

Variety Concept in Designing A Trading Area (Case Study: Dauh Puri Kangin, Denpasar City, Indonesia)

Putu Bulan Ratna Anggraeni, Purwanita Setijanti, and Asri Dinapradipta
Departement of Architecture, Institut Teknologi Sepuluh Nopember (ITS)
e-mail: asdina_p@arch.its.ac.id

Abstract—Variety is the extent to which design can give a choice of activities, types of users, functions, and meanings that occur in an environment. Feasibility of variety is fundamental in supporting the design quality of the trading area, especially in regions that have priority in developing the trading area, such as in Denpasar City. The economy of Denpasar City depends mostly on the trading sector. However, Dauh Puri Kangin, as the trade center area in the city, still has physical and non-physical problems and has not been well developed. In getting a solution, this place needs research to find design criteria that can increase environmental variety. The study used cognitive mapping methods for data collection and qualitative assessment techniques for analysis methods. The analysis process results in the conditions of the problem and the potential related to variations in the study site. Then, it becomes a consideration in the design criteria of the trading area. From the results of the analysis, the problem that occurs in the corridor facilities is have not been able to accommodate the activities of all types of users, both regular users and users with special needs. Based on the results of the analysis, some considerations for the redesign of the area proposed several design proposals related to architectural design, landscape planning, and pedestrian facilities.

Keywords—Design Criteria, Cognitive Mapping, Qualitative Assessment, Urban Studies.

I. INTRODUCTION

THE more diverse activities that can occur in an environment, the environment will be more responsive, only if the conditions of variety are in harmony [1]. Each urban space has a different historical background, form, and function. The application of various approaches to urban areas program is a way to provide sustainability [2]. Character, forms and different human activities will create various meanings. Then, their import can influence multiple choices available. Various activities built formed the environment, and variety is a product of features site and the path of movement. The type of experiences implies a place with various forms, uses and meanings [3]. Different purposes open other levels of variation, including:

- 1) Places with varied uses have varying types of buildings, with diverse forms.
- 2) Attract various people, at multiple times, for many reasons.
- 3) Because of various activities, forms and people providing rich perceptual mixtures, different users interpret the place differently: it needs different meanings.

Therefore, various uses are the key to overall variation. A designer must consider early in the design. Activities variety will give experience for regional users with certain

types of interaction systems. In the context of interactive systems, there are three types of experiences for meaning [4], such as:

- 1) Experience, referring to the continuous flow of "self-talk" that occurs when we are conscious, and the holistic knowledge based that a person gets during his life. For example, when walking in the park or doing simple housekeeping.
- 2) An experience, which it referred to like something more united, which it can articulate or named, has a beginning and end, and in the end, can be a learning point from a holistic perspective — for example, certain events or particular products that interact with someone at a specific time.
- 3) Shared experience, which involves creating meaning and emotions together, or sharing with others. Shared experience allows a series of interpretations by other people involved. Therefore, sharing and expressing meaning through social interaction influenced the personal experience. For example, interact with other people during certain events.

User experience defined some consequences, such as [5]:

- 1) User's internal status, such as pre-disposition, expectations, needs, functionality, moods.
- 2) Characteristics of systems that are designed, such as complexity, purpose, usability, functions.
- 3) The context in which interactions occur, such as social arrangements, meaningful activities, voluntary use.

Such a definition focuses on how to create a quality experience and not merely preventing problems of usability and support functions. As mentioned earlier, there is still no widely agreed definition for the variety of user experience [6]. However, after analysing several different perspectives so far, user experience design is about designing for subjective aspects: pleasure and value, different from eliminating usability problems [7][8]. These are subjective and holistic concepts that are difficult to measure and rate, because the same design can have different effects on different users at different times, influenced by the user's internal state, the context of use, and the system used [9]. Evaluation of the quality of experience can be simplified by examining the environment around public space, exploring exposure to public space in various contexts, understanding how multiple groups of users are involved with open space [9].

