

## Evaluation of pedestrian paths feasibility in the area around Manggarai to support the transit-oriented development concept

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received June 02, 2020 Received in revised form July 29, 2020 Accepted November 04, 2020 Available online August 01, 2021</p> <p><i>Keywords:</i> Manggarai station Pedestrian paths Transit-oriented development</p> <p><b>*Corresponding author:</b> Rumiati Rosaline Tobing Department of Architecture, Faculty of Engineering, Universitas Katolik Parahyangan, Indonesia Email: <a href="mailto:rumi@unpar.ac.id">rumi@unpar.ac.id</a> ORCID: 0000-0002-7771-3610</p>	<p><i>The implementation of Transit-Oriented Development (TOD) concept on pedestrian paths in Manggarai, Jakarta, requires well-ordered pedestrian path, as an area linkage between transit facility and various functions around it. Presently, the pedestrian paths condition around Manggarai Station is still not optimal. Meanwhile, the Transit-Oriented Development concept demands compliance with the standards in its implementation. This study aims to assess the pedestrian paths feasibility in the area around Manggarai Station, based on the criteria that should be met in supporting the concept implementation process. This research applied an evaluative method through POE (Post-Occupancy Evaluation), in measuring the standards of the existing pedestrian paths and providing recommendations for the authorities. The findings are novelties in understanding the disadvantages of safety factors, physical infrastructure, shelter for the hot and rainy season, easy access to the elderly and people with disabilities, especially in linking supporting facilities. Interestingly, the pedestrian path has an attraction that triggers people to walk a long distance with ease. Also, these findings are important in designing Transit-Oriented Development at Manggarai, such as wide sidewalks, providing zebra crossings, and trees. In addition, these results are in the form of suggestions for improving pedestrian path conditions as well as providing action plans for stakeholders.</i></p>

### Introduction

The transit-oriented development concept is one of the efforts made by the Jakarta Provincial Government in overcoming congestion problems (Mungkasa 2018). It is the development of a compact and mixed up areas within the walking distance from commercial center and public transport service points (Alvinsyah 2016).

Manggarai is a village in South Jakarta that is being developed with the transit-oriented development concept (Novianto 2016). The implementation of this concept in this region

requires well-ordered pedestrian paths as an area linkage (Pemerintah Provinsi DKI Jakarta 2012).

According to Jayanti (2017), the condition of the pedestrian paths around Manggarai Station is still not optimal (Jayanti 2017). This is not in line with the transit-oriented development concept which prioritizes movement on foot. Furthermore, disturbance on the pedestrian paths cause difficulties for vehicles to move, resulting to congestion around Manggarai Station, due to the people switching to the vehicle path.

The purpose of this study is to evaluate the pedestrian paths feasibility in the areas around Manggarai Station, as a support for the transit-

oriented development concept by measuring the extent to which the required standards are met, and recommending the steps needed to be taken by the authorities in meeting these criteria.

## Method

The Post-Occupancy Evaluation (POE) method was used to evaluate the pedestrian paths feasibility in the areas around Manggarai Station. This method was carried out by observing the existing conditions and comparing it with the reference criteria set by the Institute for Transportation and Development Policy (2017), as well as the government standards. This research focused on: (1) The existing conditions of the pedestrian paths around Manggarai Station were observed from the physical aspect.; (2) Comparing pedestrian path ideal criteria according to government standards and theories; (3) Recommended actions, plans or policies that need to be carried out by stakeholders.

Primary data in the form of pedestrian conditions were obtained from field observations. Photographs of fields were obtained from direct documentation and google street view at the research location to obtain the existing situation. The sliced images collected from field observations were redrawn by computer, and were used to determine the size and relationship of the pedestrian path with the vehicle lane. The area map image and its current condition were obtained from the Jakarta Province City Planning Office, using satellite imagery tracing results, which were utilized in the broad overview of the pedestrian path linkage.

