Changes in spatial patterns and the availability of social facilities in urban settlements due to reactivation of the railroad tracks in Garut

A Susetyaningsih*, A Zhafirah, C Cahyana, I Farida and N Nanang

Department of Civil Engineering, Sekolah Tinggi Teknologi Garut, Jalan Mayor Syamsu I, Garut, Indonesia

*adisusetyaningngsih@sttgarut.ac.id

Abstract. The train is one of the modes of mass transportation that is more effective in overcoming traffic congestion. Apart from its economic benefits, the activation of a long-dead train track has various impacts that cannot be ignored. This study evaluates the impact of reactivation of the Garut railroad on 1) changes in the pattern of spatial settlements along the railroad tracks, 2) identifies the need for lost social facilities on the railroad tracks. Most of the land owned by PT KAI in the city of Garut has experienced changes in land use. Data is collected through surveys and interviews of affected respondents. Reactivation of the railroad tracks caused changes in spatial settlement patterns. Empty land along the railway lines became a magnet for the growth of new settlements, which were then followed by various social infrastructure. There is a constructive relationship between the community and space. Land acquisition along the railroad reactivation track in the Garut sub-district of the city has led to the loss of settlements, markets, community meetinghouses, and basic health service buildings for posyandu. Not all lost social facilities can be rebuilt because of constraints in the provision of land.

1. Introduction
The pattern of residential space in urban areas generally develops in accordance with the availability of land and the distribution of centers of economic activity. The activation of a long-dead train track not only has positive impacts in the transportation sector but also other negative impacts that need attention [1]. The benefits of railroad transport infrastructure projects include reducing trade costs between regions, increasing inter-regional and international trade as well as increasing levels of real income and community welfare [2]. The need for mass transportation is increasing along with the increase in the number and mobility of the population [3]. The railroad is one of the choices of mass transportation because it can able to transport people and goods in large quantities at once [4]. A train is a means of transportation in the form of vehicles with immovable power, both traveling alone or coupled with other vehicles, which will or are currently moving on the rail. A train is a means of transportation that generally consists of a locomotive (a vehicle with a driving force that runs alone) and a series of trains or carriages (coupled with other vehicles) [5]. Reactivation of the railroad is an option because building more highways increases the built-up area[6,7]. This study evaluates the impact of the reactivation of
the Garut railroad track on 1) changes in the pattern of spatial settlements along the railway line, 2) identifies the need for lost social facilities on the railroad track.

2. Methods
The study was conducted in Garut Kota District because most of the land owned by PT KAI in the region had already been transferred to the land use function. PT KAI's vacant land has been converted into a densely populated settlement including supporting various socio-economic facilities. The areas affected by the Cibatu-Garut railroad reactivation project are located in Garut Kota Subdistrict, precisely in 3 Kelurahan, namely Kota Wetan Kelurahan, Ciwalen Kelurahan, and Pakuwon Kelurahan. The data collection method was carried out by surveying and interviewing affected respondents along the railroad tracks.

Data were obtained by a survey to identify lost social facilities and changes in spatial patterns in the affected neighborhoods. To complete the data relating to the needs of lost social facilities, interviews were conducted with communities affected by the impact of railroad reactivation.

Figure 1. Map of railway reactivation in the city of Garut (Source: Google Map).

3. Results and discussion
City density is a key concept in the description of urban spatial structure. There is a close relationship between building density and activity density, on the one hand, and urban environmental conditions on the other [8]. Reactivation of the Cibatu-Garut-Cikajang railway line aims to advance the economic sector and tourism in Garut. Train reactivation can transport more agricultural and human products, is free from obstacles, and is safer [9]. Reactivation of the railroad is approximately 70 km in length, at the first stage undertaken is the Cibatu-Garut rail along 19.3 km. Therefore, all buildings on vacant land along with PT.KAI's railroad which is now converted into houses, social facilities, and roads must be demolished. The total affected were 1,077 buildings, 911 households, and many public facilities that were lost, such as neighborhood roads, markets, community meetinghouses, posyandu buildings, and so on.

Of the total railroad reactivation projects along 19.3 KM, the lane in Garut Kota District is the path that feels the most of this reactivation. Viewed from the lane in the center of the city the project also passes public facilities such as provincial roads, district roads and, 3 densely populated urban villages. Hundreds of homes were lost including facilities such as educational facilities, worship facilities and, trade facilities due to land acquisition from the railroad reactivation project.