Apart from a variety of activities or experiences, how the environment can accommodate the user's variety also shows the diversity, both regular users and users with special needs. Especially for pedestrians, there are specific needs for blind people, wheelchairs, strollers or walking

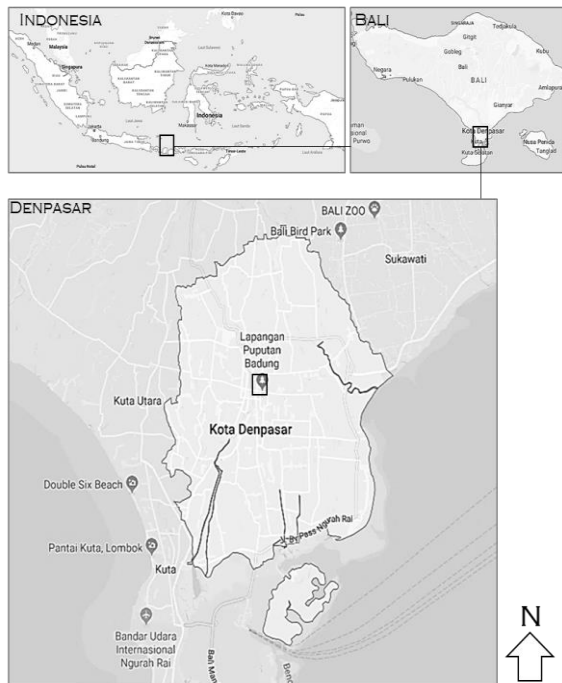


Figure 1. Orientation of Dauh Puri Kangin.

Legend
 I = Gajah Mada Street V = Ternate Street
 II = Sulawesi Street VI = Kalimantan Street
 III = Sumatera Street VII = Diponegoro Street
 IV = Hasanuddin Street --- = Boundary of District

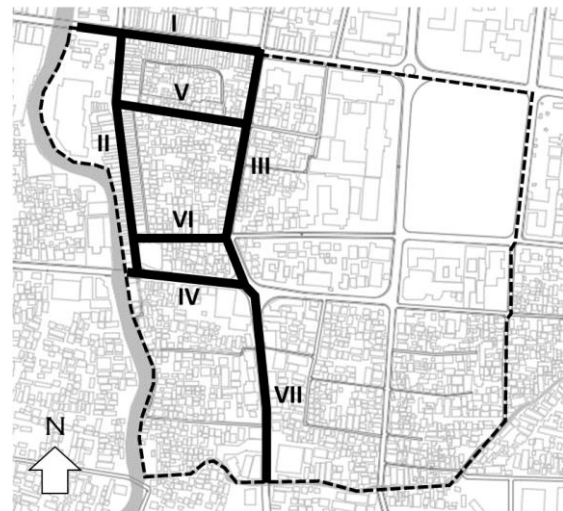


Figure 2. Boundary and Trading Corridor in Study Site.

activities at night. Fulfilment of inclusive principles for a variety of users in the design will produce a design that makes everyone able to use it safely, efficiently, and with dignity [10]. The environment will have characters that:

- 1) Flexible, which is how different people can use it in different ways.
- 2) Easy, so everyone can use it without too much effort or separation.
- 3) Accommodating, for everyone, regardless of age, gender, mobility, ethnicity, or their circumstances.
- 4) Welcoming, without barriers to deactivation which might exclude some people.
- 5) Realistic, which offers several solutions to help everyone's needs and recognise that one solution might not work for all.

To meeting the principles of the user, variety requires an understanding of how they used the building or space and who will use it. They need designed places so that they can adapt to changing uses and demands.

This study concerns the topic of urban design research, where the aspects discussed include physical and non-physical aspects. It seen physical aspects from land use, vehicle lanes and pedestrian lanes. Non-physical aspects, seen from human activities in the public space found in the trading area of Denpasar City. The trading area in Dauh Puri Kangin, Denpasar City is the site of the research. This area has seven trade corridors in it.

II. METHOD

The research used cognitive mapping to collect the data needed. The process made the cognitive mapping in the form of sketches and diagrams about the area, where humans carry out their activities. The purpose of using this technique in research is to get a picture of behaviour in the map, showing the relationship between practice, the relationship between expression with specific design forms, identifying the type of action of users of the Denpasar trade area. Data analysis carried out in this study is a qualitative assessment of the research data collected.

Qualitative assessment is a process that tries to get a better understanding of the complexities that exist in human interaction. Therefore, this method involves interpretation, understanding phenomena, and includes empirical material [8].

