Evaluation of Pedestrian Facilities in the Kuta Tourism Area (Case Study: Kuta Beach Road)

I Gede Fery Surya Tapa[1], I Nyoman Indra Kumara[1], Decky Cipta Indrashwara[1], Putu Indah Dianti Putri[2], Dewa Ayu Trisna Adhiswari Wedagama[2]

[1]Civil Engineering Department, Universitas Pendidikan Nasional, Denpasar, INDONESIA
[2]Environmental Engineering Department, Universitas Pendidikan Nasional, Denpasar, INDONESIA

E-mail: ferysuryatapa@undiknas.ac.id

ABSTRACT

The Kuta Tourist Area is a tourist area dominated by tourists who prefer to walk rather than use motorized vehicles to carry out their activities. The aim of this research is to determine the characteristics of pedestrians, determine the types of pedestrian facilities, and provide recommendations for appropriate pedestrian facility designs in the Kuta Tourism Area, especially on Kuta Beach Road. The method used in this research refers to the regulations of Minister of Public Works No.34 of the year 2014. The calculation results show that on weekdays the largest pedestrian flow occurs in the afternoon on the East sidewalk with a total of 364 people/m/hour, the average speed of space is 3.33 km/hour, density is 11 people/100m2, space is 9 .17 m2/person, and the level of service for pedestrian facilities is in category B, while on the South sidewalk the largest pedestrian flow is 202 people/m/hour, the average speed of space is 3.33 km/hour, the density is 6 people/100m2 , space is 16.49 m2/person, and the level of service for pedestrian facilities is in category A. Furthermore, on weekends the largest pedestrian flow occurs in the afternoon on the East sidewalk with a total of 765 people/m/hour, the average speed space 3.13 km/hour, density 24 people/100m2, space 4.09 m2/person, and the level of service for pedestrian facilities is in category B, while on the West sidewalk the largest pedestrian flow is 131 people/m/hour, speed the average space is 3.41 km/hour, the density is 4 people/100m2, the space is 26.09 m2/person, and the level of service for pedestrian facilities is in category A.

Keywords: evaluation; pedestrian facilities; tourist areas.

INTRODUCTION

Kuta is one of the sub-districts in Badung district. For a long time, Kuta has been known as one of the tourist areas in Bali and is one of the tourist destinations with the highest number of tourist visits in Bali (Pratiwi, 2018). The high number of tourist visits to the Kuta area is due to the many tourist destinations in the Kuta area (Dermawan & Agustin, 2020). The Kuta area has tourist attractions that are highlighted and become a characteristic of the area (Prama *et all*, 2023). The tourism that is highlighted includes beach tourism, cultural tourism, culinary tourism, and so on (Faisal & Hariani, 2023).

One of the prominent tourism objects in Kuta is Kuta Beach. This cannot be separated from the fact that Kuta Beach is known as a world-class tourist attraction (Tanan *et all*, 2023). As a tourism icon in Bali, Kuta Beach has a fairly high level of activity (Damayanti *et all*, 2024). This high level of activity is dominated by tourists visiting there (Kurniawan *et all*, 2019). In order to support tourism activities for tourists, the Kuta Beach Road is often used as an initial example of the development and development of tourist facilities and infrastructure before being implemented in other tourist destinations in Indonesia (Sari & Agusdini, 2020).

Of the many tourist infrastructure facilities, pedestrian facilities are the ones that are frequently updated (Prayogi *et all*, 2020). Pedestrian facilities on Kuta Beach Road are always being updated considering that Kuta Beach Road is dominated by tourists who prefer to walk rather than use motorized vehicles to carry out their activities while visiting Kuta Beach (Sukawati *et all*, 2022). The reason tourists prefer to walk is because all the tourist facilities along Kuta Beach Road such as

cafes, hotels and shopping centers are close to each other (Utomo & Tjahjani, 2019). Another reason is also influenced by the large number of foreign tourists who have the habit of walking when traveling from one place to another (Yani & Sylviana, 2022). Pedestrian facilities have also been updated, such as repairing sidewalks and adding pelicans as crossing facilities to increase the feeling of safety and comfort for pedestrians while touring Kuta Beach (Hidayat, 2016).

