

TRAVEL TIME ANALYSIS OF CIKURAY TRAIN DEPARTING PASARSENEN – GARUT

Nissa Nuralfi Azizah¹, Agus Nugroho², Haniva Mulyani³

^{1,2,3} Institut Transportasi dan Logistik Trisakti, Jakarta, Indonesia

□ Corresponding author: nissa.nazizah27@gmail.com

Abstract: The train is one of the land transportation that is in great demand by the public, starting from March 25, 2022 PT KAI operates the Cikuray Train with the Pasarsenen - Garut route via the southern Java route (Via Bandung) with the hope that the operation of the Cikuray train can reduce congestion levels. on the road, reduce the use of private vehicles, and provide efficient and affordable transportation solutions. With the operation of the Cikuray train, of course, proper scheduling is needed in order to optimize train travel. However, this train scheduling system is not an easy problem to solve, because there are many aspects that must be considered. To determine the performance of the Cikuray Train journey, this study discusses the calculation of realistic travel time, using the gap analysis method. The data used are primary data obtained through field surveys by following the Cikuray train journey and secondary data obtained from the Ministry of Transportation, Directorate of Traffic and Transportation. Based on the analysis and calculation of the data that has been done, it can be concluded that the actual travel time of the Cikuray Train majoring in PSE-GRT experiences a fairly high gap with the scheduled or programmed travel time. In this case, the aspect that was found was not the problem of delay, but rather that the Cikuray Train arrived 15 – 30 early at Garut Station. So, the suggestion from this research is about the adjustment of travel time.

Keywords : *Travel performance, Cikuray Train, Travel time.*

Introduction

Currently, the development of the business world in the service sector is increasing. This increase can be observed in daily activities, where most of these activities cannot be separated from various service sectors. One of the service sectors that has an important role to support various activities is the transportation services sector. Transportation has an important role in facilitating the wheels of the economy, and can affect all aspects of life. The importance of transportation is reflected in Presidential Regulation Number 87 of 2021 regarding the acceleration of the development of the Tambourine and South West Java Areas. This is stated in the construction of rail-based mass transportation in southern West Java, one of which is realized through the reactivation of the Cibatu – Garut railway line. This development is expected to be able to reduce the level of congestion on the highway, reduce the level of use of private vehicles, provide efficient and affordable transportation solutions, facilitate tourist access to tourist destinations in Garut and its surroundings, as well as grow new tourist destinations that can

create jobs and develop local industries.

In Indonesia, especially Operational Area II Bandung, train is one of the land transportation that is in great demand by the public, this is due to the relatively low cost and fast travel time compared to other land transportation. Therefore, proper scheduling is needed in order to optimize train travel, but this train scheduling system is a problem that is not easy to solve, because it must pay attention to many rules and restrictions. One of them is a path used for two different directions (double lane). The schedule contains the arrival time and departure time of the train at each station that the train passes through.

Starting from March 25, 2022 PT Kereta Api Indonesia (Persero) operates the Cikuray Train with the Pasar Senen - Garut route via the southern Java route (Via Bandung) and vice versa. According to the operating schedule set by PT. Indonesian Railways, the Cikuray Train operates one trip a day with a travel time of 387 minutes or about 6 hours 45 minutes (GRT – PSE) in the morning, and 6 hours 58 minutes (PSE – GRT) in the afternoon for one trip times or also known as v-slag. The speed of this Cikuray Train starts from 50-100 km/hour. This Cikuray Train is a long-distance train consisting of 7 economy trains with a capacity of 560 seats. With such a large movement of people from Pasar Senen to Garut and vice versa and the amount of public interest in the mode of rail transportation, it is hoped that this train will be able to serve the movement of the community.

To find out the travel time of the Cikuray Train service, in this case regarding the optimal and realistic travel time aspect, then whether the Cikuray Train is in line with expectations or not regarding the accuracy of travel time and arrival time, this study intends to conduct further observations and research. more about the travel time of the Cikuray Train with the title "Analysis of Travel Time for the Cikuray Train, Pasar Senen - Garut Department".

Literature Review

Economic Train

The Economic Train is a passenger train below the business class in the Indonesian Railways. Economy trains in Indonesia are divided into several types based on their seat configuration. Many of the economy classes

in operation use subsidies based on a public service obligation (PSO).