III. RESULTS AND DISCUSSION

Denpasar City is the capital of the Province of Bali, Indonesia. The city consists of four sub-districts, namely North Denpasar, East Denpasar, South Denpasar and West Denpasar. Each sub-district consists of urban villages. Such in West Denpasar Sub-district which consists of eleven villages. This study site took place in an urban village of this sub-district, which is Dauh Puri Kangin Village. Dauh Puri Kangin was the result of a village expansion held in 1979. At that time, the government divided Dauh Puri area into five parts, namely: Dauh Puri Village, Dauh Puri Kangin Village, Dauh Puri Kaja Village, Dauh Puri Kauh Village and Dauh Puri Kelod Village. Given village names adjusts each area direction, where "Kangin" interpreted east (where Mount Agung is a northern orientation) in traditional Balinese understanding. According to the local regulation (RANPERDA) data from the Denpasar City Spatial Plan 2008-2027, the Dauh Puri Kangin area is part of the central unit development area. The area is 0.59 km² with 5.929 people population recorded in 2016. The village area consists of several types of areas, including residential areas, the central square, government areas and trade areas. The recorded Dauh Puri Kangin area has 1.582 plots of building and a non-building space of 0,31 km².

Through land use maps, we can see the land use dominance in the area as a trading area. Furthermore, we can distinguish between trade corridors and non-trade corridors. The map identified a road as a trading corridor if the buildings on both sides dominated by trade functions. The main trading corridors in Dauh Puri Kangin area are Gajah Mada Street, Sulawesi Street, Sumatra

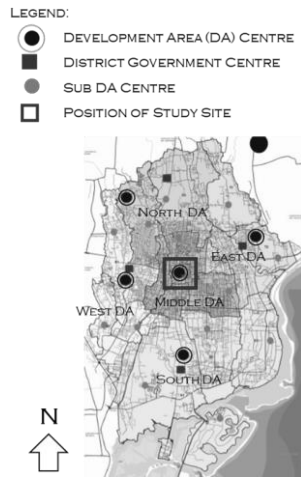


Figure 3. Development Area in Denpasar.

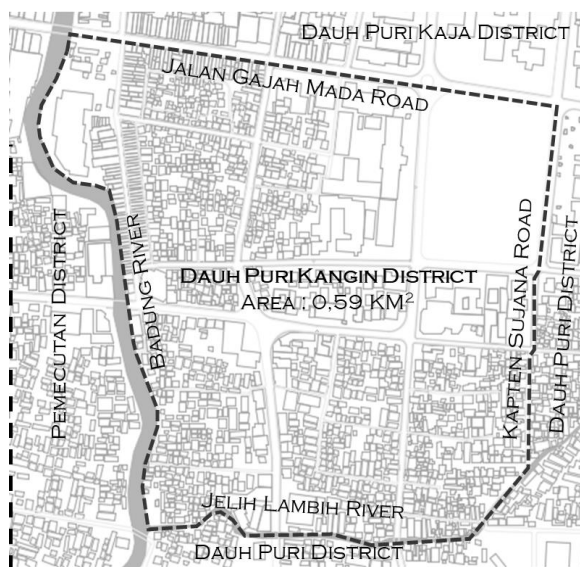


Figure 4. Dauh Puri Kangin Map.

Street, Hasanuddin Street, Ternate Street, Kalimantan Street and Diponegoro Street. Variety condition of experience in the corridor is difficult to measure and check because the user's internal state influenced it [7][8]. To make it easier describes the conditions of variety in the study site, then we need to limit the range of experiences and expressed with the characteristics of the type of merchandise that characterises each corridor.

Inventory of building functions shows that the dominant type of merchandise characterises each corridor. Gajah Mada Street and Sulawesi Street are the fabric trade corridors. There are 24 of 34 buildings (70.6%) at Gajah Mada Street, and there are 90 of 106 buildings (84.9%) at Sulawesi Street as the fabric shop. Hasanuddin Street is a jewellery trading corridor because 31 of the 41 buildings (75.6%) are jewellery stores. Ternate Street is a fruit trade corridor, where 41 of 53 buildings (77.4%) are fruit shops. Kalimantan Street is a corridor of worship equipment trade because 17 of the 30 buildings (56.7%) are worship equipment shops. Sumatra Street and Diponegoro Street are mixed trade corridors because these streets do not have one types of merchandise that dominate the trade corridors. As for the seven streets, the most various road is Sumatera Street, with 20 different types of merchandise. Moreover, the way with the least variety is Ternate Street, with four different types of merchandise.

