Research Paper

The Pedestrians' Stories: Towards Walkable Cities in Indonesia

Sustainability in Transportation

Author 1 Natalia TANAN, Ministry of Public Works and Housing; Indonesia

Author 2 Laksmi Tungga Dewi Jaya WISNU WARDANI, Reka Urban-Perubahan Iklim; Indonesia

Abstract

The paper discusses the process of providing walkable pedestrian facilities in cities in Indonesia which is considered lacking due to the limited number and poor quality. In the past few years, the government has been improving and developing the walkable pedestrian through policy and regulation, as well as physical development. This action is also linked to the green city program, in particular, sustainable transportation. However, the physical development and implementation of policy and green city program are not as smooth as expected due to the limitation of urban space, human resources, and finance. The study focuses on identifying problems and introduces arrangements that could improve the quality of pedestrian facilities. It applies interviews, questionnaires, and design competition to gather input from the public. Two cities in Indonesia are selected as the case studies, namely, Bogor and Banjarmasin. In each city, the study selects a location to elaborate for the design competition. The study analyses the walkability condition in each zone using nine parameters that emphasise on pedestrian conflict with other modes, availability of pedestrian path, availability of crossing, the safety of crossing, the behaviour of the motorcyclist, amenities, disable facility, buffer, and security. The finding points general problems such as poor amenities and lack of disabling facility, as well as the problem of motorcyclist behaviour. Besides problems, the study also identifies local potentials that could support the improvement of walkable pedestrian facilities. Those findings are important to improve the pedestrian facilities and develop an understanding of local condition since each city has different characteristics. The study applies those findings as an input to develop policy on the pedestrian facility of the green city for the Ministry of Public Works and Housing. The policy links to the green city program that addresses eight attributes, namely the green planning and design, open green space, green community, green waste, green energy, green transportation, green building, and green water. Further, the policy also emphasises five components of walkability, accessibility and connectivity, attractiveness, comfort and equality, safety, and security. Combination of green city attributes and walkability components are used for the planning-design and development of walkable pedestrian facilities in the urban area in Indonesia.

Keywords

Walkability, Pedestrian Facilities, Green Transportation, Green City

1. Introduction

In Indonesia, the walkability concept is being used to improve the quality of pedestrian facilities in urban areas. The implementation of this concept is expected could improve the accessibility and connectivity, upgrade the attraction or beauty, increase comfort and equality, safety and security. In short, the walkability concept should encourage walking activities that beneficial to the sustainable development of transportation in the green city to provide life balance in ecological, economic, and social aspects.

In Indonesia, the national government introduced the concept of green cities to improve environmental quality. Under the ministry of Public Works and Housing, the green city program, which called *Program Pengembangan Kota Hijau (P2KH)* was launched in 2011 that involves collaboration between cross-sectors. One of the points that address in the P2KH program is green transportation that links to the non-motorized vehicle and walking activity. This paper discusses walking experiences in a few cities in Indonesia and the national government efforts to implement the walkability concept that involves local governments and public engagements.

2. Methodology

This study focuses on analyzing the walkability index in two cities in Indonesia. The study combines the concept of walkability and green city. Therefore, it applies a mixed-method that combine qualitative and quantitative methods. The qualitative method is focused on the interviews and design competition, while the quantitative method is based on the walkability index. It is expected that finding from this study could help to identify potential and problems in walking, as well as deliver design criteria that could support walking and green transportation.

2.1. The Walkability Index

The walkability index focuses on identifying and assessing the quality of walking (Arup, 2016; Qingnan, Claudia, Sarmiento, & Obelheiro, 2013; Jeff, 2012; Leather, Fabian, Gota, & Mejia, 2011; Krambek & Shah, 2006). This study applies two methods to assess the walkability index, the first is the Global Walkability Index and the second is the walkability approach from ADB. The Global Walkability index is an approach that uses to evaluate the quality and performance of walking using three components, (1) safety and security, (2) convenience and attractiveness, and (3) policy support (Krambek & Shah, 2006). On the other hand, the walkability approach from ADB also applies the concept from GWI with some adjustments on Asia context (Tanan & Darmoyono, 2017). The study considered that the ADB approach could help to identify the priority areas that need for improvement (e.g. areas with high pedestrian traffic but with low walkability assessments) (ibid).

