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A study on strategy development of high-speed railway station's surrounding area in Laos

Nghiên cứu chiến lược phát triển không gian xung quanh ga đường sắt cao tốc tại Lào

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ABSTRACT

High-speed railways (HSR) has been established since the 1990s and developed strongly in Japan, France, Italy, ..., and have recently been built in developing countries. In that context, the Laos-China HSR was completed in 2021 with 422.4 km runs through Laos, connecting three countries: China, Laos, and Thailand. HSR system is one of the driving forces for urban development, however this factor has not been identified in Laos' urban development strategy. Therefore, it is necessary to develop a strategy development of space around HSR stations throughout Laos, including identifying potential, systematizing, proposing fractals for economic growth in urban areas with HSR running through, promoting Laos economic connection with the economies of neighboring countries. The research is based on litureature review, secondary data methodologies to determine the potential of stations in relation to neighboring urban areas, and the development orientation of Laos. The conclusion proposes to classify spatial development around HSR stations into 3 types, which identifies key areas, as well as proposes future research directions.

Key words: High-speed railway; Laos-China HSR; HSR station; strategy development

TÓM TẮT

Đường sắt cao tốc (ĐSCT) đã xuất hiện trên thế giới từ những năm 1990, phát triển mạnh mẽ tại các nước Nhật, Pháp, Ý,...., gần đây đã được xây dựng tại các nước đang phát triển. Nằm trong bối cảnh đó, ĐSCT Lào Trung được đi vào vận hành năm 2021, kết nối 3 nước Trung Quốc, Lào, Thái Lan, trong đó có 422,4 km chạy qua Lào. ĐSCT là động lực phát triển đô thị, tuy nhiên chưa được nhận diện trong chiến lược phát triển đô thị của Lào. Do đó, cần thiết xây dựng chiến lược về phát triển xung quanh ga ĐSCT trên toàn bộ nước Lào, bao gồm xác định tiềm năng, hệ thống hóa, đề xuất phân dạng, nhằm tăng trưởng kinh tế tại các đô thị có đường sắt chạy qua, thúc đẩy sự kết nối kinh tế Lào với kinh tế các nước láng giềng. Bài báo dựa trên phương pháp tổng quan lý thuyết, phân tích, đánh giá các dữ liệu thứ cấp để xác định tiềm năng các nhà ga trong mối quan hệ với đô thị lân cận, và định hướng phát triển của Lào. Phần kết luận đề xuất phân loại phát triển không gian xung quanh ga ĐSCT thành 3 loại, trong đó xác định các vùng trọng điểm, cũng như đề xuất các hướng nghiên cứu trong tương lai.

Từ khoá: Đường sắt cao tốc; ĐSCT Lào Trung; ga ĐSCT; chiến lược phát triển.

1. INTRODUCTION

High Speed Railway (HSR) is a railway transportation mode whose running speed is faster than ordinary railway (Leboeuf, 2018). The most important change comes from the speed. As travel times had to be reduced for commercial purposes, speed emerged as the main factor. The International Union of Railways (UIC) considers a commercial speed of 250 km/h to be the principal criterion for the definition of HSR. However, there is no unified definition of high speed railway in the world until now. Different countries or organizations have different standards on high-speed rail (Leboeuf, 2018). At the national and regional levels, HSR is considered a major economic engine because it can restructure urban systems, improve linkages between cities and towns, facilitate the formation of urban agglomerations, and bring economic dynamism to the entire region.

The Laos-China HSR project is a strategic cooperation project between Lao PDR and China (also known as the Boten-Vientiane railway), a new railway that connects Kunming in China to Vientiane capital in Lao PDR. The railway is 422.4 km long electrified high-speed railway. This is the first railway in the landlocked nation of Laos. Once this is complete it will be possible to travel from Bangkok to China by train. After years of planning and negotiations, work on the railway officially began in 2016 December, and was completed by the end of 2021. The line is a single-track railway with some double-track sections for passing. The average corridor reserve area is 13 to 50 meters away from the center. The railway run through 167 villages, 13 districts of 4 provinces and the capital Vientiane. Passenger trains have an operating at a speed of 160 km/h.

