The Relationship between Street Furniture Arrangement and Pedestrian Comfort in the Ngurah Rai Corridor, Gianyar

Cokorda Istri Arina Cipta Utari[1], and I Putu Hartawan[2]

Department of Architecture
Faculty of Engineering and Planning, Warmadewa University, Indonesia
Denpasar, Indonesia
cokarinacipta@gmail.com
Department of Architecture
Faculty of Engineering and Planning, Warmadewa University, Indonesia
Denpasar, Indonesia

Abstract Elements of street furniture are an integral part of other urban planning elements that give a city a special image and character that can enhance the identity of the city itself. The city of Gianyar is a commercial area, which is precisely along Jalan Ngurah Rai which is the center of trade, government and recreation. As a commercial area, so the physical quality is very important in this area. As a commercial city, this area has not fully improved and improved existing facilities and infrastructure, such as the arrangement of street furniture elements, which are one of the supporting elements of a public space. This can be achieved by designing street furniture that has good function and quality and is integrated with other street face elements to avoid environmental incoherence. The need for street furniture as a public open space facility is increasingly being felt and needed by the community, especially for pedestrians as a supporting element for friendly public spaces in Gianyar City to provide comfort for its users. The research method uses a descriptive method with a qualitative approach. A qualitative approach is carried out in the process of observing and analyzing elements of street furniture and pedestrian comfort in the Ngurah Rai corridor, Gianyar. This research aims to create and improve city infrastructure that is comfortable and friendly for pedestrians of various groups, both in terms of access, aesthetics, security, and safety and comfort.

***Index Terms*—At least four keywords or phrases in alphabetical order, separated by commas.**

I. Introduction

Design and planning in a city is very important to create a good physical quality of the city. One of the important elements in urban planning is the existence of public spaces. Where public space is a container that is used to facilitate public interests and the interests of the general public such as city parks, squares, fields and pedestrians. Public space owned by a city can provide a special image and character that can improve the quality of a city. The image of a city is a mental image that is formed from the biological rhythms of a particular place and space that reflects a sense of time or time that is grown from within by the social-economic-cultural activities of the urban community itself. The image-forming elements of the city itself consist of edges, nodes, districts, paths and landmarks. The city of Gianyar is a regency that is included in the province of Bali, with an area of 368 km², and a population density of 11,784 people (central statistics agency, 2020).

Gianyar City is a commercial area both as a trade center and government center which is located right on Jalan Ngurah Rai which forms the corridor of Gianyar City. As a commercial area, this area is an area that accommodates community activities and traffic activities which are quite dense during the day and night. So that physical quality is very important in this area. Good physical quality in a city can strengthen the identity that the city wants to achieve. One of them is the establishment of street furniture elements for pedestrians. street furniture is all forms of road fittings and is found on the ground with the aim of procurement is to achieve optimal road function in the sense of safety, comfort and beauty) The application of elements of street furniture is widely available in this area, but as a

commercial city, this area has not fully improve and improve existing facilities and infrastructure in the arrangement of street furniture elements such as street lights, sidewalks, and provision of other facilities. Mobility in the Ngurah Rai corridor is not only motorized vehicles but also pedestrians. Most of the pedestrians in this corridor are generated by office, commercial and recreational areas.

The flow of pedestrians in this corridor follows the pattern of the road network which is equipped with inadequate facilities such as the existing sidewalks that seem to be designed not to take into account safety and comfort, there are several motorized vehicles that climb onto the sidewalk bodies, the sidewalks are used as selling areas for street vendors (PKL)), Of course this can result in disruption of pedestrian comfort. Where comfort is one of the vital values that should be enjoyed by humans when carrying out activities in a space. so it is necessary to conduct research to analyze the relationship related to the arrangement of street furniture elements on the comfort of pedestrians from various groups, by evaluating and improving infrastructure including city supporting facilities and infrastructure that are comfortable and pedestrian-friendly, both in terms of access, aesthetics, security and safety as well comfort

II. METHOD

A city is formed because of several elements, such as the shape and mass of buildings, circulation, parking and pedestrian ways. So that the pedestrian path is an important urban design element, Street Furniture is always placed along the main road or neighborhood road which functions as a supporting facility for community activities on the main road. Street furniture or street furniture are all elements placed collectively on a street landscape for the convenience, enjoyment, information, circulation control, protection and enjoyment of road users. Comfort is everything that shows the use of space in an appropriate and harmonious manner, both with space itself and with various shapes, textures, colors, symbols or signs, sound and sound impressions, intensity and color of light or smell, or other factors that influence comfort, namely: circulation, climate or natural forces, noise, smells or smells, form, safety, beauty. (Judge and Utomo in Astria, Ricky, 2019).

