CHARACTERISTICS AND TRAVEL PATTERNS OF THE SOCIETY IN COLOMADU DISTRICT, SURAKARTA

Aninda Diah Karunia Putri[1], Nurul Hidayati[2*]
[1,2] Department of Civil Engineering, Faculty of Engineering,
Universitas Muhammadiyah Surakarta
Jl. A. Yani No.157 Pabelan, Kartasura, Sukoharjo, Indonesia 57169
[*]Email: Nurul.Hidayati@ums.ac.id

Abstract

The high number of community activities in Colomadu District, Karanganyar, causes traffic congestion at times. This study seeks to examine respondents' characteristics and travel patterns in the presence or absence of enhancements to public transportation infrastructure. Primary data includes general information about respondents, their activities, and responses to existing facilities. Data were acquired by distributing Google Form questionnaire URLs both offline and online. The Miles and Huberman Method was employed during the analysis phase. The characteristic analysis revealed that the majority of respondents were female, aged 15-30 years, and from the student/university group. The most commonly owned vehicle was a motorcycle, with the primary reason of travel being school/college. The bulk of travels were school/college-related, with destinations in Surakarta, notably Banjarsari District. Gedongan had the most travel patterns, with 8 activities and 14 destination districts, whereas Tohudan had 7 destination cities/regencies. Gedongan and Gawanan had the most vehicle users, with six different types apiece. Initially, respondents used motorbikes rather than bus stops. With infrastructure upgrades, bus stops grew, while motorbikes declined. This resulted in a reduction in vehicle options from six to five, as well as a new bus stop layout, the majority of which came from Gedongan. Based on these results, it is hoped that improvements in facilities and services will occur in the future, so that there will be an increase in the use of BST.

Keywords: *Characteristic, Respondent, Transport Mode, Travel Pattern*

1. INTRODUCTION

The movement of people can be described as economic, social, or educational activity in a certain location. Transportation is critical for a country's development since it affects so many aspects of people's lives. Generally, transportation is the process of moving people and goods from one point to another, either with or without the use of vehicles. The transportation mode, sometimes known as the vehicle, is the tool used to carry passengers or goods (Hidayati, Setiyaningsih & Idris, 2018).

Several factors can influence the selection and usage of an effective mode, including user characteristics and motions, the mode's facilities, and the condition of the city or zone (Tamin, 2000). Land transportation, which can be divided into two categories—highways and railroads—is one of the forms of transportation that are utilized (Fatimah, 2019). In terms of ownership, highway modes are separated into private and public transportation, while motorized and non-motorized modes are grouped based on the driving force (GRI, 2009). Highway modes are accessible to nearly everyone and are comparatively simple (Widiarta, 2010; Ding, et al., 2024).

Public transportation services are divided into cross-border (LBN), intercity and interprovincial (AKAP), intercity within a province (AKDP), urban and rural (GRI, 2009). One city that provides urban transportation is

Surakarta, namely Batik Solo Trans (BST). Development in this city has progressed in various sectors, as seen in the presence of star-rated hotels and luxury restaurants, for example: the 4-star Alana Hotel (Hendrawan, Anwar & Lukitasari, 2020) and the 5-star Lor In (Cahyo & Solikhin, 2015). Travel habits have also changed as a result of motorized vehicle ownership and rapid population increase. There was traffic congestion everywhere as a result of this growth (Magfirona, et al., 2017). It is anticipated that this issue will be resolved with the availability of sufficient public transit. The Surakarta City Government accomplished this by constructing six feeder lines and six main corridors, one of which was connected to Adi Soemarmo Airport (Mardiastuti, 2022). Thirty Large Buses and 80 Medium Buses with 20 seats (including priority areas) made up the operated fleet (Suryo, 2023; Hidayati, Damarjati, et al., 2024). Based on a preliminary survey, one corridor with a path outside of Surakarta is Corridor 5, which runs across Colomadu District from the Kartasura Bekonang Terminal.

