Accessible pedestrian paths for educational setting design evaluation: Case study in Surabaya and Bandung City, Indonesia and Brisbane City, Australia

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Abstract. Covid-19 has changed the city and human lives, especially related to walking. The lockdowns in several countries such as China, Japan and Australia have prescribed urban residents to stay within approximately five to ten kilometres radius of their homes. The lockdowns were found helpful in suppressing the Covid-19 spread at a local level. However, more discussions are needed on the well-being and health of residents during a hard time. In Australia, two people could exercise during lockdowns for one hour within the resident's neighbourhoods. The needs for accessible pedestrian paths in the neighbourhood are essential during Covid-19. Some universities were closed during the lockdowns in the educational sector, but students could stay near the campus and use facilities within. Many students need accessible pedestrian paths to walk to the campus from their apartments and shopping centres. This lockdown further generates the idea to research pedestrian paths' accessibilities in some educational context in Surabaya, Bandung, both in Indonesia and Brisbane, Australia. The simple access evaluations are conducted with photography documentation and simple measurement based on ADAAG 2010 and local regulations. Therefore, the pedestrian paths in two locations in Indonesia are found to be less accessible, while pedestrian paths in Brisbane are found to be more accessible. The less accessible Indonesian pedestrian paths are caused by a lack of spaces, poor construction, and pedestrian paths' poor management. Meanwhile, better access standards, better infrastructure management, and proper construction are essential key points for better accessible pedestrian paths.

1. Introduction

In 2020, Covid-19 changed the city and human lives primarily related to walking. In China and Australia, the lockdowns have prescribed urban residents to stay within an approximate radius of five to ten kilometres of their homes. The lockdowns were found helpful in suppressing the Covid-19 spread at a local level. However, more discussions are needed on the well-being and health of residents during a hard time. In strict Australian lockdown, two people could exercise during lockdowns for one hour within the resident's neighbourhoods. The needs for accessible pedestrians paths in the neighbourhood are essential during Covid-19. Some universities were closed during the lockdowns in the educational context, but students could stay near the campus and use the facilities within. Many students need accessible pedestrian paths to walk to the campus from their apartments and shopping centres.

In contrast, in countries like Indonesia, strict lockdown has not been implemented. Social distancing or social restrictions have been chosen to stop Covid-19 while mitigating the economic downturn. In Indonesia, people have begun doing healthy behaviour such as running and cycling with limited mask usage. This behaviour has created a surge of sports apparatus purchases, like bicycles, sports watch, sports attires, etc. However, pedestrian paths' poor accessibility, as argued by Ikaputra and Sholihah [1]; and Komardjaja and Tjong [2], created the conversion of the road into bike tracks or jogging tracks. This conversion further generates the idea of researching pedestrian paths' accessibilities in an educational context in Surabaya, Bandung, Indonesia and Brisbane, Australia.

Several walkability research projects have been conducted in Surabaya and Bandung as a comparison. Tanan et al. [3] and Wibowo et al. [4] have measured the walkability assessment in Surabaya Commercial Area and Bandung. The walkability score given by Tanan et al. [5] is relatively high from inputs of Surabaya residents for a commercial area in the central region, namely Dharmawangsa road sidewalks, Pemuda road sidewalks, and sidewalks in front of Gubeng Rail Station. The score of 71.11, 82.22, and 62.2 are given from the three areas, but some disability access features were found inadequate. Contrary to Surabaya, the scoring of Bandung pedestrian paths was lower than Surabaya [6]. Two pieces of research have shown the need for accessibility improvement, especially regarding disability accessibility.

Leather et al. [7] also argue that Asian cities were impacted by motorization and limited pedestrian facilities development access. The study included field walkability surveys, pedestrian interviews, and other factors in thirteen cities in Asia. Leather et al. [8] found poor pedestrian path conditions because of massive road expansion for automobile and motorcycle usage. Therefore, a recommendation is given to involve more stakeholders in improved policies and projects related to pedestrian paths.

United States Access Board. [9] has and United States Access Board. [10] has prescribed model accessible sidewalks in Chapter 5 and accessible curb ramp examples in Chapter 6. These accessible designs are found in Australia as prescribed in Standards Australia, AS 1428.1-2009: Design for access and mobility [11]. Other Australian standards were found to support the ADAAG 2010, such as Standards Australia. [12] and Standards Australia. [13] on amendments to access requirements, as well as Standards Australia. [14] and Standards Australia. [15] about Tactile ground surface indicators. The designs were proven to be accessible by some researchers such as Ward [16]; Ward et al. [17]; Franz et al. [18]; and Brett [19]. Even though Franz et al. [20] mention some minor critics related to limited accessible housing supply to support people with disabilities well-being.