The research method uses a qualitative descriptive method by prioritizing primary data as the main data by surveying the location and comparing it with existing theory. A qualitative approach is carried out in the process of observing and analyzing elements of street furniture and pedestrian comfort in the Ngurah Rai corridor, Gianyar. In this process, the results of observations and analysis are presented descriptively regarding the arrangement of street furniture, pedestrian comfort in accordance with the facts found in the field.

III. RESULT AND DISCUSSION

A. Segment I (Government/Office Area)

Fig. 1. Ngurah Rai Corridor Map, Gianyar (Segment I – Government/Office Area)

a) Signage.

Road signs and information are boards that provide instructions to road users regarding directions, places and information, which include preliminary signs, major (direction) signs, places and information, which include affirmation signs, area boundary signs and other signs that provide information and useful facilities for road users1(3) . Information boards (signages) are placed on the paths of social interaction points, on lanes with dense pedestrian flows, with the size needed, and the materials used are made of materials that have high durability, and do not cause glare effects1(4). Information boards installed along the Ngurah Rai corridor area (segment I) are blocked by trees so that these boards are difficult to see by road users. The arrangement and placement of road signs and information must be rearranged to make it more informative and the installation of signage along the Ngurah Rai corridor segment I area so as not to exceed those that affect the visual aesthetics of the road corridor. The markings must be adequately spaced one to another and avoid crowding and clutter.

Fig. 2. Signage

b) Rubbish bin

Fig. 3. Rubbish bin

Places to accommodate waste should also have a size that is wide enough to accommodate the amount of waste, direct materials. touching garbage should be waterproof and equipped with a cover. The size for one trash can is + 91.5 cm high and a maximum diameter of 76 cm (5). along the Ngurah Rai corridor segment I area, there are not enough trash bins, there are trash bins that separate the type of waste and the quality of the trash cans is not good with large

gaps causing the trash to spill back onto the road.

c) Bollard

Bollards The existence of bollards, both round and tube-shaped, has the same function, namely to prevent vehicles or moving furniture from moving up and even entering the pedestrian area. Bollards, a kind of stone blocks that function as a barrier between pedestrian paths and vehicle lanes. Bollards can also function as a low light/light spot. The material used for bollards is concrete or masonry. The distance between the bollards is 1.5 m. the height of the bollards is 0.9–1.2 m. Bollards are made to be easy to see even at night. In the city of Gianyar, bolards have not yet been found, so that motorized vehicles often use pedestrian lanes when traffic jams occur on the highway. Placement of bollards in the segment I area of the ngurah rai corridor has a distance of less than 1.5 m. this is of course inefficient and the position of the bollard is not parallel to the road markings. There needs to be improvement in terms of bollard arrangement in this area.

Fig. 4. Bollard

d) Street Lighting

Street lighting in urban areas has several functions, including: to produce contrast between objects and the road surface, as a navigation aid for road users, to increase the safety and comfort of road users, especially at night, to support environmental safety, to provide beauty for the road environment, to observe the results look at the corridor 1 area, the lighting has a Balinese-style design that beautifies the area. However, in this area the distance of the lights is too close together, causing a waste of energy in the pedestrian area. Natural street lighting facilities must meet the following requirements: a. Placed on the left side of the traffic lane according to the traffic direction or on the traffic island; b. Distance of street lighting poles is at least 0.60 meters from the edge of the traffic lane; c. The height of the lowest part of the street lighting is at least 5.00 meters from the road surface. In addition, the placement of street lighting lamps must add to the aesthetics at night in an even number and while still paying attention to energy saving areas, their placement must be considered so as to create an integrated area. The existence of street lights supported by the right design and arrangement will form the impression of a place and provide a local cultural identity that can still be preserved.

Fig. 5. Street Lighting

e) Sculpture

Some of the statues installed along the segment 1 area of the Ngurah Rai Corridor in Gianyar are in the middle of trees and plants that are tall enough so that the plants disturb the objects of the statues and are difficult for pedestrians to see. The garden around the statue should be arranged to make the statue more prominent as its main object.

Fig. 6. Sculpture

f) Pedestrian Ways, Green Pathways, Shade Trees and Potted Plants

The green line is a path for the placement of plants and other landscape elements which are located in the space owned by the road (RUMIJA) as well as in the road monitoring room (RUWASJA). Plantation path is part of the road provided for the planting of trees and other plants which are placed continuously along the sidewalk, bicycle lane or road shoulder and road median. City parks are part of green open spaces in urban areas. The function that is emphasized from the city park is the aesthetic aspect, namely maintaining the beauty and cleanliness of the city area so that the desired goals can be achieved. in the corridor 1 area, the park in the pedestrian area looks monotonous with 1 type of plant so that this area looks less beautiful. Then the gliding block in this area is a dead end, making it dangerous for the blind to cross this area.

