

TRAIN STATIONS AS NODES AND PLACES:

TRAIN STATIONS AS NODES AND PLACES: THE POTENTIAL OF TRAINS FOR TRANSIT-ORIENTED URBAN DEVELOPMENT IN SANTIAGO, CHILE¹

ESTACIONES COMO NODOS Y LUGARES: EL POTENCIAL DEL TREN PARA EL
DESARROLLO URBANO ORIENTADO AL TRANSPORTE EN SANTIAGO, CHILE

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En las últimas décadas, el tren ha jugado un rol poco relevante como elemento estructurante del desarrollo urbano en las ciudades de América Latina. Al igual que otros modos de transporte masivo, el ferrocarril puede ser objeto de estrategias que fomenten la integración del transporte público y del uso del suelo, para encauzar el desarrollo urbano hacia futuros más sustentables. Considerando que en Chile se están gradualmente reactivando servicios ferroviarios de cercanía alrededor de las principales ciudades, cabe preguntarse si el transporte ferroviario puede también aportar a formas de desarrollo urbano orientado al transporte en el contexto chileno. Así, este artículo explora precisamente el rol urbano de las estaciones y su potencial para opciones de desarrollo orientado al transporte. Enfocándose en el caso de Santiago, el trabajo analiza las estaciones a través del modelo node-place, que examina cada estación en base a su rol como nodo (es decir, a cuántos destinos permite alcanzar) y como lugar (considerando diversidad e intensidad de las actividades que se dan en sus inmediaciones). Los resultados muestran el limitado rol urbano que las estaciones ferroviarias cumplen en la capital chilena, evidenciando cierta homogeneidad respecto a los niveles de accesibilidad o a la atractividad de los entornos urbanos de cada estación. La aplicación del modelo nodo-lugar demuestra que el tren tiene un potencial no aprovechado para el desarrollo urbano de los entornos que atraviesa en Santiago y confirma el rol potencial de las estaciones como pequeñas polaridades a escala barrial y comunal.

Palabras clave: estaciones de ferrocarril, ferrocarriles, trenes, planificación urbana, transporte urbano

In Latin American cities, the train has played a less relevant role in recent decades as a structuring element of urban development. As with other means of mass transportation, railroads can be the object of strategies that foster the integration of public transport and land use, to guide urban development towards more sustainable futures. Considering that in Chile suburban rail services are gradually being reactivated around the main cities, it is worth asking whether rail transport can contribute to forms of transport-oriented urban development in the Chilean context as well. In this way, this article actually explores the urban role of train stations and their potential as options of transit-oriented development. Focusing on the case of Santiago, the article analyzes train stations by applying the node-place model, which examines each of them based on their role as a node (i.e., how many destinations they allow reaching) and as a place (considering the diversity and intensity of activities that take place in their vicinity). The results show the limited urban role that railway stations play in the context of Chilean capital, highlighting a certain homogeneity with respect to the levels of accessibility or the appeal of the urban environments of each station. The application of the node-place model shows that the train has an untapped potential for the urban development of the places it crosses throughout Santiago, and confirms the potential role of stations as small polarities at the neighborhood and municipal scale.

Keywords: railway stations, railways, trains, urban planning, urban transport

I. INTRODUCTION

The integration of public transportation and land use is key for guiding urban development towards more sustainable futures. Strategies like transit-oriented urban development (TOD) promote the concentration of elevated densities in areas that are highly accessible when using public transportation, to guarantee a more efficient land use, allowing that the functions that generate more trips, concentrate nearby means of mass transportation, thus reducing dependence on the car (Jamme, Rodríguez, Bahl & Banerjee, 2019). Although Europe and North America have more experience in this sense (Newman & Kenworthy, 1996), the integrated planning of transportation and land use has also been used in Latin American countries, for example, as a strategy to improve access to urban opportunities and to reduce existing socio-spatial inequalities (Cervero, 2013; Vecchio, Tiznado-Aitken & Hurtubia, 2020). All the current regulatory and normative frameworks do not always facilitate this integration (Suzuki, Cervero & Luchi, 2013), some cities -Curitiba and, with less success, Bogotá- have promoted forms of transit-oriented urban development, concentrating building densities and mixed uses around new public transportation infrastructures like the bus rapid transit (BRT) corridors (Rabinovitch, 1996; Rodríguez, Vergel-Tovar & Gakenheimer, 2018).

