Intermodal Transportation Improvement to Support Cibatu – Garut Railroad Reactivation

Rita*, Elviana Roseva S., dan Anak Agung Bagus Randitya

Multimodal Researcher - Badan Litbang Perhubungan Jln. Medan Merdeka Timur No 5 Jakarta Pusat 10110

*Email: ritaperhubungan@gmail.com

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Abstract

The implementation of sustainable transport systems has become a need for the policy and management strategies in handling the problems of not fully integrated transportation infrastructure network, transportation service network and the level of public transport service in the development of a transportation network. As today, reactivation of the Railway line from Cibatu-Garut is being carried out, Cibatu-Garut railway line is about 19.2 km long. While the train line from Bandung-Cibatu is approximately 55 km long. Some of the old stations used in this study are Garut Station, Wanaraja Station and Pasir Jengkol station.

The research was conducted in 2019 in West Java Province, the location of the survey reaserch activities is in Cibatu and Garut Station using the analysis method of mapping intermodal integration. The results of data collection show that increasing public transportation and increasing accessibility and integration of public transport services at the transport node (train), then a sustainable transportation system will be realized and can overcome the problem of the unified infrastructure nerwork and service nerwork as well as the level of public transport services. With the availability of public transportation with sufficient capacity, and the most important thing is that transportation services must be continuously improved so that they will become the people's choice in traveling and can improve the performance of road nerwork traffic, so that a sustainable transportation system will be realized which can save cost and travel time and the use of private vehicles will be reduced on the highway.

Keywords: Accessibility of development, route activition of the Rail Cibatu-Garut

Introduction

track Cibatu-Garut railroad inaugurated on august 1, 1930, and in 1970, it became the well-known track for overseas railroad lovers. The railways are closed in 1983. On September 26th, 2018, the Director of PT. KAI had reviewed the reactivation readiness of this track by tracing a track using a motorcycle. The program aims to support West Java tourism. This reactivation readiness is also supported by several factors, such as there is still infrequent settlement at some point (except in the already crowded Garut City area). This reactivation will be a pilot project for the reactivation of other railway lines in Java.

Currently, active train line from Bandung City is from Bandung Station to Cibatu Station (Garut Regency). Where the railways have passed through total 13 stations a big station such as Bandung, Cikudapateuh Station, Kiaracondong station, Cimekar Station, Rancaekek Station, Haurpugur Station, Cicalengka Station, Nagreg Station, Jero Station, Lebak Station, Leles Station, Karang Sari Station, Leuwi Goong Station and

Cibatu Station. From Cibatu to Garut Station, there are 9 stations which currently is not operating such as Cikoang Station, Pasirjengkol Station, Citameng Station, Wanaraja Station, Cinunuk Station, Tungilis Station, Cibolerang Station, Garut Station And Cimurah Station. For reactivation of the Cibatu-Garut route, the old route will be used because there will be only little land acquisition required. The length of the Cibatu-Garut railway is about 19.2 km. While the length of the train line from Bandung-Cibatu is approximately 55 km. Some of the old stations used are Garut Station, Wanaraja Station, and Pasir Jengkol Station.

In order to support the development of the railroad transport infrastructure network, it is necessary to increase the role of other public transports as advanced transportation and increase accessibility and integration of public transport services at the transportation node (train station) by developing advanced transport services and good modal transfer facilities. So that a sustainable transportation system will be realized and will be able to overcome the problems of the unified infrastructure network,

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service network, and the level of public transport services in the development of a railway infrastructure transportation network. availability sufficient capacity of public transportation will be one solution to meet the demand for travel, which the number of which will continue increasing along with demographic and economic growth. But in addition to adequate capacity, another thing that is very important is that transportation services must continue being improved so that it will be the people's choice in travel. Public transportation, with a sufficient amount accompanied by good service, in addition to provide alternative modes of transportation for the community, on the other hand, will be able to improve the performance of road network traffic because the use of private vehicles will be reduced. There are some things which poor public transportation services need to improve such as vehicle conditions that are not roadworthy, poor behavior of the driver, low levels of reliability. Another thing that has not been met properly is the integration of modes of transportation at the transportation node (train station) that has not been realized properly. Mode integration is the integration or harmonization between good road transport, steel road transportation, and nonmotorized transportation, in this case, pedestrians and bicycle users so as to increase transportation accessibility, efficiency, and safety. In addition to infrastructure, transportation integration can also be realized in the form of integration of nonphysical systems, such as tickets or other documents.