Fig. 7. Pedestrian Area

B. Segment II (Market Area)

There are several street furniture that are found at segment II, such as follow:

Fig. 8. Corridor Segment II

a) Signage

Road signs and information are boards that provide instructions to road users regarding directions, places and information, which include preliminary signs, major (direction) signs, places and information, which include affirmation signs, area boundary signs and other signs that provide information and facilities that are beneficial to road users (3). Information boards (signages) are placed on the paths of social interaction points, on lanes with dense pedestrian flows, with the size needed, and the materials used are made of materials that have high durability, and do not cause glare effects (4). Information boards installed along the Ngurah Rai corridor area (segment II) are blocked by trees so that

The board is difficult to see by road users. The arrangement and placement of road signs and information must be rearranged to make it more informative and the installation of signage along the Ngurah Rai corridor segment II area so that it does not exceed those that affect the visual aesthetics of the road corridor. The markings must be adequately spaced one to another and avoid crowding and clutter.

Fig. 9. Signage

b) Rubbish bin

Fig. 10. Signage

Places to accommodate waste should also have a size that is wide enough to accommodate the amount of waste, direct materials. touching garbage should be waterproof and equipped with a cover. The size for one trash can is + 91.5 cm high and a maximum diameter of 76 cm (5). along the Ngurah Rai corridor segment II area, trash bins are not adequate in terms of quantity and quality, the minimum number of trash bins and trash bins that are not good with large gaps make trash dumps spill back onto the road.

c) Street lighting

Street lighting in urban areas has functions including: as a navigation aid for road users, increasing the safety and comfort of road users, especially at night, supporting environmental security, providing beauty to the road environment, the results of observations seen in the segment II area of lighting have design with Balinese nuances so that it beautifies the area. However, in this area the distance of the lights is too close together, causing a waste of energy in the pedestrian area. Natural street lighting facilities must meet the following requirements: a. Placed on the left side of the traffic lane according to the traffic direction or on the traffic island; b. Distance of street lighting poles is at least 0.60 meters from the edge of the traffic lane; c. The height of the lowest part of the street lighting is at least 5.00 meters from the road surface (6). In addition, the placement of street lighting must add to the aesthetics at night in an even number and while still paying attention to energy saving areas, their placement must be considered so as to create an integrated area. The existence of street lamp lighting supported by the right design and arrangement will provide a characteristic of local cultural identity that needs to be preserved and considered in accordance with the original planning objectives. However, there are several lampposts that have fallen, this is dangerous and damages the beauty of the environment in this area.

Fig. 11. Street Lighting

d) Pedestrian Ways

The green belt is a path for the placement of plants and other landscape elements which are located in the space owned by the road (RUMIJA) or in the road monitoring room (RUWASJA). Plantation path is part of the road that is provided for planting trees and other plants that are placed continuously along the sidewalk, bicycle lane or road shoulder and road median. City parks are part of green open spaces in urban areas. The function that is emphasized from

the city park is the aesthetic aspect, namely maintaining the beauty and cleanliness of the city area so that the desired goals can be achieved. In the segment II area, there is a pedestrian area with damaged pedestrian paths and motorcycles parked on the pedestrian paths, and there are also street vendors selling on the sidewalks. This makes this area look untidy and dirty. There needs to be control around this area so as not to damage the order and environment of the city.

Fig. 12. Pedestrian

C. Segment II (Market Area)

Several street furniture are find at segment III, such as follow:

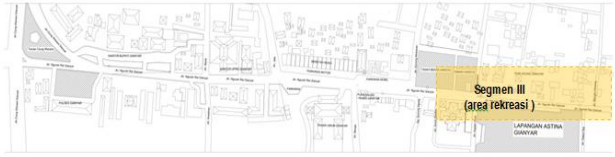

Fig. 13. Corridor Segment II

a) Signage

Road signs and information are boards that provide instructions to road users regarding directions, places and information, which include preliminary signs, major (direction) signs, places and information, which include affirmation signs, area boundary signs and other signs that provide information and useful facilities for road users1(3) . Information boards (signages) are placed on the paths of social interaction points, on lanes with dense pedestrian flows, with the size needed, and the materials used are made of materials that have high durability, and do not cause glare effects1(4). The information boards installed along the Ngurah Rai corridor area (segment III) are quite clear and do not confuse pedestrians crossing this area.

