

Comparative Analysis of Transit-Oriented Development in Thailand and Japan

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Abstract: Recently many Asian countries are showing interest in Transit-Oriented Development (TOD) projects in order to construct new urban railways and successfully develop along railway lines. Particularly in Bangkok, Thailand, there are plans for the construction of several urban railways. It is useful to consider the successful TOD experience of developed countries such as Japan when planning new urban railways. However, these countries have different laws and structures related to railway development and urban planning, so it is important to understand these differences. This study focuses on TOD in Thailand and Japan by comparing each government's laws related to railway development and urban planning in order to understand the differences in structure and function of each railway and urban planning agency. Moreover, this study investigates various aspects of railway development in Thailand and Japan consisting of laws, planning, subsidies, coordination with concerned parties, and issues related to urban planning to find key differences between both countries. In conclusion, this study demonstrates problems involving the coordination between railway projects and urban plans, constraints of land allocation, incentives for the private sector, and organization. Such issues need to be considered when proposing policy solutions for TOD projects in Thailand.

Keywords: Transit-Oriented Development, TOD, Railway, Urban Planning, Comparative Study, Thailand, Japan

1. INTRODUCTION

Urban development integrated with transport infrastructure is commonly known as Transit-Oriented Development (TOD). The TOD concept has been raised as an alternative solution, combining rail projects with land development, which not only generates revenue from railways but also commercial development around the railway station. TOD has benefits such as increasing public transportation demand, creating attractive and high service level railway, and economic growth from development along the railway line.

Recently many Asian countries are showing interest in TOD projects in order to construct new urban railways and successfully develop along railway lines. Particularly in Bangkok, Thailand there are plans for the construction of several urban railways to change the mode of transportation from heavily congested road transport to railway. In Japan, many successful urban development projects using the TOD concept have improved urban facilities along railways and enable railway companies to maximize the value of the railway by generating revenue from both passenger fares and non-passenger fares. It is beneficial to implement the TOD concept in Thailand based on the Japanese experience (not only successes but also failures).

However, the TOD concept of Japan cannot be applied in Thailand without considering the differences of each country's system such as laws, government system, and concerned parties. Understanding key differences could lead to more successful implementing of TOD in Thailand and avoid costly failures. The purpose of this study is to identify the differences regarding laws, government system, and concerned parties and to raise key issues for future development in Thailand based on these differences.

2. LITERATURE REVIEW

According to Calthorpe (1993), Transit-Oriented Development (TOD) is the type of urban development that maximizes the amount of residential, business, and leisure space within walking distance of public transport. Accessibility to public transportation is essential for promoting TOD. Tuan and Son (2015) measured the accessibility to public transport systems in Vietnam by the three main components, such as access to stops and stations, access to vehicles, and access to the service. Luatthep *et al.* (2017) also found that the rerouting of the bus network in Bangkok makes the bus service more accessible and better linked to other transport modes and newly developed areas. As previous papers mentioned about accessibility, to implement the TOD, the policy to promote accessibility of station such as promoting walking to the station including the feeder to stations is important. This study should understand the mechanism to improve access to stations such as understanding the function of agencies related to improving access and the system to coordinate among the decisions of each agency.

Pongprasert and Kubota (2017) found that not only access by vehicles but also include walking to the station since many previous papers on TOD were closely linked to walking distance to public transportation such as the passenger who commutes to work by rail in Bangkok walk to the station is quite low due to the poor pedestrian conditions, Ratanawaraha *et al.* (2015) also investigated the influencing factor to change the walking distance, the result showed that the gender, age, income and occupation, and trip characteristics significantly affect the change in walking distance, whereas residential and job sites choice has a more limited effect on the change. Within the walking distance to the station in Bangkok, improving the quality of the walking environment can increase the walking rate to the station, for longer distance, improving the feeder bus service is necessary which can be seen in Sulaksono (2010). The result of Chalermpong and Wibowo (2007) demonstrated that the passenger in Bangkok walks to railway station less than the other cities because they usually travel by the motorcycle taxis to the transit station and based on the hypothesis that people in Bangkok change the transport modes to rail transit, people will walk farther, averaging a 750 meters increase. Improving transit access such as the sidewalk improvement between residences to transit stations should be taken into consideration because they are influential on TOD residents' car use according to Pongprasert and Kubota (2017). This study also reviewed the paper concerning the walking distant rate in other countries, as Lee *et al.* (2005) studied in Korea, the distance to the subway is a more effecting factor in subway use than the income of passengers, and Santoso *et al.* (2015) also studied in Japan, 400 meters is considered an acceptable walking distance to the bus stop, the acceptable walking distance from home to the rail station is 2 kilometers. According to the walking rate to the station in Bangkok is lower than the other cities, the research should investigate the mechanism to improve the urban facility to support walking to the station such as pedestrians and skywalks to increase the walking distance to the station.

According to Sanit *et al.* (2014), people who live nearby railway stations have a convenient train travel experience that makes a more positive attitude towards the railway. Sanit *et al.* (2014), the residents who travel by train move to live closer to the stations and become regular passengers and a positive attitude towards rail transport can strongly influence the

decision of the residents. Nakamura *et al.* (2014), the existing MRT system in Bangkok is not attractive enough for all people. However, MRT has the potential to be more attractive than car use by improving its facilities and improving feeder environments. Nakamura *et al.* (2016), Current private residential development around MRT stations does not promote transit ridership and developers usually pay more attention to developing car facilities for high-income residents. Sanit *et al.* (2013), the sociodemographic factor influences the decision to commute the railway rather than transport factors, Iamtrakul and Zhang (2014) discovered that the intermodal transfer facilities are very important to attract people to use rail service. Policy to promote the use of mass transit is necessary to promote the TOD. As many papers demonstrated the result of the effecting factor to use the mass transit system in Bangkok especially residents who live near transit can become railway passengers. This study should investigate the issue related to the improvement of urban facilities supporting the use of mass transit.