Travel Time

According to Tika (2006), in calculating travel time, it is necessary to start with theoretical calculations, taking into account the traffic factor. The strength of the locomotive and the load of the towed circuit and the existing signaling equipment. To find out the truth of theoretical calculations, it is necessary to do field testing. Between the theoretical travel time and the results of field tests, it is necessary to determine the most applicable travel time.

The time to pick up and drop off passengers at the station is calculated based on need. At large stations where many passengers are expected to get on and off, it is necessary to give a longer stop time compared to the stopping time at small stations. Whether there is a change of train driver or crew will also affect the length of the stop time.

Arrival Time and Departure Time

According to the Directorate General of Land Transportation (2002), the amount of time each vehicle stops at a stop along the route will affect the efficiency of the transportation system as a whole. The amount of this time consists of 3 delay times, namely, boarding time, alighting time and dead time.

Train Travel Information (Malka)

Travel time of the train specified with train travel information (Malka), it is valid for a maximum of 6 months, and must be changed or extended every first Thursday of May and November (Office Rules 19 volume I article 8).

The Objectives of the Study

In this study, there are several objectives to be achieved to find answers to the questions mentioned in the sub-problems above, including the following:

- a. Analyze the travel time of the Cikuray train from one stop to another.
- b. Analyze the difference between actual arrivals and departures against a predetermined schedule.
- c. Finding a realistic travel time for the Cikuray Train.

Methodology

This research uses descriptive quantitative method. The data analysis used is the analysis of travel time, and the analysis of the difference between the arrival & departure times of the Cikuray train with "Gap Analysis" where gap analysis is used as a tool to evaluate gaps that occur with previously planned conditions.

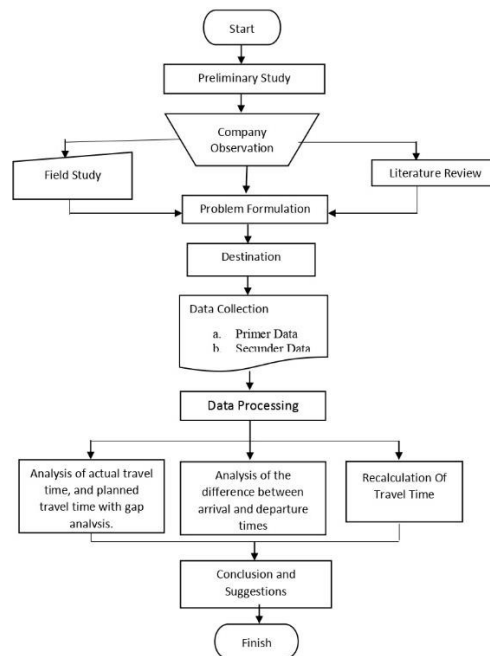


Figure 1 Research Path

Discussion and Result

This chapter contains the data that has been obtained, both primary data and secondary data, as well as the process of analysis and discussion. What is analyzed and discussed in this chapter is the calculation of the actual travel time, the difference between the delay of the Cikuray train and the schedule that has been set, and the calculation to find the optimal travel time.

Average Train Travel Time

Travel time is the time it takes for the train to travel one cycle route which is influenced by several factors such as the average travel time between stations. The travel time survey was carried out simultaneously with the actual departure and arrival survey for the Cikuray train.

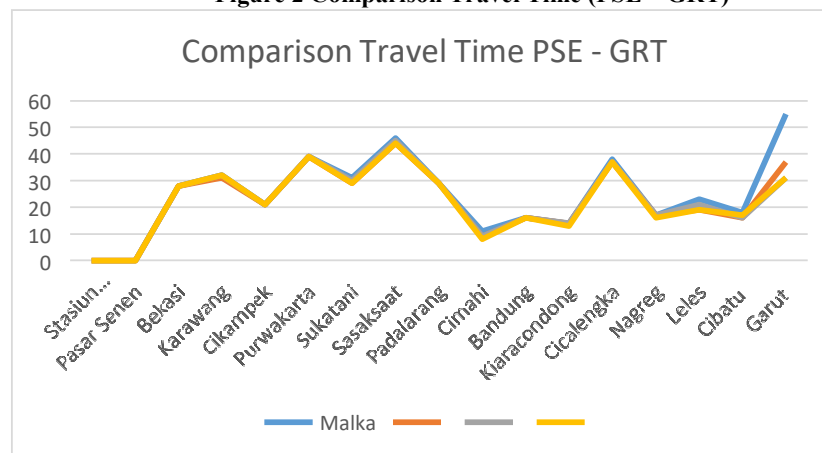
Table 1. Average Train Travel Time (PSE – GRT)