The Karanganyar Regency contains the Colomadu District, which has a population of 75,357 and an area of 15.64 km². It is geographically isolated from other districts, making it an exclave. Nevertheless, because of the large number of hotels, marketplaces, restaurants, schools, residential neighborhoods, and community health clinics, the area has become a metropolitan city (Diskominfo, 2011).

Numerous activities from the nearby residential areas to the trip-generation and attraction region have been observed to cause congestion at various periods during rush hour. Corridor 5 passes via the Tugu Boto unsignalized intersection (Novitria, 2022) as well as the LANUD signalized intersection. When workers and students leave for their destinations in the morning and return home in the afternoon, traffic is at its worst. There was no denying that the BST, particularly Corridor 5, was rarely used. Everyone who wishes to travel should be able to do so with the help of adequate services. Although the government has made efforts to improve the public transportation network, including its facilities,

the number of users is still relatively small (Hidayati, Sunarjono, et al., 2024).

Based on the foregoing, this study is required to examine people's characteristics and travel patterns when public transportation facilities and services are improved compared to when they are not. The findings are expected to be used as reference material for other researchers and as input for relevant parties.

2. METHODOLOGY

The research was conducted in Gedongan, Klodran, Tohudan, and Gawanan Villages, Colomadu District, Karanganyar Regency, with the stopping point being reviewed from Kinara Pharmacy to Colomadu Health Centre. Fig. 1 shows the location of this research.
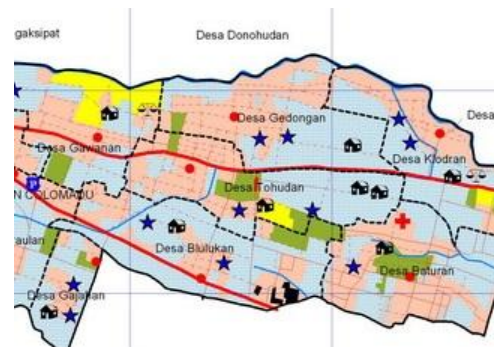

Fig.1. Research Location
(Diskominfo, 2011)

Primary data was collected by distributing questionnaires about societal characteristics and travel patterns to determine whether or not public transportation infrastructure and services have improved. The questions cover personal information and activities carried out by respondents, such as age, gender, occupation, vehicle ownership, travel purpose, and method. Travel patterns are studied in terms of activities, destinations, and modes of transportation used. If there were improvements to the BST facilities, would respondents change their mode of transportation for their daily activities? These improvements include the appearance of bus stops, buses (exterior and interior), fares, safety, comfort, service and appearance of staff, and punctuality. This study also incorporates secondary data from Google Maps and BPS Karanganyar Regency, in the

form of location maps and the number of population. Based on the total population (N) of productive age 17,814 in 2022 (BPS, 2023) with an error rate of 7.5% (d), the number of respondents (n) was calculated using Formula (1) (Machali, 2021). The number obtained was 176 respondents.

$$n = N/(1+Nd^2)$$ (1)

The distribution of questionnaires was carried out randomly in the surrounding population in residential areas, both offline and online. This activity was carried out for approximately 3 weeks in August-September 2024.
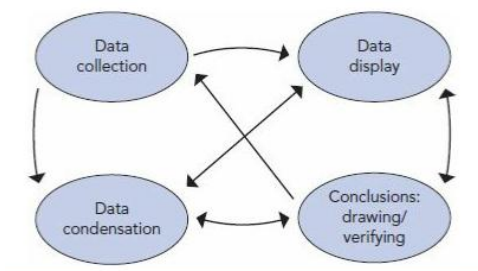

Fig. 2. Components of Data Analysis: Interactive Model
(Miles, Huberman & Saldana, 2014)

According to Miles, Huberman and Saldana (2014), the analytical technique includes: data collection, reduction, presentation, and conclusion, as seen in Fig. 2. This study will use an interactive approach, assuring a continuous process till completion. The collected data is then sorted and grouped according to the village of origin to determine characteristics and travel patterns. The next step is to present the data in tables, graphs, and similar formats to facilitate organization and facilitate discussion. The analysis will include determining the number and percentage of each category and sorting and summarizing respondents' opinions regarding improvements to BST facilities and services. The final step is drawing conclusions.