Fig. 14. Signage

b) Rubbish bin

Places to accommodate waste should also have a size that is wide enough to accommodate the amount of waste, direct materials. touching garbage should be waterproof and equipped with a cover. The size for one trash can is + 91.5 cm high and a maximum diameter of 76 cm (5). along the segment III segment of the ngurah rai corridor area has met the standards of good trash bins and there are at many points in this area.

Fig. 15. Rubbish bin

c) Bollar

The existence of bollards, both round and tube-shaped, has the same function, namely to prevent vehicles or moving furniture from moving up and even entering the pedestrian area. Bollards, a kind of stone blocks that function as a barrier between pedestrian paths and vehicle lanes. Bollards can also function as a low light/light spot. The material used for bollards is concrete or masonry. The distance between the bollards is 1.5 m. the height of the bollard is 0.9–1.2 m. Bollards are made to be easy to see even at night. In the City of Gianyar, there has not been found the installation of bolards evenly so that motorized vehicles often use pedestrian lanes when there is traffic jam on the main road. Placement of bollards in the segment III area of the ngurah rai corridor has a distance of less than 1.5 m. this is of course inefficient and the position of the bollard is not parallel to the road markings. There needs to be improvement in terms of bollard arrangement in this area

Fig. 16. Bolar

d) Strret Lighting

Street lighting in urban areas has several functions, including: to produce contrast between objects and the road surface, as a navigation aid for road users, to increase the safety and comfort of road users, especially at night, to support environmental safety, to provide beauty to the road environment, to observe the results look at the corridor 1 area, the lighting has a Balinese-style design that beautifies the area. However, in this area the distance of the lights is too close together, causing a waste of energy in the pedestrian area. Natural street lighting facilities must meet the following requirements: a. Placed on the left side of the traffic lane according to the traffic direction or on the traffic island; b. Distance of street lighting poles is at least 0.60 meters from the edge of the traffic lane; c. The height of the lowest part of the street lighting is at least 5.00 meters from the road surface (6). In addition, the placement of street lighting must add to the aesthetics at night in an even number and while still paying attention to energy saving areas, their placement must be considered so as to create an integrated area. The existence of street lamp lighting which is supported by the right design and arrangement will form the characteristics of a local cultural identity that needs to be preserved and paid attention to according to the initial purpose of the planning.

Fig. 17. Street Lighting

e) Sculpture

Fig. 18. Sculpture

Several statues installed along the segment III area of the Ngurah Rai Corridor in Gianyar reflect Balinese culture as an island of the gods. this is an added value and attraction for tourists visiting this area. but the arrangement of the garden in front of the statue needs to be considered so that it is always neat and does not interfere with the beauty of the statue itself.

f) Pedestrial Ways

The green line is a path for the placement of plants and other landscape elements which are located in the space owned by the road (RUMIJA) as well as in the road monitoring room (RUWASJA). Plantation path is part of the road provided for the planting of trees and other plants which are placed continuously along the sidewalk, bicycle lane or road shoulder and road median. City parks are part of green open spaces in urban areas. The function that is emphasized from the city park is the aesthetic aspect, namely maintaining the beauty and cleanliness of the city area so that the desired goals can be achieved. in segment III of the pedestrian path there is a cable hole that is quite large and this endangers pedestrians in this area. the arrangement of parks in the area is still lacking in maintenance, it is necessary to increase and improve the arrangement of parks in this pedestrian area.

Fig. 19. Pedestrial Way

D. The Relationship between Street Furniture Arrangement and Pedestrian Comfort

Arrangement of street furniture which is expected to affect the comfort of pedestrians. The Ngurah Rai Corridor, Gianyar, apart from being used as a pedestrian circulation platform, is also used as a place for street furniture, a place for street vendors to sell, park vehicles, and a place for community gathering or socializing.

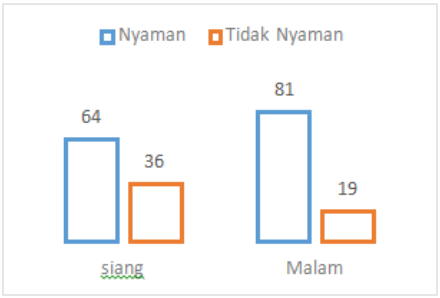

Fig. 20. Bar Chart of the Relationship between Street Furniture Arrangement and Pedestrian Comfort

Figure 21 shows the results of interviews and observations of pedestrian comfort in the arrangement of street furniture in the Ngurah Rai Corridor, Gianyar. On average, pedestrians feel comfortable in the Ngurah Rai Corridor,

Gianyar. Of the 100 pedestrians interviewed, 64 people felt comfortable walking during the day while 81 people felt comfortable walking at night. The comfort that pedestrians feel because of the well-arranged street furniture in the Ngurah Rai Corridor.

