trigger rapid growth of private car and motorcycle. Later, this condition creates traffic congestion and environmental problems, such as air pollution and the increased level of CO2. These are common problems that the urban government has to manage in order to maintain and improve the quality of built environment. To encourage walking activity, consideration on walkability index is essential. Using indicator from this index, the government could identify and assess sidewalk quality and performance that include consideration of social factors, such as safety, security, and convenience. It is expected that the walkability index could deliver useful data and information to develop walkable sidewalks for the urban inhabitant and reduce the use of the private motorized vehicle.

In order to identify and assess walkability index for some cities in Asia, the ABD adapted some parameters from Global Walkability Index (GWI) with some adjustments that referred to the Asian condition. The walkability index applies nine indicators as assessment parameters, which are (1) walking path modal conflict, (2) availability of walking path, (3) availability of crossings, (4) grade crossing safety, (5) motorist behavior, (6) amenities, (7) disability infrastructure, (8) obstructions, and (9) security from crime (see Table 2). Apparently, most of these parameters stress on safety factor, especially regarding potential conflict between pedestrian and other modes (motorized or non-motorized), crossing issues, behavior of motorist that might harm pedestrian, and provision of infrastructure for the disabled. These indicators showed the character of the urban environment, where safety issue becomes significant since it could affect or has the potential to blight walking activity in some Asian cities. Besides safety, providing facilities for sidewalk and security are other indicators that put into consideration for walkability index in this region.

In broad meaning, the walkability concept can be described as a process to identify and assess correlation between physical quality of sidewalk and activity of walking from the origin to destination that concerns with social factors such as safety, security, and convenience (ABD, 2011; PU Tata Ruang, 2011). The implementation of walkability concept could reduce the use of the motorized vehicle in an urban area that could deliver positive implication to reduce traffic congestion, energy consumption (fuel), and air pollution. Clearly, walkability is supporting the idea of the green city. The combination of both concepts could improve the quality of urban environment. Gradually, many cities in Asia are combining the concept of walkability and green city, including Indonesia. Lately, the government of Indonesia began to develop an idea to improve walkability in the urban area based on green city concept.

Green city index

Following the earlier discussion, the walkability index has a strong correlation with the green city concept that emphasizes the idea to improve environmental quality. Accordingly, the green concept helps to enrich ideas regarding energy saving and offer thermal comfort, which could implement through green corridor development, trees planting, selection of energy saving lights, recycle waste, and other options that would give benefit to the pedestrian. Discussion regarding green city become important for the urban region that is facing rapid growth and consequence of this condition is obvious to the environment. Pollution, traffic jam, limited green area, lack of clean water, and high demand for energy are few problems that occur at most of the urban regions and become homework for the government. By far, comprehensive approach at macro until the micro level is expected could manage those challenges. At the macro level, the government focuses the policy and regulation to arrange and manage

development activity, which include assessment and responsibility that all actors should take. Meanwhile, at the micro level, the government not only focuses on the policy provision, but implementation as well. Apparently, at this level some of those rules are developed as guidance for development.

Table 2. Walkability Parameters for Asian Cities (adapted from the Global Walkability Index) (Source: ADB, 2011).

Parameters	Description
Walking path modal conflict	The extent of conflict between pedestrian and other modes, such as bicycles, motorcycles, and cars on the road.
Availability of Walking path	This parameter is added to the original GWI index (combined with the original parameter "maintenance and cleanliness"). It reflects the need for, availability, and condition of walking paths.
Availability of crossings	The availability and distance between crossings to describe whether pedestrians tend to jaywalk when there are no crossings or when the distances between crossings are too long.
Grade crossing safety	This refers to the exposure of pedestrians to other modes while crossing, the time spent waiting and crossing the street, and the sufficiency of time given to pedestrians to cross signalized intersections.
Motorist behavior	The behavior of motorists toward pedestrians, which may well indicate the kind of pedestrian environment there is in that area.
Amenities	The availability of pedestrian amenities such as benches, street lights, public toilets, and trees. These amenities greatly enhance the attractiveness and convenience of the pedestrian environment, and in turn, the city itself.
Disability infrastructure	The availability, positioning, and maintenance of infrastructure for the disabled.
Obstructions	The presence of permanent and temporary obstructions on the pedestrian pathways. These ultimately affect the effective width of the pedestrian pathway and may cause inconvenience to the pedestrians.
Security from crime	The general feeling of security from crime in the street.