3. RESULT AND DISCUSSION
3.1 Characteristics of the Society

The distribution questionnaires obtained answers from 176 respondents who met the specified category. The result of the analysis of community characteristics in Colomadu District can be seen in Table 1.

Based on Table 1(1), it can be seen that the characteristics of the majority of respondents are female (64.2%). The most productive age range is 15-30 years old (61.4%) and from among students (48.3%) as shown in Table 1(2) and Table 1(3).

Table 1(4) shows that the majority of respondents owned a motorcycle (54.5%), although some had other vehicles and only 2.3% did not. Table 1(5) and 1(6) state that the most common movement destination is school/college (46%) using a motorcycle (73.9%).

3.2 Travel Patterns of the Society

In accordance with the Miles, Huberman and Saldana (2014) also Cheng et al., (2024) method, the analysis is carried out by presenting data in the form of diagrams and tables to make it easier to understand. The results of the analysis of the society travel patterns in Colomadu District are shown in Table 2, Fig. 3, and Fig. 4.

Table 1. Characteristics of the Society in Colomadu Sub-district by Village

Types	Number of Respondents from (village)				Total Respondents	
	GED	KLO	GAW	TOH	People	%
1. Gender						
Female	47	21	25	20	113	64.2
Male	25	7	7	24	63	35.8
Total Respondents	72	28	32	44	176	100.0
2. Age						
15 - 30 years old	23	23	25	37	108	61.4
31 - 45 years old	34	0	5	4	43	24.4
46 - 65 years old	16	5	2	2	25	14.2
3. Occupation						
Student	17	19	20	29	85	48.3
Self-employed	5	4	3	4	16	9.1

Types	Number of Respondents from (village)				Total Respondents	
	GED	KLO	GAW	TOH	People	%
Entrepreneur	11	1	1	2	15	8.5
PNS/TNI/Police	3	0	0	0	3	1.7
Private Employee	17	3	7	4	31	17.6
Lecturer	2	0	0	0	2	1.1
Teacher	1	0	0	0	1	0.6
Housewife	16	0	1	4	21	11.9
Retired	1	1	0	0	2	1.1
4. Vehicle Ownership						
Car	5	4	2	1	12	6.8
Motorcycle	33	17	16	30	96	54.5
Motorcycle, Car	13	0	2	1	16	9.1
Motorcycle, Car, Bike	14	1	4	5	24	13.6
Motorcycle, Bicycle	4	4	4	5	17	9.7
Bicycle	2	2	2	1	7	4.0
None	2	0	0	2	4	2.3
5. Purpose of Movement						
School pick-up and drop-off	12	0	0	3	15	8.5
Shopping	4	0	1	0	5	2.8
Work	30	8	12	9	59	33.5
Selling	7	2	0	2	11	6.3
At home	2	0	0	0	2	1.1
Sports	1	0	0	1	2	1.1
Recitation	1	0	0	0	1	0.6
School/College	16	18	19	28	81	46.0
6. Mode of Transport Used						
Motorcycle	50	21	23	36	130	73.9
Car	17	3	3	3	26	14.8
Bicycle	1	1	2	1	5	2.8
Walking	3	0	1	2	6	3.4
BST Bus	1	1	1	0	3	1.7
Online motorcycle	1	2	2	1	6	3.4

Note: GED/Gedongan; KLO/Klodran; GAW/Gawanan; TOH/Tohudan

Table 2. Travel Patterns of the Society before Facility and Service Improvements

Origin	Number of Patterns by			
	Activity	City	District	Vehicle
GED	8	6	14	6
KLO	3	4	9	5
GAW	3	4	5	6
TOH	5	7	11	5