Table 1 Comparison of GWI and ABD Walkability Approach

Comparison Factors		GWI	ADB
Component	Comfort	√	√
	Safety	√	√
	Security	√	-
	Attractiveness	√	-
Assessment method	Qualitative	√	√
	Quantitative	√	√
Implementation	Cities in Developed Country	√	√
	Cities in Developing country	√	√

2.2. The Green City

The green city concept was implemented in some countries in the world to create a friendly living environment (The Economist Intelligence Unit, 2012; Matthew, 2006; Shandu et al., 2014). In Asia, the ADB introduced the green city index that has eight indicators, namely energy and CO₂, transport, land use and buildings, waste, water, air quality, sanitation, and environmental governance (The Economist Intelligence Unit, 2012). This index was adapted to the Green City policy in Indonesia and used to assess the green city index in some cities. This study also uses the green city index to analyze the correlation between mobility and land use planning system in Indonesia, in particular, to support non-motorized transportation and encourage walking activity.

3. Walking Experiences in Indonesia

In urban areas in Indonesia, walking activities are still not an option. However, Indonesia is considered as the lowest rank in walking activities with an average of 3,513 steps per day (Althoff et al., 2017 in BBC, 2017). Compare to other cities or countries such as Hong Kong with the average citizen walks 6,880 steps per day and Ukraine with an average of 6,107 steps per day (ibid). The study of pedestrian facilities in urban areas in Indonesia aims to find out the walkability index in pedestrian facilities as well as identify why walking is less favourable in this country.

In Indonesia, the concept of green transportation was introduced in 2011 under the government program of Green City policy in order to support the Law no 26/2007 on Spatial Planning. The Green City policy focuses on bringing balance between ecological, economic, and social factors (Ministry of Public Works and Housing, 2011; Darmoyono & Tanan, 2015). The program was called Green City Development Program (*Program Pengembangan Kota Hijau* or P2KH), the Ministry of Public House and Housing is responsible for managing this program. This program has four attributes, namely (1) water resources and energy, (2) waste management, (3) integrated transport systems, and (4) healthy environment between nature and built environment using the principles of sustainable development (Ministry of Public House and Housing, 2011). The green transportation concept is linked to the attribute ecological. The concept encourages walking activity as a significant activity to reduce the use of the motor vehicle. It is expected that the provision of pedestrian facilities could improve the physical condition, as well as economic and social activities in the urban area.

Table 2 Green City Attributes P2KH in Indonesia

Attribute	Description
Green planning and design	Planning for city and region that focuses on the capacity to manage resources efficiently and create balance between nature and built environment.
Green open space	Green open space that provides safety, comfort and aesthetic quality for urban and regional area.
Green community	Communities that concern with environmental issues and socio-cultural.
Green waste	Government, private sector, and community manage and prevent waste problem.
Green energy	Renewal energy that balance development activity in city or region.
Green transportation	Transportation system that could reduce negative impact on the environment.
Green building	Building design and construction that environmentally friendly.
Green water	Water management: water absorption management and reduce peak of runoff for natural resources.

3.1. City of Bogor

The city of Bogor close to DKI Jakarta and it is known as a destination for tourism (Botanical Garden, the Palace of Bogor, etc.) and education (Bogor Agricultural Institute or IPB). As a one of the cities that has significant history, Bogor has a historical street, the corridor of Sudirman street. The Sudirman street is know as the heritage axis that connected the Palace of Bogor. This street is a secondary arterial street that has two ways and four lanes, which each of them has a width approximately four meters. This street also has a wide sidewalk with width around 2.5 meters to 3.5 meters. Although the sidewalk quite wide, nevertheless, it has limited trees shade, limited facilities for disabilities, and used as parking are for motor vehicle at some parts. Those conditions challenge this corridor as a heritage axis. Improvement is needed to upgrade the quality of pedestrian facilities as well as strengthen the historical character.

Figure 1 Corridor of Sudirman Street, Bogor City (adapted from the Municipality of Bogor, 2014)

3.2. City of Banjarmasin

Banjarmasin is the capital city of the South Kalimantan Province. The city accommodates various activities such as trade, government administration, education, social services, and so on. The Martapura river through this city and used as a route for water transportation, while the waterfront is a public open space for the local people. This waterfront area is flanked by two major streets, the Jendral Sudirman street and Pierre Tendean street. Along these streets are commercial areas, offices, residential, and education facilities. Because of its scenic view, this area becomes one of the tourist destinations in Banjarmasin. Both locals and tourists enjoy the landscape of the waterfront as well as for sports and culinary destinations. Aware of the potential, the city government improves the open space along the waterfront area. Even though the improvement is being carried out, efforts are still needed to escalate the quality of pedestrian facilities. The provision of disabled facilities, growth shade trees, upgrade the signage system, develop vehicle parking area, and others.