In comparison with the BRT and unlike what has historically occurred in cities like London and Amsterdam (Haywood & Hebbert, 2008), in recent decades the train has played a less relevant role as a structuring element of urban development in Latin America. However, the train potentially has a key role in this sense, as shown in the case of Buenos Aires (Pucci, Vecchio, Bocchimuzzi & Lanza, 2019), and in some reactivation proposals, like that of San José (Pucci, Barboza & Vecchio, 2020). In Chile, rail services are in an apparently more favorable situation than in the past, and the number of passengers is increasing, especially thanks to the maintenance and the gradual reactivation of shuttle services around some large cities -Santiago, Concepción, Valparaíso and Temuco-. The suggested reintroduction of suburban type passenger services, for example, in the Santiago metropolitan area, and the promotion of existing services at a national level (Ministry of Transportation and Telecommunication [MTT], 2019), suggest that the importance of the train will increase in coming years. However, the possibility of planning the impact of rail lines in the region is affected by current planning limits, characterized by sectorial plans, non-binding between different scales, and fragmented by red tape (Katz et al., 2019).

Considering the role of railroad transportation at a metropolitan level, and the lack of integration between urban planning and mobility, it is worth asking whether the train can contribute to the forms of transit-orientated urban development in the Chilean context. This article explores the urban role of railway stations in Santiago, analyzing the relationship that active stations establish with the metropolitan mobility system, and with their immediate urban surroundings. The paper evaluates the Metrotren-Nos suburban train stations by applying the node-place model (Bertolini, 1999), that examines each one based on its role as a node -that is to say, how many destinations it can reach- and as a place -considering the diversity and intensity of activities that take place in its surroundings-. The focus on the urban stations of Santiago, subject of significant investment in recent years, allows analyzing the coordination between transportation and land uses in a scenario with limited integrated planning at a communal and metropolitan level (Vicuña del Rio, 2017). It is hypothesized that the stations of the Metrotren Nos service and some areas around the railroad still have an untapped development potential. After discussing the territorial role of railway stations, a first application of the node-place model is made in the context of Santiago, using its results to define transit-orientated urban development guidelines and thus provide an approach that is also valid for other Chilean railway lines.

II. THEORETICAL FRAMEWORK

THE STATION IN ITS AREA

From the perspective of transit-oriented development (TOD), stations contribute to the mobility system of an area and make its area of influence appealing, allowing increasing the number of public transport users and thus favoring the growth of new areas as well as the regeneration of existing urban ones (Cervero, Guerra & Al, 2017, cap. 7). The urban development setup around a station can take on different forms, depending on prevailing land uses, their density, and their scale of influence, which makes it possible to not just regenerate large central areas, but also reorganize low density suburban ones (Nigro, Bertolini & Moccia, 2019), or revitalize intermediate cities and reduce regional inequalities (Vickerman, 2015). However, in the Latin American context, the promotion of TOD around railway stations has been limited, being restricted to the reactivation of short railway lines such as trams -in Mendoza and in Bogotá, among other cities- (Dejtiar, 2017; Quintero González, 2017).

The double role of the station in its territory is well captured by the node-place model, which analyzes the potential of a station and its surroundings for different forms of urban development (Bertolini, 1999). The station as a node, offers a certain potential for physical human interaction, captured by the accessibility of the node, since “the more people can access it, the greater the possible interaction is” (Bertolini, 1999, p. 201). The station as a place depends on the intensity and diversity of activities performed there and around it, and represents the realization of the aforementioned potential, based on the idea that the “more activities there are, the greater the interaction that effectively takes place is” (Bertolini, 1999, p. 201).

A value is assigned to node and place components that allows giving a score to each station and, through a diagram (Figure 1), observing the situation of each station compared to others from a same line or network. Among the factors that are considered for the node function, the available railway services and the intermodality level of a station are included. Among the elements analyzed for the place function, the population that lives around the station is included, as are the services and land uses found there. Considering the performance of each station as node and place, it is possible to evaluate their urban role alongside a single line. If the node and place role are equally strong, there is a balance, but when both values are very high, a station finds itself in a “stress” situation. But if both are low, the station is “dependent” on other areas. If one component is much stronger than the other, a station can become an “unbalanced node” or an “unbalanced place”. Then, the determination of the role of a station does not exclusively depend on its intrinsic features, but rather on the contrary, it is based on the comparison between the stations that serve the same area or region.