Despite that HSR is considered as major economic engine, having potential to change the spatial and economic structure of cities, Lao-China HSR has not been recognized in the cities' master plan as well as Lao's city development strategy. In the master plan of cities that HSR stations located in, there are only two cities among 10 cities, Vientiane and Vangvieng, cover the station area. However, even in these two master plans, the HSR station's surrounding area is planned as agriculture zone or green zone. Thus, HSR station has not considered as the development factor for Lao's cities.

Figure 1. Master Plan of cities that HSR station is located in or near to

Therefore, it is necessary to study strategy development for HSR station's surrounding area in national scale. The research methodology is mostly based on literature review and secondary data, which will be presented in the following sections number 2 and 3. Section 4 will be discussion and proposal for future researches in order to develop the Lao's economy and to integrate Lao's economy with neighboring countries.

2. LITERATURE REVIEW ON THE DEVELOPMENT OF HSR STATION'S SURROUNDING

HSR shortens the space-time distance between cities in a region and changes the spatial relationship of the city network at the regional level. In particular, it link the areas of weaker economic growth to the economically developed areas more rapidly and promote regional integration and development. Research on the impact of transportation facilities on urban development is conducted at three levels: the region, the city, and the area surrounding the station. According to the different spatial scales, the researches' focus are also different: when focusing on the regional level, the reachability and regional integration brought by the rail transit will be analyzed; at the urban level, the impetus for urbanization brought by rail transit and new economic growth opportunities are emphasized; and the research on the area surrounding the site mainly includes theoretical and empirical studies of circle-style development and the theory of the TOD of the new urbanism.

At the regional level, the current study focuses on the impact of HSR lines and stations on regional accessibility (Liwen Liu, 2021). Traffic facilities usually improve regional accessibility by reducing transportation costs in terms of currency and time, bringing about major changes in the modes of travel of residents along the route and resulting in the rapid increase of large-scale population movements. In these studies, cities are nodes in the regional network, and regional accessibility is the main content of the study. For example, three parallel indicators, weighted average travel time, economic potential and daily accessibility, are used to measure the improvement of accessibility between cities in the region (Lou P, 2004).

With the improvement of accessibility, the basic assumptions of individual urban development have been changed as urban agglomerations participate in regional and global competition, forming a global city region that can be linked to the world economy at each urban scale. Such research focuses on how enterprise networks and industry

chains extend from regional central cities to small- and medium-sized cities, increase employment opportunities, optimize industrial structures and open up markets (Chen, 2007). Rapid regional transport links cities that lack large-scale external transport facilities (deep-water ports and airports) with cities that own these facilities to connect with the global economy. Such studies focus on the analysis of industrial links among cities and the spatial requirements of enterprises and investors in cities in the region. In research at the regional level, HSR enhances the reachability of the whole region, changes the industrial relations within the region and enhances the interaction between the city and the region.

There is also a slight difference in regional resource needs over time, such as a demand for accommodation space. The link between HSR and regional transport facilities also affects the spatial structure of cities . It mainly reflects the conditions of urban development and the links with a wider market and industrial chain. (Xiaomin Wang J. L., 2022)

With regards to HSR Accessibility, researches on HSR has investigated effects at different spatial levels. Vickerman (1997) concentrated on HSR impacts at the international corridor level. Most authors have examined outcomes at the national levels, with sporadic analyses at the regional (U. Blum, 1997) or local levels (Maddi Garmendia, 2008). In any case, it became evident that indicators not employing a distance decay function were dependent on the geographical area of the study (Bruinsma, 2008). Thus, multilevel analyses have highlighted a further issue in the spatial discrepancies of accessibility. In particular, Urena et al. (2009) (José M. Ureña, 2009) have conducted a multilevel analysis on HSR territorial implications, as advocated by Menerault (2006), Harman (2006) and Garmendia (2008). They assess long-term opportunities created by HSR for medium-large agglomerations, which are intermediate station locations of intermetropolitan services. Taking into consideration inferences at all geographical scales, Urena et al. (2009) (José M. Ureña, 2009) conclude that each level interacts and influences the others. Network characteristics and travel times between metropolises determine the feasibility of intermediate stops at the national level. According to HSR levels of service and network development, time-distance relations may change the balance and hierarchy of city systems at the regional level. An increased accessibility may contribute either to polarize activities toward the metropolises or to increase intermediate cities' regional role and attraction of activities. Certainly, it is important to maintain a global view for political and technical reasons, both to take advantage of HSR investment at all levels and to account for specific contexts that may influence HSR performance.