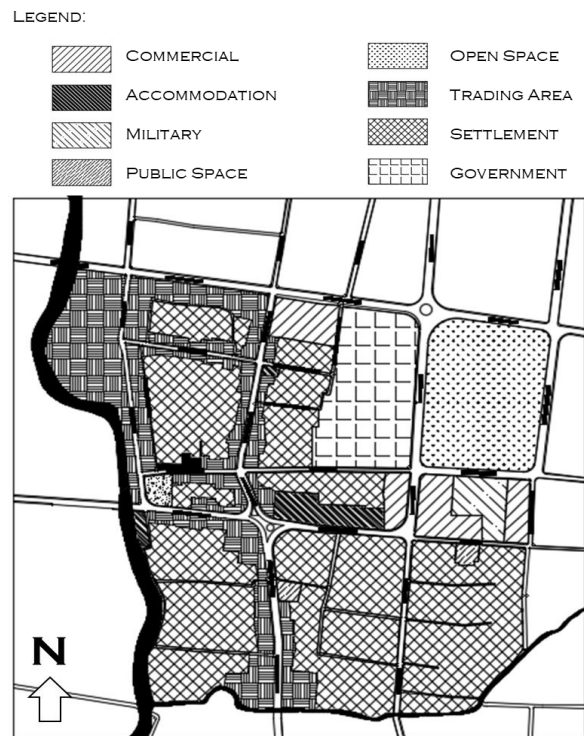


Figure 5. Land Use Map.

This pattern shows that stores with similar merchandise tend to gather and line up on the same road. This phenomenon occurs with the local connectivity existence that forms a series of store lines (shopping streets) as stated by Van Ness related to the trading area centrality [11]. The type specificity/ type of business for each road makes the series of shops very vital within the city centre. In other words, in terms of the role vitality of the way, it is always associated with the type specificity/ type of business that permanently occupies a particular road.

As far as the area can accommodate variations in road users, this is underlying the variety. The sidewalk facilities that are in the corridor become the user inclusiveness cause. The recorded conditions of the sidewalk facilities are the dimensions of the sidewalk, finishing materials, lighting, and the blind path. The following is situations for sidewalk facilities in each corridor.

A. Gajah Mada Street Corridor

Gajah Mada Street Corridor has sidewalks on both sides of the road with a width of 100-200 cm, so the street is wide enough to accommodate walking activities. The path is also equipped with pedestrian lighting so that people can use the sidewalk at night. On both sides, tactile paving provides the street to helping blind people. However, the area in front of the Badung Market needs to add tactile paving to keep up blind line connectivity. The sidewalk condition is also quite extensive and good enough for the use of walking aids such as wheelchairs or baby strollers.

Gajah Mada Street is quite good with the weather protection using a sheltering vegetation arrangement. Also, the quite high shop building gives shading that dispels the sun's rays. The sidewalk area allows for the pedestrian shelter addition that it can protect pedestrians from sunlight and rain. Besides, we can add pedestrian seating because the width of the sidewalk is quite extensive.

Table 1.
Corridor Facilities at Gajah Mada Street

Corridor Facilities	Conditions
Dimension	All roads have a sidewalk of 265 meters long, 100-200 cm wide.
Material Finishing	Paving blocks combinations with brush stones, conditions are very good.
Lighting	Use street lighting per distance of 25 meters and there is a pedestrian lighting
Blind Path	The 195 meters long front of the shop already exists. The 70 meters long front of Badung Market does not yet exist.
Types of vehicles	Passenger Car, Bus, Truck Wagon, Motorcycle

Table 2.
Corridor Facilities at Sulawesi Street

Corridor Facilities	Conditions
Dimension	The 348 meters road does not have sidewalks. Pedestrian uses a 2.5 meters wide shopping terrace as access.
Material Finishing	Using a floor that varies according to each store. Conditions are still quite good.
Lighting	Using street lighting per distance of about 25 meters and pedestrian lanes rely on the bright lights of the shops.
Blind Path	Not available.
Types of vehicles	Passenger Car, Motorcycle