3.1. Changes in the pattern of spatial settlements
The existence of vacant land along the railroad track which has been inactive for 35 years is an attraction for urban communities to build settlements on it. Groups of urban low incomes migrants tend to look
for marginal lands to occupy [10]. Therefore it cannot be denied if the development of some of the settlements in the district of Garut existence follows the pattern of extending the empty land on either side of the Cibatu Garut railroad track. The vacant land owned by PT KAI has changed its function to become a settlement with a land leasing system [11]. The most extensive vacant land is the land around the Garut station in the Pakuwon district. Even the Garut regency government relocated the slaughter market to the city Garut station area. Even though this market did not work effectively, it encouraged the growth of dense settlements around it. The linear form follows the railroad tracks. The accessibility level attracts vacant lots along the railroad tracks [12]. It is not surprising that after more than 30 years settlements along the railroad tracks in the city Garut increasingly crowded [13]. An overview of land use conditions along the Cibatu Garut railway can be seen in the following figure 2 and 3.

Reactivation of the Cibatu Garut railway line begins with land clearing on the railroad tracks. The railroad is a supporting operational area for trains [14]. This initial activity in the Garut Subdistrict of the city caused more than 600 families living on PT KAI land to lose their homes. In Pakuwon sub-district, even RW 12, which occupies land around the Garut station, is missing. Garut Kota Subdistrict also lost Green open land located in RW 02, Pakuwon Village. Cleaning up settlements along the railroad tracks also results in the loss of funds or the interruption of several environmental roads that connect inter-settlements in Garut Kota District [15].

3.2. Identification of missing social facilities

The development of formal housing in Indonesia is supported by the availability of social facilities to develop the social, economic, and cultural populations. Social facilities have an important role to enhance the social values of residents by providing space for interaction [16]. Reactivation of the railroad tracks has resulted in many buildings that have to be demolished, roads cut off and social facilities lost. Social facilities are facilities that are needed by the community in a residential environment [17]. Especially in the Garut Kota sub-district which is densely populated and has the most complex problems. One of the missing social facilities is the educational facility, Nurul Huda Kindergarten in Wetan City. The existence of TK in the neighborhood is important for residents as a means of early education for the children of the local population because other kindergartens are quite
far from residential areas. The TK building is not entirely located on land owned by PT KAI, but part of the class building expansion was built on land owned by PT KAI. The kindergarten building area is 70 m² and is affected by half of the building’s width so that it can still be used even if it is not feasible because it cannot accommodate all students. To meet the school building eligibility standards there must be plans to expand the building [18].

In addition to building educational facilities, social facilities that are no less important are mosques. The mosque is a religious institution that is inseparable from the spiritual, social, and cultural life of Muslims [19]. The existence of a mosque can be seen as one of the manifestations of the existence and aspirations of Muslims, especially as a means of worship that occupies a central function in social life. Considering its very strategic function, the appearance and management of the mosque need to be fostered as well as possible to be able to benefit the surrounding resources, both in terms of the physical building and in terms of its prosperity activities [20]. The railroad that will be built on the railroad reactivation project removes one of the social facilities in the form of a mosque in Ciwalen Urban Village and 1 mosque building in Pakuwon Urban Village. Various social facilities affected in Garut Kota District are shown in the following table 1:

| Types of Social Facilities that are missing | Kelurahan Kota Wetan | Kelurahan Ciwalen | Kelurahan Pakuwon |
|-------------------------------------------|----------------------|------------------|------------------|
| Kindergarten                              | 1                    | -                | -                |
| Mosque / mosque                           | -                    | 1                | 1                |
| Posyandu                                   | 1                    | -                | 3                |
| Market                                    | -                    | -                | 1                |
| Citizens’ meeting hall                    | 2                    | 1                | 3                |

Source: Survey 2019

Not all social facilities that are lost in the Garut Subdistrict area of the city can be relocated even though their existence is needed by the local community. The main obstacle to rebuilding public facilities is the availability of land. It is very difficult to find vacant land in the city that can be used/granted for public purposes. Also besides, the issue of cost sources becomes an obstacle because in general social facilities are built with non-governmental organizations or with assistance from government programs.

4. Conclusion
Before the reactivation of the Cibatu Garut railroad, the settlement in the town of Garut sub-district which occupies linear railways follows the railroad tracks. The accessibility level attracts vacant lots along the railroad tracks. Reactivation causes changes in the pattern of residential spaces due to the loss of buildings of social facilities and interrupted or lost environmental roads. Public facilities that have been lost include the kindergarten school building, posyandu building, market, community meeting hall, and so on. Not all social facilities that are lost in the Garut Subdistrict area of the city can be relocated due to the difficulty of obtaining vacant land and constrained development costs that are generally self-supporting.