3. HSR IN LAOS

3.1. Context

Laos officially the Lao People's Democratic Republic is a socialist state and the only landlocked country in Southeast Asia. At the heart of the Indochinese Peninsula, Laos is bordered by Myanmar and China to the northwest, Vietnam to the east, Cambodia to the southeast, and Thailand to the west and southwest. Laos's population was estimated at 7.45 million in 2020, dispersed unevenly across the country. Most people live in valleys of the Mekong River and its tributaries. Vientiane prefecture, the capital and largest city, had about 683,000 residents in 2020.

There is a growing trend of urbanisation across Lao PDR, with the 2016 UN-Habitat World Cities Report identifying the Lao PDR as the most rapidly urbanising country in Southeast Asia. According to the 2015 census, approximately 33% of the Lao population lived in urban areas, mainly in Vientiane Capital. However, there are many smaller settlements which are becoming more urban in nature due to a range of factors including rural urban migration and government policy such as the practice of grouping a number of villages together to form a town.

Urban planning is not strong, particularly at local levels, with no comprehensive urban strategy, and many towns do not show evidence of having followed their urban plans, which often date from the 1990's or 2000's. Along with poor coordination between the multiple ministries responsible for various aspects of urban planning and management, it has highlighted the necessity to update and revise master plans. Land-use planning, and management is also poor, and urbanisation has resulted in agricultural lands and wetlands being converted to residential and economic developments in fast-growing urban and peri-urban areas.

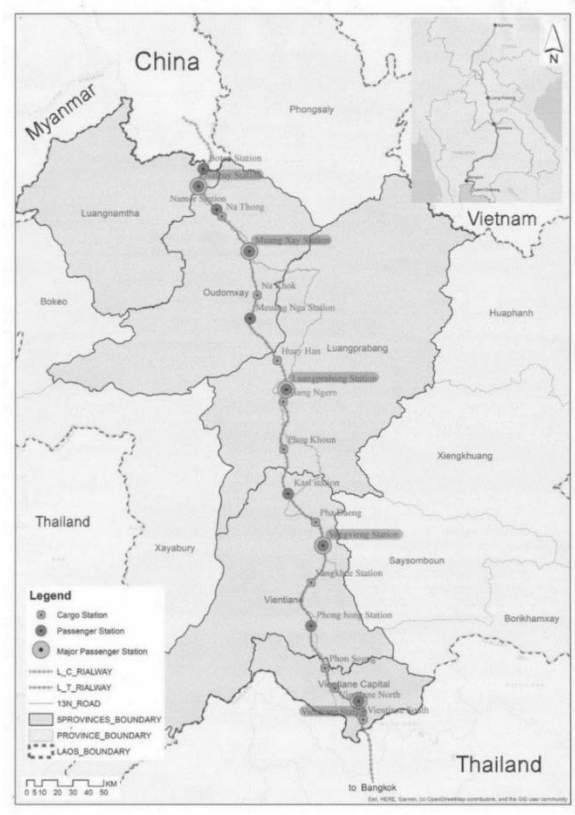


Figure 2. System of HSR Stations in Laos (Michael Epprecht, 2018)

Lao's HSR station has 20 stations including 10 passenger stations and 10 cargo stations. The passenger transport station divided into 5 main stations in big cities and 5 secondary stations in small towns. Among them, there are main stations in big cities that can support a lot of passengers and belong to the capital cities of the provinces, including: Natray Station (Luang Namtha Province); Xay District Station (Oudomxay Province); Luang Prabang Station (Luang Prabang Province); Vang Vieng Station (Vientiane Province); and Vientiane Station (Vientiane Province). The station has a special point as it is a station where only EMU passenger trains (also known as Phae Lan Chang) run at a speed of 160 km/h enter and receive passengers at the main station. As for the small town's station, there will only be ordinary trains that run at a speed of 120 km/h, which can stop passengers at every station.