The secondary data involved the criteria obtained from literature studies and government standards, and included (Institute For Transportation And Development Policy 2017; Kementerian Pekerjaan Umum dan Perumahan Rakyat 2014; 2018; Wijaya and Sari 2020; Sirait, Naibaho, and Aritonang 2018; Setiawan and Ikaputra 2020): (1) The pedestrian path should be safe, complete, and accessible to all groups, in order to ensure its users' safety; (2) Pedestrian paths should be unobstructed, unbroken, continuous (not intermittent), free of obstacles, and connected to a network of transit points; (3) Pedestrian crossing should be accessible to all groups. The minimum width of the road should be 2 meters and given a dividing line; (4) The

building facade should be active and alive for walking to be attractive and safe. When the sidewalk becomes busy and visually active, it should be equipped with various activities and media interactions, such as restaurants and shops; (5) There should be elements of shade and protection from sun and rain to increase the desire to walk with ease. This shade should be in the form of trees, construction of buildings such as arcades, canopies, and other elements.

## Result and discussion

The scope of the Transit-Oriented Development area was at a radius of 350 meters from the transit point (Pemerintah Pusat DKI Jakarta 2017). Based on observations, the roads within 350 radius were divided into four types:

### 1. Primary artery road

Roads such as Tambak and Sultan Agung street do not have direct access to the station, which should be via a secondary collector path. This type of primary arterial road has access to Manggarai Terminal (figures 1, 2, and 3).



Figure 1. The location map of primary arterial roads

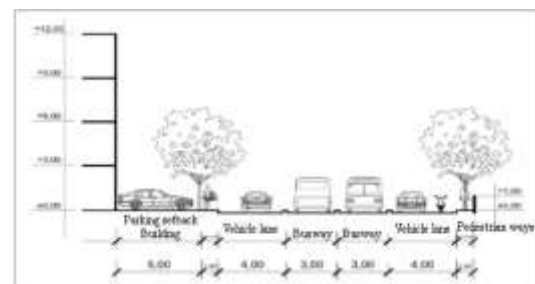




Figure 2. The intersection of primary arterial road at Sultan Agung Street







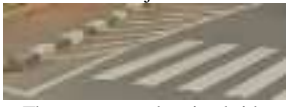




**Figure 3.** The atmosphere of the primary artery road

Table 1 showed the evaluation results of the pedestrian paths condition that were on the primary arterial road type, based on the criteria set.

**Table 1.** Conditions of pedestrian paths on primary arterial roads

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
Pedestrians protected from vehicles.	The sidewalk was higher than the vehicle road 	Safe because the sidewalk was higher than the vehicle lane.	Met sidewalk safety criteria.	Maintainable.
Completed pedestrian path.	<ul style="list-style-type: none"> <li>There was a street light</li> </ul> 	Incomplete, because there was lighting, however, no guide for low vision people.	Did not meet the criteria for the completeness of the pedestrian path.	Need to add a low vision person guide.

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
	 <ul style="list-style-type: none"> <li>No low vision guidance</li> </ul> 			
<p>Pedestrian path convenience.</p>	<ul style="list-style-type: none"> <li>Sidewalk height <math>\pm</math> 15 cm;</li> <li>The width of the sidewalks varies, at least 1.5 m;</li> <li>The ramp was in the middle of the sidewalk, not at the end or near an intersection.</li> </ul>	<p>Less comfortable, because:</p> <ul style="list-style-type: none"> <li>The sidewalk was only sufficient for walkers and wheelchairs;</li> <li>Easily accessible to normal people, difficult for the elderly and wheelchair users due to the wrong location of the ramp.</li> </ul>	<p>Did not meet the criteria for pedestrian comfort, and the standard width of the sidewalk.</p>	<ul style="list-style-type: none"> <li>Provide sidewalks according to standards, minimum width of 2 m;</li> <li>Provide a ramp as a start and end access to the sidewalk for wheelchair users and the elderly.</li> </ul>
<p>Sidewalks were unobstructed and unbroken.</p>	<ul style="list-style-type: none"> <li>There were obstacles on the sidewalk</li> </ul>  <ul style="list-style-type: none"> <li>Street furniture becomes an obstacle</li> </ul>  <ul style="list-style-type: none"> <li>The sidewalks were not cut off</li> </ul>	<p>Even though the sidewalk was not cut off, it was taken over for other activities such as housing, trading, parking vehicles, etc.</p>	<p>Did not meet the criteria.</p>	<ul style="list-style-type: none"> <li>Freeing sidewalks from activities that hinder pedestrian circulation;</li> <li>Movable street furniture, therefore, it does not become a pedestrian barrier.</li> </ul>