Concerning the education sector, Marginson et al. [21] analysed the higher education in the Asia-Pacific related to globalisation. Marginson et al. [22] have mentioned the shifting of power worldwide higher to the Asia-Pacific region. Several 'world-class' universities are developed in Singapore, Hongkong, China, Korea and Taiwan. However, some reforms in higher education are effective enough in developing Asian countries, such as in educational participation rate, levels of university resources, and freedom of speech of academicians. Access to people with disabilities in Indonesian education institutions is not facilitated, as argued by Thohari [23]; Parker [24]; Grimes et al. [25]; and Japan International Cooperation Agency et al. [26].

In contrast, in Australia, Brett [27] has analysed the students with disability in Australian higher education. He praised Australian higher education for providing accessibility options for their students with disability. Therefore, we need to compare Australia's educational setting to create more sustainable, accessible pedestrian paths for the future.

2. Methodology

The simple access evaluation is chosen because of Covid-19 restrictions in Indonesia and research limitations in Australia. The evaluation involved photography documentation and simple measurement based on ADAAG 2010 [28] and local regulations. The objects chosen are pedestrian paths located in the surrounding University Campus in Bandung, Surabaya and Brisbane. The pedestrian paths are public areas and are not managed by the Universities.

The pedestrian paths selected are located on major roads connecting the Universities and at least one central apartment with more than 100 rooms. The apartments are also easily accessible by cars, public transport (taxis and minibuses), and online taxis. The sidewalks are selected with a google mapping process and focus group discussions with five students in two Indonesian Private Universities. However, sidewalks in Brisbane are taken to compare sidewalks' condition in Indonesia (Surabaya and Indonesia). The condition sidewalks' condition was evaluated in great detail due to Covid-19 restrictions, but the University students were involved in walkthrough evaluations of each sidewalk. Photo documentation was taken during the walkthrough, while researchers, after the walkthrough, filled out a simple checklist adopted from [29] and local regulations.

3. Results and discussions

There are three study cases evaluated in this paper from 2018 until 2021. Three cases are Siwalankerto Street sidewalk in Surabaya, Surya Sumantri Street sidewalk in Bandung, and Musk Avenue sidewalk in Brisbane. Three sidewalks were chosen because of the educational institutions located in the area and a massive number of students living in the neighbourhood.

The first case study is the Bandung sidewalk. The case study is located along Surya Sumantri Street between Maranatha Christian University (MCU) and Majesty Apartment (figure 1). Ten thousand (10,000) MCU students potentially used the sidewalk before Covid-19. The sidewalk was not appropriately plannied, because segmented urban development of the Surya Sumantri area (figure 2). The sidewalk was found wide enough for pedestrian usage and parking; however, paths mismanagement happens because of weak control of local government and landowners. Many retail and illegal hawkers converted the paths for parking and extension of eating spaces. Therefore, it is pretty hard to create accessible pedestrian paths, including people with disabilities, in the context.

The Surabaya sidewalk case study is located along Siwalankerto Street between Petra Christian University (PCU), High-point Apartment and ANTA parking area (figure 3). Eight thousand eight hundred five (8,805) of PCU students potentially used the sidewalk before Covid-19. The sidewalk was not designed properly because Siwalankerto Street was developed from a village to a built-up urban context in the 1970s without planning interventions. The access standards cannot be fulfilled because villagers own the sidewalk land (figure 4). The Surabaya Government has tried improving the accessibility of pedestrian paths but stopped because of Covid-19. Besides that, flooding created barriers to accessible pedestrian paths because many houses are elevated 50 cm to 100cm from the roadside. Therefore, the pedestrian paths are not suitable for people with disabilities.

The third case study is the Brisbane sidewalk (figure 5). The case study is located along Musk Avenue within the Kelvin Grove Urban Village, connecting the Queensland University of Technology (QUT) Creative Industry Precinct and several apartments (Urban Village Apartment, IGLU Apartment, Zest Apartment). There is no accurate data on QUT students utilising the pedestrian paths, but presumably, 48,503 students can use the sidewalk. Therefore, the sidewalk facilitates more usage than in the other 2 case studies. The pedestrian paths were properly designed in 1998 but had several steep sections because the sidewalk was prepared following the old road alignment of Musk Avenue, created in 1914. The pedestrian path is found accessible according to ADAAG 2010, and it has some

Tactile ground surface indicators and curb ramps (figure 6). These features are accessible to blind users as well as wheelchair users. Some wheelchair users might find some sections are too steep and use other connecting sidewalks that have 1:12 slopes. Musk Avenue's parking is catered to and managed correctly on the roadside, creating no conflict with pedestrians. Meanwhile, building accesses might be found crossing some sidewalk sections, but the crossings are equipped with Tactile ground surface indicators and contrasting colour ground markings (figure 7).