Despite having been prepared and initially applied in the Netherlands, the node-place model has shown potential for application in different settings. Literature on the subject (see the revision of Lyu, Bertolini & Pfeffer, 2016) has used the model to analyze short lines and dense domestic networks, contemplating a different radius of influence around stations based on their role and position in urban contexts or in low density surfaces -usually 400 or 800 meters for walkable urban areas, and 1500 meters for stations accessible by car- (Pucci, 2019). Successive applications of the model have elaborated more sophisticated analyses that, in sectors with substantial train use, have also managed to study station design and user experience (Caset, Derudder, Witlox, Teixeira

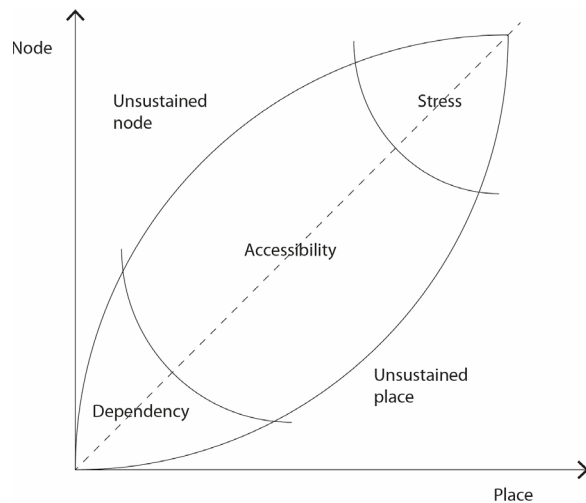


Figure 1. The node-place model. Source: Bertolini (1999, p. 202).

& Boussauw, 2019). The versatility of the node-place model suggests the possibility of applying it in regions where the model has not yet had practical applications, like Chile, and where the results could strengthen the fledgling role that the train plays in mobility on a metropolitan scale.

III. CASE STUDY

The analysis presented, focuses on the railway stations of the Greater Santiago Southern Railway, that includes 10 stations spread over a 20-kilometer long section (Figure 2). The section in question is used by three services: a suburban service, the Metrotren Nos, which covers the section between Alameda (Estación Central) and Nos (San Bernardo) -the segment being analyzed-; a regional service, the Metrotren Rancagua, that serves the city of Rancagua and the peri-urban areas between it and Santiago; and a medium distance service, TerraSur, between Santiago and Chillán. The study addresses the urban stations of Santiago because of the availability of data, the different services, and the high number of passengers on Metrotren Nos, that transports 88% of the line’s users (EFE, 2019). The stations are located in four communes -Estación Central, Pedro Aguirre Cerda, Lo Espejo and San Bernardo-, which, with the exception of San Bernardo, have a low Urban Quality of Life Index (Observatorio de Ciudades, 2019).