Figure 2 Corridor of Martapura Promenade, Banjarmasin City

4. Achieving Walkable City in Indonesia

Achieving a walkable city is a challenge for most cities in Indonesia. However, to support the green city concept, in particular, the green transportation concept, those cities have to accommodate this demand and improve the quality of pedestrian facilities. Therefore, to identify the quality of pedestrian facilities, the Ministry of Public Works and Housing conducted a survey and later followed by a design competition to gain innovative idea from the public. Then, this input will be used to planning and design pedestrian facilities in a guideline for Indonesian cities.

4.1. Walkability Survey in Bogor

The walkability survey in Bogor is conducted along the corridor of Sudirman street. It applies two methods, (1) inventory of pedestrian facility and (2) interview to the pedestrian. The survey of inventory pedestrian facilities uses the Global Walkability Index to identify some factors related to the current condition of the pedestrian facilities at the site. While, the pedestrian interview is about getting information on pedestrian perceptions and preferences, as well as characteristics of pedestrian and the trip. Input from the survey helps to identify the condition of pedestrian facilities based on the types of activities and trip purposes.

Apparently, the pedestrian inventory survey is a site-specific that focuses on the segments on the right and left along the corridor of Sudirman street. The survey identifies problems and potentials of the pedestrian facilities along the corridor. It also points the type of pathways and the intersection, green open space (parks), location with limited interaction with to the motorized vehicle. The results of the assessment of this corridor are as follows (see figure 3):

Based on the survey result, the sidewalk has three different characteristics, (1) sidewalk close to the Palace of Bogor has the best quality due to the wide dimension, the low conflict between pedestrian and other modes of transportation and equipped with a barrier. The second (2) is the corridor with green shade trees that provide shade and create a comfortable walking environment. The third (3) is the commercial segment, which has the lowest score of the walkability index. Most of the sidewalk space was used as parking areas for motor vehicles, which limited the access for the pedestrian. Another problem that identifies from the survey is the speed of the motor vehicle, which could danger the pedestrian crossing the street.

This zone has 3 clusters, (1) the segment next to the Bogor Palace (the best condition); (2) the green open space area that is clean, calm and comfortable to walk; and (3) a commercial area where most of the space on the sidewalks is for motor vehicle parking area.

From the survey, the commercial area has limited amenities and narrow sidewalks at some segments. The corridor also has limited number of pedestrian-crossing and no pedestrian bridge to support mobility. A few parts of the sidewalk are under construction, which close the pedestrian accessibility.

Figure 3 Walkability Rating at the Design Competition Site, Bogor City

The walkability rating at corridor of Sudirman Street is as follows:

Table 3 Rating of walkability at corridor of Sudirman Street	
Parameter	Walkability Rating
Conflict – pedestrian and other mode of transportations.	85.14
Availability of pathway	82.00
Availability of crossing	74.29
Crossing safety	67.62
Behavior of motor vehicle user	52.57
Amenities	44.00
Infrastructure facilities for disable	53.71
Obstruction	80.57
Walking security	86.29
Total Average	69.58
Results	Average

The interview survey focuses to gain information about perception and preference on pedestrian facilities and characteristics. the study uses two formulas to determine number of samples, (1) Population unpredictable/known – population is the city inhabitant and (2) population unpredictable/known to achieve accuracy of 95%. Bogor City has population approximately 1,013,019 people (BPS City of Bogor, 2014). The calculation is as follows:

$$n = \frac{1,013,019}{1 + (1,013,019 \times 5\%^2)} \quad (1)$$

Result, $n = 399.84 \approx 400$ sample

$$n \geq \frac{1}{5\%^2} \quad (2)$$

Result, $n \geq 400$ sampel

The calculation shows that the study needs at least 400 samples to gain 95% accuracy, while the survey manages to collect data from 480 respondents, which is more than the minimum requirements.

The survey reveals that in general, most of the respondents are agree that facilities for pedestrian are available and accessible (with some notes). Nevertheless, they point out the condition of sidewalk that not friendly to the special need people, in particular people with disability, elderly, children, and pregnant woman (see Figure 4). The survey also requests the participants to make a list of priorities three times to see what is considered necessary to pedestrians (see Figure 5). In the first round, the respondents demand to improve the infrastructure for disabilities (16.5%). The second round shows that the participants demand a pedestrian-crossing to cross the street (19.8%). The third round, the respondents' concern with the motorists' behavior that less interest in pedestrian safety (15.8%). These findings help the study to identify the problems and potentials of this corridor and seek a creative solution.