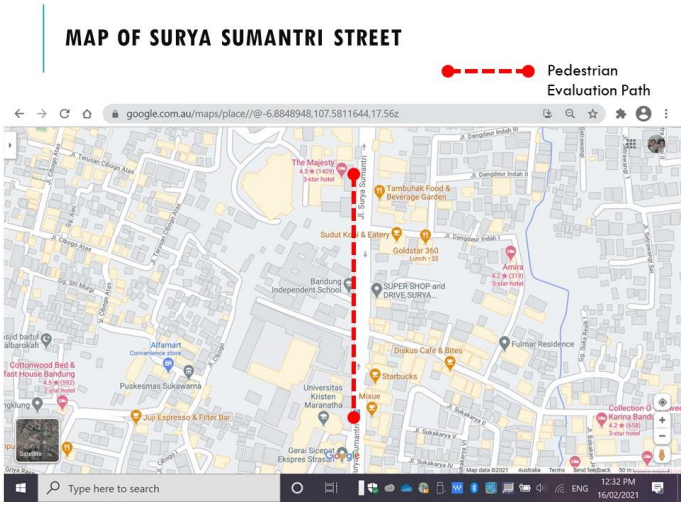

Figure 1. Map of Surya Sumantri Street and Pedestrian Paths Evaluation Route

Figure 2. Photos of Surya Sumantri Street's Pedestrian Paths Evaluation

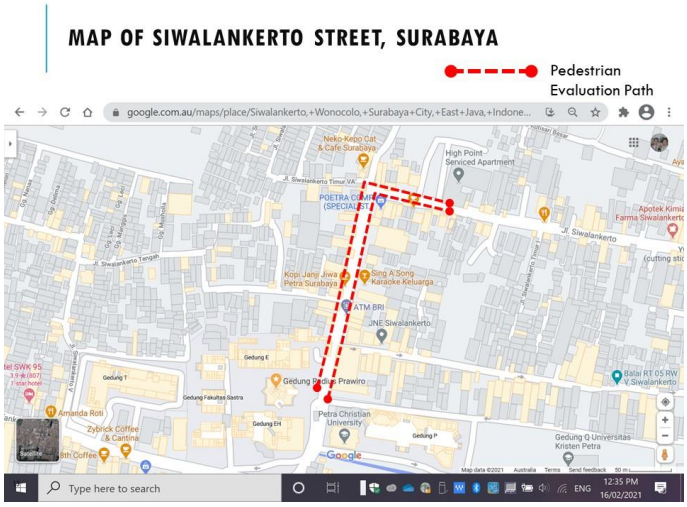

Figure 3. Map of Siwalankerto Street and Pedestrian Paths Evaluation Route

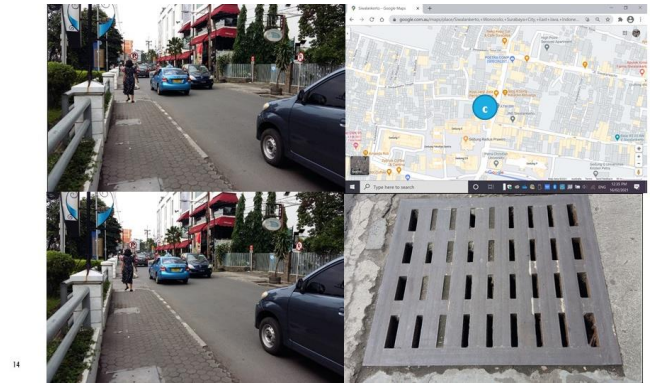

Figure 4. Photos of Siwalankerto Street's Pedestrian Paths Evaluation

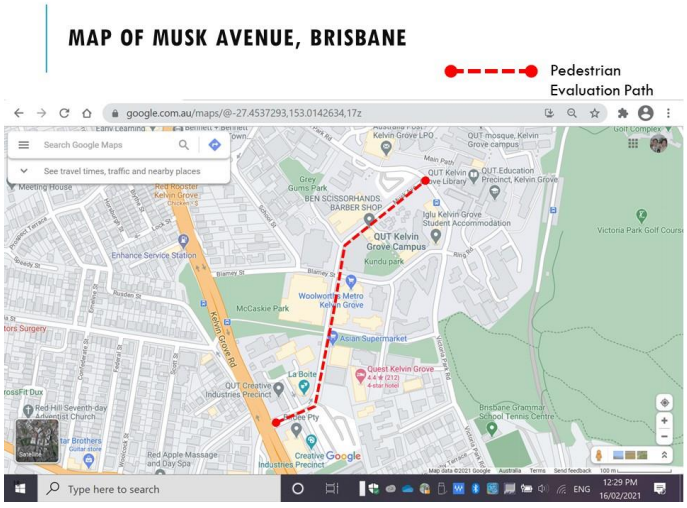

Figure 5. Map of Musk Avenue and Pedestrian Paths Evaluation Routes

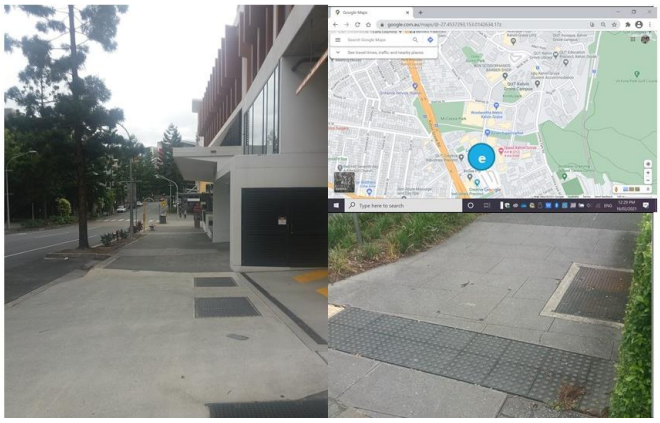

Figure 6. Photos of Musk Avenue's Pedestrian Paths Evaluation

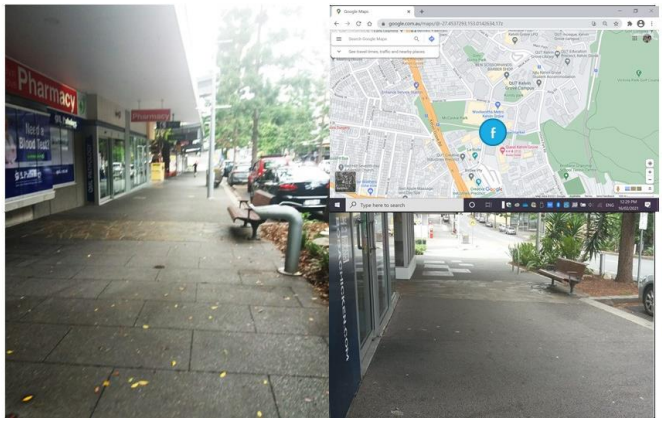

Figure 7. Photos of Musk Avenue's Pedestrian Paths Evaluation

Furthermore, the evaluation has been assessed for Bandung, Surabaya and Brisbane (in front of MCU, PCU and QUT). Several related variables have been selected such as pedestrian path width, level difference with road or street, gradient of ramp (1:12), accessible road crossing, accessible signage, drainage in pedestrian path, guiding path or tactile ground surface indicators (TGSI). The results of evaluation can be seen on Table 1 as below.

Table 1. A evaluation table of pedestrian path evaluation for Bandung, Surabaya and Brisbane (in front of MCU, PCU and QUT).

	Surya Sumantri Street's Path Evaluation	Siwalankerto Street's Path Evaluation	Musk Avenue's Path Evaluation
1. Pedestrian path Width	150 cm but so many obstacles	80 cm with many obstacles	300 cm with minimum clear pathways with 150 cm

Table 2. A evaluation table of pedestrian path evaluation for Bandung, Surabaya and Brisbane (in front of MCU, PCU and QUT).

	Surya Sumantri Street's Path Evaluation	Siwalankerto Street's Path Evaluation	Musk Avenue's Path Evaluation