As with the planned development/reactivation of the railway line from Cibatu-Garut, then this should be anticipated by planning a system of intermodal transportation integration of public transport at the train station node so that it will provide convenience and increase comfort for railroad users. If this is achieved, it will help to reduce the burden of vehicles on the road network, so that, it can improve traffic performance on the highway.

Methodology

The research method used in this study are: (1) evaluating intermodal transportation cohesion (Center for Intermodal Transportation, 2013) to identify problems of intermodal transportation cohesion at railway station locations, (2) Planning for intermodal transportation cohesiveness in train station locations comprehensively and (3) Planning an intermodal public transportation service system

at each train station on the Cibatu-Garut line. The study was conducted in 2019 in West Java Province. The location of survey research activities in Bandung, Cibatu and Garut Stations and secondary data collection will be conducted, using the Mapping Intermodal Integration Mapping analysis method.

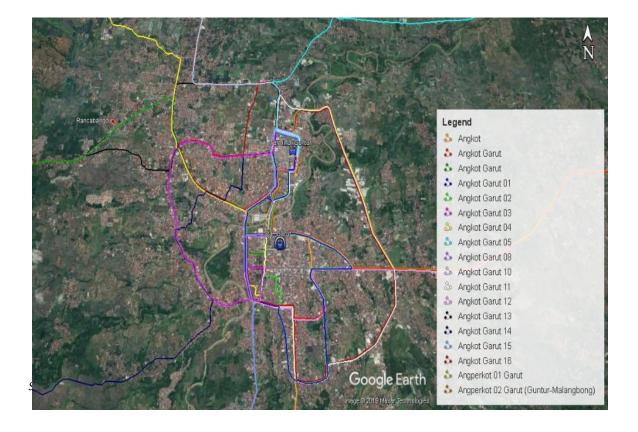
The mindset of the work implementation shows that the output of this work is the formation of an intermodal integration to increase accessibility and intermodal public transport services in the railway stations contained in the Cibatu-Garut railroad. In general, the results of this study will be used as consideration in making policies for the development of accessibility and intermodal transportation at stations to support reactivation of the Cibatu-Garut railroad track.

Results and Discussion

The infrastructure network, the existing conditions of public transport services and the existing conditions of intermodal transportation cohesiveness (particularly those related to reactivation of the Cibatu-Garut Railway), are as follows:

- 1. Road infrastructure in Garut Regency especially the road network associated in this study has an average width of ± 5-7 m. with some high obstacles in several areas like the market, shopping centers, and office center buildings. For access roads to tourist sites, the width of the road is narrower ± 4-5m.
- Public transportation services in Garut 2. Regency, served by 3 types, namely City Transport (serving the connectedness of the City of Garut including Garut District and surrounding areas), Urban Transport (serving the interconnected area between the Districts in Garut Regency) and Rural Transport (serving connectivity within the sub-district area). There are 16 City Transportation routes, 29 Urban Transport routes and 57 rural Transportation routes. Thus, it can be identified that at this time the entire region in Garut Regency, especially the City of Garut (Garut District) has been served by public transportation, the number of routes and the number of fleets is quite a lot. Transport public service of map research routes related in Garut as can be seen in Figure 1.
- 3. The station existing node that is now active, at the moment (Cibatu-Garut), is not completed with changing mode facility. Also, public