This research is important to carry out considering the increasingly complex problems for pedestrians. This is also influenced by the increasing number of tourists visiting Kuta Beach which directly causes the number of pedestrians to increase (Delima, 2017). The problem is compounded by the fact that violations are still found in pedestrian facilities such as sidewalks, where there are still local people or tourists who still park their motorbikes on the sidewalk and sometimes even motorized vehicles pass on the sidewalk, which causes limited space for pedestrians to move around. Similar research was also carried out on Kuta Beach Road (Surya, 2011). Considering that this research was more than 7 years ago, it is necessary to evaluate the area due to changes in several conditions to obtain more up-to-date information.

RESEARCH METHODS

Data collection In collecting data and information, it was obtained from different sources. These data can be collected through field surveys, obtained from agencies related to studies conducted, or obtained from the internet. This data is collected and grouped into primary data and data secondary.

Primary data is data obtained by conducting surveys in the field. Data collection for pedestrian characteristics and provision of pedestrian facilities includes: Road Geometry Data Survey, Traffic Volume Survey, Pedestrian Speed Survey, Pedestrian Volume Survey, Road Pedestrian Volume Survey. Secondary Data The data needed in secondary data is data that already exists, those that have been analyzed or those that have been surveyed. Secondary data is data which is used to support primary data, where secondary data is included can be from sources or related agencies related to the survey.

In data analysis, the data that has been recorded is then collected for processing and processing analyzed according to the research objectives. The analysis that can be carried out is Analysis of pedestrian characteristics, level of pedestrian facility service, and type of pedestrian facility. Following The research steps can be explained in Figure 1.
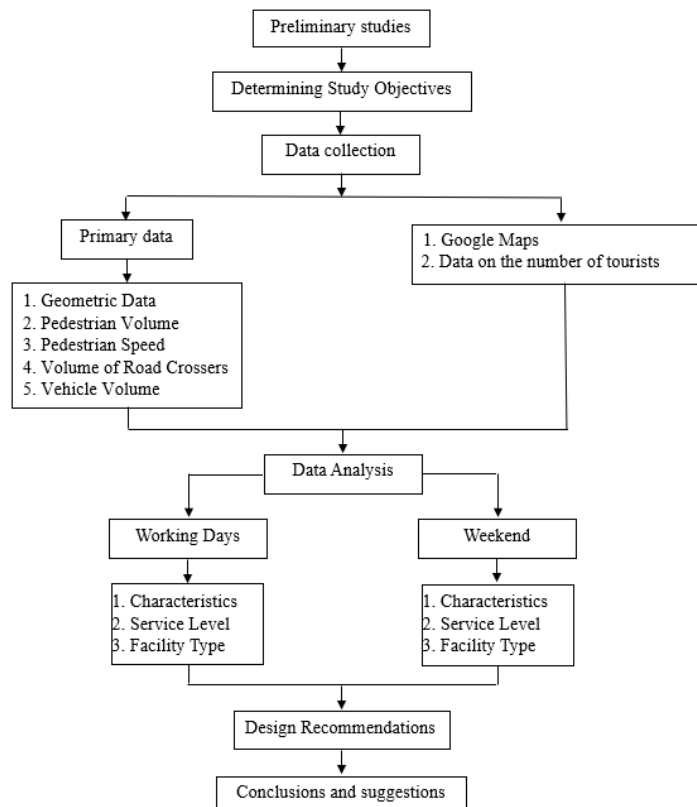
Figure 1. Research Framework