Discussion of the green city tends to focus on environmental sustainability in all of its aspects that relate to the action and outcome to improve the built environmental quality. Much of the knowledge it attempts to identify significant factors that influence the use of resources and interaction process as well as an action that should be conducted as a commitment to environmental protection. In some countries, the concept of the green city has been implementing to create environmental friendly. Many countries developed and apply the green city index to evaluate performance and achieve of urban government to improve the quality of urban area based on sustainability concept. In general, the green city index has several indicators that use to assess the green level of the urban area. These indicators apply qualitative and quantitative approaches to scoring various aspects that have a correlation with environment and infrastructure. Each city could have different indicators to assess and identify the degree of greenness and sustainability; however, the basic idea is the same. A study regarding green city index in European cities (EIU - Siemens, 2012) introduced 8 indicators that include CO2, energy, building, transport, water, waste and land use, air quality, and environmental governance. Meanwhile, in Asia, the study of green city index is quite different from the previous. It also has eight indicators to make an assessment; however, sanitation is included in the indicator since many cities in Asian are facing difficulty to manage sanitation (EIU - Siemens, 2012). Therefore, eight indicators for Asian cities are energy and CO2, transport, water, air quality, land use and buildings, waste, sanitation, and environmental governance. Using these indicators, the study assessed and identified cities that have already achieved or still pursuing to achieve category as a green city.

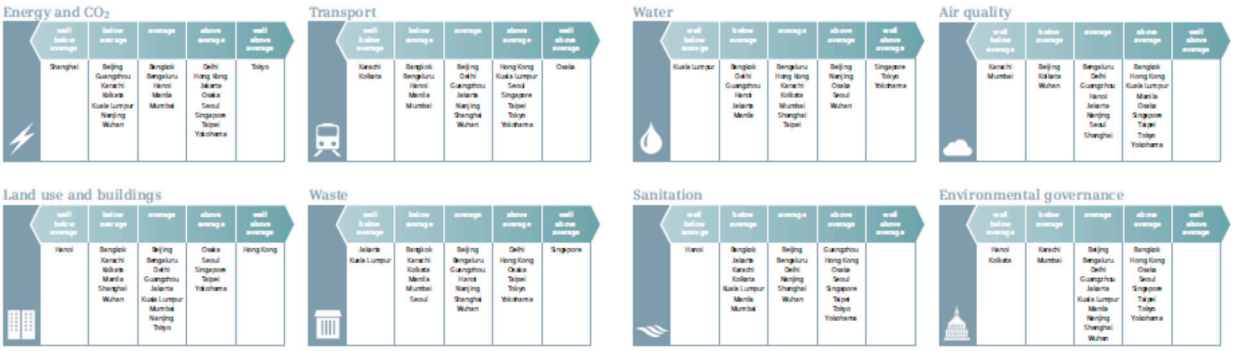
Besides the study above, the Asian Development Bank (ADB) also conducted research on this topic in 2012. Almost similar, the ADB also introduced some indicators to assess some cities in Asia. Although the report from ADB not specifically explained indicator for the discussion; however, there are some factors that were put for consideration such as spatial planning and technology, energy and building, transport, water, solid waste management, infrastructure, city greening, and green financial. All of these factors are considered could develop some understanding and awareness regarding factual condition in some cities in Asian. Furthermore, it also introduces the idea of investment activity that could support the concept of the green city. According to this research, the investment should concern with green infrastructure, low-carbon transport, green industry, energy efficient buildings, and city greening. The green transportation focuses to develop urban transport that integrated into the land use system, especially to support the movement from origin to destination of various activities. With regards to this idea, the urban government needs to develop link between transport, planning, and implementation. Furthermore, the plan should identify arterial and secondary road that generate movement. A guideline for the development would manage activity before and after the development process, as well as prevent problems such as congestion. Meanwhile, the green industry seeks innovation to support industrial activity that environmental friendly. In this manner, the industry activity emphasizes to manage basic problems such as waste and pollution as well as maintain the efficiency of energy. The discussion of green building become essential to help the city reduce energy consumption from several functions such as commercial, household, office, industry, etc. The concern not only focuses on the operational, but also the building material, construction, and maintenance. The city greening is another aspect that put into consideration, particularly since it attempts to encourage the idea of passive cooling for the urban environment.

Box 1. Green City Index in Asian and European Cities (EIU – Siemens, 2012)

The study of green city index was conducted by Economist Intelligence Unit that sponsored by Siemens (2012) to assess level of green from several cities in the world. Since some countries have different characteristics, the study adjusted some categories based on local condition and introduced five levels of assessment (well below average to well above average) based on the performance of those cities.