- transport services currently don't reach the location of the train station node, but at this time public transport services only reach the main road.
- The estimated demand for public transport users in the City/District of Garut is based on the Study of Transport Routes Study of the City of Garut, Garut Regency Transportation Department, In 2014. Passenger movements are quite common between important activity centers in the City of Garut, such as the Garut Train Station (in Pakuwon), Guntur Terminal (Tarogong Kidul), Shopping Centers (Ciwalen, Regol, Wetan City), and Garut City Square (Paminggir). Passenger movements also occur quite a lot from the activity centers (Pakuwon, Tarogong Kidul, Paminggir) to the tourist sites (in Samarang and Tarogong Kaler). The movement towards Situ Bagendit and Cibodas tourism areas is not too much. Desire line passanger transportation public movement district Garut City as can be seen in Figure 2.
- 5. The results of the passenger interview at Cibatu Train Station are:
 - a. Most passengers are over the age of 30, who travel for work and trade. Most of them have an average income above Rp. 3.000.000:
 - b. Most of the passengers are from the District of Cibatu and a few from the District around Cibatu:
 - c. Most of the passengers choose to travel by train because they feel that the train is fast, comfortable and punctual;
 - d. Most of the passengers come to the station from their house by using private transportation (use both car or motorcycle), but some of them rent public transportation.
 - e. Based on the perception of passengers interview, most passengers will use trains, even though the ticket cost is increased to almost 4 times.



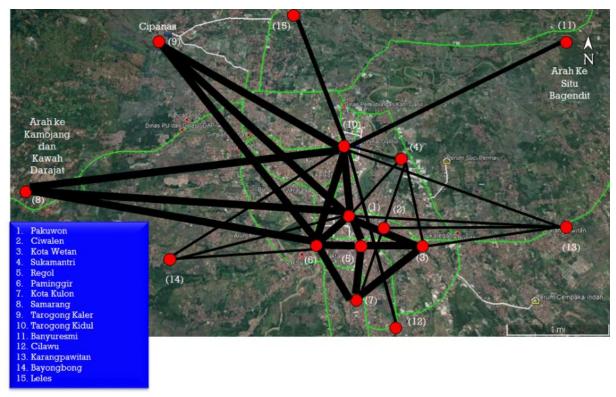


Figure 2. Desire line passanger transportation public movement District Garut City. *Source: Procesed from SK Bupati No. 551/KEP.374-DISHUB-2007*

Table 1. Inter-zonal passanger movement in Garut Regency in 2016 (passanger/year)

_A/T	1	2	3	4	5	6	7	8	9	10	11	12	13	Oi
1		8733	11005	16388	13318	8165	13842	12648	23474	10809	12104	5656	55506	191649
2	10900		4169	1254	88	64	2982	1498	494	172	294	145	2779	24840
3	11732	3046		1187	139	64	3608	1971	108	145	974	64	889	23927
4	21760	1254	1691		713	1870	1214	1576	2029	2935	544	1315	6055	42956
5	25080	531	139	886		707	298	145	237	64	494	264	2806	31650
6	6468	64	44	1870	2478		247	64	233	152	142	291	142	12195
7	14995	3296	933	1971	17	247		4345	17	152	1745	487	4625	32830
8	18806	808	145	443	230	20	1494		345	17	926	463	1947	25726
9	20776	128	145	2076	3567	128	720	230		693	764	139	3479	32864

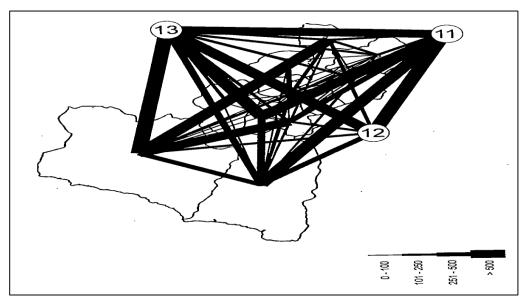


Figure 3. Desire line regency passanger movement Garut 2016 Source: Inter-zonal passanger movement in Garut Regency in 2016 (passanger/year)

6. For the mode selection analysis, a mode selection model is applied to the changes in the difference in the cost of travel and the value of the travel time of the train mode and public transportation for Bandung-Cibatu. The time value in Garut Regency is assumed to be Rp. 8913 /hour. For train mode services used are AC economic services. Based on the results of interviews with users of public transport obtained the cost of travel in Bandung-Cibatu is Rp. 536 / km / trip / person with an average speed of 11.8 km / hour. From the analysis, it was found that the maximum difference in the cost of travel and time value was Rp.50,958, with the probability of choosing train mode is 62%.