According to Ito and Kubota (2018), the current policies on urban planning of Thailand cannot promote area development as a whole sufficiently. Morichi and Acharya (2012) stated to study transport issues and solutions in Asian Megacities, the coordination of public transport and spatial planning was considered as necessary. Wicaksono *et al.* (2015), the development of intermodal facilities such as bus terminals and rail station plazas are considered as one of the solutions for overcoming the issue of integrating urban public transport. Muromachi *et al.* (2015), researchers studied the government level, urban planning, and financial aspects for a comparative study on road-based urban public transport policies in six Asian countries: Cambodia, Indonesia, Japan, Philippines, Thailand, and Vietnam. The paper discovered that the bus terminal linked to public transportation has been found in Indonesia and the Philippines and the railway station plaza has been found in Japan. For financial aspects, bus mode, all six countries, are subsidized, however, paratransit modes are not subsidized. Kitajima *et al.* (2015) investigated the 6 issues such as proximity to public transportation, mixed-use, high-density development, multimodal, public space, and the walking environment to understand the TOD. As many papers mentioned about studying in many aspects such as government structure, financial and urban planning, it needs to investigate such issue.

According to previous studies, this research will investigate railway and urban planning on many issues, consisting of study the government's structure related to rail development and urban planning in Thailand to understand the function of both the railway and urban planning agencies in Thailand. It is necessary to examine and compare the railway development in both Thailand and Japan in various aspects such as law, financial, procedure, and coordination with other agencies. It also needs to study and compare the issues related to urban planning in both Thailand and Japan.

3. GOVERNMENT' S STRUCTURE CONCERNING RAILWAY AND URBAN PLANNING IN THAILAND

3.1 Government's structure on railway development in Thailand

The ministries of Thailand are the government agencies that compose the executive branch of the government of Thailand; each ministry is headed by a minister. Thailand has 20 ministries, there are 2 major ministries related to railway development as the following.

3.1.1 Ministry of Transport (MOT)

The ministry of transport responsible for the supervision, development, construction, and regulation of the land, marine, and air transportation systems. The office of transport and traffic

policy and planning (OTP), which belonged to the ministry of transport, was responsible for formulating overall transport policy and plans. Besides, the department of rail transport (DRT), the new agency under the ministry of transport, performing duty as railway policymaker and regulator for overall rail transport as well as formulating the strategy and development plans of the rail network in Thailand.

3.1.2 Ministry of Interior (MOI)

The Ministry of the Interior is responsible for many tasks consisting of local administration, internal security, citizenship, disaster management, road safety, land management, and public works. The Bangkok metropolitan administration, which is the local government under the ministry of interior, is responsible for the management of the city of Bangkok.

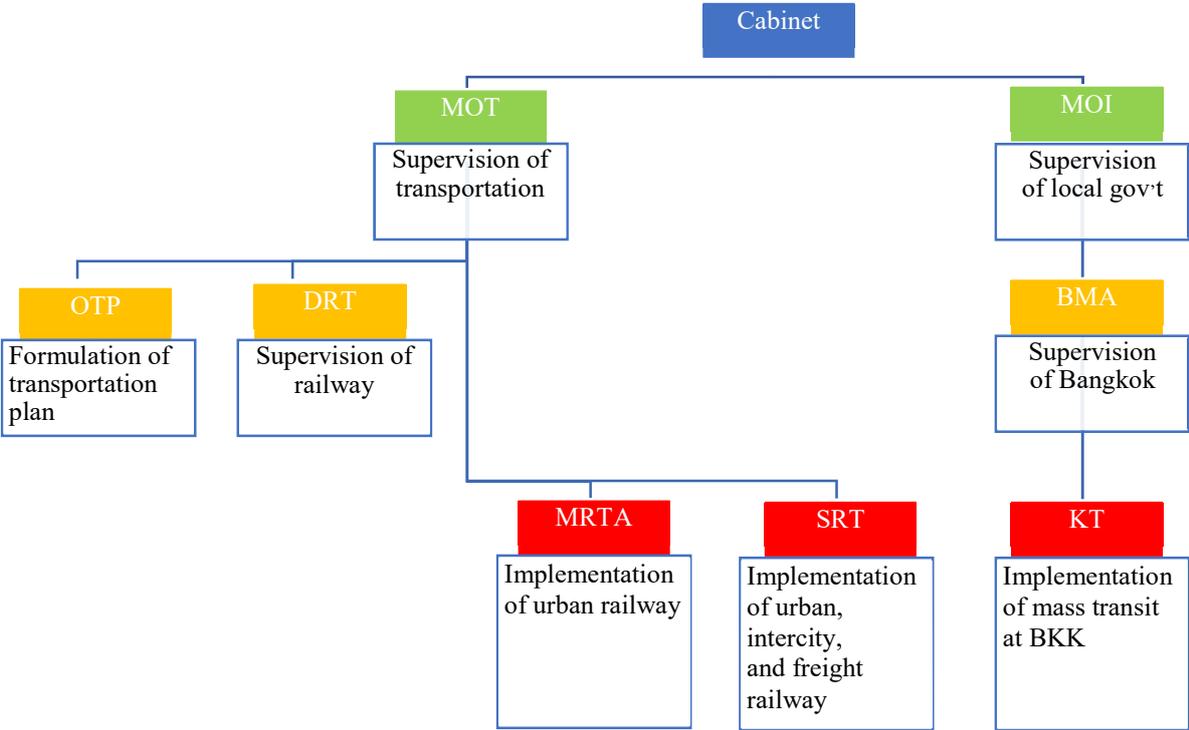


Figure 1 Government's structure related to railway development.

Some railway projects in Thailand are usually invested by the central government, and some railway projects were shared on private sector investment using the PPP Act. There is no clear rule on the railway project subsidy system.

Most of the railway projects including transport infrastructure in Thailand were carried out by the Ministry of Transport. The minister of Transport, under the act on the state railway of Thailand and act on mass rapid transit authority of Thailand, shall directly supervise two railway authorities consist of the state railway of Thailand and the mass rapid transit authority of Thailand (MRTA). SRT operates the long-distance train and establishes an SRT electric train company (SRTET) to operate the airport rail link line. The MRTA authorities to Bangkok expressway and the metro public company limited (BEM) to operate the blue line and purple line including the Bangkok mass transit system company (BTS) to operate the pink and yellow line.