RESULT AND DISCUSSION
Visitation fluctuations

Fluctuations in tourist visits are the number of tourist visits in a certain period of time. Fluctuations in tourist visits are obtained based on results of the publication of the Bali provincial tourism office. The data obtained is volume visits by foreign tourists and domestic tourists in five years final.
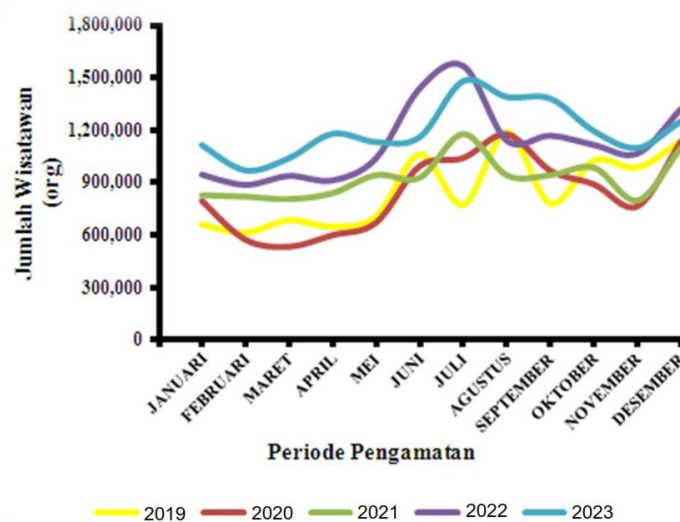

Figure 2. Fluctuations in Tourist Visits Source: Research Data, 2023

Based on Figure 2, there are different conditions in 2019 where only in that year did the volume of visits decrease traveler. The highest volume of tourist visits in the last five years there will be 14.4 million people/year in 2023.

Road Geometry Conditions

In the road geometry survey at the research location, data was taken in the form of sidewalk width, lane width, type and width of obstacles, as well as signs located on the road. along this stretch of road.
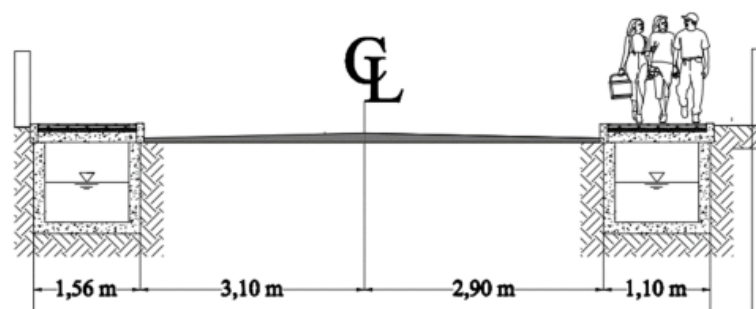

Figure 3. Road Cross Section Source: Research Data, 2023

From Figure 3 above it can be seen that Kuta Beach Road has traffic lane width 11 m without road shoulder. Apart from that, on every sidewalk has different sizes where the East sidewalk has a width of 1.1 m, while the West sidewalk has a width of 1.56 m

Traffic Volume Fluctuations

Peak traffic hours are obtained based on the results traffic volume surveys that have been carried out and have been grouped in units of vehicles/hour. Traffic volume is obtained from the type of vehicle grouped into 4 types, namely light vehicles, heavy vehicles, motorbikes and non-motorized vehicles.
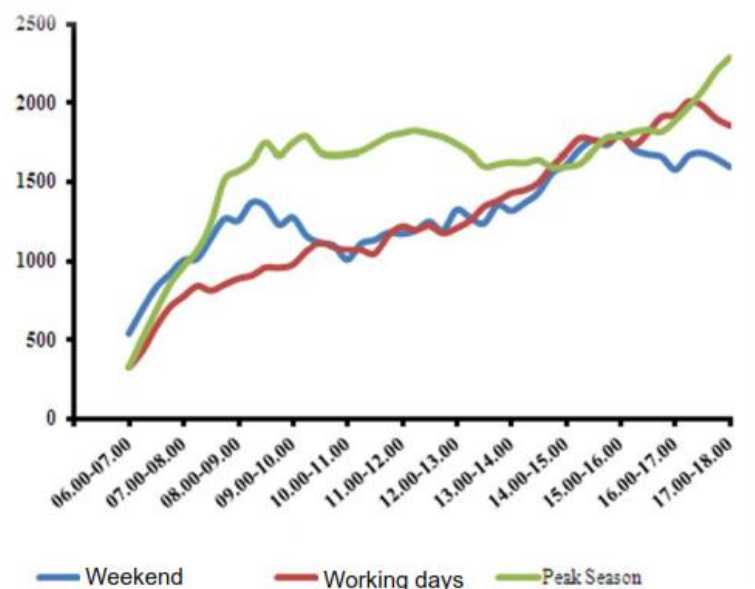