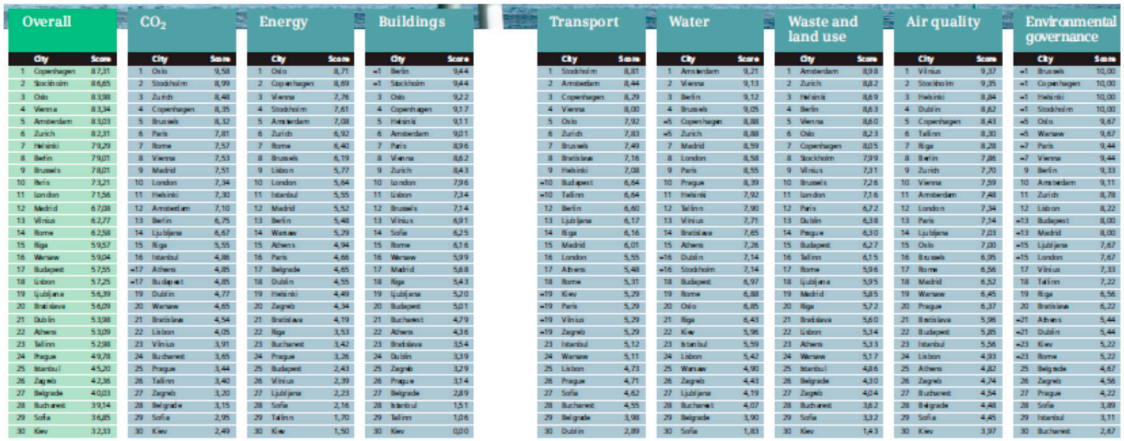
Asian Cities: The assessment for Asian cities focuses to identify green city index from energy and CO2, transport, land use and buildings, waste, water, air quality, sanitation, and environmental governance. Results from these study showed variation level of results, which most of them positioned at the average level. Each city has a specific problem that need to be solved to improve the environmental condition. Broadly speaking, only a few cities achieved levels of above average and well above average in Asia. Apparently many cities in this region have homework to improve the environmental quality. Gladly, many of them are willing to get better and work to manage these problems.

Figure 1. Green City Index for Asian Cities.



European Cities: Meanwhile, the assessment of green city index for European cities is a little bit different from the Asian cities. Since most cities in Europe do not have a problem with sanitation, this aspect is not include in the indicator. Furthermore, the study applies scoring technique to assess each city and does not use comparison to identify performance level (well below average – well above average) of those cities. Therefore, it is a little bit difficult to compare green city index between Asian cities and European cities. Nevertheless, the study for European cities focuses to assess CO2, energy, buildings, transport, water, waste and land use, air quality, and environmental governance. In general, most cities in Europe are focused to provide the green city in order to achieve sustainability; many of them have excellent environmental quality. The government develops policy and environmental governance to improve the condition. Besides that, support from the community reduces the burden of the government to maintain and improve the environment. The study also found a strong correlation between the wealth of the city and performance toward the idea of green. Wealthy cities have the capacity to improve the quality of the environment while low-income cities deal with a limited budget to manage basic development demand as well as an environmental condition.

Figure 2. Green City Index for European Cities.



The improvement of thermal comfort could reduce the use of energy consumption for air conditioning, fan, etc. Furthermore, it also could encourage inhabitant to walk instead to use motor vehicles to reduce the use of fuel consumption and air pollution. From the green infrastructure perspective, this approach attempts to seek for innovation for urban infrastructure that could manage and reduce consumption of energy such as energy saving for street lighting, energy saving technology for water supply and sewerage, power supply, etc.

3. Indonesia Case: The Green Pedestrian Facilities

As mentioned earlier, many cities in Indonesia are dealing with environmental problems. This condition affects the city performance, particularly the quality of living environment. To improve this condition, the government introduces some environmental policies to support environmental-friendly development, which one of them is the green pedestrian facilities. The implementation of green pedestrian facilities is referring to the concept of the green city in Indonesia under the Law no. 26/2007 on Spatial Planning. This Law has a correlation with the concept of sustainable development that related to ecological, economic, and social factors. Accordingly, the Law introduces the idea of a green city that emphasizes on the environmental-friendly city that could manage the utilization of natural resources such as water and energy in productive and efficient manner. Furthermore, it also stresses the need to reduce and manage waste, integrated transit of modes, synchronizes nature and built environment based on planning and design to provide healthy and sustainable development (P2KH, Ministry of Public Works, 2011:6). A statement of the P2KH policy becomes a reference to support green development in the urban area, including the green pedestrian facilities.