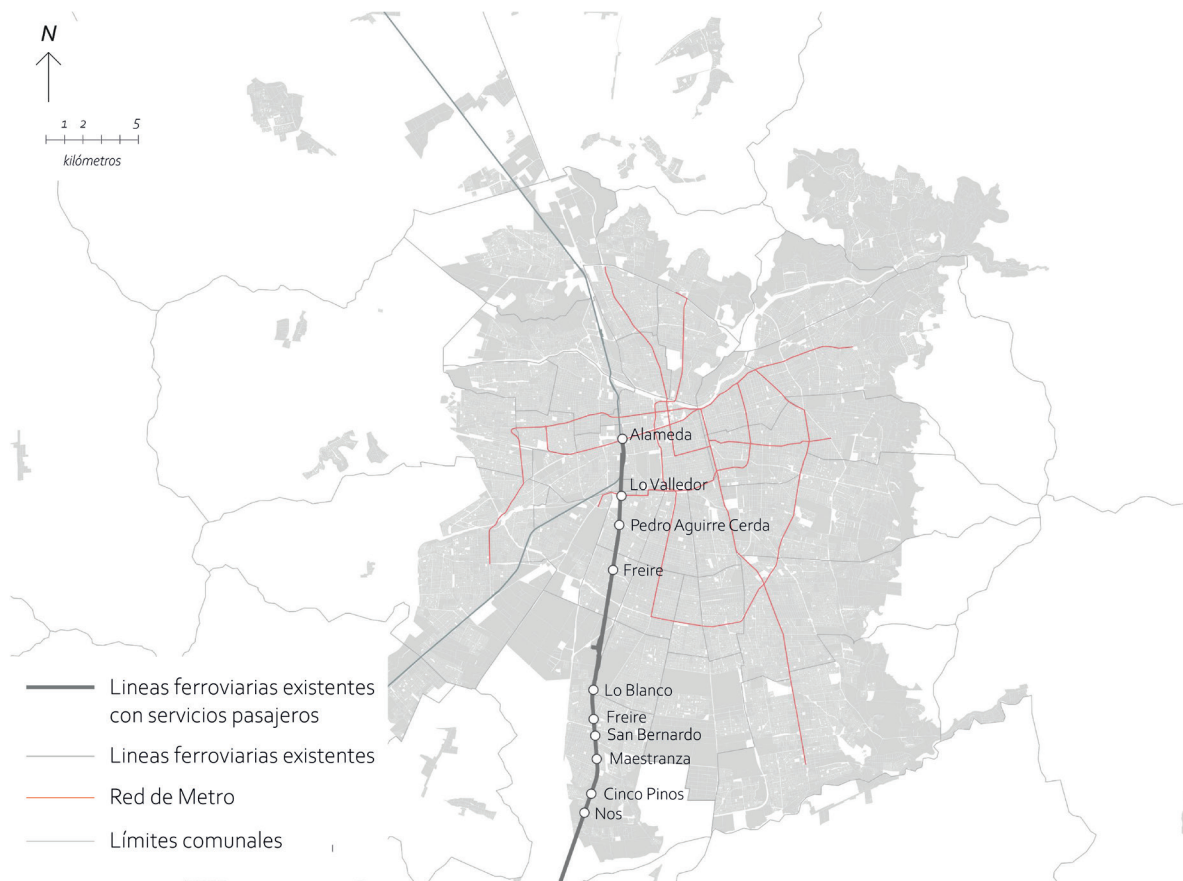


Figure 2. Stations analyzed in Santiago. Source: Preparation by the Author.

IV. METHODOLOGY

Bearing in mind that the stations revised are in an urban context, the indicators analyzed for the node and place functions consider an 800-meter buffer, that corresponds to a 10-minute walkable distance for urban stations (Currie, 2010). Based on indicators used in other applications of the node-place model and on the available data, the study considers five indicators for the node function and seven for the place (Table 1). These refer to available mobility offer around the stations, using public data available from EFE and the Metropolitan Public Transportation Directorate, as well as inhabitants and land uses found in their surroundings, using information from the 2017 Census and the Internal Revenue Service. The available data does not allow considering other significant elements, like intermodality with cars, or characterizing in detail the potential

train users, or observing the number of employees in relevant work sectors.

Using GIS software, the number of elements there are in each station and their area of influence -length of cycle-paths, number of inhabitants per block, square meters of shops, etc.- are counted for each indicator, taking into consideration the elements within the buffer. For example, to analyze public transport, the bus stops included in the buffer are considered, and the number and frequency of lines in operation are quantified. The value of the indicator corresponds to the sum total of elements found within the area of influence. A standardization of results is made for each indicator, adjusting them in a range of 0-1. Finally, the standardized indicators are averaged, which allows calculating the role of each station as node and as place. The standardization of the scores makes it

Dimension	Indicators for each station	Data source	References
Node	Destinations served by the train	EFE, 2020 (web page of the railroad company)	Bertolini (1999), Lyu et al. (2016), Reusser et al. (2008), Pucci (2019), Vale (2015)
	Railroad transportation offer (number of daily trips)		Bertolini (1999), Caset et al. (2019), Lyu et al. (2016), Reusser et al. (2008), Pucci (2019), Vale (2015)
	Public transportation lines passing by the station.	DTPM, 2020 (general specification of public transportation feeds – GTFS)	Bertolini (1999), Caset et al. (2019), Reusser et al. (2008), Pucci (2019), Vale (2015)
	Public transportation offer (number of daily trips)		Bertolini (1999), Caset et al. (2019), Lyu et al. (2016), Reusser et al. (2008), Vale (2015)
	Cycle paths (meters)	OCUC, 2019 (.shp cycle path network)	Reusser et al. (2008)
Place	Inhabitants	INE, 2017 (Census, microdata at a block level)	Lyu et al. (2016)
	Active population (15-64)		Bertolini (1999), Reusser et al. (2008), Pucci (2019), Vale (2015)
	Residential surface area (meters squared)	SII, 2017 (use surface area)	Pucci (2019)
	Commercial surface area (meters squared)		Pucci (2019)
	Industrial surface area (meters squared)		Pucci (2019)
	Educational establishments	Ministry of National Assets (-shp Educational Establishments)	
	Healthcare services	Ministry of National Assets, 2020 (.shp Healthcare Facilities)	

Table 1. Indicators used for the analysis. Source: Preparation by the Author.

possible to evaluate the performance of each station in comparison with others of the same line.