Some projects are implemented by local cities such as the Green Line in Bangkok. The Bangkok metropolitan administration under the ministry of interior, in accordance with the

announcement of the national executive council no. 58, granted BTS Company to run the green line, it is the first elevated railway in Bangkok, commonly known as the BTS or Sky train.

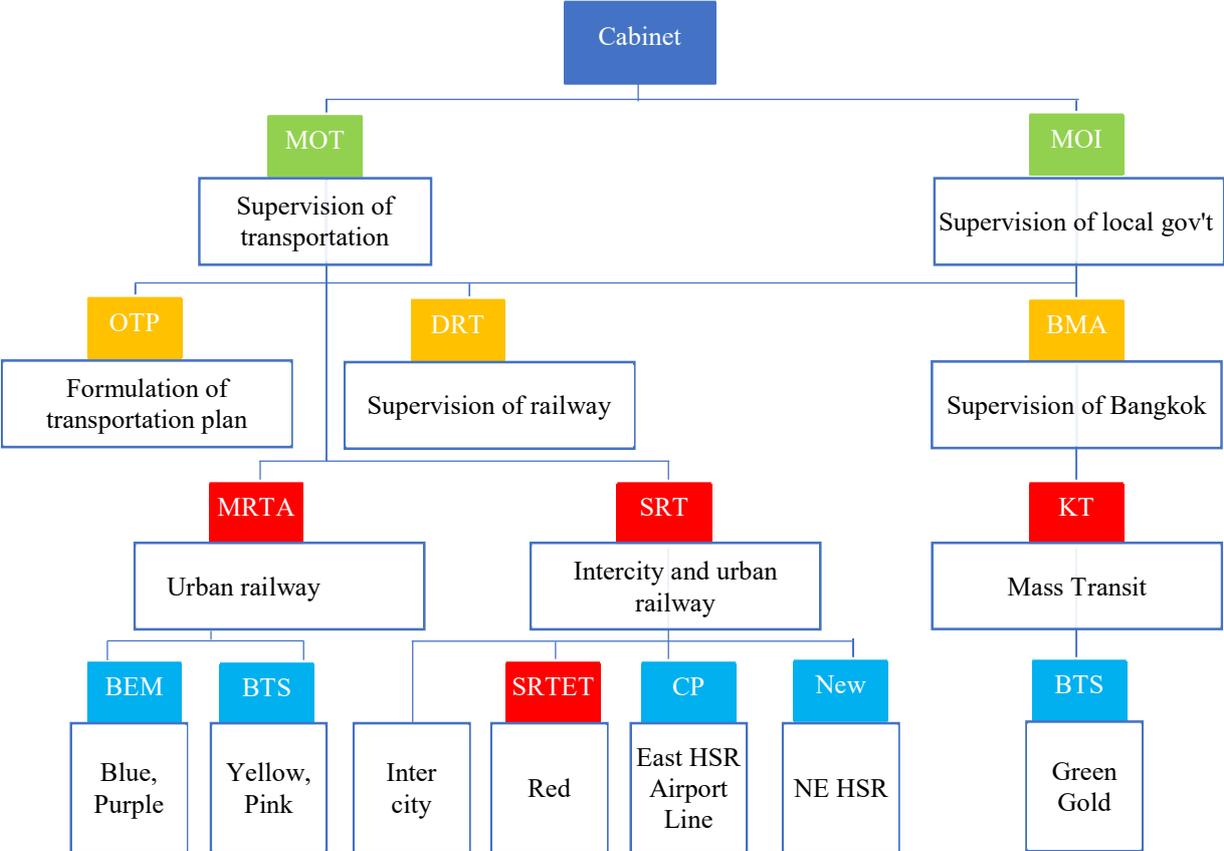


Figure 2 Railway line

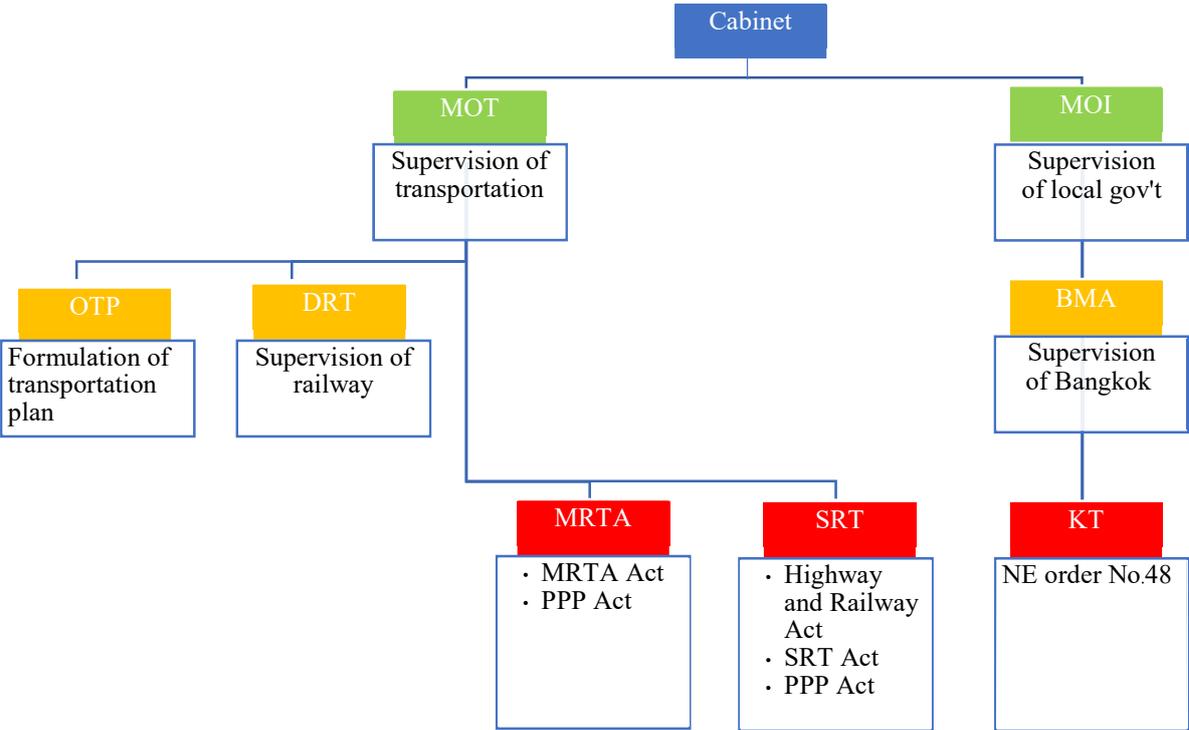


Figure 3 Laws related to railway.

3.2 Government structure on urban planning

The determination of the urban plan in Thailand needs to coordinate with many agencies as Thailand has 20 ministries, these papers mainly focused on ministries related to urban plans and infrastructure development as follows.

3.2.1 Ministry of the interior (MOI)

The Ministry of the Interior oversees the local administration, homeland security, citizenship, disaster management, road safety, land management, and public works. The MOI also supervises urban planning policy through concerned agencies.

The department of public works and town planning (DPT) is responsible for assignments on the urban plan at every level and supports local administrative authorities on the town, area, and rural development by formulating and supervising land-use policies.

The Bangkok Metropolitan Administration (BMA) is the local government of Bangkok. The roles of BMA are to formulate and implement policies to govern Bangkok including transportation services, urban planning, waste management, housing, roads and highways, security services, and the environment. When the BMA formulated urban planning, many urban facilities stipulated in the urban plan of Bangkok were not completed within the specified period due to other agencies being responsible for most of the urban facilities.