Note: GED/Gedongan; KLO/Klodran; GAW/Gawanan; TOH/Tohudan

Fig. 3 shows that the majority of respondents' activities involve school/college, with destinations in Surakarta City, Banjarsari District. However, there are also respondents who work, shop, sell, recite, exercise, and stay at home. Referring to Fig. 4, respondents who go to school mostly choose motorcycles as their mode of transportation. Another thing that can be seen is that there are respondents who choose other vehicles such as cars, walking, bicycles, online motorcycle taxis, and BST.
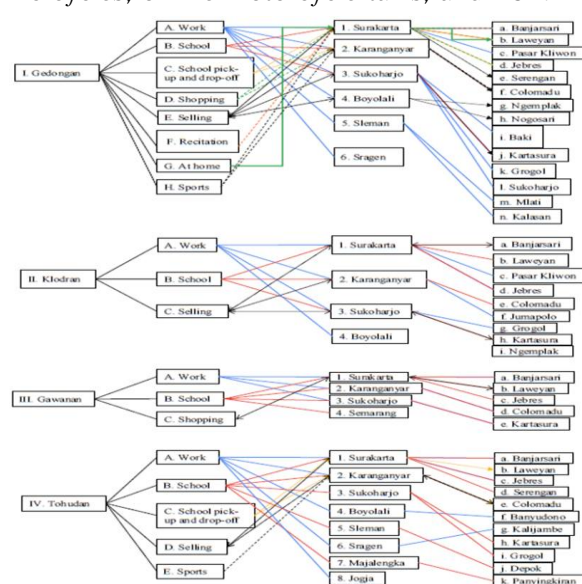

Fig. 3. Travel Patterns of The Society in Colomadu Based on Sub-district (Analysis, 2024)
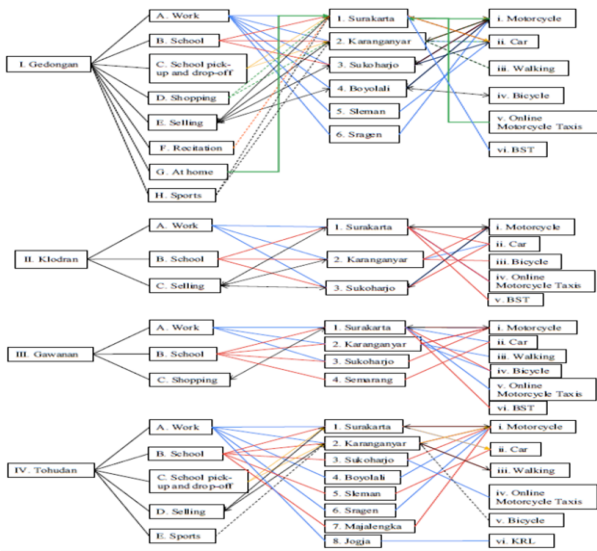
Fig. 4. Travel Patterns of The Society in Colomadu Based on the Vehicle Used (Analysis, 2024).

Gedongan has the highest number of travel patterns, with 8 types of activities and 14 district destinations, as shown in Table 2, Fig. 3, and 4. Tohudan has the most voters with 7 city destinations, while the highest number of vehicle

patterns comes from Gedongan and Gawanan with 6 types each.

3.3 Travel Patterns of the Society If There are Improvements in Facilities of Public Transportation

As mentioned in the introduction, people still rarely use public transportation. The results of the analysis related to the travel patterns of the community, if there are improvements in facilities and services to BST, as well as the generation of each bus stop, are shown in Table 3, Table 4, Table 5, and Fig. 5.