Dealing with reality

The development of green pedestrian facilities is part of the policy of Green City Development Program (Program Pembangunan Kota Hijau or P2KH). It has a link with the green transportation that emphasizes the importance to improve public transport, provide pollution-free vehicles, and reduce congestion. In this context, the concept of the green pedestrian facilities is considered as part of the implementation of green transportation. The development could deliver options for environmental-friendly transport modes (ITF, 2009; University of Cambridge, 2013) as well as creates connection to the green open space (Tanan and Suprayoga, 2013) and other major activities in the urban area. Understand the importance to upgrade the built environmental quality in the urban area many local governments are giving prioritization. Local government in some cities such as Yogyakarta (Malioboro), Badung (Kuta), and Bandung (Braga) develops policies to support the development of pedestrian facilities. The development in these cities not only focuses on physical factor, but it also concerns with other factors such as safety, security, and convenience. Awareness of these factors are significant for pedestrian facilities since the demand of walking is predicted will be increase in many cities in Indonesia in the coming years (Center for Roads and Bridges, 2011; University of Indonesia, 2013).

Research on pedestrian facilities attempts to elaborate some facilities that are essential to support walking activity. Some cities in Indonesia have provided pedestrian facilities that connect several major hubs (see Table 3); however, many of them have poor quality that unable to deliver safety, security, and convenience feeling for the user. In general, pedestrian facilities could categorize into two types, (1) the

main facilities and (2) supporting facilities. The main facilities are related to sidewalk and crossing (pedestrian bridge or zebra cross); meanwhile, the supporting facilities of any means are lighting, signs, information boards, public telephone, shelter or public transportation stops, bench, waste cans, and so forth. Aware of the importance of walking activity, many local governments are working to provide and improve pedestrian facilities to support this activity. Nevertheless, there is still some homework to improve the quality and performance of the pedestrian facility, particularly to meet the requirement of green city and walkability index.

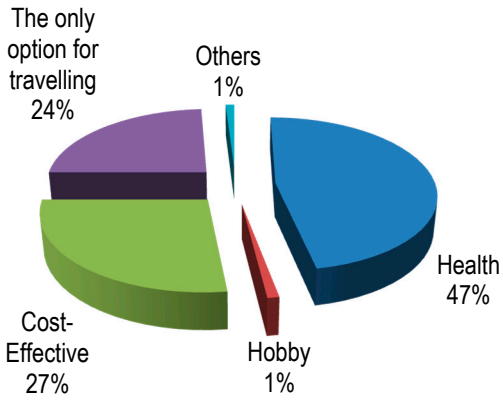
Table 3. Pedestrian Faciliteis in Some Cities in Indonesia (2007). (Source: Dit. BSTP, WTN 2007, in Tanan, 2011).

No	City	Number of stops	Number of crossing facilities	Number of sections	Number of APILL
Metropolitan City					
1	Surabaya	53	192	133	124
2	Bandung	35	165	3.523	182
3	Medan	36	312	239	43
4	Palembang	34	46	57	43
5	Makassar	70	324	80	46
6	Semarang	57	77	94	105
Big City					
7	Bogor	15	56	57	37
8	Padang	65	177	269	38
9	Pekanbaru	15	138	212	27
10	Samarinda	24	254	316	31
11	Tasikmalaya	13	85	304	25
12	Surakarta	42	71	134	63
13	Balikpapan	19	121	844	21

Research on green pedestrian facilities that involve walkability and green city index could support walking activity, which yet to be popular in Indonesia. A study by the Committee for Elimination of Leaded Gasoline (Komite Penghapusan Bensin Bertimbal or KPBB) revealed that 10% of respondents in Yogyakarta city preferred walking, while 40% respondents favored walking for distance less than 3

km in Surabaya city (KPBB, 2012). Furthermore, this research confirmed that walking is considered could reduce transportation cost (27%) as well as the only option for traveling (24%) (see Figure 3). Result from this study is almost similar to the study that conducted by the ABD (2011) that showed walking is favorable in many cities in Asia, particularly for the low-income inhabitant that has limited access to another travel mode.