Provincial level is part of the national level of Thailand that is divided into 76 provinces; a governor who is appointed by the national government to lead each province. The provincial is responsible for the local governments. The local government formulates their urban plan and mainly implements small urban infrastructure, for the large scale of infrastructure is usually supported budget from the provincial level or national government.

3.2.2 Ministry of Transport (MOT)

The Ministry of Transportation in charge of supervising, developing, building, and regulating the land, marine, and air transport systems. The Ministry of transport shall implement the transportation infrastructure according to the ministry plan. However, such infrastructure has to comply with the urban plan stipulated by DPT.

3.2.3 Other ministries related to urban infrastructures.

There are many infrastructures in urban plans that need to be implemented e.g., schools, hospitals, irrigation, and so on which are carried out by each concerned ministry. For example, the ministry of education responsible for the oversight of the school, the ministry of public health responsible for the oversight of hospitals, and the ministry of agriculture and cooperatives responsible for the administration of agriculture including the construction of irrigation systems.

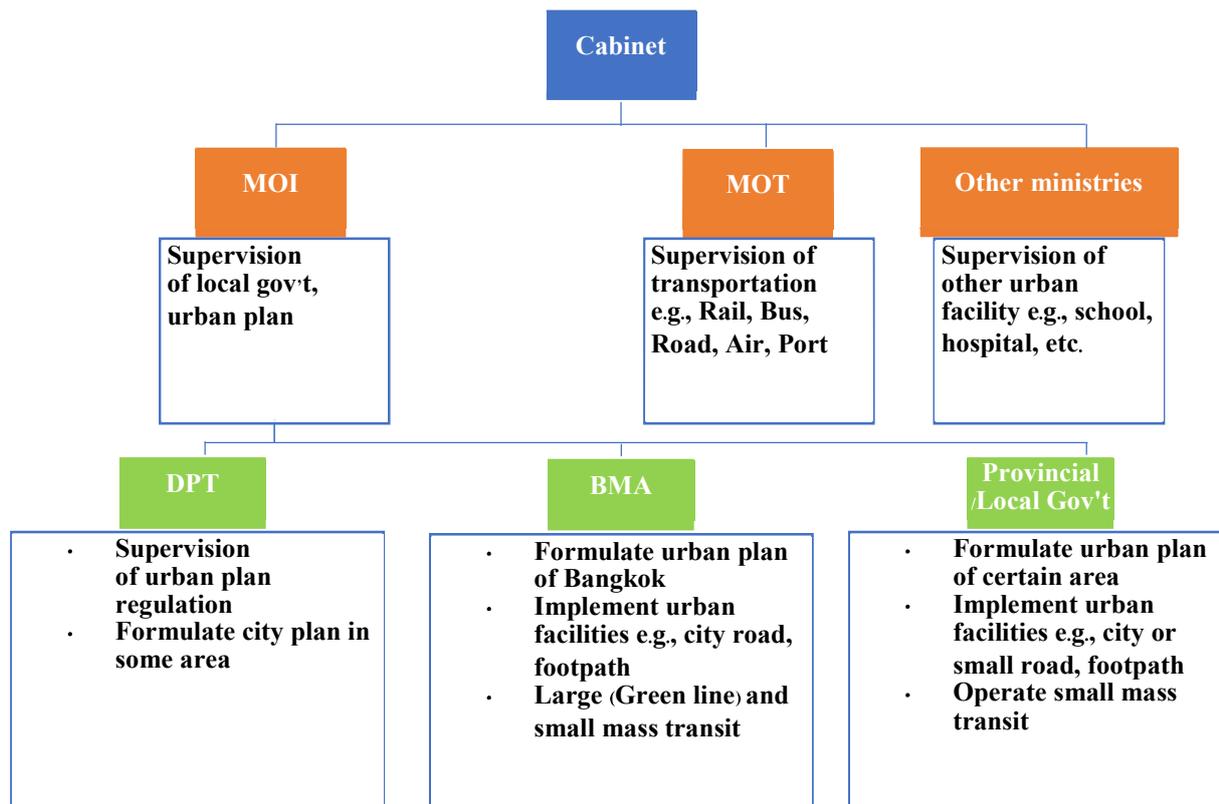


Figure 4 Government's structure related to urban planning in Thailand

4. COMPARISON STUDIES ON THE RAILWAY AND URBAN PLANNING IN THAILAND AND JAPAN

4.1 Comparison of railway development in Thailand and Japan.

4.1.1 Law related to railway.

In terms of railway operators and users, Thailand has the Railway and Highway Act, 1921 as a technical and safety standard on the public railway, private railway, and highway construction as well as prescribed the responsibility of the royal railway company in the case of train accidents. Japan has Railway Business Act, No.92, 1986 and Railway Operation Act, No. 65, 1900 to supervise all railway operators including a passenger.