Acknowledgements
Thanks to Sekolah Tinggi Teknologi Garut for facilitating and supporting writing this article.

References
[1] Mohmand Y T and Wang A 2016 The impact of transportation infrastructure on economic growth: empirical evidence from Pakistan Quality, Equity and Accountability in Education Delivery; its importance, levels, and understanding: A Hedonic Pricing Model giving Evidence from Pakistan Vie Artic. Transp. Lett. Int. J. Transp. Res. 9 63–9
[2] Donaldson D 2018 Railroads of the Raj: Estimating the Impact of Transportation Infrastructure†
5th Annual Applied Science and Engineering Conference (AASEC 2020) IOP Publishing IOP Conf. Series: Materials Science and Engineering 1098 (2021) 022083 doi:10.1088/1757-899X/1098/2/022083

Am. Econ. Rev. 108 899–934

[3] Yulianto M A, Budiarto A and Hidayat R 2019 Perancangan Stasiun Kereta Api Pasar Minggu Dengan Konsep Arsitektur Post Modern Semin. Nas. Komunitas dan Kota Berkelanjutan 1 353–63

[4] Sartika D 2018 Analisis Ketersediaan Dan Kebutuhan Fasilitas Sosial Di Pinggiran Kota Kabupaten Pinrang (Studi Kasus: Kawasan Perkotaan Tiroang Kecamatan Tiroang, Kabupaten Pinrang) (Doctoral dissertation, Universitas Islam Negeri Alauddin Makassar).

[5] Mughni M 2018 Perencanaan Reaktivasi Jalan Rel Kereta Api Rute Yogyakarta–Parangtritis (Reactivation Planning Of Road Rail Train Route Yogyakarta-Parangtritis).

[6] Mariza A N Z and Puspitasari A Y 2019 Analisis Pemanfaatan Ruang Publik Pada Aktivitas Penduduk Di Permukiman Studi Kasus: Permukiman Mlaten Kota Semarang J. Planol. 14 102–16

[7] Litman T 2008 Evaluating transportation land use impacts

[8] Krehl A, Siedentop S, Taubenzöck H, Wurm M, Behnisch M, Meinel G and Kainz W 2016 Geo-Information A Comprehensive View on Urban Spatial Structure: Urban Density Patterns of German City Regions ISPRS Int. J. Geo-Information 5 76

[9] Litiloly M K 2019 Studi Morfologi Kawasan Kotagede Di Kota Yogyakarta “Perkembangan Pola Kawasan Kotagede dan Faktor-faktor yang Mempengaruhinya”

[10] Setyono J S, Yunus H S and Giyarsih S R 2016 The spatial pattern of urbanization and small cities development in Central Java: A Case Study of Semarang-Yogyakarta-Surakarta Region Geoplanning J. Geomatics Plan. 3 53–66

[11] Kim G 2016 The Public Value of Urban Vacant Land: Social Responses and Ecological Value Sustainability 8 486

[12] Duan X and Wang L 2018 High-speed rail network development and winner and loser cities in megaregions: The case study of Yangtze River Delta, China Cities 83 71–82

[13] Susetyaningsih A, Permana S, Johari G J and Chandrahadinata D 2019 Model of ecological approaches to build community response to flood disasters J. Phys. Conf. Ser. 1402 022012

[14] Fraga-Lamas P, Fernández-Caramés T M and Castedo L 2017 Towards the Internet of Smart Trains: A Review on Industrial IoT-Connected Railways Sensors 17 1457

[15] Horte O S and Eisenman T S 2020 Urban Greenways: A Systematic Review and Typology Land 9 40

[16] Yuliastuti N, Sukmawati A M A and Purwoningsih P 2018 Utilization Of Social Facilities To Reinforce Social Interaction In Formal Housing ArchNet-IJAR 12

[17] Croucher S 2015 The future of lifestyle migration: challenges and opportunities J. Lat. Am. Geogr. 14 161–72

[18] Farida I, Anasarida A A, Susetyaningsih A and Kurniawati R 2019 Revenue components of road construction operations based on economic feasibility analysis J. Phys. Conf. Ser. 1402 22017

[19] Bakri A H, Zakaria I H, Nur A, Ahmad A, Bakri A, Husna Zakaria I and Kassim R 2018 Adoption of the Systematic Facilities Management Approach to the Sustainable Performance of Mosques Artic. Int. J. Technol. 8 1542–50

[20] Simanjuntak J O, Suita D and Simanjuntak S 2018 Analysis soil investigation of railway reactivation Km. 28+980 to 50+450 (North Sumatera, Indonesia) IOP Conf. Ser. Mater. Sci. Eng. 420 12007