3.2. The relationship between HSR station and urban system in Laos

Urban system in Laos

There is no standardized definition of towns or urban areas used in the Lao PDR. The following provides a short overview of some of the official references to definitions of towns and urban areas (based in Article 3 of the revised Law on Urban Planning (2017):

- Vientiane Capital City;
- Main metropolitan areas (Luang Prabang, Pakse, and Savannakhet towns);

- Municipality/ main district / center of the province;
- Center of district;
- Center of large villages or village groups (kum ban).

According to the Law on Local Administration (2003), there are provinces or cities (="urban province") at the provincial level, and districts and municipalities (="urban district", main district of a province capital) at the district level. The head of the city is the mayor (Art. 2), and the head of the municipality is the chief of municipality (Art. 3.). The city is defined as a local administrative territory comprising larger urban communities and several municipalities (Art. 6). It is the center of political, economic, cultural and social services and activities that influence the socio-economic development of the country.

The criteria for the creation of a city are:

- Occupy a large urban area that is the center of economic, political and socio-cultural activities, [and of] tourism, services, commerce, communications, transport and foreign affairs;
- Make a significant contribution to the socio-economic development of the country;
- Have a population of at least eighty thousand
- Have a developed infrastructure and public facilities. (Art. 12.)

According to that law, a municipality is a local administrative territory the same level as a district, which is in an urban area (i.e., essentially an urban district). It is the place where the offices of the provincial or city administration are located, or some other urban area that meets the rater unspecific criteria provided in that law, such as "high population density and socio-economic, political, cultural and public service development". A municipality comprises several villages. The urban centers of other districts can be established as a municipality if they meet the following criteria:

1. Population of at least 10,000 people;
2. A developed economic, social, and cultural area and a developed infrastructure system; [and]
3. An ability to generate revenue to respond to necessary expenditures. (Art. 38).

In essence - the laws provide only very loose definitions on what constitutes a town. The definition of the extent of a town rests with the relevant authorities at the respective administrative level, in the form of urban development plans. For most Lao towns there is an urban development plan, although e.g. in the case of Vientiane city, the urban development plan of 2012 has not been approved yet, meaning that the one of 2002 is the valid basis for respective urban planning, although the realities of on-going urban development has rendered much of it obsolete. In the absence of any official delineation of a town, the definition of "urban areas" used in the Lao PDR are not of much help for urban planning or analysis either.

The national Population and Housing Census records: a) whether a village is part of a municipality of a district or a province, and b) classifies villages as "urban" if any three of the following criteria are met: village is part of a province or district municipality; >70% of households use electricity; >70% of households use piped water; village is accessible by road all year around; village has permanent all-day market.

This definition is clearly not equal to "belonging to a town or a city", but rather refers to the degree of access to certain services/ public infrastructure (which is similar to the inverse measure used to identify poor villages). Further, the municipality as defined in the census does not appear to follow the definition stated in the above mentioned law on local administration, and can be composed of a number of rather dispersed rural villages, and has therefore little in common with a typical urban area. Indeed, a closer look at the distribution of villages marked as belonging to a municipality reveals surprisingly many such villages in remote countryside areas without any urban characteristics. There are several other limitation to those definitions mentioned above for any of them to be useful as a basis for analysis or planning or urban spaces:

Defining a town area based on the district boundaries does not reflect realities of urban space in the Lao PDR. The town area of Vientiane, for instance, does not match the extent of the three, four, or five central district, or the urban areas of e.g. Luang Prabang or Savannakhet are much smaller than the respective districts in which they are located. The typical categorizations of towns used in the Lao PDR:

- National city, equivalent to the status of a province, with a population greater than 100,000 people, along with its main agglomerations;
- Large provincial capitals, with a population of at least 50,000 inhabitants - often referred to as "secondary towns", along with their main agglomerations;
- Small and medium size provincial and district capitals, with over 10,000 people;
- All other very small provincial and district capitals and rural towns of at least 1,000 inhabitants.