The minister of interior of Thailand is entitled to permit tram operator, under announcement of the national executive council, no. 58, 1972. The MLIT of Japan has the authority, under the act on the Rail track, to grant the tram business, supervise the tram operator, and support the tram operator under the Act on Mortgages over a rail track. Such law applied to a railway that lay on the streets for use in general transportation.

The establishment of two agencies in Thailand, the state railway of Thailand (SRT) and the mass rapid transit authority of Thailand (MRTA), both railway authorities are entitled to implement a railway project in Thailand, The SRT in charge of the long-distance railway and MRTA responsible for urban railway under the Act on state railway of Thailand, 1951 and act on mass rapid transit authority of Thailand, 2000, respectively. The announcement of the national executive council, no. 58, 1972 is another law relating to railway development that allows the Bangkok metropolitan administration (MBA), in charge of managing the city of Bangkok, to permit the private rail company as rail operator in Bangkok. Besides, in the case

of projects that need a budget from the private, PPP act enables the private company to participate in the railway project. Japan has many laws regarding rail development; moreover, Japan enacted the law to support transit facilities for railway under the act on the enhancement of convenience of urban railway, No.41, 2005.

4.1.2 Planning

Ministry of Transport of Thailand determines the master plan on the railway, railway authorities must conduct the feasibility study, environmental impact assessment, and route design report before getting approval from the cabinet to implement the railway project. In Japan, the ministry of land, infrastructure, transport and tourism, and the council of transport determine the railway master plan while the railway business operator shall estimate and survey on demand of railway and preparing the business plan for approval from the ministry. Transit facilities need to be stipulated in the city plan. Without the approval of such facilities on the urban plan, the railway project is not allowed to be implemented in Japan.

4.1.3 Land allocation for the railway project

Railway projects in Thailand use the existing land of railway operators and expropriated land. In the case of land being acquired by the expropriation method, it was necessary to adhere to the purpose of land to be expropriated. Japan has many kinds of land allocation method e.g., using the railway operator's existing land, land purchase, land acquisition, land readjustment, urban redevelopment. Also, some projects use special law e.g., law to Integrated promotion of urban and railway (Special law for Tsukuba Express line)

4.1.4 Subsidy

The railway project in Thailand has been invested by the central government and some of the rail projects will be shared on investment by the private sector using the PPP act. There is no clear rule regarding the subsidy system, and the subsidy shall be decided in the event of the approval of the cabinet. Japan set the subsidy scheme for the railway, for example, in the new urban railway's project shall be invested by the central government of 35% and the local government of 35% based on the act on the enhancement of convenience of urban railways (enacted in August 2005). A subsidy scheme was set for enhancing the convenience of urban railways by developing facilities that improve the urban rail network function while using existing infrastructure and construction of new lines that connect existing urban railway facilities; these are subsidized by the government of Japan.

4.1.5 Coordination with other agencies

In Thailand, the railway project implementer shall only notify the concerned agencies about the use of the area to be implemented for the railway project. There is no clear procedure for implementation on needed facilities such as station plaza, pedestrian, and road. Approval of such facilities on an urban plan is not required. When the railway project ends, transit facilities do not usually complete at the same time as the railway project. In Japan, private railway companies and local government companies coordinate with concerned agencies to implement the railway project and develop needed facilities along the railway line. When the railway project is planned, the transit facilities for the railway will be stipulated in the city plan.

Table 1 The comparison of railway development in Thailand and Japan

Issue	Thailand	Japan
1. Law related to railway	<ol style="list-style-type: none"> 1. Railway and Highway Act, 1921 Construction standards for railways and roads include safety measures. 2. Act on State Railway of Thailand, 1951 Establishment of SRT, which is entitled to implement a railway project. 3. The announcement of the National Executive Council, No. 58, 1972 MOI is entitled to permit the private as the railway operator. 4. Act on Mass Rapid Transit Authority of Thailand, 2000 Establishment of MRTA entitled to implement urban railway project. 5. Public-private partnership Act, 2019 Private has the right to invest in the public project. 6. Rail Transport Act, (Draft) Legislation to regulate the railroad. 	<ol style="list-style-type: none"> 1. Railway Business Act, No.92, 1986 To secure transportation safety and protect the benefit of rail users. 2. Railway Operation Act, No.65, 1900 Technical standard for facilities and the essential rule 3. Railway Mortgage act, No.53, 1905 Special provisions for cases where the railway or rail track facilities are the subject of collateral. 4. Act on special provisions concerning the punishment for conduct impeding the safety of the train operation on the Shinkansen Railway, No.111, 1964 Punishments for acts that interfere with the safety of rail services. 5. Railway and Tramway Development Act, No.169, 1953 Subsidy measures to the railway company in a failing management state. 6. Act on Rail track, No.76, 1921 Grant the tram business and supervise the tram operator. 7. Act on Mortgages over tramway, No.28, 1909 Support the tram operator. 8. Shinkansen Railway Development Act, No.71, 1970 To develop the Shinkansen railway network and connect to the core cities. 9. The Law Concerning Passenger Railway Companies and the Japan Freight Railway Company, No.88, 1986 Establish passenger rail companies and rail freight companies. 10. Japan railway construction, transportation and technology agency act, No.180, 2002 Establishes the name, purpose, scope of operation, and the accounting category of JR TT. 11. Act on special measures concerning the integrated promotion of urban and railway in the Metro area, No.61, 1989 Promote integrated housing and rail development (Tsukuba Express) 12. Act on special measures to promote the development of the designated urban railway, No.42, 1986 Special measures to reduce the burden on railway operators and users.