From the results of this study, the condition of the road network in Garut Regency are generally quite narrow and it will be difficult to pass by bus (both medium and large buses), therefore the type of vehicles for advanced transportation planning needs to consider its condition.

For advanced public transport service planning that serves the train station node, it is better to optimize the existing public transport routes. Because if new public transport service routes are made from the train station node, overlapping public transport routes will occur more and more, not only between urban transport routes, between urban transport routes and urban transport routes but between urban transport routes, transport routes urban and also advanced transport routes.

Conclusions

Public transportation services in Garut Regency, served by 3 types of public transportation routes; they are city transport (serving the Garut city, Garut District and surrounding areas), urban transport (serving inter-district in Garut District) and Rural Transport (serving in the district area). There are 16 City Transport routes, 29 urban transport routes and 57 transportation routes rural. Thus it can be identified that at this time all regions in Garut Regency, especially the City of Garut (Garut District) has been served by public transportation, which has a large number of routes and fleets.

The existing station node, that is still active (Cibatu Station), is not equipped with transfer mode facilities. In addition, public transport services currently do not reach the location of the train station node, but at this time public transport services only reach the main road.

The development of adequate intermodal transition facilities at the station transportation node for efficient and convenient mode changes and continued public transport planning to serve each station transportation node that allows passengers to be able to make modal changes efficiently, quickly, cheaply and comfortably to reach their destination.

In the mode selection analysis, a mode selection model has changed changes both in the difference in the cost of travel and the value of the travel time of the train and public transportation for Bandung-Cibatu. The time value, in Garut Regency, is assumed to be Rp. 8913 /hour. For train mode services used are AC economic services. Based on the results of interviews of public transport users, it is obtained the cost of Bandung-Cibatu travel in 536/km/trip/person with an average speed of 11.8 km / hour. From the analysis, it is found that the maximum difference in the cost of travel and time value is Rp.50,958, with the probability of choosing the train mode is 62%.

Based on the results of the analysis above, Recommendations for further transportation to connect the Garut Train Station to surrounding activity center, it is proposed to re-route City Transport 01 (Guntur-Sukaregang Terminal). City Transport 01 is re-routed by turning the track to connect to the Garut Station, to be able to go to the activity center in the City of Garut (total length of the track ± 12 km). Re-routing proposals for Angkot 01 route are: Guntur Terminal-Guntur street-Guntur Melati Sari Street-Perintis Kemerdekaan street-Pramuka Street-Bank-Garut Road Train Station-A. Yani Street-Cimanuk Street-Guntur Street-Sukaregang- A. Yani street-Baratayuda street-Sukadana-Pasundan Street-Papandayan street-Maktal-Cimanuk street-Jayaraga Roundabout-Cimanuk-Simpang Lima Street-Pembangunan-Merdeka Road-Guntur Indah Street-Guntur Sari Street.

Recommendation for further transportation to connect Cibatu station and Pasirjengkol station to activity center in Cibatu Regency and Sukawening regency (City Transport 01 (Guntur Terminal-Cibatu).

It is proposed to re-route (Cibatu station-Alun-Alun Cibatu-Jengkol-Sukawening station-Alun-alun-Wanaraja.

If there are passengers who will travel to Talaga Bodas, then in Wanaraja Square, passengers can change vehicles with tourism transportation to Talaga Bodas.

For continued transportation from Wanaraja Station, you can use the Tourism Transport plan. The proposed route is: Wanaraja Station-Alun-Alun Wanaraja-Tourist Location (Talaga Bodas).

Recommendations for further transportation connecting the Garut Train Station with tourist sites located in the Samarang, Tarogong Kaler and Banyuresmi areas are:

First, rerouting City Transport 04 (Cipanas), total length of ± 10.77 km, Guntur Terminal-Guntur Sari street- Guntur Melati street-Perintis Kemerdekaan street-Pramuka Street-Garut Railway Station-Bank Station-Cimanuk street-Simpang Lima street-Otista street-Panday street-Cipanas-Panday street-Otista steet-Cimanuk street- Lingkar Jaya street-Merdeka Street- Guntur Indah street-Guntur Sari street.