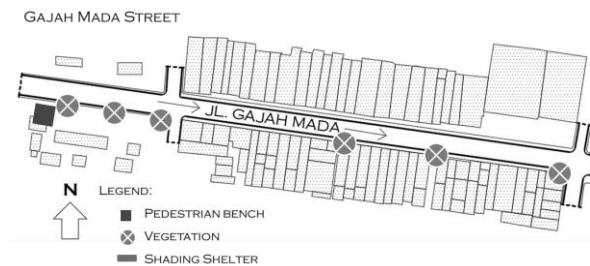


Figure 6. Layout of Gajah Mada Street



Figure 7. Pedestrian Ways at Gajah Mada Street.

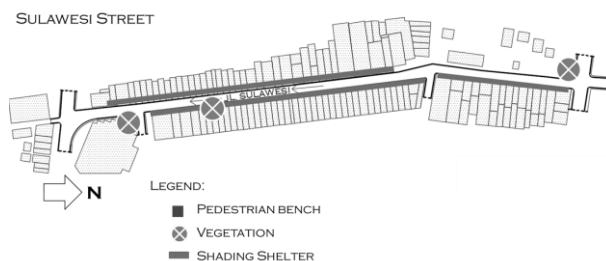


Figure 8. Layout of Sulawesi Street.

B. Sulawesi Street Corridor

Sulawesi Street Corridor does not have sidewalks, so pedestrians use the shopping terrace as a pedestrian path. These lane condition uses the lighting of each store to allow users to walk at night. However, the shopping terrace is not inclusive for the blind. The situation also does not help the use of walking aids because of the differences in floor height level without a ramp between one shop and the other. Therefore, it is necessary to align the storefront area (terrace) by replacing the cover material and matching the terrace height level.

Regarding weather protection, Sulawesi Street is quite good with shade because the pedestrian lane is a shop terrace that has a roof so protected from the weather. Motorbikes and passenger cars can only pass roads



Figure 9. Pedestrian Ways at Sulawesi Street.

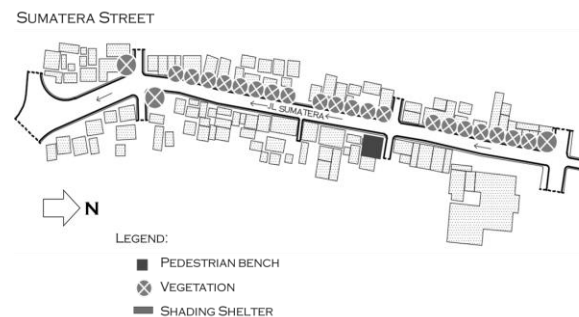


Figure 10. Layout of Sumatera Street.

because the road is relatively narrow. Therefore, this road needs to free from on-street parking in the design by making communal parking to prevent vehicle delays.

C. Sumatera Street Corridor

Sumatera Street Corridor has a pedestrian path on both sides of the road with a width of 80-100 cm. The pedestrian can use the sidewalk at night with the street lighting presence. Along the sidewalks have not accommodated the need for blind people. The sidewalk condition is less extensive and much damaged, so it does not allow pedestrians with assistive devices.

Sumatera Street has supported shade vegetation on the west side, while it also needs to equalize on the east side, so that protect both parties. Besides, it can widen the front area of the shop by the pedestrian lane and allow to add pedestrian seating facilities. This effort supports McCall et al.'s statement about the need for active areas to give to outdoor activities [12].

D. Hasanuddin Street Corridor

Hasanuddin Street is a corridor dominated by jewelry shops, especially in the southern part of the road. This road is a one-way road that connects Diponegoro Street to Imam Bonjol Street. Pedestrian lanes on this road have conditions that are not well-organized. The activities of

Table 3.
Corridor Facilities at Sumatera Street

Corridor Facilities	Conditions
Dimension	It has sidewalks on both sides of 340 meters long, 80-100 cm wide.
Material Finishing	Paving blocks with a lot of damage.
Lighting	Use street lighting per distance of 25 meters and bright lights belonging to shops.
Blind Path	Not available
Types of vehicles	Passenger Car, Bus, Truck Wagon, Motorcycle



Figure 11. Pedestrian Ways at Sumatera Street.