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
Pedestrian crossing.	<ul style="list-style-type: none"> <li>There was a zebra crossing to cross the road junction</li> </ul>  <ul style="list-style-type: none"> <li>There was a pedestrian bridge to access the terminal</li> </ul> 	Even though it already has crossing facilities, it was difficult for wheelchair users to access, because there were no ramps on the sidewalks and pedestrian bridges.	Did not meet the criteria for pedestrian crossing.	<ul style="list-style-type: none"> <li>Provide a ramp as access for wheelchair users from the sidewalk to the zebra crossing;</li> <li>Provide ramps for pedestrian bridges.</li> </ul>
Active and living facades of buildings.	There were shops, visually activated. 	The facade of the building next to the sidewalk was active and alive because it was a visual activated shop.	Met the criteria of being active and alive.	Maintainable.
Has shade and protection.	<ul style="list-style-type: none"> <li>There was a tree on the edge of the sidewalk</li> </ul>  <ul style="list-style-type: none"> <li>There were plants used to filter dust on the sidewalk</li> </ul> 	Inadequate because: <ul style="list-style-type: none"> <li>The trees were far apart and did not act as a shade;</li> <li>Plants filtered dust unevenly along the primary artery path.</li> </ul>	Did not meet the shading and protective criteria.	<ul style="list-style-type: none"> <li>Replacing with shade trees;</li> <li>Increase the number of trees, therefore, the sidewalks are shaded;</li> <li>Provide arcades in buildings on the edge of the sidewalk.</li> </ul>

## 2. Secondary collector road type

These road types included North Manggarai, Minangkabau, and Sahardjo streets. North Manggarai street has direct access to the station, not to the Manggarai Terminal (figures 4, 5, and 6).



Figure 4. Map of secondary collector road location

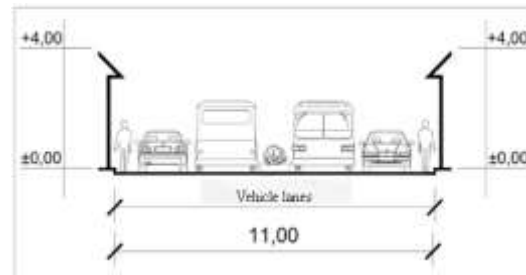








Figure 5. The intersection of the secondary collector road on North Manggarai Street










Figure 6. The atmosphere of the secondary collector's road

Table 2 showed the evaluation results of the pedestrian paths condition, on the secondary collector arterial road type, based on the established criteria.

**Table 2.** Pedestrian path condition on the secondary collector road

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
Pedestrians protected from vehicles.	The sidewalk was higher than the vehicle road  Safety in the form of plants  Security in the form of a fence 	Safe with various types of security, such as a higher position of the sidewalk, plants, and safety fences.	Met sidewalk safety criteria.	Maintainable.
Completed pedestrian path.	<ul style="list-style-type: none"> <li>There was a street light  </li> <li>No low vision guidance  </li> </ul>	Incomplete, because there was lighting with no guide for low vision people.	Did not meet the requirements of pedestrian path completeness.	Need to add a low vision person guide.
Pedestrian path convenience.	<ul style="list-style-type: none"> <li>Sidewalk height <math>\pm</math> 15 cm;  </li> </ul>	Less comfortable, because:	Did not meet the criteria for	<ul style="list-style-type: none"> <li>Provide sidewalks</li> </ul>