Second, rerouting City Transport 05 (Situ Bagendit), total length of ± 13.64 km, Guntur Terminal-Guntur Sari street-Guntur Melati street-Perintis Street-Pramuka Street-Garut Railway Station-Bank Station- Cimanuk street-Merdeka street-Banyuresmi-leuw-goong-Banyuresmi-Merdeka street-Guntur Cendana street -Guntur Sari street-Guntur Terminal.

Third, rerouting City Transport 09 (Kamojang and Kawah Darajat), total length of ± 14.77 km, Guntur Terminal-Guntur Melati street - Guntur Sari Street-Kemerdekaan street-Perintis Kemerdekaan street-Pramuka street-Garut Railway Station-Bank Road-Cimanuk street-Simpang Lima- Otista Street-Samarang-Cibodas-Samarang-Otista street-Simpang Lima- Cimanuk street-Jaya Raga street-Merdeka street-Guntur Indah street-Guntur Sari street.

As an alternative, tourism transportation is recommended by changing City Transport Routes 04, 05 and 09 to Tourism Transportation that directly connect the Guntur Terminal-Garut Train Station-Tourist Location. So the tourism transportation routes are:

Tourism transport to Cipanas, total length of ± 10.77 km, it is proposed: Guntur Sari-Guntur Melati street-Guntur Melati street-Perintis Kemerdekaan street-Pramuka street-Garut Train Station-Bank Road-Bank-Cimanuk street-Simpang Lima-Otista street-Panday street-Cipanas-Panday street- Otista street-Cimanuk street-Jaya Raga roundabout-Merdeka street-Guntur Indah street-Guntur Sari street.

Tourism Transport to Situ Bagendit, total length of ± 13.64 km, it is proposed: Guntur Sari-Guntur street-Guntur Melati street-Perintis

Kemerdekaan street-Pramuka street-Garut Railway Station-Bank Road-Cimanuk street-Merdeka street-Banyuresmi-leuwigoong-Banyuresmi-Merdeka street-Guntur street Cendana-Guntur Sari street-Guntur Terminal.

Kamojang Tourism and Darajat Crater Transportation for Tourism Transport Kamojang, it is proposed: Guntur Terminal-Guntur Melati street-Guntur Sari Kemerdekaan street-Perintis Kemerdekaan street-Pramuka street-Garut Railway Station-Bank street-Cimanuk street-Simpang Lima street-Otista street-Samarang- Cibodas street-Kamojang Area-Samarang- Otista street-Simpang Lima street-Cimanuk street-Jaya Raga roundabout- Merdeka street-Guntur Indah street -Guntur Sari street. (± 14.77 km + 12.2 km).

For Tourism Transportation to Darajat Crater, it is proposed: Guntur Terminal-Guntur Melati street-Guntur Sari street- Kemerdekaan street-Perintis Kemerdekaan street-Pramuka street-Garut Railway Station -Bank Station-Bank street- Cimanuk street-Simpang Lima-Otista street-Samarang-Cibodas-Darajat-Samarang Crater Area-Otista street-Simpang Lima-Cimanuk street-Jaya Raga roundabout-Merdeka street-Guntur Indah street-Guntur Sari street (± 14.77 km + 14.8 km).

Mode integration planning at Cibatu Train Station, integration of Cibatu Train Station Area Infrastructure Network, including, Cibatu Train Station as a switch node over railroad transportation modes.

Providing advanced public transit stop facilities as a transfer node for continued transportation and online public transportation, which are equipped with pedestrian/pedestrian facilities connecting from the bus stop to the Cibatu train station. At the exit point of the Cibatu station, information/ directions need to be provided to direct passengers to the location to change modes/waiting rooms.

Providing waiting room to transfer, which is equipped with information about advanced transportation (schedule, routes and ticket prices), counters for advanced transport reservations and seating for waiting passengers for further transportation.