Table 4.
Corridor Facilities at Hasanuddin Street

Corridor Facilities	Conditions
Dimension	It has sidewalks on both sides of 148 meters long, 80-100 cm wide
Material Finishing	Paving blocks with a lot of damage
Lighting	The path on the north side of the road has equipped with street lighting per 25 meters, while on the south side does not and only relies on lighting from shops.
Blind Path	Not available
Types of vehicles	Passenger Car, Truck Wagon, Motorcycle



Figure 13. Pedestrian Ways at Hasanuddin Street

HASANUDDIN STREET

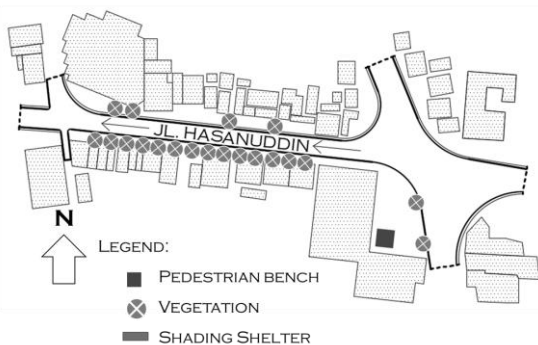


Figure 12. Layout of Hasanuddin Street.

TERNATE STREET

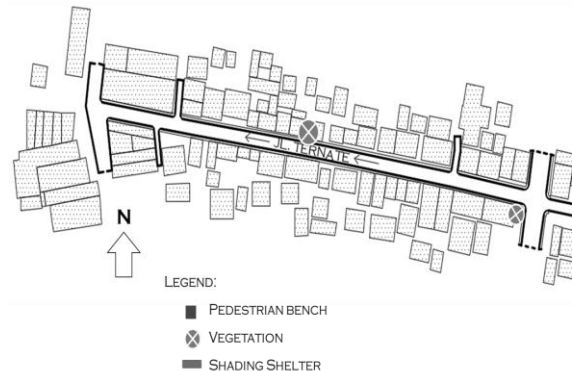


Figure 13. Layout of Ternate Street.

street vendors disturb circulation and pedestrian activity. Besides, on-street parking also concerns the security and comfort of corridor users. On Hasanuddin Street, the north side needs to add shade vegetation or shelter for weather protection. Moreover, it needs to redesign the socializing area in the shopping building on the east corner of the road to make it greener.

E. Ternate Street Corridor

Ternate Street is a one-way road that connects Sumatera Street and Sulawesi Street. Fruit and vegetable shops dominate trading activities in this corridor. The loading and unloading activities of fruits and vegetables cause visual problems and visitor movements. Besides, Ternate Street has a narrow road width, which disrupts vehicle circulation. Ternate Street is minim for weather protection, so it is very uncomfortable when used for rain or during hot weather. The width of the pedestrian lane on both sides of Ternate Street is less than the width of a decent pedestrian lane. Pedestrian facilities in this corridor

are minim, limited to sidewalks presence and without good separations between pedestrians and vehicles.

F. Kalimantan Street Corridor

Kalimantan Street is a one-way street connecting Sulawesi Street and Sumatera Street. Aside from being a trading corridor, activities that affect this road are worship activities because there is a mosque on the street. This corridor consists of residential buildings by utilizing the front area of the house as a shop.

Kalimantan Street has a relatively narrow road width, and there are sidewalks on both sides of the road. The pedestrian route has weather protection in the form of shade vegetation. Pedestrian facilities in this corridor are minimal, limited to the presence and without good separations between pedestrians and vehicles. This road is still not inclusive because tactile paving for the needs of blind people is not yet on this road.

Table 5.

Corridor Facilities at Ternate Street	
Corridor Facilities	Conditions
Dimension	It has sidewalks on both sides of 200 meters long, 80-100 cm wide.
Material Finishing	Paving blocks with a lot of damage.
Lighting	Use street lighting per distance of 50 meters
Blind Path	Not available
Types of vehicles	Passenger Car, Motorcycle



Figure 14. Pedestrian Ways at Ternate Street.

