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Characteristic of Shelter for Child Pedestrian Febriane Paulina Makalew1/_, Sherley Runtunuwu1/_, Estrellita Varina Yanti Waney1 and Steve Wilben Macquarie Supit1/_ 1Manado State Polytechnic, Dept. Civil Engineering, Manado, Indonesia febriane.makalew@polimdo.ac.id, Sherley.runtunuwu@sipil.polimdo.ac.id, lita_waney@yahoo.com, stevewmsupit@gmail.com Keywords: Child pedestrian, Shelter, Pathway, Public Facility, Urban Area Abstract: Child pedestrians require an adequate and safe facility to protect during their journey. As there is no standard available yet for child pedestrian facilities, research on its facility is urgent.

The shelter is functioning as a temporary place to protect the user from bad weather impacts and as a transit area in using public transport. This research aim is to evaluate the characteristic of child pedestrian shelters as public facilities in pedestrian pathway areas. The method used is survey and literature study. Results show that there is no particular shelter for child pedestrians yet.

The type of shelter to be developed is based on the consideration of child pedestrian movement pattern, child behavior, and available shelter such as transit commuter shelter and concept of shelter function. There is a need for further research of child pedestrian facility which is lead to guideline providing to accomplished pedestrian standard.

1 INTRODUCTION Child pedestrian shelter prototype is one of the street infrastructure facilities for pedestrians and commuters who travel with different transport modes. In an urban area, a pedestrian facility is an important infrastructure to protect users to be safe and comfortable n their activity. For child pedestrians, activity in walking including playing and running.

The child movement needs to be accommodated in child activity including a place for a temporary stop during bad weather conditions and short rest. The shelter is one of facility need for pedestrians, usually for transit to public transport such as a bus. The shelter is also used as a transit area for pedestrians and visitors to the public area.

For child pedestrians, a shelter needs to have adequate quality and functioning as a safe place for children to transit and play with or without playing objects as their major need based on their behavior. Shelter for child pedestrians can fulfill child needs as well as learning facility with interesting design, rich of color pattern and local texture.

Facility for shelter support safety and comfortable facility for the child who has high risk of accident in the public area. To help create a child-friendly pedestrian shelter It needs to support with suitable material in which is safe, comfort and eye-catching. Therefore, the use of the material should be rich in texture and has a strong character.

The use of local materials such as coconut timber and recycle plastic waste can contribute to create a type of shelter with local character and accommodate child activity. 2 LITERATURE REVIEW Research related to child pedestrian facilities is mostly related to the pathway and child pedestrian behavior. Concerning child pedestrians, standard use including criteria for housing pedestrian areas is comfortable and accessible.

Criteria for accessibility is considering ideal distance for walking to public facilities (BSN, 2004). The principle of a circulation system for pedestrians is connection, safety, comfortable and clearness (ibid). Dimension for pedestrian walking area is based on the standard including minimum standard of projection user need, network shape for neighborhood center and its surrounding area, characteristic of the local area, safety and comfort space for pedestrian from the impact of local and regional weather prediction (ibid).

In finishing pedestrian pathway, criteria include the placement of pathway on the streetside with a material different than the street material such as using paving block, bollard, safety surface material and suitable wide of the pathway for pedestrian. Student journey as the pedestrian is influenced by environmental and social factors (Zacharias et

al, 2017).

Pedestrian behavior influences the route choice and space use such as taking the risk in hurry (Charron et al, 2015). Pedestrian behavior is influence by facility available (Sisiopiku et al, 2003). Standard related to pathway wide and land use (APA, 2007), wide, access and facility of the pedestrian pathway (BSN 2004, BSN 1991, Ditjen Bina Marga 1999 and Kementerian PU 2014). Research on materials for small-scale buildings is including environmentally friendly materials and local materials.

Research related to plastic waste such as recycle used plastic water bottles, plastic bags, and bottle lids in making paving blocks (Burhanudin et al, 2018). The paving block is used for the garden park area. Research on material with plastic waste for part of building construction such as filling element, structural element, and additional element (Winnerdi et al, 2020).

The use of coconut timber as a material improves the quality of surface texture to be lighter with a clear pattern using finishing material such as polyurethane, melamine-formaldehyde, and ultra-vernix (Purwanto, 2011). The shelter is functioning as a protected place to avoid the impact of bad weather conditions. A shelter as an evacuation facility that is used during a tsunami needs to be resistant to an earthquake, tsunami and can accommodate a large number of people (Yuhanah, 2014). A shelter for a commuter is a place for transit and a waiting area.

The use of shelter as public transport facility is related to distance, accessibility, waiting time, placement, facility, land use, pedestrian facility, and easy accessibility to public transport (Sihotang et al, 2019). In the public areas of bus shelters, it needs to fulfill the facility for pedestrian and pedestrian bridges (Sihotang et al, 2019).