Integration of the Transportation Service Network for the Cibatu Train Station Area, including the provision of routes leading to the Cibatu Train Station street both served by advanced public transportion, and online public transportation (proposed public transportation routes serving Cibatu Train Station are Cibatu-Alun Station-Alun Cibatu-Pasir Jengkol Station-Sukawening-Alun-Alun Wanaraja).

Planning for mode integration at Pasir Jengkol Railway Station, integration of Infrastructure Network Area of Pasir Jengkol Railway Station Area, including Pasir Jengkol Train Station as a switchover for railroad transportation modes.

Providing advanced public transit stop facilities as transfer nodes for continued transportation and online public transportation, which are equipped with pedestrian/pedestrian facilities connecting from the bus stop to the Pasirjengkol train station. At the exit point of the Pasirjengkol station, information/directions need to be provided to direct passengers to the location to change modes/waiting rooms.

Providing waiting rooms for transfer, which are equipped with information about advanced transportation (schedule, routes and ticket fare), counters for advanced transport reservations and seating for the waiting passengers for further transportation.

Integration of Transportation Services Network in the Pasir Jengkol Railway Station Area, including the provision of routes leading to the Pasir Jengkol Railway Station both served by continued public transport, and online public transportation (proposed public transportation routes serving the Pasir Jengkol Railway Station are Stations Cibatu-Alun-Alun Cibatu-Jengkol-Sukawening-Alun-Wanaraja Station).

Planning for integration mode at the Wanaraja Train Station, integration of the Wanaraja Train Station Area Infrastructure Network Area, including Wanaraja Train Station as a switchover for railroad transportation modes.

Providing advanced public transit stop facilities as transfer nodes for continued transportation and online public transportation, which are equipped with pedestrian/pedestrian facilities connecting from the bus stop to the Wanaraja train station. At the exit point of the Wanaraja station, information/directions need to be provided to direct passengers to the location to change modes/waiting rooms.

Providing waiting rooms for transfer, which are equipped with information about advanced transportation (schedule, routes and ticket fare), counters for advanced transport reservations and seating for the waiting passengers for further transportation.

Integration of the Transportation Service Network of the Wanaraja Train Station Area, including the provision of routes leading to the Wanaraja Railway Station both served by advanced public transport, and online public transportation (proposed public transportation routes serving the Wanaraja Train Station are Wanaraja-Alun Station-Alun Wanaraja-Tourist Location (Talaga Bodas).

Planning for integration mode at the Garut Train Station, integration of Garut Train Station Area infrastructure Network, including Garut Train Station as a switchover for railroad transportation modes.

Providing advanced public transit stop facilities as a transfer node for continued transportation and online public transportation, which is equipped with pedestrian/pedestrian facilities connecting from the bus stop to the Garut train station. At the exit point of Garut station, information/directions need to be provided to direct passengers to the location to change modes /waiting rooms.

Providing waiting rooms for transfer, which are equipped with information about advanced transportation (schedule, routes and ticket fare), counters for advanced transport reservations and seating for the waiting passengers for further transportation.

Integration of the Transportation Service Network for the Garut Train Station Area, including the provision of routes to the Garut Train Station street both served by advanced public transport, and online public transportation (proposed public transportation routes serving the Garut Train Station are re-routing City Transport 01, re-routing City Transport 04, rerouting City Transport 09, the details of the track can be seen in Recommendation points 1, 3 and 4).

For the continued development of public transportation, further and more detailed research is needed, by conducting a passenger interview survey at each train station location that will be re-activated, so that the characteristics of the trip and the origin of the passenger destination will be known. Therefore, it can be planned specifially for the type of vehicle, the number of vehicle, the schedule and frequency of the follow-up transportation.

Integration mode/modal change facilities also need to be developed at tourist sites and activity centers in Garut Regency.

The socialization of the railway line reactivation plan as a development of public transportation is needed. Therefore, a number of development plans (especially those that are cross-sectoral and cross-regional) can be realized with the full support of all parties concerned.

For railroad operations, it is best to go directly from Bandung/Jakarta to Garut-Cikajang, so that the passengers will find it easier to reach their destination in Garut Regency.

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