Figure 4. Vehicle Volume Comparison Source: Research Data, 2023

Based on Figure 4, during the weekend the traffic volume is at its minimum, while the highest traffic volume is during the weekend peak season. Peak hours for traffic volume on weekdays are 15.00-

16.00 with a traffic volume of 1796 vehicles/hour, on weekends namely 16.15-17.15 with a traffic volume of 2010 vehicles/hour, while peak hours for peak season occur at 17.00-18.00 with the total traffic volume is 2292 vehicles/hour. The graph is also available the difference in conditions where the traffic volume is above average occurs at 12.45 until 18.00 on weekends and weekdays, while during peak conditions The above average traffic volume season occurs from 08.15 to 18.00. The average traffic volume on weekends reaches 1279 vehicles/hour, on days Working traffic volume reaches 1311 vehicles/hour, during peak season reaching 1610 vehicles/hour.

Pedestrian Speed Survey Results

Pedestrian speed surveys were carried out along a 25 m segment already limited by duct tape. This survey was conducted during peak hours, both morning, afternoon and evening. 60 samples were taken for each side of the sidewalk by taking two to three samples every 15 minutes on the clock peak.
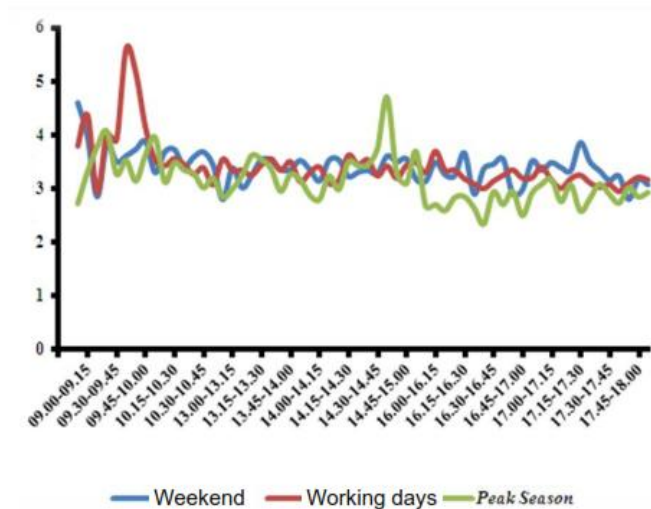
Figure 5. Comparison of Pedestrian Speeds on the East Sidewalk Source: Research Data, 2023
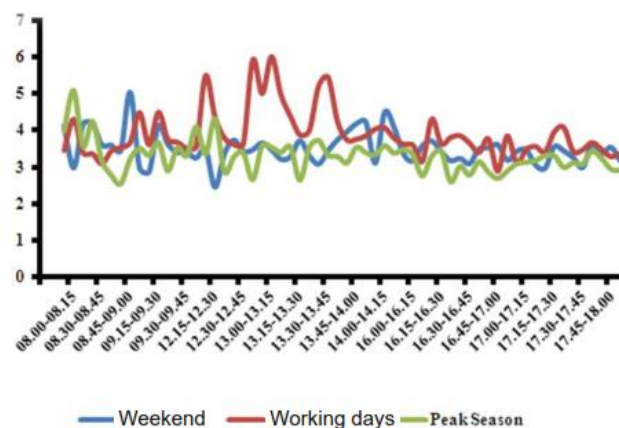
Figure 6. Comparison of Pedestrian Speeds on the West Sidewalk Source: Research Data, 2023

Based on Figure 5 and Figure 6 shown, there are different conditions for pedestrian speeds on the two sidewalks. On The East and West sidewalks have the same conditions, where maximum conditions occur on weekends, but during peak season pedestrian speeds decrease. Average speed of pedestrians on the East sidewalk at this time weekends and weekdays reach 3.42 km/hour while

during peak season reaching 3.14 km/hour. The average speed of pedestrians on the West sidewalk on weekdays reaches 3.51 km/hour, on weekdays it reaches 3.90 km/hour, while in peak season it reaches 3.31 km/hour.