N0.	Stop Station	Time travel based on MALKKA (Program)	Time travel based on survey 1	Time travel based on survey 2	Time travel based on survey 3
1	Pasar Senen	-	-	-	-
2	Bekasi	28	28	28	28
3	Karawang	32	31	32	32
4	Cikampek	21	21	21	21
5	Purwakarta	39	39	39	39
6	Sukatani	31	29	30	29
7	Sasaksaat	46	44	45	44
8	Padalarang	29	29	29	29
9	Cimahi	11	9	9	8
10	Bandung	16	16	16	16
11	Kiaracondong	14	14	14	13
12	Cicalengka	38	37	37	37
13	Nagreg	17	17	17	16
14	Leles	23	19	21	19
15	Cibatu	18	16	16	17
16	Garut	55	37	31	31
	Total TT	418	386	385	379

Source : Malka No. 580 & Analysis result ; Survey 1, Survey 2, dan Survey 3

If we presented in graphical chart, the comparison of travel time (PSE – GRT) between Malka No. 580 and survey's result 1, 2, 3 can be seen in the following figure :

Figure 2 Comparison Travel Time (PSE – GRT)



Source : Analysis Result

Based on figure 2, it can be conclude that there's a fairly large gap in travel time between travel times based on Malka No. 580 and actual travel

time. The travel time gap is quite far. And located on the Cibat – Garut cross.

So, that's can be used as an evaluation material design timetable.

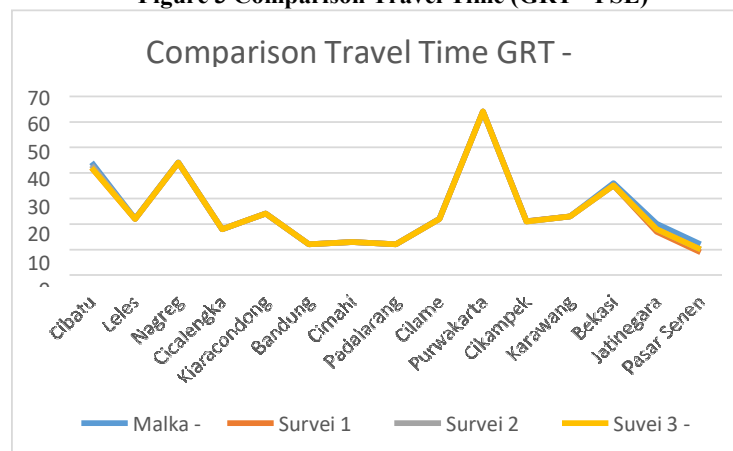
Table 2 Average Train Travel Time (GRT - PSE)

No.	Stop Station	Malka	Survey 1	Survey 2	Survey 3
1	Garut	-	-	-	-
2	Cibatu	44	44	44	44
3	Leles	22	22	22	22
4	Nagreg	44	44	44	44
5	Cicalengka	18	18	18	18
6	Kiaracondong	24	24	24	24
7	Bandung	12	12	12	12
8	Cimahi	13	13	13	13
9	Padalarang	12	12	12	12
10	Cilame	22	22	22	22
11	Purwakarta	64	64	64	64
12	Cikampek	21	21	21	21
13	Karawang	23	23	23	23
14	Bekasi	36	35	35	35
15	Jatinegara	20	17	18	18
16	Pasar Senen	12	9	10	10
	Total TT	387	380	382	382

Source : Analysis Result

If we presented in graphical chart, the coparison of travel time (GRT – PSE) between Malka No. 580 and survey's result 1, 2, 3 can be seen in the following figure :

Figure 3 Comparison Travel Time (GRT - PSE)



Source : Analysis Result

Difference Between Scheduled Cikuray Train Arrivals – Departures with Actual Arrivals - Departures

The difference between the arrival and departure of the Cikuray train is very determine once in the assessment. Because in this paper, the starting point determination of eligibility is from the difference between the time of arrival and actual departure. The results of this study are in the form of a

realistic travel time Cikuray Train departing Pasar Senen - Garut to predetermined schedule.