The facility in the shelter including size based on standard, identity, route board, light, chair, rubbish bin, bollard, and advertisement board (Sihotang et al, 2019). The shelter setting place and design improve the service to public transport commuters in which it is still functioning and some need to be replaced (Rusmandani et al, 2020). Requirement for transit commuter place including the identity of shelter, traffic sign, information board, light, and chair (DPDJPD, 1996).

Pedestrians use the shelter as a temporary place to protect themselves from the impact of weather conditions or to transit to public transport or continue to walk. For child pedestrians, shelter functions as a temporary place during walking journeys including playing. There is no available standard shelter for child pedestrians therefore there is a need to do research on shelter for child pedestrians.

Previous research on a pedestrian is related to the use of the material including material fly ash (Makalew et al, 2020) and development in using plastic in design paving blocks for material in pathway surface (Makalew et al, 2020 and Supit et al, 2019.) The design small scale building is using coconut timber is explored to find possibility patterns (Makalew et al, 2015) Space need and child pedestrian patterns show different characteristics in the urban and rural areas (Makalew et al, 2017., 2018).

A potential area for pedestrian with a large number of pedestrians is school area (Makalew et al, 2018) in which front school area need a facility for school entrance and consider child pedestrian pattern. The area needs child pedestrians including a pathway and playing area (Makalew et al, 2020) as can be seen in Figure 1 / Figure 1: Facility for child pedestrian pathway and playing pocket area (Makalew et al, 2018) 3 RESULT AND DISCUSSION Define the characteristic of shelter is drawn based on survey and literature study.

A survey on shelter is important in finding the type, function, and material use as well as evaluate how the public uses them. The shelter design is based on research in the different field yet focus on shelter as a transit place for commuter and visitor. The method used for design a shelter is varied to create a comfortable and safe area.

The result of the characteristic design of the shelter based on a literature review can be seen in Table 1. Table 1: Design of Shelter. Type of shelter _Design _Method use _ _Bus Shelter _The size of the shelter is 7x3x4 m3 Lighting at least 3 pieces Colour use is red and blue Stair's size 12 cm height and 30 cm wide Frame material made of concrete Chair material made of stainless Information board _Quality Function Deployment (QFD) (Hasibuan et al 2020) _ _Bus Shelter _Suitable of dimension.

Scale and space View, lighting, and open up to potential crime place Connectivity within facilities _Rhyme concept for anti-vandalism and crime problem (Marta et al 2013) _ _Bus Shelter _Ramp design should not be high yet comfortable for disability Size fits all users including wheelchair Suitable Distance between shelter and cars Adequate seat area available _Ergonomic (Toghas 2015) _ _Bus Shelter on campus _Seat area, ramp, wall, canopy, floor, color, setting, information board, light, rubbish bin Space available 11 m2 Consider the design of the main building _Iconic and local wisdom concept (Apdeni 2019) _ _Public service area shelter _User is age 2 to 60, student and worker Size 10m x 4m x 3m Facility for diffable Colour creates a fresh and comfortable area Material environment friendly such as metal, aluminum, plastic polythene, LED light, and low E glass Solar panel for energy and technology for information _Comfortable, discipline, and independent (Kurniawan et al 2011) _ _Type of shelter _Design _Method use _

_Evacuation shelter _The public facility as a shelter for tsunami Can be used for public activity including a multi-function entertainment area and praying area.

_Mitigation (Alifah et al 2020) _ _Evacuation shelter _Structure, evacuation floor, public service, capacity 1 m2/ person, location, and accessibility _Mitigation (Yuhanah 2014) _ _Evacuation shelter _Location in potential area Use of public facilities such as mosques, schools, public health centers, government buildings, and shopping centers. _Mitigation (Husa et al 2019) _ _ The function of shelter and its material use is varied when the shelter is constructed in a public area.

based on the survey, shelter in which is a function for transit areas of public transport commuters has changed gradually considering users in the area and aspect of maintenance. Function and material use including evaluation of available shelter can be seen in table 2 Table 2: Function and material of Shelter PICTURE _FUNCTION _MATERIAL USE _ _Location: Manado Town Square, Manado (2021) _Bus and microbus Shelter Available use for pedestrian transit and commuter for online transport _Structure: Steel Seat area: Concrete The floor is ceramic with texture and color.

In good condition _ _Location: Boulevard, Manado (2021) _Bus and microbus Shelter Available use for pedestrian transit and visitor for short rest _Structure: Steel Seat area: Concrete Floor concrete No maintenance: Column and frame is the rust. Floor is damage _ _PICTURE _FUNCTION _MATERIAL USE _ _Location: Mega Mall, Manado (2021) _Bus and microbus Shelter Existing use for street vendor and visitor _Structure: Steel Wall: brick Floor: concrete No maintenance: ceiling, wall, and floor are damage _ _Location: Mega Mall, Manado (2021) _Bus and microbus Shelter Abandon area _Structure: Pipe Steel Seat: concrete Floor: Paving block No maintenance: no ceiling and structure is the rust _ _Location: Denpasar, Bali (2021) _Shelter for online transport commuter Available use for pedestrian transit and commuter for online transport _Structure and Seat area: Metal with eye-catching color _ _Location: Denpasar, Bali (2021) _Shelter for commuter and visitor _Structure: Concrete Traditional design Information board _ _Location : Megamall, Manado (2021) _Shelter for commuter and visitor _Structure and Seat area: Metal with eye-catching color _ _Location: Tikala Manado (2021) _Seating area for pedestrian and visitor _Chair: Metal _ _PICTURE _FUNCTION _MATERIAL USE _ _Location: A.A. Maramis, Manado (2021) _Shelter for commuter _Structure and Seat area: Metal with eye-catching color _ _Location: A.A.