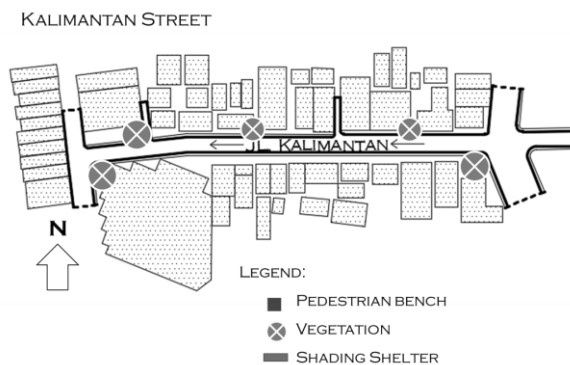


Figure 15. Layout of Kalimantan Street



Figure 16. Pedestrian Ways at Kalimantan Street

Table 6. Corridor Facilities at Kalimantan Street	
Corridor Facilities	Conditions
Dimension	Has sidewalks on both sides 134 meters long, 80-100 cm wide.
Material Finishing	Paving blocks with a lot of damage
Lighting	Use street lighting per distance of 40 meters
Blind Path	Not available
Types of vehicles	Passenger Car, Motorcycle

G. Diponegoro Street Corridor

Diponegoro Street Corridor has sidewalks that equipped with tactile paving on both sides of the road. Besides that, people can use it at night, and the sidewalk conditions are

still not wide enough to use a baby stroller or wheelchair. All sidewalks of the trading corridor should add bollard to prevent vehicles from entering the sidewalk area. Moreover, the paths need-blind facilities and ramp facilities on the street. User needs a ramp for the use of walking aids such as wheelchairs and baby stroller. Tactile paving at the connection between the intersections is necessary. Diponegoro Street is a road that already has enough weather protection in the form of shade trees.

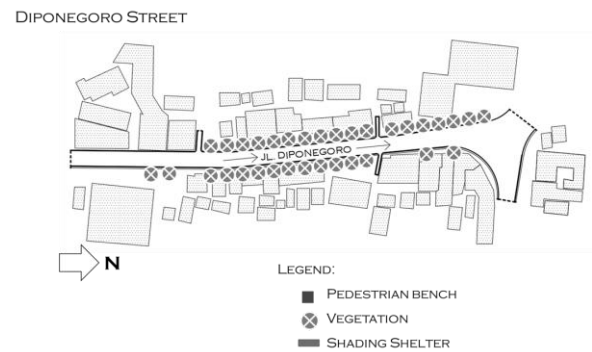


Figure 17. Layout of Diponegoro Street.



Figure 18. Pedestrian Ways at Diponegoro Street

Table 7. Corridor Facilities at Diponegoro Street	
Corridor Facilities	Conditions
Dimension	Has sidewalks on both sides of 260 meters long, 80-100 cm wide.
Material Finishing	Paving blocks with good conditions
Lighting	Use street lighting per distance of 25-30 meters
Blind Path	It's already along the two lines
Types of vehicles	Passenger Car, Bus, Truck Wagon, Motorcycle

Segregation of paths in the corridor is necessary to avoid conflicts between different types of movements, either between pedestrians and motorists or between vehicles. Segregation of lanes needs to consider the capacity of the vehicle, where low capacity requires higher vehicle frequency so that the level of segregation becomes higher [13]. The pedestrian pathway in the study site requires prevention of motorbikes entering the pedestrian pathway aims to improve the safety of the corridor users. This matter helps to avoid conflicts between motorbikes and pedestrians. Both of these make it possible to apply to the seven main trade corridors at the study site. As for the design of the pedestrian lane that allows use skateboards and roller skates, it is only possible on the street that has wide pedestrian lanes such as Gajah Mada Street and Hasanuddin Street.



Figure 19. Visualization of Trading Corridor at Dauh Puri Kangin

An inclusive trading area has a flexible, accessible, accommodating, welcoming, and realistic character [10]. Whereas, in the study locations, variations in activities were not supported by physical elements that made it possible for all groups, especially for persons with disabilities so that the area became less inclusive. Activities other than trade such as city tours, religious and traditional events, jogging in this area but have not been well accommodated for the users.

Therefore, the trade corridor requires several design criteria, as follows

- 1) Must be able to show the character of the variety of merchandise types per street.
- 2) Must be able to optimize the inclusiveness of the use of sidewalks for both regular users and those with special needs.
- 3) Must be able to give facilities for users to take a break on the pedestrian path.