Pedestrian Volume Fluctuations

Peak pedestrian hours are available pedestrian volume surveys that have been carried out and grouped in units person/hour. Pedestrian volume is obtained from the number of pedestrians walking on sidewalks and number of pedestrians.
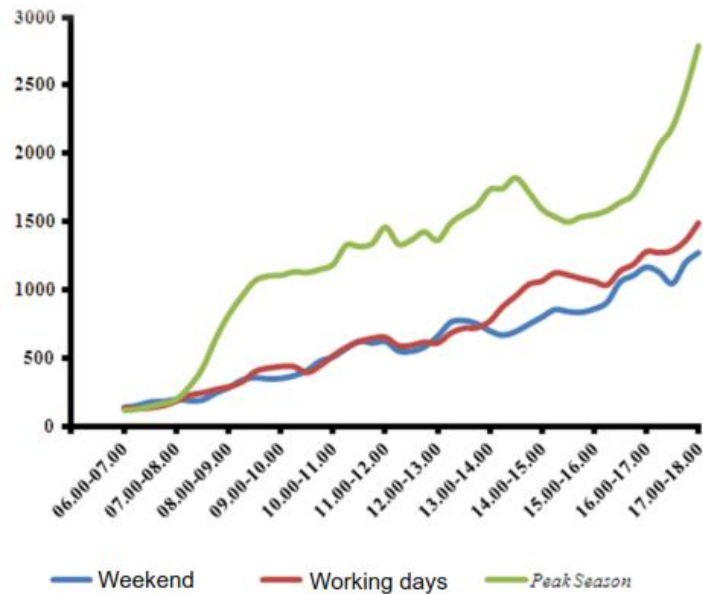
Figure 7. Pedestrian Volume Comparison Source: Research Data, 2023

Based on the results of Figure 7, during weekdays the volume of pedestrians is high in minimum conditions, while in conditions of highest pedestrian volume is during peak season. Peak hours for pedestrian volume on weekdays namely 16.00-17.00 with a pedestrian volume of 1161 people/hour, while on weekends and peak seasons the peak pedestrian volume hours occurred at 17.00-18.00 with a vehicle volume of 1494 people/hour weekdays and peak hours for peak season is 2794 people/hour. On figure 7 also shows differences in conditions where pedestrian volume is above average on weekdays it occurs from 12.00 to 18.00, on weekends it is volume pedestrians above the average occur from 12.30 to 18.00, meanwhile During peak season conditions the pedestrian volume is above average at 10.15 until 18.00. The average pedestrian volume on weekdays reaches 625 people/hour, on weekends the pedestrian volume reaches 708 people/hour, meanwhile in peak season it reaches 1317 people/hour.

Pedestrian Facility Service Level

The main criteria for determining level of service of pedestrian facilities used pedestrian space because By knowing the pedestrian space, it can be seen whether a pedestrian facility is feet have a density problem or not and to determine the space Pedestrians need data on the flow and average speed of pedestrian space.

Table 1. Service Levels During Peak Hours on Weekdays

Sidewalk	Peak flow time	Pedestrian space (m2/person)	Level of service for pedestrian facilities
East	Morning	11,890	**B**

Sidewalk	Peak flow time	Pedestrian space (m2/person)	Level of service for pedestrian facilities
	Afternoon	10,534	**B**
	Afternoon	9,170	**B**
West	Morning	56,543	**A**
	Afternoon	19,897	**A**
	Afternoon	16,492	**A**

Source: Analysis Results (2023)

Table 2. Service Levels During Peak Hours at the End of Work

Sidewalk	Peak flow time	Pedestrian space (m2/person)	Level of service for pedestrian facilities
East	Morning	10,897	**B**
	Afternoon	5,149	**B**
	Afternoon	4,094	**B**
West	Morning	55,758	**A**
	Afternoon	39,554	**A**
	Afternoon	26,089	**A**