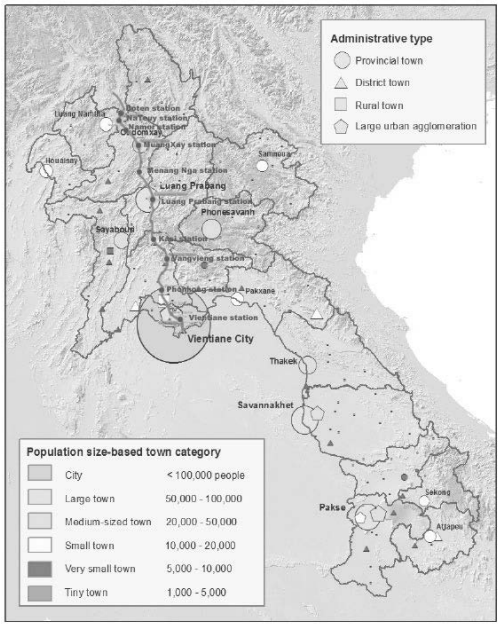


Figure 3. Urban system and HSR line (Michael Epprecht, 2018)

Besides the centrally located town area of Vientiane Capital city, with slightly more than half a million people, there are three larger towns in the Lao PDR, all with a population of over 50,000: Luang Prabang in the North, and Pakse and Kaysone Phomvihane town (hereafter referred to as Savannakhet town) in the South. Particularly in the peri-urban agglomerations of these relatively larger towns, as well as in the country's smaller and medium-sized towns, the share of households engaging in agricultural activities is over one third of all households, representing a relatively high proportion compared to the nearby main town.

There are currently fifteen small to medium size towns in the Lao PDR, three quarters of which have a population of 10,000-20,000 inhabitants. While in those smaller ones, over 40% of all households engage in agricultural activities, it are in the larger ones about one quarter of all households that engage in agricultural activities.

Many provincial capitals are rather small - 22% of all provincial capitals have less than 10,000 inhabitants, and 10% less than 5,000 inhabitants. Over 80 percent of all district capitals have a population of less than 5,000 inhabitants. Relatively large shares of all households in those towns engage in agricultural activities. District capitals with less than 1,000 people typically represent a group of geographically dispersed

rural villages, and so cannot be considered as a town.

3.3. National policies and strategies

The centerpiece of national development policy is the five-year National Socio- Economic Development Plan (NSEDP). The Sam Sang ("Three Builds") directive (Politburo Resolution No.03/CPP/2012), launched in 2012, identifies three tiers of public administration with: i) provinces as strategic units; ii) districts as sectorial strengthened units; iii) villages as development units. In terms of urban planning, Sam Sang acts as a motor, defining the partition of tasks, duties and responsibilities from the center to the local level for the different levels of towns defined in the Law on Local Administration.

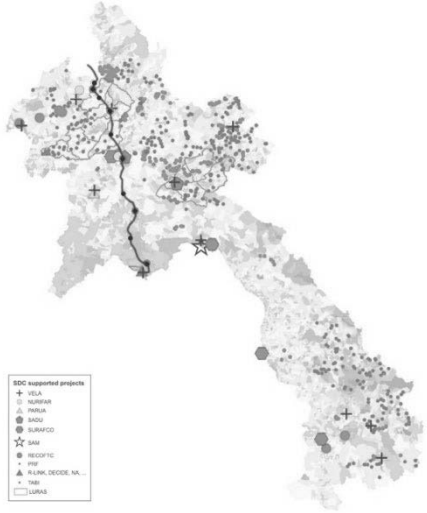
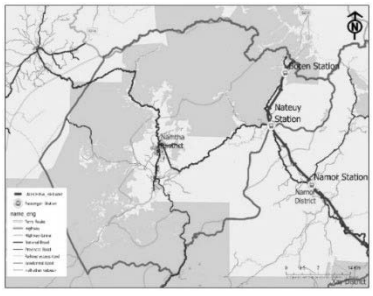