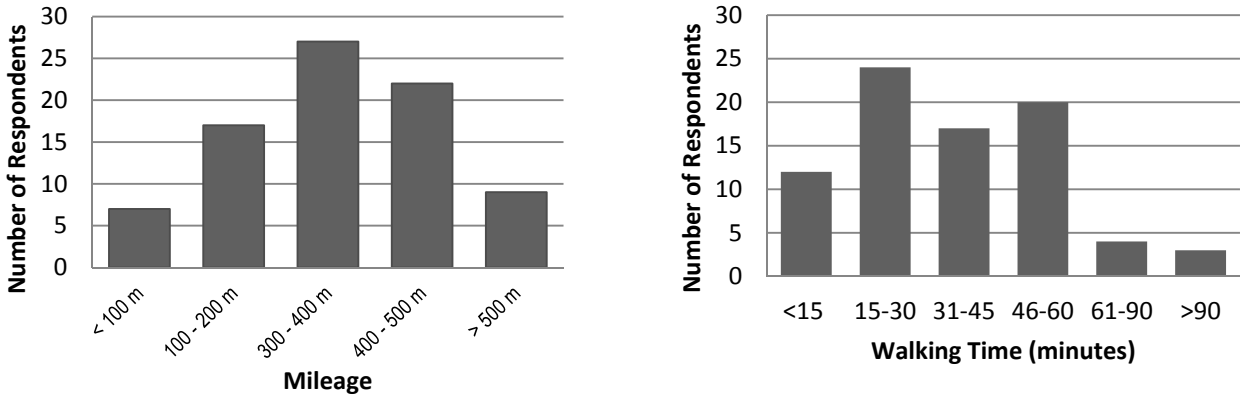
Figure 3. Walking Motivation in Yogyakarta, Surabaya, and Bandung City.



Source: Institute of Road Engineering, 2011

The research also found that inhabitant in Yogyakarta and Bandung cities have the ability to walk on a relative moderate, which less than 500 meters. Apparently, inhabitants in these cities have no difficulty to travel in a short distance. Information from this study would useful to develop traffic master plan and identify a strategic location to develop main pedestrian facilities. A study that conducted by the Ministry of Public Works – Institute of Road Engineering (2011) informed that the farthest walking distance for a pedestrian is in between 300 until 400 meters. Besides distance, time is another factor that needs to consider; according to the research walking is considered convenience in between 15 until 30 minutes.

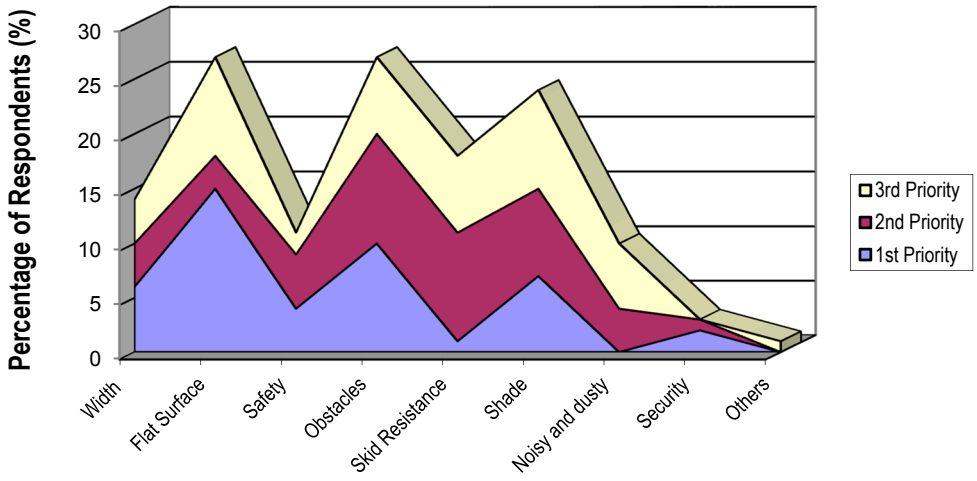
Figure 4. Correlation between mileage and walking time.



In 2009, the Ministry of Public Works – Institute of Road Engineering conducted a study to identify perception and give advice for sidewalk improvement in Cipacing region, Bandung. The research identified general problems that affect the quality of sidewalk and performance of walking activity. According to this research, unruly informal activity, disorder location of advertisement or signage,

limited green coverage (trees), as well as hot and humid temperature makes walking activity is not favorable in many cities in this country. Not a surprise that most of the respondents (95.6%) did not choose walking as a possible option for traveling..

Figure 5. Perception and Advice for Sidewalk Improvement.



Source: Institute of Roads Engineering, 2009

Another research on walkability in Yogyakarta city revealed that the sidewalk has a significant effect to support economic activity, particularly in the commercial area such as Malioboro area (Wibowo, 2008). This study found that the good quality sidewalk could encourage shopping activity and attract customers. A walkable sidewalk creates convenience feeling for the pedestrian, and, therefore, could enjoy several activities such shopping, sightseeing or other social interaction. Apparently, the Malioboro sidewalk could provide this condition and maintain its performance (ibid).