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
	<ul style="list-style-type: none"> <li>The width of the sidewalks varies, at least 1.5 m;</li> <li>The ramp was in the middle of the sidewalk, not at the end or near the intersection.</li> </ul> 	<ul style="list-style-type: none"> <li>The sidewalk was wide enough for walking and wheelchairs;</li> <li>Easily accessible to normal people, difficult for the elderly and wheelchair users due to the wrong location of the ramp.</li> </ul>	pedestrian comfort, and the standard width of the sidewalk.	<ul style="list-style-type: none"> <li>according to standards, minimum width of 2 m;</li> <li>Provide a ramp as a start and end access to the sidewalk for wheelchair users and the elderly.</li> </ul>
Sidewalks were unobstructed and unbroken.	<ul style="list-style-type: none"> <li>There were obstacles on the sidewalk</li> </ul>  <ul style="list-style-type: none"> <li>Street furniture becomes an obstacle</li> </ul>  <ul style="list-style-type: none"> <li>Trees become obstacles</li> </ul> 	Although the sidewalk was not cut off, it was taken over for other activities, such as housing, trading, parking vehicles, etc.	Did not meet the criteria.	<ul style="list-style-type: none"> <li>Freeing sidewalks from activities that hinder pedestrian circulation;</li> <li>Move trees and street furniture in order not to become a pedestrian barrier.</li> </ul>
Pedestrian crossing.	<ul style="list-style-type: none"> <li>The sidewalks were not cut off</li> </ul> <ul style="list-style-type: none"> <li>There was not crossing facility to reach the station</li> </ul>  <ul style="list-style-type: none"> <li>There was not crossing facility at the intersection</li> </ul>	Did not meet the criteria because there was no crossing facilities.	Did not meet the criteria.	<ul style="list-style-type: none"> <li>Provide zebra crossing especially in front of Manggarai Station;</li> <li>Provide a ramp as access for wheelchair users from the sidewalk to the zebra crossing.</li> </ul>
Active and living facades of buildings.	<p>There were shops that were visually active.</p> 	The facade of the building next to the sidewalk was active and alive, because it was a visual actived shop.	Met the criteria of being active and alive.	Can be maintainable.
Has shade and protection.	<p>There was a tree shade and dust cover on some of the sidewalks</p>	It does not meet the criteria because there were already shade trees and plants to protect it from dust, but it	Did not meet the criteria of shade and protection from dust.	<ul style="list-style-type: none"> <li>Adding shade trees and plants in places that still do not exist;</li> </ul>

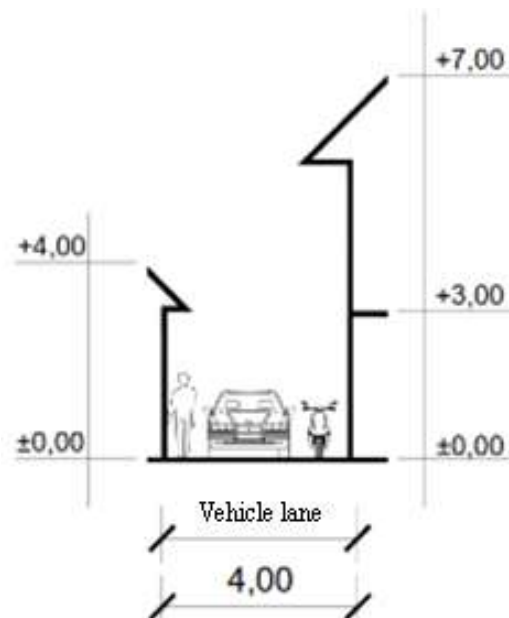
Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
		was not evenly distributed in all places.		<ul style="list-style-type: none"> <li>Provide arcades in buildings on the edge of the sidewalk.</li> </ul>

### 3. Neighborhood road type with access to Manggarai Station

This type of road includes Dr. Saharjo 1 street which has direct access to the station, and does not have access to Manggarai Terminal (figures 7, 8, and 9).



**Figure 7.** Map of neighborhood road location with access to stations








**Figure 8.** The road intersection on Dr. Saharjo 1 street






**Figure 9.** The atmosphere of a neighborhood road with access to the station

Table 3 showed the evaluation results of the pedestrian paths condition located in the neighborhood road with access to the station, based on the criteria set.