Figure 4. Location of Swiss Agency for Development and Cooperation (SDC) funded project activities (Michael Epprecht, 2018)

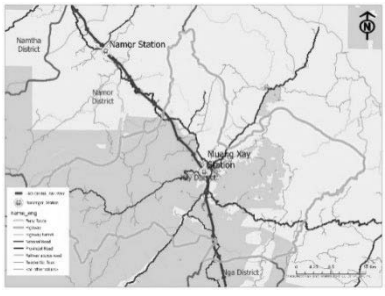
A land titling program initially commenced from 1997, where 540,000 titles were issued in urban and peri-urban areas. Certain areas of the Lao PDR have witnessed emerging land markets and rising land prices. This potentially prohibits poorer populations from either retaining or gaining access to land. A potential consequence sees growing numbers of informal urban settlements without adequate services. Further, the 2003 Lao Land Law allows requisition of land by the state for public purpose or interest, conditions that are open to broad interpretations (Hirsch & Scurrah, 2015), and may have further exclusionary effects on certain sections of the population.

Urban development strategy 2030 outlines MPWT's vision on urban development and the country's regional integration into main transport and development corridors of the Great Mekong Sub-region from 2016 to 2030. The main objective is to define directions, targets and investment plans for urban development, and should serve as a main reference for infrastructural developments and the protection of the country's architectural, cultural and environmental heritage. Rationales include the urbanization of rural areas through the development of small towns towards reducing rural-urban disparities, as well as strengthened regional integration through the development of economic centers along main trans- counts corridors.

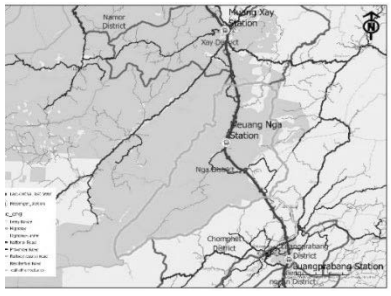
Nearly all provincial and district towns and centers in principle have an urban development plan, which spells out the individual development strategy for each town. Most of those plans are from the mid- 1990s, and a number of them from early 2000. Besides the fact that most of these plans are rather outdated, an important problem appears to be that neither those plans, nor any relevant law, are being followed in practice. The current urban masterplan of Vientiane City is of 2001. While JICA has supported the development of a major new urban development masterplan for the city in 2012, its approval is still pending. The urban development has in reality largely ignored those plans, rendering most of the proposed developments obsolete. Using infrastructural development, the Lao government is attempting to shake off an image as a landlocked country to one that is land-linked. Vientiane is seen as key to this strategy, whether through its position within the Greater Mekong Subregion (GMS) Economic Corridors, or as a hub for regional train networks being built by China.



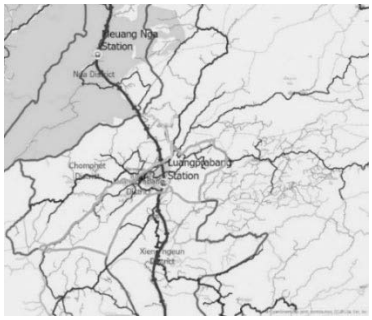
Boten Station - Na Teuy Station - NaMor Station