Based on Table 3 (B, Before), it can be seen that the majority of respondents choose to use motorcycles (21-50 persons) rather than BST (1 person). The table (A, After) also shows that BST experienced an increase in use (for example Gedongan from 1 to 31), while motorcycles experienced a decrease (from 50 to 27) if there were improvements in facilities and services. Improvements include bus stops, bus exterior and interior, fares, safety, comfort, service and appearance of officers, and punctuality.

Table 3. Choices of Modes used by the Society Before and If There are Improvements in Facilities

Modes Used	Number of Respondent Each Village Origin								Total respondent		% of Total	
	GED		KLO		GAW		TOH					
	B	A	B	A	B	A	B	A	B	A	B	A
Motor cycle	50	27	21	9	23	12	36	18	130	66	73.86	37.50
Car	17	13	3	1	3	1	3	2	26	17	14.77	9.66
Bicycle	1	1	1	0	2	1	1	1	5	3	2.84	1.70
Walking	3	0	0	0	1	0	2	1	6	1	3.41	0.57
BST	1	31	1	18	1	17	0	21	3	87	1.70	49.43
Online Motor cycle	1	1	2	0	2	1	1	0	6	2	3.41	1.14
Total	73	73	28	28	32	32	43	43	176	176	100.00	100.00

Note: GED/Gedongan; KLO/Klodran; GAW/Gawanan; TOH/Tohudan; B (before), A (After).

Table 4. Number of People Who Choose BST If There Are Improvements in Facilities

	Number of Trip Generation Each of Bus Stop Village Origin			
	GED	KLO	GAW	TOH
AK	1	0	3	0
SMP1	1	1	8	0
SMK AS	2	0	1	0
YK	2	1	2	4
AKFIS	1	0	0	9
SS	16	3	2	7
PC	8	13	1	1

Note: GED/Gedongan; KLO/Klodran; GAW/Gawanan; TOH/Tohudan; AK/Apotek Kinara; SMP 1 GAW/ SMP 1 Gawanan; SMK AS/ SMK Adi Soemarmo; YK/Yakkum;

Akfis/Akademi Fisioterapi; SS/Soto Sawah; PC/Health Centre Colomadu.

Table 5. Travel Patterns of the Society with Improved Facilities

	Number of Pattern Each Activity Every Village Origin			
	GED	KLO	GAW	TOH
Activity	8	3	3	5
City Destination	6	4	4	7
District Destination	14	9	5	11
Vehicle	5	3	5	5
Bus Stop	7	4	5	4

Note: GED/Gedongan; KLO/Klodran; GAW/Gawanan; TOH/Tohudan.

Table 4 shows that the highest number of people from Gedongan is at the Soto Sawah bus stop, as many as 16, and 13 from Klodran at the Colomadu Health centre bus stop. Gawanan had 8 people at the SMP 1 Gawanan bus stop, and Tohudan had 9 at the AKFIS bus stop. Although few, there are also productions/generations from Kinara Pharmacy (AK), SMK Adi Soemarmo, and Yakkum (YK) Stops.
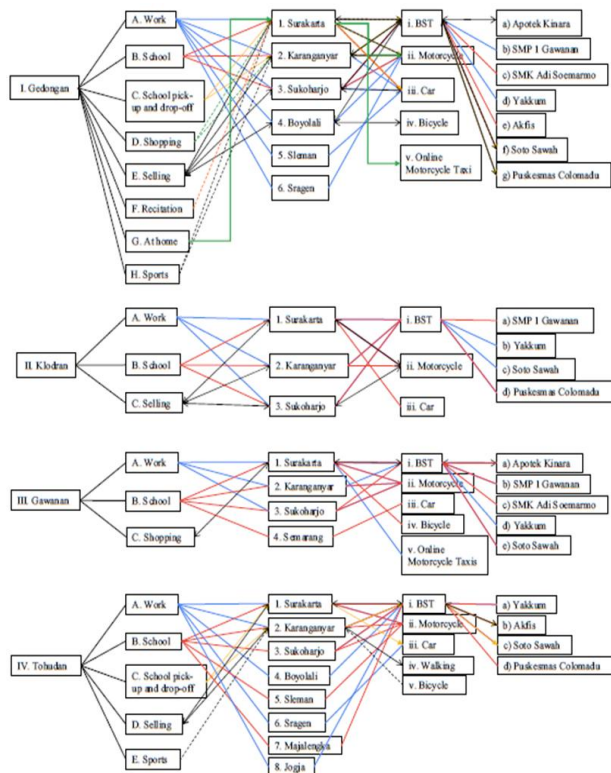