Source: Analysis Results (2023)

Table 3. Service Levels During Peak Hours in Peak Season

Sidewalk	Peak flow time	Pedestrian space (m2/person)	Level of service for pedestrian facilities
East	Morning	4,980	**B**
	Afternoon	3,126	**C**
	Afternoon	2,579	**C**
West	Morning	7,674	**B**
	Afternoon	7,397	**B**
	Afternoon	6,760	**B**

Source: Analysis Results (2023)

From the data obtained, it can be seen that the level of facility service pedestrian peak hours on weekends and weekdays are identical. On the sidewalk East during peak hours on weekends and weekdays facility service levels pedestrians are at level B, while on the West sidewalk during peak hours on weekends and weekdays the level of service for pedestrian facilities is at level A. During peak season there is a change in the level of facility service pedestrians which is quite significant compared to the two previous conditions where changes reached one level below the usual day. When the sidewalk is on Service level A means that free flow for pedestrians is possible provides comfort for passing other pedestrians and being free inside choose the walking speed, so that conflicts between pedestrians are impossible happen. When the sidewalk is at service level B, it means it is for pedestrians freedom to determine walking speed, freedom to pass other pedestrians or to avoid crossing movement conflicts with other pedestrians, so that pedestrians begin to know the whereabouts of other pedestrians and respond to their presence to determine where to walk. On When the sidewalk is at service level C, it means pedestrians can move with current in the same direction normally even in the opposite direction There is a small and relatively slow contact due to limited space between them pedestrian.

CONCLUSION

The characteristics of the Kuta Beach Road area are due to the beach Kuta, Hotels and Restaurants which is a pedestrian center and this strengthen the hypothesis regarding pedestrian movement, then it can be taken conclusion as follows: 1. Characteristics of Pedestrians on Kuta Beach Road on Weekdays: 10.00-11.00 WITA on East sidewalk with a total of 290 people/m/hour with an average speed space 3.45 km/h, density 8 people/100m^2, space 11.89 m^2/person, and the level of service for pedestrian facilities is in category B. 08.15-09.15 WITA on West sidewalk with a number of 65 people/m/hour with an average speed space 3.70 km/h, density 2 people/100m^2,