Figure 4 Ranking of the Pedestrian Facilities Condition at the Competition Site, Bogor

Figure 5 Respondents' Priority for the Facility Improvement, Bogor

4.2. Walkability Survey in Banjarmasin

In Banjarmasin, the walkability study also conducts through the inventory of pedestrian facilities and interview with the pedestrians. The study applies the Global Walkability Index to collect data and analyze the condition of pedestrian facilities along the Martapura promenade. In order to get information and understand pedestrians' perception and preference, characteristic of the walkers and journeys, this study conducts interviews. In general, the walkability survey provides information about the condition of pedestrian facilities in Martapura promenade based on types of activities and trip purposes.

The pedestrian inventory survey along the Martapura promenade focuses on two corridors of Sudirman street and Pierre Tendean Street between segments Merdeka bridge and Old Market bridge (Jembatan Pasar Lama). The survey identifies potentials and problems as follows:

Figure 6 Walkability Rating at the Design Competition Site, Banjarmasin

Sudirman street is one of the major streets in Banjarmasin city that has many of government offices. As a major street the vehicle speed on this street is quite high. Nevertheless, during peak hours this street deals with traffic congestion. Almost similar, the Pierre Tendean street is in an area that dominated by residential, educational, and mixed functions. Despite the vehicle speed is moderate, during peak hours the street also deals with congestion problems. In order to provide pedestrian safety, improvement on pedestrian facilities is needed. Based on the survey, the pedestrian facilities along at this segment have characteristics: (1) main access to the Martapura river and water transportation, (2) each street has a different tone; Sudirman street (domination of government offices) and Pierre Tendean Street (housing area, education facility, and mixed-use area), (3) limited green corridor – shade trees, (4) high speed vehicle on Sudirman street, (5) limited parking space at Sudirman street and Pierre Tendean street, and (6) traffic congestion during peak hours on both streets. In order to provide safety to pedestrian, improvement on pedestrian facilities is needed.

The walkability rating at corridor of Sudirman Street is as follows:

Table 4 Rating of walkability at the Design Competition Site

Parameter	Walkability Rating
Conflict – pedestrian and other mode of transportations.	94.19
Availability of pathway	82.58
Availability of crossing	71.61
Crossing safety	70.32
Behavior of motor vehicle user	70.97
Amenities	43.23
Infrastructure facilities for disable	20.00
Obstruction	83.55
Walking security	90.97
Total Average	69.71
Results	Average

From the interviews, the study gathers information about perception and preference on pedestrian facilities and characteristics. The Banjarmasin case also wants to achieve accuracy of 95%, therefore it applies two formulas which are, (1) Population unpredictable/known – population is the city inhabitant and (2) population unpredictable/known - assuming Banjarmasin is a destination city for tourism; therefore, some of the pedestrians could be tourists from other cities. Banjarmasin City has population approximately 666,223 people (BPS City of Banjarmasin, 2015). The calculation is as follows:

$$n = \frac{666223}{1 + (666223 \times 5\%^2)} \quad (1)$$

Result, $n = 399,759 \approx 400$ sampel

$$n \geq \frac{1}{5\%^2} \quad (2)$$

Result, $n \geq 400$ sampel

From the calculation of formula 1 and 2, the study needs at least 400 samples in order to get 95% accuracy. The survey only collected data from 300 respondents, nevertheless, if the calculation is reversed, the error level of 6.4% is still acceptable.

The interviews results show that most of the respondents consider that the conflict with the motor vehicle is minimum, as well as pedestrian facilities, are provided along the promenade (see Figure 7). However, many of them argue that the facility for disable, security, and pedestrian-crossing facility are limited and need to be improved (see Figure 8). Therefore, the study asks the pedestrians (respondents) to make a list of priorities regarding improvement on pedestrian facilities. The list has nine-parameters of priorities that related to the pedestrian facilities improvement and respondents must make the list of priority three times. Accordingly, these lists will help the study to understand the respondents' preferences and their rank of priorities development. Still, some of the respondents have difficulties in setting priorities. Because of this condition, the study only selects the top three

over the nine-parameters. The three stages of respondents' preferences are: (1) reduce the speed of motor vehicle for pedestrian safety (motorists' behaviour) (15.3%), (2) provision of pedestrian-crossing facilities (currently this segment does not have any pedestrian bridge) (16.7%); (3) improve the amenities (12.7%). The ranking of the three stages priority can be seen in the following Figure 8.