Table 3 Gap Arrival dan Departure (PSE - GRT)

Monitoring of Cikuray Train Road ime Based on Malka & Survey 1, 2, 3															
NO.	Station	Program		Survey 1		Gap 1		Survey 2		Gap2		Survey 3		Gap 3	
		Arrival	Departure	Arrival	Departure	A	D	Arrival	Departure	A	D	Arrival	Departure	A	D
1	Pasar Senen	-	17.55	-	17.55	0	0	-	17.55	0	0	-	17.55	0	0
2	Bekasi	18.21	18.23	18.21	18.23	0	0	18.21	18.23	0	0	18.21	18.23	0	0
3	Karawang	18.53	18.55	18.52	18.55	1	0	18.53	18.55	0	0	18.53	18.55	0	0
4	Cikampek	19.14	19.16	19.14	19.16	0	0	19.14	19.16	0	0	19.14	19.16	0	0
5	Purwakarta	19.34	19.55	19.34	19.55	0	0	19.34	19.55	0	0	19.34	19.55	0	0
6	Sukatani	20.15	20.26	20.13	20.26	2	0	20.14	20.26	1	0	20.13	20.26	2	0
7	Sasaksaat	21.02	21.12	21.00	21.12	2	0	21.01	21.12	1	0	21.00	21.12	2	0
8	Padalarang	21.33	21.41	21.33	21.41	0	0	21.33	21.41	0	0	21.33	21.41	0	0
9	Cimahi	21.49	21.52	21.47	21.52	2	0	21.47	21.52	2	0	21.46	21.52	3	0
10	Bandung	22.03	22.08	22.03	22.08	0	0	22.03	22.08	0	0	22.03	22.08	0	0
11	Kiaracondong	22.17	22.22	22.17	22.22	0	0	22.17	22.22	0	0	22.16	22.22	1	0
12	Cicalengka	22.45	23.00	22.44	23.00	1	0	22.44	23.00	1	0	22.44	23.00	1	0
13	Nagreg	23.15	23.17	23.15	23.17	0	0	23.15	23.17	0	0	23.14	23.17	1	0
14	Leles	23.38	23.40	23.34	23.40	4	0	23.36	23.40	2	0	23.34	23.40	4	0
15	Cibatu	23.55	23.58	23.53	23.58	2	0	23.53	23.58	2	0	23.54	23.58	1	0
16	Garut	00.53	-	00.35	-	18	0	00.33	-	20	0	00.33	-	20	0
Total gap 1						32	0	Total gap 2		29	0	Total Gap 3		35	0
Gap Average = 32+29+35 /3 = 23															

Source : Malka, and Analysis result

Table 3 is the average difference between the arrival and departure times of the Cikuray train, based on the results of survey 1, survey 2, and survey 3. There is no difference in departure time at each stop station, so the total difference = 0. While the average difference in arrival time based on malka No. 580 (program) with the actual is 32 minutes. Which means, based on 3 survey results, on average the Cikuray train arrives 32 minutes earlier than the scheduled schedule. There are several plots of roads that can still be adjusted for travel time, namely at Padalarang – Cimahi, Nagreg – Leles, and Cibatu – Garut. To be more precise, it is in table 3 which is marked with a yellow block.

Table 4 Gap Arrival dan Departure (GRT - PSE)

NO.	Stasiun	Program		Survei 1		Selisih 1		Survei 2		Selisih 2		Survei 3		Selisih 3	
		Datang	Berangkat	Datang	Berangkat	D	B	Datang	Berangkat	D	B	Datang	Berangkat	D	B
1	Garut	-	07.05	-	07.05	0	0	-	07.05	0	0	-	07.05	0	0
2	Cibatu	07.44	07.49	07.44	07.49	0	0	07.44	07.49	0	0	07.44	07.49	0	0
3	Leles	08.05	08.11	08.05	08.11	0	0	08.05	08.11	0	0	08.05	08.11	0	0
4	Nagreg	08.31	08.55	08.31	08.55	0	0	08.31	08.55	0	0	08.31	08.55	0	0
5	Cicalengka	09.11	09.13	09.11	09.13	0	0	09.11	09.13	0	0	09.11	09.13	0	0
6	Kiaracondong	09.34	09.37	09.34	09.37	0	0	09.34	09.37	0	0	09.34	09.37	0	0
7	Bandung	09.45	09.49	09.45	09.49	0	0	09.45	09.49	0	0	09.45	09.49	0	0
8	Cimahi	10.00	10.02	10.00	10.02	0	0	10.00	10.02	0	0	10.00	10.02	0	0
9	Padalarang	10.11	10.14	10.11	10.14	0	0	10.11	10.14	0	0	10.11	10.14	0	0
10	Cilame	10.26	10.36	10.26	10.36	0	0	10.26	10.36	0	0	10.26	10.36	0	0
11	Purwakarta	11.37	11.40	11.37	11.40	0	0	11.37	11.40	0	0	11.37	11.40	0	0
12	Cikampek	11.59	12.01	11.59	12.01	0	0	11.59	12.01	0	0	11.59	12.01	0	0
13	Karawang	12.22	12.24	12.22	12.24	0	0	12.22	12.24	0	0	12.22	12.24	0	0
14	Bekasi	12.58	13.00	12.57	13.00	2	0	12.57	13.00	1	0	12.57	13.00	1	0
15	Jatinegara	13.18	13.20	13.15	13.20	3	0	13.16	13.20	2	0	13.16	13.20	2	0
16	Pasar Senen	13.32	-	13.29	-	3	0	13.30	-	2	0	13.30	-	2	0
Total Selisih						8	0	Total Selisih		5	0	Total Selisih		5	0
Rata - Rata = 8 + 5 + 5 / 3 = 6															