space 56.54 m^2/person, and The level of service for pedestrian facilities is in category A. 14.00-15.00 WITA on East sidewalk with a total of 321 people/m/hour with an average speed space 3.38 km/hour, density 9 people/100m^2, space 10.53 m^2/person, and the level of service for pedestrian facilities is in category B. 12.45-13.45 WITA on West sidewalk with a total of 173 people/m/hour with an average speed space 3.44 km/hour, density 5 people/100m^2, space 19.90 m^2/person, and The level of service for pedestrian facilities is in category A. 16.45-17.45 WITA on East sidewalk with a total of 364 people/m/hour with an average speed space 3.33 km/hour, density 11 people/100m^2, space 9.17 m^2/person, and the level of service for pedestrian facilities is in category B. 16.45-17.45 WITA on West sidewalk with a total of 202 people/m/hour with an average speed of 3.33 km/hour, density of 6 people/100m^2, space of 16.49 m^2/person, and the level of service for pedestrian facilities is in category A. 2. Characteristics of Pedestrians on Kuta Beach Road on Weekends: 10.00-11.00 WITA on East sidewalk with a total of 312 people/m/hour with an average speed space 3.40 km/h, density 9 people/100m^2, space 10.90 m^2/person, and the level of service for pedestrian facilities is in category B. 08.30-09.30 WITA on West sidewalk with a number of 67 people/m/hour with an average speed space 3.73 km/h, density 2 people/100m^2, space 55.76 m^2/person, and The level of service for pedestrian facilities is in category A. 13.45-14.45 WITA on East sidewalk with a total of 648 people/m/hour with an average speed space 3.34 km/hour, density 19 people/100m^2, space 5.15 m^2/person, and the level of service for pedestrian facilities is in category B. 12.30-13.30 WITA on West sidewalk with a total of 93 people/m/hour with an average speed space 3.66 km/hour, density 3 people/100m^2, space 39.55 m^2/person, and The level of service for pedestrian facilities is in category A. 17.00-18.00 WITA on East sidewalk with a total of 765 people/m/hour with an average speed space 3.13 km/hour, density 24 people/100m^2, space 4.09 m^2/person, and the level of service for pedestrian facilities is in category A. 17.00-18.00 WITA on West sidewalk with a total of 131 people/m/hour with an average speed of 3.41 km/hour, density of 4 people/100m^2, space of 26.09 m^2/person, and the level of service for pedestrian facilities is in category A. 3. Characteristics of Pedestrians on Kuta Beach Road during Peak Season: 10.00-11.00 WITA on East sidewalk with a total of 656 people/m/hour with an average speed space 3.42 km/h, density 20 people/100m^2, space 4.98 m^2/person, and the level of service for pedestrian facilities is in category B. 08.45-09.45 WITA on West sidewalk with a number of 426 people/m/hour with an average speed space 3.24 km/h, density 13 people/100m^2, space 7.67 m^2/person, and The level of service for pedestrian facilities is in category B. 13.30-14.30 WITA on East sidewalk with a total of 1010 people/m/hour with an average speed space 3.58 km/hour, density 32 people/100m^2, space 3.13 m^2/person, and the level of service for pedestrian facilities is in category C. 12.30-13.30 WITA on West sidewalk with a total of 432 people/m/hour with an average speed space 3.27 km/hour, density 14 people/100m^2, space 7.40 m^2/person, and The level of service for pedestrian facilities is in category B. 17.00-18.00 WITA on East sidewalk with a total of 1130 people/m/hour with an average speed space 2.91 km/hour, density 39 people/100m^2, space 2.58 m^2/person, and the level of service for pedestrian facilities is in category C. 17.00-18.00 WITA on West sidewalk with a total of 466 people/m/hour with an average speed of 3.15 km/hour, density of 15 people/100m^2, space of 6.76 m^2/person, and the level of service for pedestrian faciliesis in category B. The type of pedestrian facility is a pedestrian facility that is suitable for the Kuta Beach Road section based on calculation results and government regulations used in this research is a crossing tunnel. In addition, sidewalks along the road are necessary added shade in the form of a pergola with a roof as a vine shade for pedestrians to ensure comfort for pedestrians.

REFERENCES

Surya, L. 2011 Analisis Karakteristik dan Penyediaan Fasilitas Pejalan Kaki di Kabupaten Badung (Studi Kasus: Ruas Jalan Pantai Kuta). (Tugas Akhir yang tidak dipublikasikan, Jurusan Teknik Sipil Fakultas Teknik Universitas Udayana, 2011).

Delima, S. Analisis Karakteristik dan Penyediaan Fasilitas Pejalan Kaki (Studi Kasus di Jalan Gajah Mada). (Tugas Akhir yang tidak dipublikasikan, Jurusan Teknik Sipil Fakultas Teknik Universitas Udayana, 2017).

Hidayat, N. "ANALISIS TINGKAT PELAYANAN FASILITAS PEJALAN KAKI," Jurnal Transportasi, vol. 6, no. 2, pp. 20–30, 2016, doi: https://doi.org/10.26593/jtrans.v6i2.1808.%25p

Yani, J. P. Sylviana, R. "ANALISIS TINGKAT PELAYANAN FASILITAS PEJALAN KAKI PADA TROTOAR JALAN AHMAD YANI KOTA BEKASI" AKSELERASI Jurnal Ilmiah Teknik Sipil., vol. 3, no. 2, pp. 129–138, 2022, doi: https://doi.org/10.37058/aks.v3i2.4583.