Figure 7 Ranking of the Pedestrian Facilities Condition at the Competition Site, Banjarmasin

Figure 8 Respondents' Priority for the Facility Improvement, Banjarmasin

5. The Design Competition

The Ministry of Public House and Housing would like to gather more ideas from the public; therefore, they initiate a design competition in those cities, Bogor and Banjarmasin. The design competition was held in 2015 and aims to get smart, innovative and realistic ideas for improving the quality of pedestrian facilities based on green city concept in Bogor and Banjarmasin. The competition introduced three design criteria based on the green city concept, namely: (1) green transportation, (2) green building, and (3) green open space. Besides that, participants have to meet the requirements in each city. In Banjarmasin, the participants have to design a pedestrian path along the riverbank. At present, the pedestrian lines at the edge of the water are cut off by the bridge. The continuous pedestrian path at that time was not yet possible because the bridge height was too low. In the future, Banjarmasin city government has a plan to increase the height of the bridge so that it is possible to make continuous access under the bridge. The design of pedestrian paths under the bridge must prioritize aspects of safety and security for the user, mainly because this river is the circulation path of freight and passenger ships. Besides, participants must also consider the use of space under the bridge at night. User safety and security are essential aspects of design. While in Bogor, the participants have to manage limited space of pedestrian because of trade and service activities that forced the pedestrian walking on the street at specific locations. With this condition, Sudirman street corridor has not been able to provide an image as a heritage axis that has historical value. The design competition is expected to improve the quality of pedestrian facilities along the Sudirman street corridor that encourage walking activities. The design competition got positive responds and received twenty-two design proposals.

5.1. Bogor City

The “Dialogue between Spaces” was the second winner of the design competition. It has the meaning of collaboration between nature, economic, and cultural factors as a representation of a public space in the city of Bogor. According to the team of jury, this concept had original idea and focused on utilize the local characteristic. Using the tag-line of Dialogue between Space, the designers would like to introduce the 3K zone label-attributes: Contemplating Space-Contemporary Space-Colonial Space-and the nodes connecting and set the axis of Sudirman Street. Other interesting points from the design are:

1. Integrated the walkability principle (improve pedestrian facilities, provide comfort and equality, and safety).
2. Build a sky walk to connect areas such as residential, commercial, office and recreation, and landmarks.
3. Improve green open space through develop buffers, multipurpose pathways, natural furniture, and connected green canopy.
4. Encourage integration of eco-friendly transportation with the Pedestrian path.
5. Innovative design of pedestrian facilities and amenities (book shelter, story frame, Skywalk, swing chair, pedestrian path with Batik motif, etc.).

Figure 9 The 3K Zones of the Sidewalk at the Sudirman Street, Bogor

5.2. Banjarmasin City

The “Great City Walk: Banjarmasin – Martapura Green Movement” was the winner of the design competition. The designer translated the local dialect of Baugal (Banjar dialect), which means 'moving'. Moving defined the urban citizens activities, able to walk, run, and move freely. This made the idea of this design original and rooted locally. Besides that, the designer also able to combine the components of the city of Banjarmasin that are integrated with the elements of the Martapura River. The designer creatively associates with the network system approach, based on strengthening the urban infrastructure network system as well as the river infrastructure network system. The designer succeeded in describing future infrastructure ideas, including:

1. River traffic with waterways and interchanges.
2. Integrated the street network system with the river terminals.
3. Drainage system integrated with river revitalization.
4. Demonstrating energy traffic intersection and stop APU stops.
5. Develop social infrastructure in pedestrian and community infrastructure designs.
6. Ecological integration in complementary infrastructure and street equipment.

Figure 10 The Concept of Great City Walk: Banjarmasin – Martapura Green Movement

6. Conclusions

The study concludes some findings:

1. In general, the local governments have provided pedestrian facilities; however, some facilities still need to build and improve to encourage walking activity.
2. Study on the walkability index helps to identify potentials and problems regarding the walking activity.
3. Further study regarding the walkability index needs to be carried out after the improvement of pedestrian facilities to identify the potential increase of walking activity.
4. The design competition brings some innovative ideas to improve the quality of pedestrian facilities. Nevertheless, a few of the ideas must be adjusted to the real condition.
5. The public participation through the survey interviews and design competition is useful to gather information and understanding regarding the idea of pedestrian facilities from the public.

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