Source : Malka and Analysis Result

Table 4 is the result of the average difference in arrival and departure times for the Cikuray Train towards GRT-PSE. There is no difference in departure hours at each station, so the departure difference is 0, while the average difference in arrival time is only 6 minutes. time is still considered normal, so there is no need to save travel time.

Realistic Travel Time Analysis For Cikuray PSE – GRT

Due to the travel time of the Cikuray Train heading to Garut - Pasarsenen does not experience a high gap, then the recalculation of the travel time is only carried out for the Cikuray Train heading to Pasarsenen -Garut. This research will recalculate the travel time on each route passed by the Cikuray train in order to find a realistic travel time as the final result of the trip analysis and become the output of this research. In this research, the calculation of the travel time for the Cikuray train in the direction departing Pasarsenen - Garut uses a manual system, where in this system more train travel is taken into account. The units used and the formulas used are - details of the conventional system, the elements that influence are :

S = The calculated or known distance can be in kilometers / meter

T = The calculated or known time can be in minutes / second

V = The calculated or known speed in km/hour

α = Calculated or known acceleration or deceleration, in km/hour/second.

Based on the technical specifications of the CC206 locomotive, to facilitate the calculation of travel time manually, but the results are still accurate then, the acceleration value is used is the average acceleration value, namely :

Locomotive 0-40 km/h = 1.08 km/h/d

Locomotive 40-100 km/h = 0.25 km/h/d

Thus, the average acceleration is 0.67 km/h/s and with the proposed 80% graphics speed and peak speed. Due to the different peak traffic speeds, the calculation of travel time is carried out partially or in accordance with the peak traffic speed. The following is the peak speed of the Pasarsenen - Garut line and the graphics speed.

The first step to finding travel time with a manual system is to find the V-Ops, acceleration time, and deceleration time. The following are the steps to calculate travel time with a manual system.

1. Kecepatan Ops	=	Kecepatan Maks x 80%
2. Waktu Percepatan	=	$\frac{(Kecepatan Ops \times 1000/3600)m/s}{0.67 m/s}$
3. Waktu Perlambatan	=	$\frac{0 - (Kecepatan Ops \times 1000/3600)m/s}{0.67 m/s}$
4. Jarak Pengereman	=	$\frac{Vt^2 - Vt^0}{2(0.67)}$

Source : Perencanaan Perjalanan Kereta Api (Uned, 2019)

So, with the formulas above, the result will be in the form of travel time as following :