Although it seems promising, in reality many pedestrian facilities are in poor condition and unable to meet the basic standard for the user (Tanan and Suprayoga, 2013). Some studies indicated that improvement in pedestrian facilities is needed, particularly to deliver safety, security, and convenience. Furthermore, an observation also indicated that many pedestrian facilities could not provide service as expected. Poor planning and maintenance make many of them are in damage condition, have limited space, disconnected, and inaccessible due to the overlap with informal activities. Less concern for convenience factor such as thermal comfort, shading, and green factor make walking activity is not favorable; not a surprise that walking is not a popular activity. Therefore, to encourage walking activity, the ideas to develop pedestrian facilities that integrated with the green factor become significant. Collaboration between pedestrian facilities and green line could create linkages to support mobility, ecological balance, and improve esthetics factor for an urban area.

In general, this research focuses to discuss walkability factor that has correlation to the green city index as follows:

1. Elaborate and identify some factors that associate with the provision of pedestrian facilities for the green city that involve various urban stakeholders.

2. Assess and evaluate the correlation between condition (based on demand) and the role and possibility for implementation of the green pedestrian.
3. Develop master plan and design guidelines as a reference for green pedestrian facilities in the urban area.

Table 5. Indicator of Walkability Index.

No	Component of Walkability	Description
1	Infrastructure	Public facilities, services, and installations that are needed to support pedestrian activity which is equipped with lighting, signage system, etc.
2	Accessibility and connectivity	Easy to access or use the facilities to support walking activity and the sidewalk connectedness with various major activity hubs in the urban area.
3	Attractiveness	Aesthetic value of pedestrian facilities such as street furniture, lighting, sidewalk material, etc that provide or improve the quality of space.
4	Comfort and equality	Condition of pedestrian facilities that creates a sense of comfort, convenience or happiness as well as equality feeling for the user.
5	Safety	Safe environment for pedestrian facilities that ensure walking is protected from criminal activity.
6	Security	Secure environment for pedestrian facilities to prevent danger during walking activity.

Searching for the Green Pedestrian Facilities

This research is ongoing; it applies the mixed-method (qualitative and quantitative method) to gather data and analyze information regarding walkability and green city index. The qualitative method uses focus group discussion, interview, and design competition to seek for an innovative idea for the planning and development. Meanwhile, the quantitative method employs questioner and statistical data to identify and analyze potentials and problems that could support and hamper walking activity and development of pedestrian facilities. This method applies to a structure and quantifies information regarding trip characteristics, selection of walking route, socio-economic condition, and preference of the respondent. The study uses questioner to simplify the process and shorten time to analyze the data. Furthermore, it also conducts inventory survey using the scoring method to identify the physical condition and dynamic activity in some selected segments. This inventory would help to recognize problems in walkability as well as a green city index that affected the quality and performance of sidewalks. Data from the inventory will be used to develop a categorization of the sidewalk based on actual condition (potentials and problems) in the field.

The study has three phases to identify, assess and develop the green pedestrian facilities. The first phase (1) attempts to identify potentials and problems to develop parameter for the master plan and design guidelines. This parameter is expected could give guidelines to develop pedestrian facilities that safe, secure, convenience, attractive, and environmental-friendly to encourage walking behavior and support social interaction. The first phase of this study is almost completed; it introduced a proposal for green pedestrian facilities that combined walkability and green city index. The walkability index in this study is combined several studies regarding facilities and behavior of walking (Sonny, 2014; Asian Development Bank, 2012; Reyer et al., 2014; Nawrocki et al., 2014; Krambek & Shah, 2006) and introduces six components of walkability, which are: (1) infrastructure, (2) accessibility and connectivity, (3) attractiveness, (4) comfort and equality, (5) safety, and (6) security (see Table 3). These components are considered could represent significant elements of pedestrian facilities that should take into consideration in Indonesia. Later, these components are combined with the attribute of green city index from P2KH to develop planning and design parameter for green pedestrian facilities.

Table 6. Attribute of Green City Index.

No	Attribute	Description
1	Green planning and design	Planning for urban and region that concern with the capacity to manage resources in efficient natural resources and space, as well as create balance between natural and built environment.
2	Green open space	Green open space that give contribution for safety, comfort and aesthetic quality for urban and regional area.
3	Green community	Citizen groups or communities that concern with environmental issues and socio-cultural.
4	Green waste	Effort from the government, private sector, and community to manage and prevent waste problem in urban and regional area.
5	Green energy	Renewal energy that give benefit to balance development activity at urban or regional area.
6	Green transportation	Develop transportation system that could reduce negative impact on the environment.
7	Green building	Provide environment-friendly design and construction of a building.
8	Green waste	Concept to improve water absorption management as well as reduce peak of runoff for efficient use of natural resources.