[Utomo, F. T, Tjahjani. A. R. I, "ANALISIS KARAKTERISTIK DAN TINGKAT PELAYANAN FASILITAS PEJALAN KAKI DI KAWASAN TERMINAL KENDARAAN UMUM KOTA DEPOK" Jurnal Infrastruktur, vol. 3, no. 2, pp. 107–114, 2019, doi: 10.35814/infrastruktur.v3i2.710

Prayogi, F. Priyanto, S. Muthohar, I, "ANALISIS KINERJA DAN TINGKAT PELAYANAN FASILITAS PEJALAN KAKI DI KAWASAN STASIUN KARET," Teknisia, vol. 25, no. 2, pp. 59–68, 2020, doi: https://doi.org/10.20885/teknisia.vol25.iss2.art1

Sari, E. P. Agusdini, T. M. C, "Analisis Tingkat Pelayanan Jalur Pedestrian di Jalan Kranggan Kota Surabaya" Jurnal Teknologi dan Manajemen, vol. 1, no. 1, pp. 50–56, 2020, doi: https://doi.org/10.31284/j.jtm.2020.v1i1.620

Kurniawan, S. Pratama, H. P. Masyukur. M, "ANALISIS KARAKTERISTIK PENYEBRANGAN PEJALAN KAKI PADA RUAS JALAN JENDERAL SUDIRMAN KOTA METRO" Jurnal Teknologi Aplikasi Konstruksi, vol. 9, no. 1, pp. 50–56, 2019, doi: http://dx.doi.org/10.24127/tp.v9i1.1045

Damayanti, N. F. Hidayat, D. W. Pamungkas. T. H, "ANALISIS KARAKTERISTIK DAN PELAYANAN FASILITAS PEJALAN KAKI" Jurnal Teknik Gradien, vol. 16, no. 1, pp. 28–35, 2024, doi: https://doi.org/10.47329/teknik_gradien.v16i01.1176

Tanan, B. Arselina, D. Radjawane. L. E, "Analisis Tingkat Pelayanan Fasilitas Pejalan Kaki di Ruas Jalan Lamadukelleng" Jurnal Teknik Sipil UKIPaulus-Makassar, vol. 5, no. 4, pp. 658–670, 2023, https://ojs.ukipaulus.ac.id/index.php/pcej/article/view/12

Sukawati, N. K. S. A. Wirasutama, C. P. Loma, D. I. D, "Analisis Kondisi Eksisting Fasilitas Pejalan Kaki di Jalan Kamboja Kecamatan Denpasar Utara" Jurnal Ilmiah Kurva Teknik, vol. 11, no. 1, pp. 63–69, 2022, doi: https://doi.org/10.36733/jikt.v11i1.3936.

Faisal, M. Hariani, M. L, "ANALISIS TINGKAT PELAYANAN JALUR PEJALAN KAKI DI JALAN SILIWANGI KABUPATEN KUNINGAN" Jurnal Konstruksi dan Teknologi Teknik Sipil dan Perencanaan, vol. 11, no. 2, pp. 55–66, 2023, doi: http://dx.doi.org/10.33603/jki.v11i2.8730

Pramana, A. D. Fadly, I. Andiyani, "EVALUASI TINGKAT PELAYANAN JALUR PEJALAN KAKI JALAN AREA SEKITAR PANGKER KABUPATEN SIDRAP" JURNAL KARAJATA ENGINEERING, vol. 3, no. 1, pp. 17–27, 2023, doi: https://doi.org/10.31850/karajata.v3i1.2062

Dermawan, A. W. Q. Agustin, I. W, "TINGKAT PELAYANAN JALUR PEJALAN KAKI PADA KORIDOR JALAN MT HARYONO KOTA MALANG" Jurnal PURE, vol. 9, no. 2, pp. 49–58, 2020, https://purejournal.ub.ac.id/index.php/pure/article/view/111.

Pratiwi, N. M. W, "ANALISA KINERJA RUAS JALAN DAN FASILITAS PEJALAN KAKI (STUDI KASUS: JALAN WR. SUPRATMAN, DENPASAR)" Jurnal Paduraksa, vol. 7, no. 1, pp. 50–56, 2018, doi: https://doi.org/10.22225/pd.7.1.818.77-78