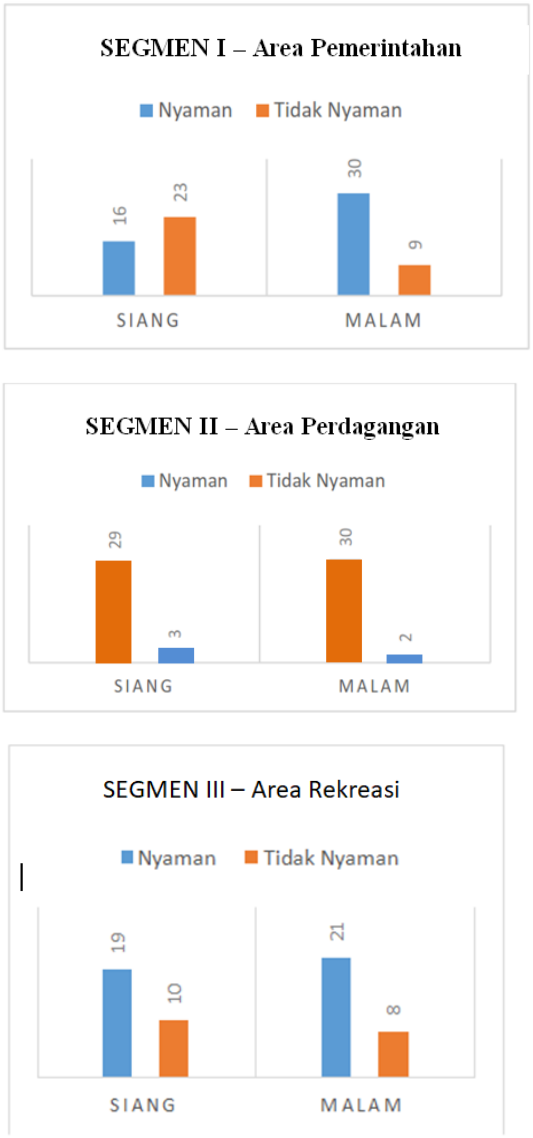

Fig. 21. Bar Chart of the Pedestrian Comfort

IV. Conclusion

From interview data and observations that have been carried out. Globally, the result is that some street furniture in Gianyar has been arranged, but some maintenance segments are still lacking (especially the maintenance trade area segment is still lacking), from 3 segments. The most comfortable segment/street furniture is the most organized in the recreation area, second in the government area, and finally in the trading area... from the lack of maintenance that affects the comfort of pedestrians. And then at night from the interview data (the average pedestrian discomfort there, the problem of excessive street lights makes the eyes dazzle). furniture maintenance on a regular basis to maintain the comfort of pedestrians

Acknowledgment

Praise goes to God Almighty, because of His blessings and grace, I can complete this research (scientific writing). I realize that without help and guidance from others, it is quite difficult for me to complete this research. Therefore I would like to thank: Mr. Dr. Eng. Hanson Endra Kusuma, S.T.M.Eng. as a supervisor who has provided guidance, direction, support, and input to the author; Warmadewa Research Center, has given the author the opportunity to qualify for this research; Korpri Welfare Foundation, Bali Province; Lecturers in the Architecture Study Program, Faculty of Engineering, Warmadewa University, thank you for sharing

References

[1] Astria R. Perubahan Tingkat Kenyamanan Pedestrian Di Jalan Braga Utara, Bandung. Jurnal Ilmiah Desain & Konstruksi. 2019;18(1):27–39.

[2] Arris C Dines N. Time Saver Standards For landscape Architecture: Design and Construction Data. second edition. New York (US): Hill Publishing Company;

[3] Dirjen binamarga. Ditjen Binamarga dan Direktorat Pembinaan Jalan Kota No.01/P/BNKT/1991. In: Ditjen Binamarga dan Direktorat Pembinaan Jalan Kota No01/P/BNKT/1991. 1991.

[4] Direktorat Penataan Ruang Nasional. Direktorat Penataan Ruang Nasional, 1993. In: Direktorat Penataan Ruang Nasional. 1993.

[5] Intan mentari. Street Furniture Harris dan Dines. Academia.edu.

[6] Kadek Pranajaya Staf Pengajar Program Studi Desain Interior I, Tinggi Desain Bali S. Kajian Penataan Elemen Street Furniture Di Kota Denpasar Menuju Kota Yang Humanis [Internet]. Available from: https://www.academia.edu/7282576/Street_Furniture_Harris_dan_Dines