V. RESULTS

Stations as nodes

The stations analyzed play their node role differently along the railway line. Alameda and San Bernardo stations stand out due to the additional presence of mid and long distance railway

services. However, the element that determines the greatest differentiation between stations is the presence of public transportation. Alameda, with a metro line and more than 40 bus routes, clearly stands out as the main node of the line. Because of the multiple combinations that it offers with public transportation and with Metro line 1, the terminal also has the highest number of passengers. Given the great differences with the other stations of the line, the decision is made to not consider Alameda Station in the node-place model, to thus more clearly appreciate the characteristics of the other stations.



Figure 3. Population density around the stations examined. Source: Preparation by the Author based on INE data (2018).

A second group of stations, served by ten lines, is located in an intermediate position. However, it is possible to imagine that the switching of lines they have is quite limited. For example, Lo Valledor Station allows switching to Metro Line 6 at the station with the same name, but it is used just by the Metrotren Nos service. A third group of stations is served by fewer routes, probably because of their location on the outskirts. Regarding cycle paths, it has to be mentioned that these are found in some sectors, limited to the surroundings of some stations -from Alameda to Lo Blanco- and are not seen in the commune of San Bernardo. In conclusion, excluding Alameda, San Bernardo appears as the main node of the line, thanks to the railway services that stop at the station and the multiple public transportation routes that pass nearby. On the other hand, the stations located in less consolidated urban settings are weaker in this sense.

Stations as places

In Santiago, the urban sectors the train passes through, are characterized by a certain level of similarity among them (Figure 3). These are mainly areas with a medium-low density in comparison to other areas of the city, that are at the same time characterized by a residential and, to a lesser extent, commercial purpose. The Estación Central area is also an

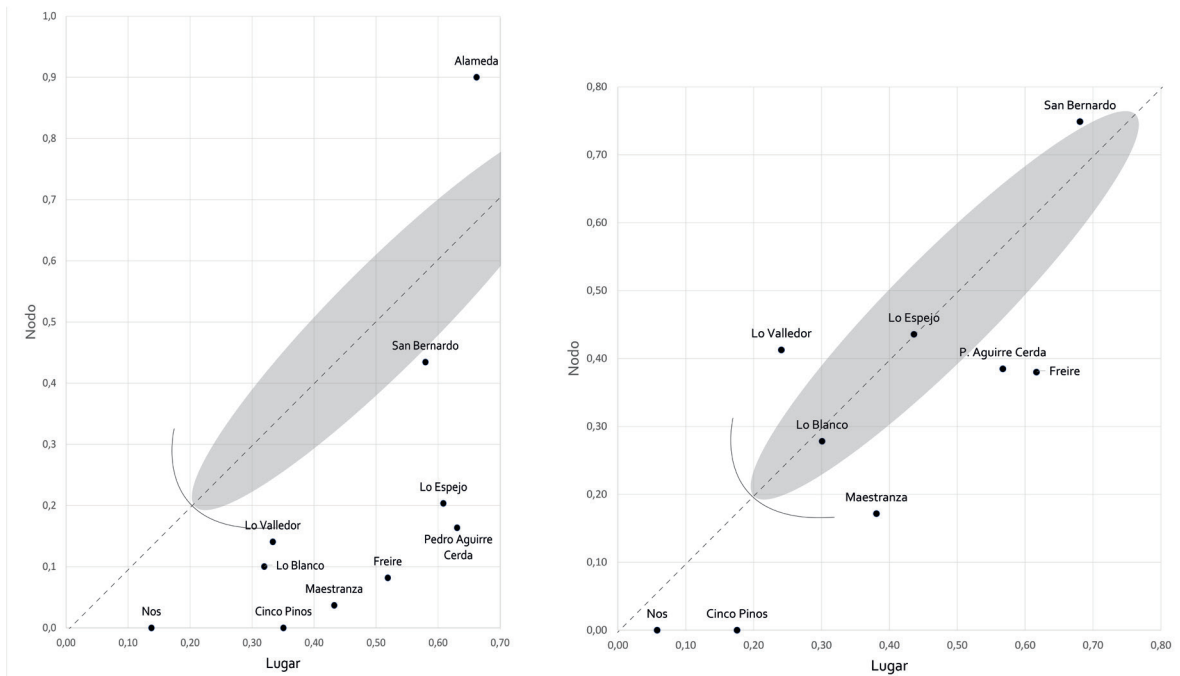
exception in this case, thanks to the presence of universities and cultural spaces in its surrounding area. Considering the other stations of the line, most of the places analyzed are in prevalently residential settings, with a certain presence of commercial activities, educational establishments, and even healthcare services, when dealing with older urban hubs -like the stations of San Bernardo, and to a lesser degree, Freire-. Lo Valledor stands out here as the station with a greater presence of industries around it. At the same time, the residential areas are differentiated by population density, which is higher in Pedro Aguirre Cerda and Lo Espejo. Now, the balance between the number of inhabitants and the surface areas destined to different activities means that no station stands out because of its strong vocation in the place dimension. On the contrary, the periphery stations of Nos and Cinco Pinos also turn out to be the weakest in this dimension.