Source: Ministry of Public Works, 2011

Meanwhile, the attribute for green city index in this research applies to develop parameter for green pedestrian facilities. The government of Indonesia introduced the Green City concept as a manifestation of the implementation the Law no. 26/2007 on Spatial Planning. This concept attempts to support the sustainable development that focuses on life balance between ecological, economic, and social factors. Apparently, the idea of the green city has a broad concern, not only focuses on the presence of green space alone. The even developed the Green City Development Program (Program Pengembangan Kota Hijau or P2KH) to support the green concept. This program is implemented by the Ministry of Public Works that attempt to create environmental-friendly city that use water resources and energy in productive and efficient manner, reduce waste, integrated transport systems, and ensure healthy environment to balance the nature and built environment based on the principles of sustainable development (Ministry of Public Works, 2011). Under the goal to improve living environment, the program introduced eight attributes of green city index as in Table 6.

Using a combination of indicators of walkability index and attributes of green city index, the research develops guidelines for green pedestrian facilities. In order to ensure its implementation, it conducted focus group discussion that discusses points that significant for the implementation of planning and design. The output from the focus group discussion is the reference of the green pedestrian facilities in Indonesia (see Table 5). The focus group discussion conducted on 28 January 2015; it gathered information on green pedestrian and evaluated the guidelines for planning and design. Some experts from various backgrounds such as civil engineering, urban planning, architecture, and environmental engineering were participated in the discussion. The output from this forum revealed the parameter for green pedestrian facilities as well as some useful information for preparation of design competition. Furthermore, these parameters use as reference to select three cities for observation as well as develop some questions for the interview. The discussion attempts to discuss policy and regulation, as well as the general condition of pedestrian facilities, what should improve and develop from the government officer and pedestrian (approximately 100 respondents) perspective. It also seeks the possibility to support the idea of green pedestrian as part of development policy for the urban area.

Table 7. Guidelines for Green Pedestrian Facilities (Source: adapted from Wibowo, 2008, ADB, 2011, Ministry of Public Works report, 2011).

Walkability Component		Green City Index							
		Green Planning & Design	Green Open Space	Green Community	Green Waster	Green Energy	Green Transportation	Green Building	Green Water
Infrastructure	Parameter	Policy/regulation and standard for urban area.	Physical infrastructure for green pedestrian facilities.	Community involvement in the green pedestrian provision.	Waste facility based on 3R concept.	Green energy of public lighting and WIFI.	Provide public transport and provide stops for mode transit	Environmental-friendly building.	Environmental-friendly drainage system.

	Indicator	Implementation of policy and regulation.	Physical infrastructure provision to support green pedestrian facilities.	Community participation to develop and maintain pedestrian facilities.	Master plan to select location of trash can. Waste sorting system.	Master plan of public lighting and WIFI.	Provide stops for public transport and develop special area for non-motorized vehicles access and parking.	Environmental-friendly design and construction (recycle materials).	Integrated drainage system and recreation.
Accessibility & Connectivity	Parameter	Connection between green pedestrian facilities and major hubs.	Connection of green corridor and local master plan.	Community participation to improve access.	Accessibility for waste collection vehicle.	Master plan green energy for pedestrian facilities.	Connectivity between transportation modes, sidewalk, and terminal hub.	Accessible building for all stakeholders.	Integration pedestrian facilities with promenade or waterfront.
	Indicator	Implementation of green pedestrian facilities that connects major hubs.	Connection between green open space and green corridor.	Community involvement in planning, development and maintenance.	Stop area for the waste collection vehicle.	Integration of green energy network and pedestrian facilities.	Sidewalks that connected terminal and major activity hubs.	Building that accessible for all stakeholders including disable.	Pedestrian facilities at the waterfront area for public.
Attractiveness	Parameter	Design of pedestrian facilities that attractive and convenience.	Vegetation selection that has aesthetic value.	Community involvement to make pedestrian facilities attractive.	Attractive design for public trash can.	Attractive lighting design.	Attractive design for public transportation stops.	Attractive design for facilities such as information building, security building, etc.	Attractive and practical design for pedestrian facilities and green water.
	Indicator	The implementation of design guidelines for pedestrian facilities.	Selection of vegetation that has aesthetic value and could improve thermal comfort.	Community participation to create social activity that gives value for the space.	Standard design for public trash can.	Standard design for lighting and solar panel.	Design public transportation stops that improve the quality of area.	Accommodates local character in the design and uses recycle materials.	Drainage system on-street and on sidewalk to prevent puddles.
Comfort & Equality	Parameter	Standard reference for comfortable and convenience pedestrian facilities	Vegetation (tree) to improve thermal comfort.	Community participation to maintain convenience quality.	Design and location of public trash can that accessible.	Lighting system that provide convenience.	Facility to support transport mode transit and access for non-motorized vehicle.	Accessible for all stakeholders and concern with thermal comfort.	Pedestrian facilities that accommodate all stakeholders to enjoy green water.