		13. Act on the enhancement of convenience of urban railway, No.41, 2005 Enhancing transit facilities with developments contributing to speed improvement and facilitation of passenger transit
2. Planning	<ul style="list-style-type: none"> - Formulate the master plan by MOT. - The mass transit master plan was approved by the Land Traffic Management Commission and cabinet - The project implementer (MRTA, SRT, BMA) conducts the feasibility study report, route design, and EIA based on the master plan. - Approval of the urban plan is not required. 	<ul style="list-style-type: none"> - The Council of Transport Policy and MLIT set the master plan. - The railway business operator estimates and surveys the demand of the railway and make a business plan. - The urban plan is approved by the urban planning council under the local government. - Without the approval of the urban plan, the railway project is not allowed to be implemented in Japan.
3. land allocation for the railway project	<ul style="list-style-type: none"> - Use the existing land of the railway operator. - Land expropriation - Land readjustment (not popular) - In the case of land being acquired by the expropriation method, it is necessary to comply with the purpose of land to be expropriated. 	<ul style="list-style-type: none"> - Use existing land of the railway operator. - Land buying - Land acquisition - Land readjustment method - Urban redevelopment method - Law to Integrated promotion of urban and railway (Special law for TX)
4. Subsidy	<ul style="list-style-type: none"> - Financial resources come from Central Government/PPP - No rule on subsidy - The subsidy shall be decided in the event of the approval of the cabinet. 	<ul style="list-style-type: none"> - Financial resources come from Central/Local/Private - Subsidy scheme <ul style="list-style-type: none"> - Urban railways convenience enhancement (1/3 national, 1/3 local) - Underground high-speed railway (35% national, 35% local) - New town railways support (15% national, 15% local for new town railways, 18% national, 18% local for airport access railways) - Main railways revitalization (20% national, 20% local) - Railway station comprehensive improvement (20% national and 20% local) - Transport hub improvement (50% by the national depending on the project)
5. Coordination with other agencies	<ul style="list-style-type: none"> - The railway project implementer shall only notify the concerned agencies about the use of the area to be implemented for the railway project. - There is no clear procedure for implementation on needed facilities. - Approval of transit facilities on an urban plan is not required. - When the railway project ends, transit facilities do not usually complete. 	<ul style="list-style-type: none"> - The private railway companies and local government companies coordinate with concerned agencies to implement the railway project and develop needed facilities along the railway line. - When the railway project is planned, the transit facilities for the railway will be stipulated in the city plan.

4.2 Comparison of urban planning in Thailand and Japan

4.2.1 Laws

The Town planning Act, under this act, the urban plan will be a plan, policy, and project including a measure of general control. The Department of Public Works and Town & Country Planning shall study and analyze data to formulate a country plan in accordance with the Town planning Act. At the National Area, the twelfth national economic and social development plan (2017-2021) prescribes that the urban plans need to consider economic growth, environmental balance, and social sustainability.

The city area of Japan has the City Planning Act to implement urban facilities and urban development projects set out in city plans. Municipalities must set basic policies on municipality planning based on the prefecture policy of urban planning areas; all city plans are stipulated by the local government.

Land replotting method is popular under Land readjustment which is entitled to alter the shape and condition of plots of land and to install or improve public facilities in a city planning area to provide better public facilities and to increase the usage of each plot. Urban Renewal Act is similar to land readjustment to Improve public facilities by the construction of new building comprehensively, right of original landowners will convert to land and floor on the new building. At the National level of Japan, the Urban Renaissance law 2002 designates a special district for urban redevelopment consists of two parts: the planning proposal by private developers and deregulation on urban planning. It enables private developers to make flexible plans in special districts.

4.2.2 What is decided in urban planning?

Thailand has four items that will be stipulated in the urban plan consisting of land use, open space, transportation, and public utility. The urban development project is not required to stipulate an urban plan. Three main items stipulate in the urban plan of Japan consists of land use plan, public facilities (e.g., road, park and greenery, sewage, public transport, etc.) urban development projects (e.g., land readjustment, urban renewal, and new residential area)

4.2.3 Urban Development Plan

TOD projects of Thailand usually formulated as a standalone project. Meanwhile, the Japanese government designated the 55 areas to be the emergency district to be developed in accordance with urban renaissance law in 2002. In emergency districts, the private developers in the emergency areas obtain privileges such as special tax rates, financial support to persuade private developers.

4.2.4 Urban development coordinator

In Japan, Urban Renaissance Agency (UR), which is a semi-governmental organization, plays an important role as urban development coordinator. The UR collaborates with local cities including the invitation of private involvement with the project. Thailand does not have an agency as an urban project coordinator to integrate with concerned parties.

4.2.5 Enforcement of urban planning

Urban plan in Thailand shall be enacted as ministerial regulations in the period, which shall not exceed five years. Many urban facilities stipulated in the urban plan of Bangkok did not complete within the specified period. Most urban facilities stipulated in the urban plan will not be implemented. One reason is that the urban plan enacted as a ministerial regulation that is weak enforcement law. In the case of urban plans in Japan, most of the urban infrastructures have been developed by the local city.

4.2.6 Incentive in the urban plan for private

To control the height of buildings and density of certain areas in Thailand, the height of the building will be restricted by FAR. In the Bangkok area, the relaxing FAR will be adopted, if any developer decides to provide consist of public space or greenery park, park and ride within 500 meters of the transit station, transit facilities within 200 meter of the transit station, affordable housing, energy-saving building, drainage area, riverfront open space, and daycare service for the child or aging people.

BMA also introduce the new measure of urban plan consist of; Transfer of Development Right (TDR), the landowner can transfer FAR within 500 meters of the transit station to the other landowner and Planned Unit Development (PUD) is the measure that the landowner may improve FAR in their land, but the total of FAR shall not exceed the FAR stipulated.