Classification of the stations

Based on the results obtained (Table 2), it is possible to classify the stations considering their role as node and as place (Figure 4). This is an evaluation that compares the stations, considering the relative role of each one. As has been mentioned, the analysis did not include Alameda Station, as this appeared as

Dimension	Indicators for each station	Stations									
		Alameda	Lo Valedor	P. Aguirre Cerda	Lo Espejo	Lo Blanco	Freire	San Bernardo	Maes-tranza	Cinco Pinos	Nos
Node	Destinations served by the train	3	2	2	2	2	2	4	2	2	2
	Railroad transport – daily trips	96	76	76	76	76	76	92	76	76	76
	Public transportation lines that pass by the station	39	14	12	12	9	13	12	8	4	4
	Public transportation – daily trips	7.944	1.313	1.067	1.042	1.185	1.734	1.671	1.130	620	620
	Cycle paths (meters)	2.307	745	1.220	1.687	648	0	0	0	0	0
	Standardized score (with Alameda)	1	0	0	0	0	0	0	0	0	0
	Puntaje normalizado (sin Alameda)	-	0,41	0,38	0,44	0,28	0,38	0,75	0,17	0	0
Place	Inhabitants	21.307	11.218	38.041	37.124	22.896	24.719	23.584	20.739	26.560	15.593
	Active population (15-64)	16.272	7.260	25.542	25.367	15.526	15.702	15.021	13.767	18.621	10.575
	Residential surface area (meters squared)	829.204	560.075	1.693.293	1.855.317	979.287	2.018.434	2.232.738	1.649.866	784.458	443.757
	Commercial surface area (meters squared)	807.215	294.087	91.143	52.393	96.306	306.981	466.071	100.119	12.624	44.786
	Industrial surface area (meters squared)	261.147	266.820	37.133	9.090	24.127	42.762	59.057	117.324	40.332	23.474
	Educational establishments	7	2	8	11	8	21	27	20	5	3
	Healthcare services	1	0	3	0	2	4	3	0	0	0
	Standardized score (with Alameda)	0,66	0,33	0,63	0,61	0,32	0,52	0,58	0,43	0,35	0,14
	Standardized score (without Alameda)	-	0,24	0,57	0,44	0,3	0,62	0,68	0,38	0,18	0,06

Table 2. Results for each indicator and scores of each station. Source: Preparation by the Author.



Figur3 4. Results of the node-place model (left: with Alameda; right: without Alameda). The stations in a balanced condition are shown. Source: Preparation by the Author.

an extremely strong node compared to the other contexts examined.

In the framework of the methodology used, it was possible to recognize the following station typologies along the line:

Balanced stations. These are contexts where the role of node and place is balanced. This is the case of Lo Espejo and Lo Blanco, where both functions are balanced, although with a relatively low intensity.

Dependent stations. These are weak contexts as nodes and as places, which are characterized by the relative lack of available mobility alternatives, and by a lower intensity of land use. On the line examined, this corresponds to Nos and Cinco Pinos, which share a periphery location on the outskirts of the urban area of Santiago.

Unbalanced places. These are stations, whose role as place is stronger than their role as node. They are in contexts with relatively high housing densities and with large surfaces destined to trade or industry. In comparison with other stations, they perform a weaker role as node, due to the frequency of the train services and the public transport lines that pass by them. On the line examined, the imbalance is stronger in Maestranza, while Pedro Aguirre Cerda and Freire

have a stronger role as nodes and are closer to a balanced condition.

Unbalanced nodes. These are stations, whose role as node is stronger than their role as place. This is the case of two stations: Lo Valledor, the only station with a connection to the Metro; and San Bernardo, which, due to its importance on the line, ends up having high levels of accessibility and is located in a dense context, although a prevailing residential and commercial one.

The analysis does not show stations belonging to another typology individualized by Bertolini (1999), that is to say, **stations under stress** -with a high performance as node and as place, that determines a number of potential users that exceeds the current capacity of the station-; compared with the stations analyzed, this could be the condition of Alameda.