2. Level Difference with Road or Street	25 - 30 cm	0 - 50 cm	10 cm
3. Gradient of Ramp (1:12)	1:7	flat	1:12 in almost all sections and 1:10 in certain part because of limited space.
4. Accessible Road Crossing	Crossings are not accessible	Crossings are not provided	Provided with traffic lamp
5. Accessible Signages	Not fully visible because too many trees	Not consistently provided	Provided
6. Drainage in Pedestrian path	Closed drainage with unsafe drainage cover	Closed drainage with unsafe drainage cover	Closed drainage and with safe drain cover
7. Guiding Path or Tactile Ground Surface Indicators (TGSI)	Unclear and inconsistent design	Not provided	Provided in several road crossings
Overall evaluation	Not accessible	Not accessible	Accessible

4. Conclusions

The pedestrian paths comparison has shown that the design of pedestrian paths can impact the accessibility of pedestrian paths. Several problems in the design are related to the planning process before the streets are constructed. In two cases of Bandung and Surabaya, two streets are not properly planned. The poor planning process can create further inaccessibility after the streets are utilised. In Brisbane's pedestrian paths, the proper drawing standards have guided the Brisbane City Council properly and provide more accessible features. However, a specific part of Musk Avenue's pedestrian path is less accessible for wheelchair users because it was constructed before the adoption of

Standards Australia. (2009a). The solution is to create accessible detour routes around Musk Avenue. We hope that this comparison will create a better understanding of the design of pedestrian paths in Indonesia and Rural Australia that are not accessible yet.

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