FAR of Japan is similar to Thailand, the floor area ratio is stipulated in districts such as high-rise residential attraction districts, high-level usage districts, and specified blocks, etc. If developers establish a more efficient infrastructure than one subscribed by an urban plan, they can use more floor area than the designated floor area ratio without traffic congestion and environmental problems, for example, public space, public facilities (railway station, pedestrian space), green facilities, residence, accommodation, etc. Japan has another measure called the Transfer of Floor Area Ratio. It was introduced to preserve landmark buildings and pursue high-density utilization, for example, Tokyo Station was applied by this measure.

Table 2 Comparison of urban planning in both Thailand and Japan

Issues	Thailand	Japan
1. Laws	<p>City Area</p> <ol style="list-style-type: none"> Town planning Act The urban plan will be a plan, policy, and project including a measure of general control, to be used as a guideline for the city. Land readjustment Act Implement and develop many plots of land by land replotting. 	<p>City Area</p> <ol style="list-style-type: none"> City Planning Act No. 100 of 1968 Implementation of urban facilities and urban development projects in city plans. Land Readjustment Act No. 119 of 1954 Alter the shape and condition of plots of land and install or improve public facilities. Urban Renewal Act No. 38 of 1969 Construction of new buildings comprehensively, right of original landowner will convert to land and floor on the new building. New Residential Area Development Law of 1963 (new town) The law granted a public body to purchase land for public purposes on large-scale residential development. Act on special measures concerning the integrated promotion of urban development and railway construction in Metro area, No.61, 1989.

		Promote integrated residential development and railways of a new railway.
	<p>National Area</p> <ol style="list-style-type: none"> 1. Town planning Act Formulation of the country plans to be the framework of national land-use policy. 2. The twelfth national economic and social development plan (2017-2021) Improve city ordinances and building codes to encourage efficient use. 	<p>National Area</p> <ol style="list-style-type: none"> 1. Urban Renaissance law 2002 Designation of the areas as the emergency areas to be developed. 2. National Land Use Planning Act No. 92 of 1974 Effect the comprehensive and systematic use of national land use. 3. National Spatial Planning Act No. 205 of 1950 Implementation of national spatial strategies to promote spatial development use.
2. What is decided in the urban planning	Land use Open space Transportation Public utility	<ul style="list-style-type: none"> - Land use - public facilities - Ex. Road, Park and Greenery, sewerage, public transport, etc. - Urban development projects - Ex. LR, Urban renewal, and New Residential Built-up Area development, etc. - Lecture by City Bureau (City Planning Law)
3. Urban Development Plan	TOD projects are usually formulated as a standalone project	The Japanese government designated the 55 areas to be the urgent district to be developed under urban renaissance law in 2002 so far, providing the incentive to private to be involved in the development
4. Urban development coordinator	-	UR plays an important role to be urban development coordinator, coordinating with locals including the invitation of private participation with the project.
5. Enforcement of urban planning	<ul style="list-style-type: none"> - The urban plan shall be enacted as ministerial regulations and the specific plan shall be enacted as royal decree or act. - urban plans enforce in a period which does not exceed five years. - The use of land needs to comply with the urban plan. - Infrastructure project stipulated in the existing urban plan did not complete because the central government developed most of the urban infrastructure, such agencies did not follow the plan. 	<ul style="list-style-type: none"> - Designated city planning Area. - Stipulating city planning - Limiting Development Project and city planning Project - Implement urban infrastructures. - Most of the urban infrastructures are developed by local cities, it will be enforced by such local cities.
6. Incentive in the urban plan for private (FAR bonus)	<p>To control the height of buildings and density of certain areas, it will be limited at FAR specified in the regulation.</p> <p>In the Bangkok area, the FAR bonus shall be received, if any developer decides to provide the following.</p> <p>FAR Bonus</p> <ol style="list-style-type: none"> 1. Affordable housing = 4x 2. Public space or greenery park = 5x 3. Park and ride within 500 meters of the transit station = 30 sqm/car 4. Drainage area = 20% 5. Energy-saving building = 20% 6. Riverfront open space= 8x 	<ul style="list-style-type: none"> - The floor area ratio is stipulated in districts such as high-rise residential attraction districts, high-level usage districts, and specified blocks, etc. - Limitation for floor area ratio is stipulated in building standard law. <p>FAR Bonus</p> <ul style="list-style-type: none"> - Public space - public facilities (railway station, pedestrian space), - Green facilities - Residence - Accommodation

7. Transit Facilities within 200 meters of the transit station = 5x

8. Daycare service for the child or aging people = 8x

BMA introduces the new measure of the urban plan consisting of.

Transfer of Development Right (TDR)

The landowner can transfer FAR within 500 meters of the transit station to the other landowner.

Planned Unit Development (PUD)

The landowner can improve FAR in their land, but the total of FAR must not change as FAR stipulated.

- etc.

For example, in an industrial zone in an emergency district, the maximum FAR is 200 percent; if the developer wants a 600 percent FAR, they must meet the specified conditions.

Transfer of Floor Area Ratio

In the case of the preservation of landmark buildings and the pursuit of high-density utilization, for example, Tokyo station was applied by this measure, Akashi (2007).

4.3 Case Study of TOD in Japan

The Umekita redevelopment project in Osaka, which is the case study, is a large-scale TOD. Umekita is located near Osaka's Umeda station and was formerly the north freight yard of JR Osaka Station. It has been designated as an urgent development district by the national government in accordance with urban renaissance law. Osaka City and UR worked together to build a 31-hectare office and residential complex with a greenery park. UR has implemented a large-scale area through the land readjustment method in order to develop Umekita. The access road, station plaza, and transit facilities were all stipulated in the Osaka city's urban plan. To encourage private developers, Osaka city supported the urban plan's urban facilities, as previously mentioned. Incentives for private developers include project proposals in urban plans, requests for land use changes, and FAR bonuses. Additionally, private companies in Umekita will be eligible for financial incentives such as a special rate of income tax and corporation tax.