Fig. 5. Travel Patterns of the Society in Colomadu If There are Improvements in Facilities

Based on Table 3, Fig. 4, and Fig. 5, when there are improvements in facilities and services, there will be changes in the types of vehicles used, a new generation in the form of bus stops. Currently, more respondents use motorcycles (73.86%) than BST (1.7%). However, if there are changes to facilities in the future, there will be a shift in mode of transport, with motorcycles (37.5%) and BST (49.43%). This happens because there are respondents who switch to using BST and choose Kinara Pharmacy, SMP 1 Gawanan, SMK Adi Soemarmo, Yakkum, Akfis, Soto Sawah, and Colomadu Health Centre Stops as departure locations.

Table 2 and Table 5 show that in the selection of vehicles, there is a reduction in the number of each from 6 to 5 types originating from Gedongan and Gawanan. In addition, the table also shows that there is a new pattern related to bus stops, where the most come from Gedongan (7 locations).

4.   CONCLUSIONS

Based on the analysis, it can be concluded that the characteristics of respondents in Colomadu District are mostly female (64.2%), aged 15-30 years old (61.4%), students (48.3%), and motorcycle owners (54.5%).

The majority of respondents' used motorcycle for school/college activities, with destinations in Surakarta City, Banjarsari District. Gedongan has the highest number of travel patterns with 8 activities and 14 district destinations. Tohudan had the highest voters, with 7 city destination, while the highest number of vehicle patterns came from Gedongan and Gawanan with 6 types each.

Currently, more respondents use motorcycles (73.86%) than BST (1.7%). However, if there are changes to facilities in the future, there will be a shift in mode of transport, with motorcycles (37.5%) and BST (49.43%). Based on these results, it is hoped that improvements in facilities and services will occur in the future, so that there will be an increase in the use of BST.

REFERENCES

BPS. 2023. Kecamatan Colomadu dalam Angka. Karanganyar. Available at: https://karanganyarkab.bps.go.id/publication/2023/09/26/75744ec08dcc9c5fc7d374ad/kecamatan-colomadu-dalam-angka-2023.html.

Cahyo, D.A. & Solikhin, A. 2015. Analisis Peranan Purchasing terhadap Proses Pengadaan Barang di Hotel Lorin Solo, Jurnal Pariwisata Indonesia (JPI), 10(2), pp. 1–23. Available at: https://jurnal.stpsahidsurakarta.ac.id/index.php/JPI/article/view/190.

Cheng, L. et al. 2024. Characterising Travel Behaviour Patterns of Transport Hub Station Area Users Using Mobile Phone Data. Journal of Transport Geography, 116, p. 103855. Available at: https://doi.org/https://doi.org/10.1016/j.jt

rangeo.2024.103855.

Ding, F. et al. 2024. A Hybrid Method For Intercity Transport Mode Identification Based on Mobility Features and Sequential Relations Mined From Cellular Signaling Data. Computer-Aided Civil and Infrastructure Engineering, 39(21), pp. 3206–3224. Available at: https://doi.org/https://doi.org/10.1111/mice.13229.

Diskominfo. 2011. Wilayah Kecamatan Kabupaten Karanganyar: Kecamatan Colomadu, Dinas Komunikasi dan Informatika Kabupaten Karanganyar. Available at: https://www.karanganyarkab.go.id/kecamatan-colomadu/.