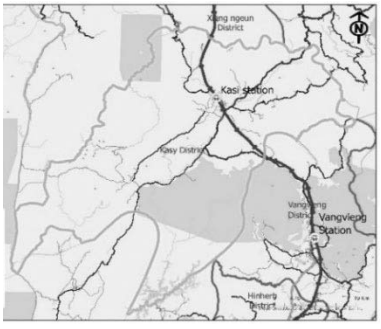
Meuang Xai Sation



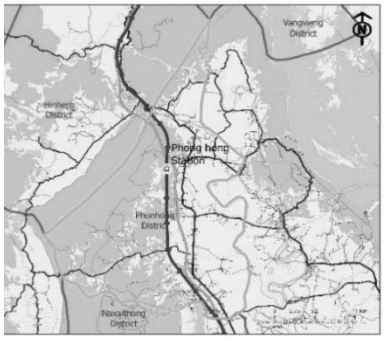
Meauang Nga Station



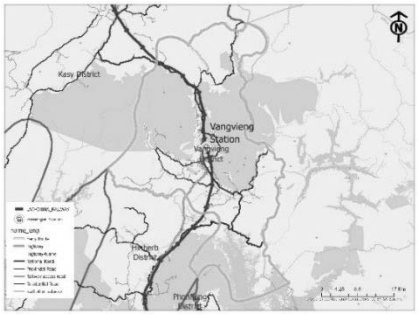
Luang Prabang Station



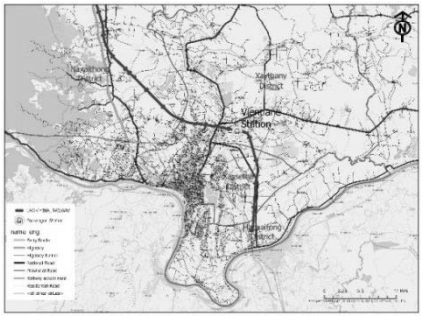
Kasi Station



Phonhong Station



Vang vieng Station



Vientiane

Figure 5. Location of HSR stations in Laos

A summary of characteristics of HSR stations in Laos as following:

Table 1. Characteristics of passenger stations

No	Station name	Type Station	Level of city	Distance to center City (km)	Distance to urban boundary (km)	Station Building size (m^2)	Capacity of passengers
1.	Boten		District Community	37	31	6,500	300
2.	Na Teuy	Major station	Municipality	27	25	1,500	300
3.	NaMor		Town of District	34	33	1,500	150
4.	Muang Xai	Major station	Municipality	3	1	2,000	400
5.	Muang Nga		Town of District	0.5	0.5	1,500	300
6.	Luang Phrabang	Major station	Town of City	7.5	7	7,970	1200
7.	Meuang Kasi		Town of District	3	2	1,500	150
8.	Vang Vieng	Major station	Town of District	4	1	3,000	600
9.	Phonhong		Town of District	16	14	1,500	300
10.	Vientiane	Major station	Capital city	20	0.5	14,500	2500

3.4. Location and characteristics of HSR stations in Laos

The Passenger Station are 10 Stations and include 5 major stations and all located in five Provinces including Louangnatha Porvince, Oudomxai Porvince, Luang Prabang Porvince, Vientiane Porvince and Vientiane Capital.

4. DISCUSSION AND CONCLUSION

In Western European countries and Japan, HSR is the process of deindustrialization in the post-modern era, associated with the development of the knowledge economy (Bharule, 2019). Most HSR stations are connected with conventional train stations in urban centers to promote urban regeneration. These stations are located in the existing urban center and are considered an important element to develop commercial and service elements in the 1km radius around the station.

Meanwhile, HSR in Laos was developed in the early stages of urbanization, with the expectation of creating a boost in investment attraction and economic development in the whole region. Therefore, it is necessary to have a specific assessment of the impact of railway stations in Laos with the surrounding area. Moreover, in Laos, railway stations are mainly located far from urban areas (average radius about 10km), in undeveloped areas. Through studying the Lao's urban system, Lao's city development plan, and characteristic of HSR station in term of city connection, the HSR station's surrounding area need to be classified by potential development into 3 types: regional level, urban level, spatial surrounding development, in which Vientian can be the regional one, and 4 others including Vang vieng, Kasi, Muang Nga, Muang Xai can be urban level. In the further study, it is necessary to conduct researches on: Spatial structural models around the stations and Design solutions for the space around the station to be input for Lao's city master plan.

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