**Table 3.** Conditions of pedestrian paths in neighborhood road types with access to stations

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
Pedestrians protected from vehicles.	<p>Some have a sidewalk higher than the road</p>  <p>Some are shared street pedestrians and motorized vehicles</p> 	<ul style="list-style-type: none"> <li>The sidewalk height met the criteria;</li> <li>Shared street met the criteria because it was on a road with low vehicle flow.</li> </ul>	Met the safety criteria for pedestrian paths.	Maintainable.
Completed pedestrian path.	<ul style="list-style-type: none"> <li>There was a street light</li> </ul>  	<p>Incomplete, because there was lighting but there was no guide for low vision people.</p>	Did not meet the criteria for the completeness of the pedestrian path.	Need to add a low vision person guide.
Pedestrian path convenience.	<ul style="list-style-type: none"> <li>No low vision guidance</li> <li>Sidewalk height <math>\pm</math> 15 cm;</li> <li>Sidewalk width <math>\pm</math> 2 m;</li> <li>There was no ramp for wheelchair access to the sidewalk.</li> </ul> 	<p>Less comfortable, because:</p> <ul style="list-style-type: none"> <li>The sidewalk was wide enough for walking and wheelchairs;</li> <li>Easily accessible for normal people, inaccessible for elderly people and wheelchair users because</li> </ul>	Did not meet the criteria for pedestrian comfort.	Provide a ramp as the start and end of the sidewalk for wheelchair users and the elderly.

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
Sidewalks were unobstructed and unbroken.	<ul style="list-style-type: none"> <li>The sidewalks were blocked and cut off, only 10 m long</li> </ul> 	<p>there was no ramp.</p> <p>Sidewalks were cut off and taken over for other activities such as trading.</p>	Does not meet the criteria.	<ul style="list-style-type: none"> <li>Freeing sidewalks from activities that hinder pedestrian circulation;</li> <li>Continuing on the sidewalk.</li> </ul>
Pedestrian crossing.	There is no crossing the road facility.	Did not meet the criteria, because there was no crossing facilities.	Did not meet the criteria.	Providing zebra crossing especially in front of the Airport Train Station.
Active and living facades of buildings.	<p>There were stalls that were visually active.</p> 	The tendency to be active and alive.	Met the criteria of being active and alive.	Can be maintainable.
Has shade and protection.	<p>Has a shade tree.</p>  <p>Did not have a dust filter plant.</p>	<p>Not meeting the shading and protective criteria, because:</p> <ul style="list-style-type: none"> <li>Shade trees were not evenly distributed along the road;</li> <li>There was no dust filter but the flow of vehicles on this road was relatively low. Only residents and people who want to go to the airport train station pass on this road.</li> </ul>	Does not meet the criteria.	<ul style="list-style-type: none"> <li>Adding shade trees and plants in places that still do not exist;</li> <li>Provide arcades in buildings on the edge of the sidewalk.</li> </ul>

4. Residential neighborhood road type

Roads, such as Padang and Bukittinggi streets, etc., are located in a residential area, do not have access to stations or terminals (figures 10, 11, and 12).



Figure 10. Map of neighborhood road locations with access to stations

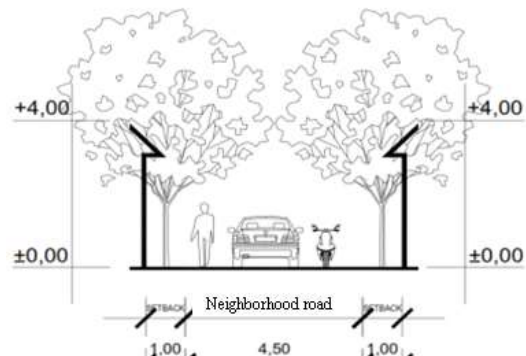





Figure 11. A section of a residential neighborhood road on Bukittinggi Street




Figure 12. The street atmosphere of a residential neighborhood

Table 4 showed the evaluation results of the pedestrian paths condition in residential area, based on the criteria set.