Fatimah, S. 2019. Pengantar Transportasi. Cetakan Pe. Ponorogo: Myria Publiser. Available at: https://books.google.co.id/books?id=PEnCDwAAQBAJ&printsec=frontcover#v=onepage&q&f=false.

GRI. 2009. Undang-undang Republik Indonesia, Nomor 22, tentang Lalu Lintas dan Angkutan Jalan [Republic of Indonesia Act, Number 22, concerning Road Traffic and Transportation]. Republic of Indonesia: Government of Republic of Indonesia.

Hendrawan, R., Anwar, A.K. & Lukitasari, E.H. 2020. Perancangan Company Profile the Alana Hotel Solo. Universitas Sahid Surakarta. Available at: http://repository.usahidsolo.ac.id/90/.

Hidayati, N., Sunarjono, S., et al. 2024. Evaluation of Public Transportation Implementation as Part of Supporting Sustainable Transportation, Civil Engineering and Architecture, 12(3A), pp. 2360–2369. Available at: https://doi.org/10.13189/cea.2024.121330.

Hidayati, N., Damarjati, I., et al. 2024. Performance Analysis of Batik Solo Trans Corridor-6 Services, in https://www.mdpi.com/2673-4591/63/1. Surakarta: MDPI, pp. 4–11. Available at: https://doi.org/https://doi.org/10.3390/engproc2024063009.

Hidayati, N., Setiyaningsih, I. & Idris, Z. 2018. Sistem Transportasi dan Rekayasa Lalu Lintas. Surakarta: Muhammadiyah University Press.

Machali, I. 2021. Metode Penelitian Kuantitatif: Panduan Praktis Merencanakan, Melaksanakan dan Analisis dalam Penelitian Kuantitatif. Cetakan 3. Yogyakarta: Fakultas Ilmu Tarbiyah dan Keguruan, Universitas Islam Negeri Sunan Kalijaya.

Magfirona, A. et al. 2017. Analisis Kinerja Ruas Jalan Di Kawasan Kerten Surakarta, in Prosiding Konferensi Nasional Ke-5 Asosiasi Program Pascasarjana Perguruan Tinggi Muhammadiyah (APPPTM). Yogyakarta: Program Pascasarjana Universitas Muhammadiyah Yogyakarta, pp. 152–157.

Mardiastuti, A. 2022. Rute Lengkap BST Solo. Available at: https://www.detik.com/jateng/berita/d-6383884/rute-lengkap-bst-solo-cek-di-sini.

Miles, M.B., Huberman, A.M. and Saldana, J. 2014. Qualilative Data Analysis: A Methods Sourcebook. Third Edit. United States of America: SAGE Publications, Inc. Available at: https://www.metodos.work/wp-content/uploads/2024/01/Qualitative-Data-Analysis.pdf.

Novitria, A.A. 2022. Analisa Kinerja Simpang Tiga Tugu Boto di Klodran Colomadu. Universitas Tunas Pembangunan. Available at: http://repository.utp.ac.id/75/.

Suryo, D. 2023. Rute, Tarif, dan Jadual Batik Solo Trans Berkeliling di Kota Surakarta, Kompas.tv. Available at: https://www.kompas.tv/lifestyle/433224/rute-tarif-dan-jadwal-batik-solo-trans-untuk-berkeliling-di-kota-solo?page=all.

Tamin, O.Z. 2000. Perencanaan dan Pemodelan Transportasi [Transport Planning and Modeling]. Bandung: Penerbit Institut Teknologi Bandung.

Widiarta, I.B.P. 2010. Analisis Pemilihan Moda Transportasi untuk Perjalanan Kerja (Studi Kasus: Desa Dalung, Kecamatan Kuta Utara, Badung, Bali), Jurnal Ilmiah Teknik Sipil Universitas Udayana, 14(2), pp. 218–225. Available at: https://ojs.unud.ac.id/index.php/jits/article/view/3638/2667.