Table 5 Calculation Of TRavel Time

Recalculation Of Travel Time With Mnuual System									
V maks 70 km/jam									
Station	Graphic Speed / V ops	Braking Distance	Distance	Accelerati-on Time	Decelerati-on time	Travel time	Dwell time	Travel Time	
								Second	Minute
	Km/j	M	Km	Sec	Sec	Sec	Sec	Sec	Min
PSE	56	179.29	5.605	23	23	338.47	30	414.47	7
JNG									
V maks 90 km/jam									
JNG	72	298.5	9.185	30	30	429.4	30	519.4	9
CUK									
CUK	72	298.5	5.617	30	30	251	120	431	7.18
BKS									
BKS	72	298.5	36.317	30	30	1786	120	1966	33
KW									
KW	72	298.5	20.958	30	30	1018	120	1198	20
CKP									
CKP	72	298.5	19.063	30	30	923	1260	2243	37.3
PWK									
V maks 60 km/jam									
PWK	48	132.60	13.801	20	20	1015.43	660	1715	29
SUT									
SUT	48	132.60	27.840	20	20	2068.62	600	2708.62	45.14
SKT									
SKT	48	132.60	14.361	20	20	1057.44	480	1577.44	27
PDL									
V maks 90 km/jam									
PDL	72	298.5	6.485	30	30	294.4	180	534.4	9
CMI									
CMI	72	298.5	8.177	30	30	379	300	739	13
BDG									
BDG	72	298.5	4.990	30	30	219.65	300	729	12
KAC									
KAC	72	298.5	22.141	30	30	1077.2	900	2037.2	44
CCL									
V Maks 50 km/jam									
CCL	40	92.11	20.689	16.58	16.58	1845	120	1998.77	35
LL									
V Maks 60 km/j									
LL	48	132.60	4.512	20	20	318	30	388.58	6.47
KRAI									
V Maks 55 km/jam									
KRAI	44	111.43	6.159	18.24	18.24	485.77	180	702.25	12
CB									
V Maks 40 km/jam									
CB	32	58.84	19	13.26	13.26	2126	30	2182	36.38
GRT									
Total Travel Time									382.47

Source : Analysis Result

And the results of the analysis above, the realistic travel time required for the Cikuray Train trip to Pasarsenen (PSE)-Garut (GRT) is 382.47 minutes or about 6 hours 41 minutes. Meanwhile, the Cikuray train travel time is based on Malka No. 580 which is 418 minutes or about 6 hours 58 minutes, so it can be concluded that the travel time for the Cikuray train can still be shortened, or can still be effective.

Conclusion

- a. Based on the results of primary data processing, the PSE-GRT travel time generated from survey 1, survey 2, and survey 3 which was then processed using gap analysis, the average travel time generated was 383 minutes. There is a fairly high gap between the actual travel time and the programmed travel time, the gap value obtained is 35 minutes. Based on the results of the analysis, the road plots that are considered to be subject to travel time adjustments are Padalarang-Cimahi, Nagreg-Leles, and Cibatu-Garut
- b. Based on the results of the re-calculation of the travel time for the Cikuray Train journey towards Pasarsenen - Garut, the travel time required is 382.47 minutes. So, based on this calculation, the realistic travel time for the Cikuray train from Pasarsenen - Garut is 382.47 minutes.
- c. Based on the research results and from recalculation of the travel time, it can be seen that there is no trip that exceeds the peak speed that has been set.

References

- Christy, F. J., Linggasari, D. & Angkat, d. H., 2020. ANALISIS TINGKAT KETEPATAN WAKTU KRL COMMUTER LINE TANAH. *Jurnal Mitra Teknik Sipil*, p. 1031.
- Dika Saputra, P. J. O. W. M., 2019. Analisis Kinerja Operasional Kereta Api Pangrango Bogor – Sukabumi. *Jurnal Sipil*, pp. 68 -69.
- Indonesia, 2007. *Undang-Undang Republik Indonesia No 23 Tahun 2007*. s.l.:s.n.
- Lathiif, M. R., 2017. Analisa Kinerja Operasional Kereta Api Penataran Jurusan Surabaya Gubeng - Malang - Biltar. *Jurnal Sipil*, pp. 30-34.
- Oktaviasari, N. & Rachma, N., 2019. PENGARUH KUALITAS

PELAYANAN, TARIF DAN KETEPATAN WAKTU
TERHADAP KEPUASAN PELANGGAN (Studi Pada Penumpang
Kereta Api Tawang Alun Jurusan Malang-Banyuwangi Di Stasiun
Kota Malang). *Jurnal Ilmiah Riset Manajemen*, pp. 5-10.

Pemerintah, 2011. *Peraturan Dinas 19 (Urusan Perjalanan Kereta Api)*. Jilid
1 Pasal 8 penyunt. s.l.:Peraturan Dinas .

RI, M. P., 2017. *Peraturan Menteri Perhubungan*. No. PM 110 penyunt.
s.l.:s.n.

Saputra, D., Osly, P. J. & dan Wita Meutia, t.thn.

Wikipedia, 2022. *Peta Rute KA Cikuray*. [Online]

Available at:

[https://id.wikipedia.org/wiki/Templat:Peta rute kereta api Cikura](https://id.wikipedia.org/wiki/Templat:Peta_rute_kereta_api_Cikura)

y