V. CONCLUSION

The design of the right corridor dramatically affects comfort when doing activities within the trade corridor. Variety is one of the critical factors in designing public facilities. The type of events is not supported by a physical element that is possible for all groups, especially for people with disabilities so that the area becomes less inclusive. People need activities other than trade such as city tours, religious and traditional events, and jogging in this area but this corridor has not accommodated well. The street consists of two lanes, the vehicle lane and the pedestrian lane where it separated the two lanes clearly through the floor level differentiation, the types

differentiation of cover material and the bollard use. At least, blind people can use pedestrian pathways through the use of tactile paving. Curb cover material uses flat, and the lane used the non-slippery with walking aids such as wheelchairs and baby stroller. Pedestrian lane facilities optimize the completeness of users' needs with repetitive and easily accessible places to sit, trash, and spot drinking water. The merchandise variety is more highlighted as the distinctive character of each corridor. Specific research on variety will make the findings more in-depth and specific and enrich research in the field of urban design. Regional arrangement and design in addition to paying attention to existing physical conditions, should also pay attention to several important aspects, namely applicable regulations and external influences such as technological developments. Designers must consider the applicable regulation in addition to seeing whether or not the desired form of development can also provide feedback on whether or not the regulation is proper whereas external influences such as technological developments are beneficial for optimizing urban space to be more conducive.

REFERENCES

- [1] I. Bentley, A. Alcock, P. Murrain, S. McGlynn, and Smith, *Responsive Environments: A Manual for Designers*. London: The Architectural Press, 2015.
- [2] S. E. Fakhar and P. Shahab, "Investigating the Relationship between Responsive Environment and Appearance of Public Art Case Study: The St. Petersburg Palace Square and Moscow Red Square," *Int. J. Sci. Basic Appl. Res.*, vol. 42, no. 2, pp. 57–69, 2018.
- [3] T. Silavi, F. Hakimpour, C. Claramunt, and F. Nourian, "Design of A Spatial Database to Analyze The Forms and Responsiveness of An Urban Environment Using an Ontological Approach," *Cities J.*, vol. 52, no. 1, pp. 8–19, 2016.
- [4] J. Forlizzi and K. Battarbee, "Understanding Experience in Interactive Systems," in *Proceedings of 5th Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, 2004, pp. 261–268.
- [5] M. Hassenzahl and N. Tractinsky, "User Experience – A Research Agenda," *J. Behav. Technol. Inf.*, vol. 25, no. 2, pp. 91–97, 2006.
- [6] V. Roto, H. Rantavuori, and K. Väänänen-Vainio-Mattila, "Evaluating User Experience of Early Product Concepts," in *Proceeding of the International Conference on Designing Pleasurable Products and Interfaces*, 2009, pp. 1–10.
- [7] E. Law, V. Roto, A. Vermeeren, J. Kort, and M. Hassenzahl, "Towards a Shared Definition of User Experience," in *CHI 2008 Proceedings*, 2008, pp. 2395–2398.
- [8] E. Aarts and B. de Ruyter, "New research perspectives on Ambient Intelligence," *J. Ambient Intell. Smart Environ.*, vol. 1, pp. 5–14, 2009.
- [9] J. Koohsari, S. Mavoa, K. Villanueva, and T. Sugiyama, "Public Open Space, Physical Activity, Urban Design and Public Health: Concepts, Methods and Research Agenda," *Health Place*, vol. 33, pp. 75–82, 2015.
- [10] Commission for Architecture and the Built Environment, *The Principles of Inclusive Design*. London: CABI, 2006.
- [11] A. Van Ness, "Centrality and Economic Development in The Rijnland Region: Social and Spatial Concepts Of Centrality," in *Proceedings of 6th Space Syntax Symposium Istanbul*, 2007.
- [12] R. McCall, S. O'Neill, F. Carroll, and D. Benyon, "Responsive Environment, Place and Presence," *PsychNology J.*, vol. 3, no. 1, pp. 35–73, 2005.
- [13] D. Mephram, "Transit mode and route decisions enabling transit oriented development," in *4th International urban design conference: Resilience in urban design Surfers Paradise, Gold Coast*, 2011.