VI. DISCUSSIONS.

The station as an object of urban policies

The application of the node-place model allows observing the limited urban role that railway stations have in the Santiago context. On being a line with a restricted length that crosses

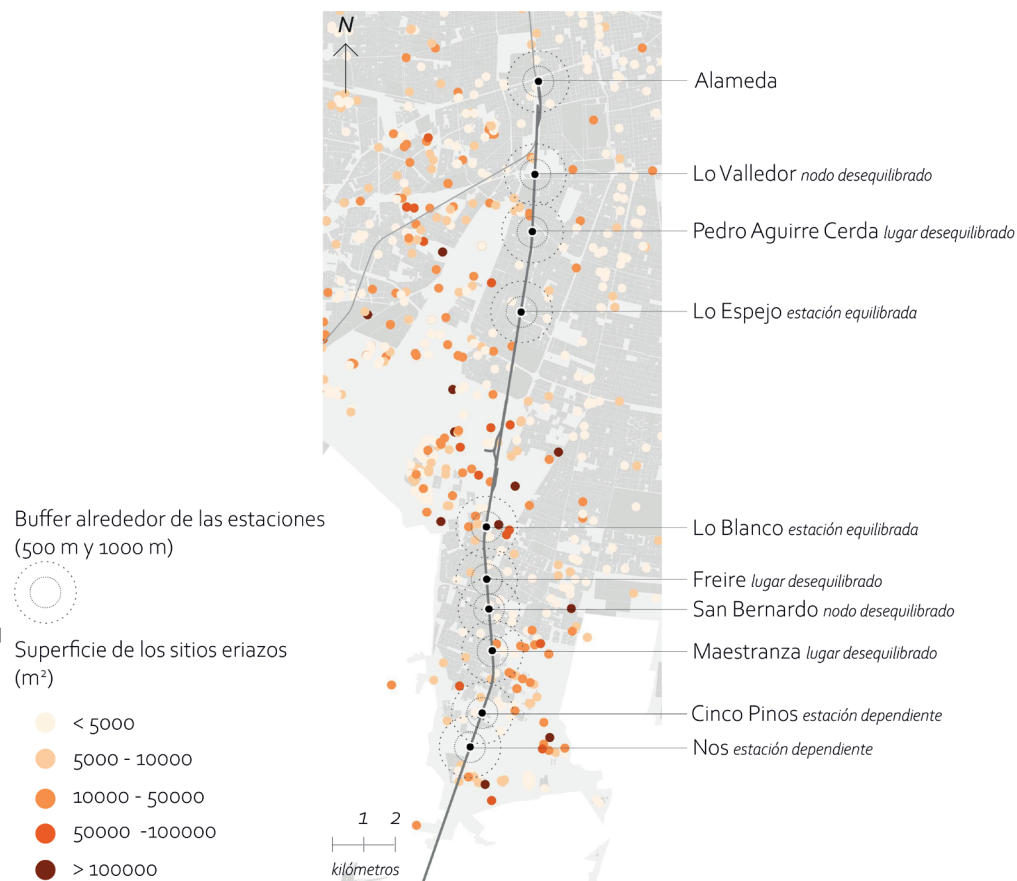


Figure 5. Barren lands around the studied stations. Source: Preparation by the Author.

similar contexts in terms of densities and urban roles, the analysis does not show major disparities regarding accessibility levels or the appeal of the urban settings. Despite offering a similar service -in terms of frequency- to the Metro network, around the railway stations there does not seem to have been land valuation or densification processes like those generated by said network (López-Morales, Sanhueza, Espinoza & Órdenes, 2019). In this way, a potential urban development around the stations is seen and to take advantage of it -promoting forms of TOD- the application of the node-place model can contribute to defining intervention guidelines referring to each station typology and to planning, in broad terms.

Regarding the stations, in general it is possible to propose a strengthening of their role as node and as place along the entire line, considering the relatively low scores that also characterize the balanced stations, except for San Bernardo. The dependent stations can be prioritized, from this perspective, promoting new balanced developments -whether residential

or not- that are benefitted from the accessibility offered by the train, concentrating in their surroundings land uses that can generate or attract an elevated demand of mobility and that can functionally be integrated with the railway (Vale, 2015). Regarding the stations identified as unbalanced places, for example Maestranza, it is necessary to strengthen their value as node through a multimodal approach (Nigro et al., 2019), namely increasing the possibility of switching through greater and more frequent public transportation routes, and facilitating intermodality at a local scale, through the creation of cycle paths to the stations. Following this logic, promoting densification may generate greater benefits in the unbalanced nodes -Lo Valledor, San Bernardo-, thanks to the good amount of public transportation already in place (Lyu et al., 2016). In addition, it is possible to develop proposals or specific stations that have positive effects for others too. For example, establishing stops for all the services at Lo Valledor station could strengthen its role as a switching lines node and also reduce the pressure on Alameda, today the only place to switch to the Metro for those living outside Santiago.