Maramis Street, Manado (2021) _Shelter for commuter Bus Damri Manado Abandon area Ceiling and wall damage _Structure: Metal _ _Location: Samratulangi Street, Manado (2021) _Area for visitor and pedestrian Open structure without a roof Highly use by pedestrian and visitor _Structure: Metal Chair: Concrete _ _Location: Multi mart,

Wolter Monginsidi Street, Manado (2021) _Shelter for commuter Bus Damri Manado Abandon area Ceiling and wall damage _Structure: Metal Wall: glass Chair: Metal _ _Location, Bantik Park, Malalayang Manado (2021) _Shelter for commuter reconstructed from shelter for Bus Damri to public transport including online commuter _Structure and Seat area: Metal with eye-catching color Wall: panel _ _PICTURE _FUNCTION _MATERIAL USE _ _Location: Ahmad Yani street, Manado (2021) _Shelter for commuter public transport _Structure and Seat area: Metal with eye-catching color Wall: panel with the information board _ _Location: Macau (2019) _Shelter for commuter bus _Structure: Wood with eye-catching color _ _Location: Cannes, France (2019) _Area for visitor and pedestrian Open structure without a roof Highly use by pedestrian and visitor _Structure: wood _ _Location: Cannes, France (2019) _Shelter for commuter bus Well maintenance _Structure: Metal _ _Location: Amsterdam, Holland (2019) _Shelter for commuter bus Well maintenance _Structure: Metal _ _Location: Tourism Water Village, Giethoorn, Amsterdam (2019) _Shelter for commuter bus Well maintenance _Structure: Metal _ _PICTURE _FUNCTION _MATERIAL USE _ _Location: Amsterdam, Holland (2019) _Shelter for commuter bus Well maintenance _Structure: Metal _ _Location: Geitthoorn, Holland (2019) _Shelter for commuter bus Well maintenance _Structure: Metal _ _Location: Perth, Australia _Shelter for commuter bus Well maintenance _Structure: Metal _ _Location: Freemantle, Australia (2017) _Shelter for commuter bus Well maintenance _Structure: Metal _ _Location: UWA Perth, Australia (2017) _Shelter for commuter bus Well maintenance _Structure: Metal Wall: glass Information board _ _Location: Perth, Australia (2017) _Shelter for commuter bus Well maintenance _Structure: Metal Wall: glass Information board _ _Location: Perth, Australia (2017) _Shelter for visitor Well maintenance Eye-catching design _Structure: Metal, wood _ _PICTURE _FUNCTION _MATERIAL USE _ _ Location: Perth, Australia (2017) _Shelter for the visitor with child Well maintenance Eye-catching design _Structure: wood _ _Location: Perth, Australia (2017) _Shelter for train commuter Well maintenance _Structure: Metal _ _ Child pedestrians require shelter that can support their activity including walking, resting, playing, and running (see Makalew et al, 2018).

Based on child behavior, standards available, literature review, and survey on shelter from many places, the characteristic of child pedestrian shelter is evaluated. Evaluation on shelter for child pedestrian is based on child behavior and the pedestrian facility can be seen in Table 3. Table 3: Characteristic of Child Pedestrian Shelter Characteristic _Design and material _ _Available playing area _Playing objects Playing space _ _Strong construction and structure _Local material with strong joints and finishing _ _The protected area from bad weather _Adequate roof and wall with resistant material _ _The protected area from a traffic crash _Adequate space considering child space need and movement _ _Available seating area _Chair available with safe finishing _ _Available information board _Information board for the child considering knowledge

development and safety rule _ _Eye-catching design and color _Colorful, rich in texture, design for child _ _Well maintenance _Material and design easily maintenance _ _ The design for child pedestrian-friendly shelter is the potential to be developed.

Considering the existing condition of the pathway on the study area, characteristics of the pedestrian pathway, and the concept of the construction system, it is possible to create a prototype for the child pedestrian shelter. 4 CONCLUSIONS The characteristic of child pedestrian shelters influence by the function, type, and material use.

For child pedestrians, the main consideration is their activity should accommodate in the shelter provided. As there is no standard yet for child pedestrian shelter, there is a need to do further research to provide an adequate guide in design it and support child pedestrian needs.

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