5. CONCLUSION

This study aimed to identify the differences regarding laws, government system, and concerned parties and to raise key issues for future development in Thailand based on these differences. The study demonstrates problems involving the coordination between railway projects and urban plans, constraints of land allocation, incentives for the private sector, and organization for TOD. Such issues need to be considered when proposing policy solutions for TOD projects in Thailand. The differences identified in this study are explained below. The findings of this study should have practical value as well as academic value and provide useful insights not only for Thailand but also for other Asian countries considering TOD projects. This conclusion is divided into sections covering in detail the structure and function as well as key issues identified in this study.

5.1 Structure and function

5.1.1 Railway development

There are major differences in railway development between Thailand and Japan such as management of operation and development of transit facilities, which affect how railway projects are implemented. Thailand's railway project usually uses existing land of railway operators and methods of land expropriation. In the case of land acquired by the method of

expropriation, the purpose of land expropriation must be fulfilled. In the meantime, Japan has many methods for land allocation, including land purchases, land acquisitions, land readjustment, and urban redevelopment. In addition, railway projects in Thailand are typically funded by the central government, though some have been shared with private sector investors through the PPP Act. The railway project subsidy system is not defined by any clear rules. On the other hand, the Japanese government sets up various subsidy schemes to develop and improve railway station accessibility. In Japan, private railway companies and local governments play an important role in coordinating with relevant agencies in order to implement the railway project and develop necessary infrastructure along the railway line.

In Thailand, approval for transit facilities in an urban plan is not required for a railway project. Transit facilities have not been developed at the time of railway project's completion. On the other hand, private railway companies and local governments in Japan collaborate with relevant agencies to implement the railway project and build the necessary facilities along the railway line. Prior to project implementation, transit facilities must be stipulated in the urban plan, such a railway project is not permitted if the approval of transit facilities in the urban plan is not completed.

Based on these differences, we believe Thailand could benefit from referring to the Japanese methods regarding the development of transit facilities and land acquisition. Other ASEAN countries in similar situations to Thailand could learn from Japan's experience and go through the same stages as Thailand.

5.1.2 Urban Planning

The study discovered differences in urban planning in both countries, including central and local government roles, coordination systems, and urban planning incentives. These must be considered when proposing TOD in Thailand.

The Thai local government stipulates infrastructure in the urban plan, while the central government grants construction for such infrastructure. Many of the urban facilities specified in the urban plan are not completed within the time period specified because most of the urban facilities are under the control of many central government agencies. In the case of Japanese urban plans, most urban infrastructures have been implemented by the local city. The Japanese government has also designated UR as a key urban development coordinator. The UR usually works with the local government, as well as inviting land developers to participate in urban development projects. To support urban development, Japan's government designated many districts to develop as emergency areas. In an emergency area, the government provides incentives to private developers who have participated in the urban development project, particularly incentives related to the urban plan deregulation system.

Such issues, in particular the mechanism of coordination between the central and local government of Japan, should be considered in the future to adopt new laws and amend existing laws.

5.2 Key Issue

After comparing various issues between Thailand and Japan, both rail and urban planning. The following are the major issues that the study discovered between the two countries.

5.2.1 Coordination between railway project and urban plan

The railway project should have not only the construction of railway infrastructure, but also transit facilities, which must be defined in the urban plan prior to the project's commencement. Many Japanese railway stations have transit facilities such as station plazas, pedestrian decks, bus terminals, taxi pools, access roads, bike lanes, and other transit facilities that support feeder systems, demonstrating good coordination between railway and urban planning. However, no such transit facilities have been found in Thailand's urban plans.

TOD requires collaboration between rail projects and urban plans. To implement TOD in Thailand, all transit facilities in railway stations must be specified in urban plan prior to the start of the railway project.

5.2.2 Constraints of the land allocation

Land expropriation is commonly used in Thailand for railway projects. When TOD is planned, such expropriated land is not eligible for commercial development under the Constitution or land expropriation laws. Land adjustment is another land allocation method used in Thailand that should be applied for railway projects because the land adjustment area can be developed commercially. However, land adjustment is not widely used for land development in Thailand, and only a few projects have been completed using this method. Japan has many laws supporting urban development such as land adjustment law and urban renewal law. Furthermore, a special law was enacted in the case of the Tsukuba express line in order to integrate urban and railway development. To achieve TOD, Thailand needs to enact new laws and amend land expropriation laws to support area development.

5.2.3 The incentive for the private sector

For private land developers, incentives make TOD projects more appealing. Incentives include things like subsidies or grants, tax reductions, and loans. In 2002, Japan's government designated 55 districts across the country as urgent development areas under the urban renaissance law. To convince the private sector, special tax rates, financial support, and urban plan deregulation are given to private developers in emergency areas. Japan's government also sets up a subsidy scheme for railway operators to improve railway stations. Station plaza and transit facilities through a subsidy system have been developed. Aside from financial incentives, a land regulation bonus system, such as the FAR bonus, is an additional incentive for land developers. The land regulation bonus system is being enforced in Thailand as well, but it is inadequate to convince developers to participate in the development along the railway. Following the construction of the railway, the development along the route has stayed unchanged. According to Ito and Kubota (2018), the results show that Thailand's current urban planning policies are insufficient to promote area development. Thailand should provide additional incentives for private TOD developers, such as special tax rates, low-interest rates, or long-term loans.

5.2.4 Organization for TOD

Because TOD involves many agencies and local governments, the organization in charge of implementing TOD is essential. Due to land allocation constraints for railway operators and budget constraints for local governments, Thai railway operators and local governments are unable to implement TOD. As a result, there is no direct agency carrying out TOD in Thailand.

The UR is a semi-governmental organization in Japan in charge of housing, UR specializes in land allocation and acts as an urban development coordinator, coordinating with local governments and privates. Thailand does not have an agency that works with relevant parties to coordinate in urban projects. Thailand should designate or establish such an agency as the coordinator of urban development, including the setting up of a railway-urban planning coordination system.

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