The node-place model also motivates broader considerations about urban and metropolitan scale planning. Considering the levels of accessibility that the railway service and its integration with the public transportation network guarantees, including two metro lines that head to the east of the city, it is possible to promote balanced forms of densification (Vicuña del Río, 2020) around the stations. There are areas around the railway line that could increase their density, as well as barren sites that be used for new developments (Figure 5). In this vein, it can likewise be proposed to build new stations in locations where an elevated presence of inhabitants and/or future appealing activities are projected. Although the metropolitan planning limits and the lack of coordination between land and transport uses complicate the implementation of an integrated strategy in the current Santiago planning context (Vicuña del Río, 2017), it would be good to prepare intercommunal plans that coordinate the new developments around stations (Katz et al., 2019). Likewise, it would be relevant to introduce mechanisms to capture the gains generated, to finance public transportation (Mathur, 2019) or other urban regeneration projects (Ruiz-Tagle, Labbé, Rocco, Schuster & Muñoz, 2019).

Finally, the results of the analysis suggest considering the design and management of the stations, thinking about them not just as places of transit, but also as relevant destinations in themselves. For this reason, the quality of station spaces is equally important to foster train use (Pucci, 2019). As the French program to make “open stations” shows (SNCF, 2018), station spaces can be (re)used for coworking, to house associations, for commercial activities, and for basic services. This allows strengthening stations as small neighborhood and communal scale polarities, to improve the limited access to basic services that some peripheral areas of Santiago have today, and to contribute towards increasing the opportunities available on a local scale.

VII. CONCLUSIONS

The application of the node-place model to Santiago’s railway stations shows that the train has an untapped potential for the urban development of the contexts it crosses. The distribution of inhabitants, land uses and the organization of the urban mobility system show that the setting of stations could house forms of transit-oriented urban development, considering that few stations have a balanced situation and their role, be it as node or as place, reveals room for improvement. Likewise, the results show the consequences of the lack of integration between land use and transportation planning, at a metropolitan and municipal level (Vicuña del Río, 2017). The stations have not been subject of a coordinated planning strategy that, along the line, would recognize the potential of the

areas around the train and give a clear role to each station, making their surroundings appealing and improving their connectivity (Cervero et al., 2017). This is shown by the Lo Valledor station that, despite its strong role as a node, it is not served by all the trains passing through, or that of Nos and Cinco Pinos, whose marginal position weighs more than their high accessibility and ends up assigning them as dependent stations, and even those of Maestranza, Freire and Pedro Aguirre Cerda, weak nodes despite the appeal of their surroundings. Facing this scenario, a greater coordination at a metropolitan level between public transportation authorities and regional planning entities could facilitate the strengthening of the line and of its urban stations, through better connections with their possible area of influence (Katz et al., 2019). However, the communal planning also shows significant limitations, since greater densities are not found around stations, unlike what is seen along Santiago’s Metro line, and also, within the commune itself, the stations end up performing a different role despite finding themselves in settings with similar characteristics. To sum up, the limitations observed in other Latin American settings are confirmed, related to the regulatory frameworks for the integrated planning of transportation and land uses (Suzuki et al., 2013).

The distribution of inhabitants, land uses, and the organization of the urban mobility system show that the station’s surroundings could be subject to initiatives that encourage transit-oriented development. The results of the analysis show that there is still room to maximize the benefits of the high accessibility guaranteed by the train, whether through forms of balanced densification (Vicuña del Río, 2020) or through the promotion of new local centralities. These initiatives require profound changes in urban planning and mobility in Santiago, as the case of the intense real estate development around Santiago’s Metro stations (López-Morales et al., 2019) shows, contrary according to the results, but similar in terms of lack of planning. In this sense, the application of the node-place model allows a first reading of the role that the stations perform and could perform in the region. The model applied here to the urban stations of Santiago could be a relevant analytical tool for other railway lines in the country and in other Latin American contexts that are reactivating their railroads, especially in the case of new services which, from their entry, could contribute to guiding the development of the areas they pass through.

VIII. ACKNOWLEDGMENTS

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