	Indicator	Implements standard for friendly pedestrian facilities.	Pedestrian facilities such as benches, location of trees that bring convenience.	Community participation to prevent discrimination.	Accessible access of public trash can.	Standard LUX and location for lighting.	Integrated and accessible sidewalks and public transportation stops for all users.	Energy-saving building: natural lighting and thermal comfort. Friendly design for disable.	Recreational facilities that integrated to pedestrian facilities and accessible for all stakeholders.
Safety	Parameter	Introduced standard for signage system at crossing area.	Safety vegetation standard.	Community participation to maintain physical condition.	Safety location of public trash can.	Lighting system for safety.	Safety location for transit and clear separation between motorized and non-motorized vehicle.	Standard construction for safety.	Construction standard for green water and pedestrian facilities.
	Indicator	Developed some installations for pedestrian facilities.	Select vegetation that safe for pedestrian.	Community involvement to maintain physical condition and performance.	Safety design standard for public trash can.	Standard lighting policy for pedestrian facilities.	Master plan for transit area of public transportation and separation between motorized and non-motorized vehicle.	Followed the safety standard of construction. Implemented safety standard procedure.	Standard requirements for safety and prevent erosion due to water absorption.
Security	Parameter	Programs to secure few areas that are considered unsecure.	Selection of secure vegetation.	Community participation to prevent crime.	Design of sealed public trash can.	Lighting system at crime-prone areas.	Safety design for public transportation stops.	Secure the building from vandalism.	Secure area for blue recreation activity.
	Indicator	Provided security system at unsecure areas.	Design and location of vegetation to ensure security.	Routine patrol that involve community.	Standard design of sealed public trash can.	Standard lighting system to secure crime-prone area.	Standard security design for public transportation stops (openness, easy to monitor).	Design and select building material that could prevent vandalism.	Standard security for blue recreation area.

Next Agenda

The second phase of this research will be conducted later in this year to gather information regarding experiences and preferences of pedestrian from a field survey in some cities that are selected based on Indonesian green city index. These cities have the capacity and willingness to develop green pedestrian that could improve the environmental quality. Input from the focus group discussion clarified that support from local government through legal aspect and commitment is essential to ensure the implementation (focus group discussion, 2015). Besides the primary survey, this research also introduces a design completion to enrich design ideas for pedestrian facilities. This competition is open for the public to encourage inhabitant to participate in the planning process, design, until development the

pedestrian facilities that are innovative and user-friendly. It is expected that this competition could accommodate input from the inhabitant, and, therefore, could create the sense of belonging to support and maintain these facilities.

Figure 6. Focus Group Discussion.

Source: Institute of Road Engineering – Ministry of Public Works (2015)

The third phase of this research is implementation, which focuses the arrangement between local government and the competition winner to develop the design in real condition. This process might take time due to the bureaucracy system; nevertheless, this bottom-up approach could deliver positive implication to the local development. The involvement of inhabitant in the process could help local government to provide green pedestrian facilities in the future.

4. Conclusions

1) The quality of pedestrian facilities needs to be improved in many cities in Indonesia. This improvement not only for physical condition, but it should concern with safety, security, and convenience factors as well. Apart from the poor condition, many of local governments are aware and have willingness to improve the quality and performance of pedestrian facilities.

2) Consideration of walkability index enriches the planning and design process for pedestrian facilities. Although the physical condition is necessary, consideration of social factors is also significant. These factors help to encourage inhabitant to walk and conduct social activity outdoor.

3) Awareness on the green city index become necessary for most of the cities in this country. It improves the urban planning and design process to upgrade the quality of built environment, including the pedestrian facilities.

4) This study is an ongoing research that still in the phase to find an arrangement that could support the planning and implementation process. It may take time; however, in general, it shows that many urban regions concern with the environmental quality and have willingness to upgrade this condition.

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