Table 4. Pedestrian paths conditions in residential neighborhood roads

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
Pedestrians protected from vehicles.	Shared street pedestrians and motorized vehicles. 	Shared street met the criteria because, it was on a road with low vehicle flow.	Met the safety criteria for pedestrian paths.	Maintainable.
Completed pedestrian path.	<ul style="list-style-type: none"> <li>There was a street light </li> <li>No low vision guidance</li> </ul>	Incomplete, because there was lighting but there was no guide for low vision people.	Did not meet the criteria for the completeness of the pedestrian path.	Need to add a low vision person guide.
Pedestrian path convenience.	Shared street with low motorized vehicle flow. 	Met the criteria because it was a shared street, the flow of motorized vehicles was low, and crossed only by people living in the residential area.	Met the criteria for pedestrian comfort.	Maintainable.
Sidewalks were unobstructed and unbroken.	There was no obstacles.	Met the criteria.	Met the criteria.	Maintainable.

Pedestrian path criteria	Field conditions	Analysis	Conclusion conditions	Recommendation
Pedestrian crossing.	There was no crossing facilities.	Met the criteria because, there was no crossing facility, the flow of vehicles on this road was classified as low.	Met the criteria.	Maintainable.
Active and living facades of buildings.	The building has a set-back and was bordered by a house fence.	Not visually active because it was blocked by the house fence.	Did not meet the criteria of being active and alive.	Maintainable because: <ul style="list-style-type: none"> <li>This was a residential neighborhood road only passed by people living in the vicinity;</li> <li>To maintain the safety of the houses around this road and provide a green atmosphere.</li> </ul>
Has shade and protection.	Has a shade tree.  Did not have a dust filter plant.	Not meeting the shading and protective criteria, because: <ul style="list-style-type: none"> <li>Shade trees were not evenly distributed along the road;</li> <li>There was no dust filter and the flow of vehicles was relatively low. Only local residents pass on this road.</li> </ul>	Does not meet the criteria.	<ul style="list-style-type: none"> <li>Add a shade tree where it does not exist yet.</li> </ul>

## Conclusion

In realizing a pedestrian path system on the implementation of the transit-oriented development concept, it is necessary to have a good cooperation from various groups, ranging from the central government, provincial, practitioners, and academics.

The following is a summary of the actions, plans or policies implemented, and needed to be carried out by stakeholders for the pedestrian route to fully support the implementation of the transit-oriented development concept in the areas around Manggarai Station, Jakarta: (1) Central Government, Making reference standards for city authorities, planners, and other related parties (Kementerian Pekerjaan Umum dan Perumahan Rakyat 2014); (2) Jakarta Provincial Government, Establishing policy targets, competency

standards, Detailed Spatial Plan (RDTR), and assisting pedestrian path equipment and facilities (Kementerian Pekerjaan Umum dan Perumahan Rakyat 2014; Pemerintah Pusat DKI Jakarta 2017; Presiden Republik Indonesia 2009); (3) PT. KAI, Planning and helping to seek land acquisition for pedestrian path improvements (Pemerintah Pusat RI 2012); (4) Practitioners, Carrying out technical work under the guidelines (Kementerian Pekerjaan Umum dan Perumahan Rakyat 2014); (5) Academics, Providing direction for the draft policy in the form of an academic paper (Presiden Republik Indonesia 2003); (6) Public, Various parties should be involved in the pedestrian paths planning (Kementerian Pekerjaan Umum dan Perumahan Rakyat 2014).

Based on the results from field observations and analysis, it is concluded that, the pedestrian paths around Manggarai Station faced different

problems, such as meeting safety criteria, unavailability of low-vision guides, less wide path, active and living conditions of the surrounding buildings, as well as a lack of shade.

The conditions observed on the field indicated that, the pedestrian path around Manggarai Station, still needs to be reorganized and improved, in order to support its function as a linkage and circulation that connects buildings, parking areas, public transportation modes, and others.

Based on the current conditions, the area around Manggarai Station needs to be arranged, in order to meet the pedestrian paths criteria, such as safety, completeness, and pedestrians' comfort, barriers and continuity, completeness of crossing facilities, as well as the availability of shade and protection for the implementation of the transit-oriented development concept.

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#### **Author(s) contribution**

**Muhammad Faleri Febriyanto** contributed to the research concepts preparation, methodologies, investigations, data analysis, visualization, articles drafting and revisions.

**Yohanes Karyadi Kusliansjah** contribute to methodology, supervision, and validation.

**Rumiati Rosaline Tobing** contribute to the research concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.