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Insight

Thai transport mega-projects pave way for countless business opportunities

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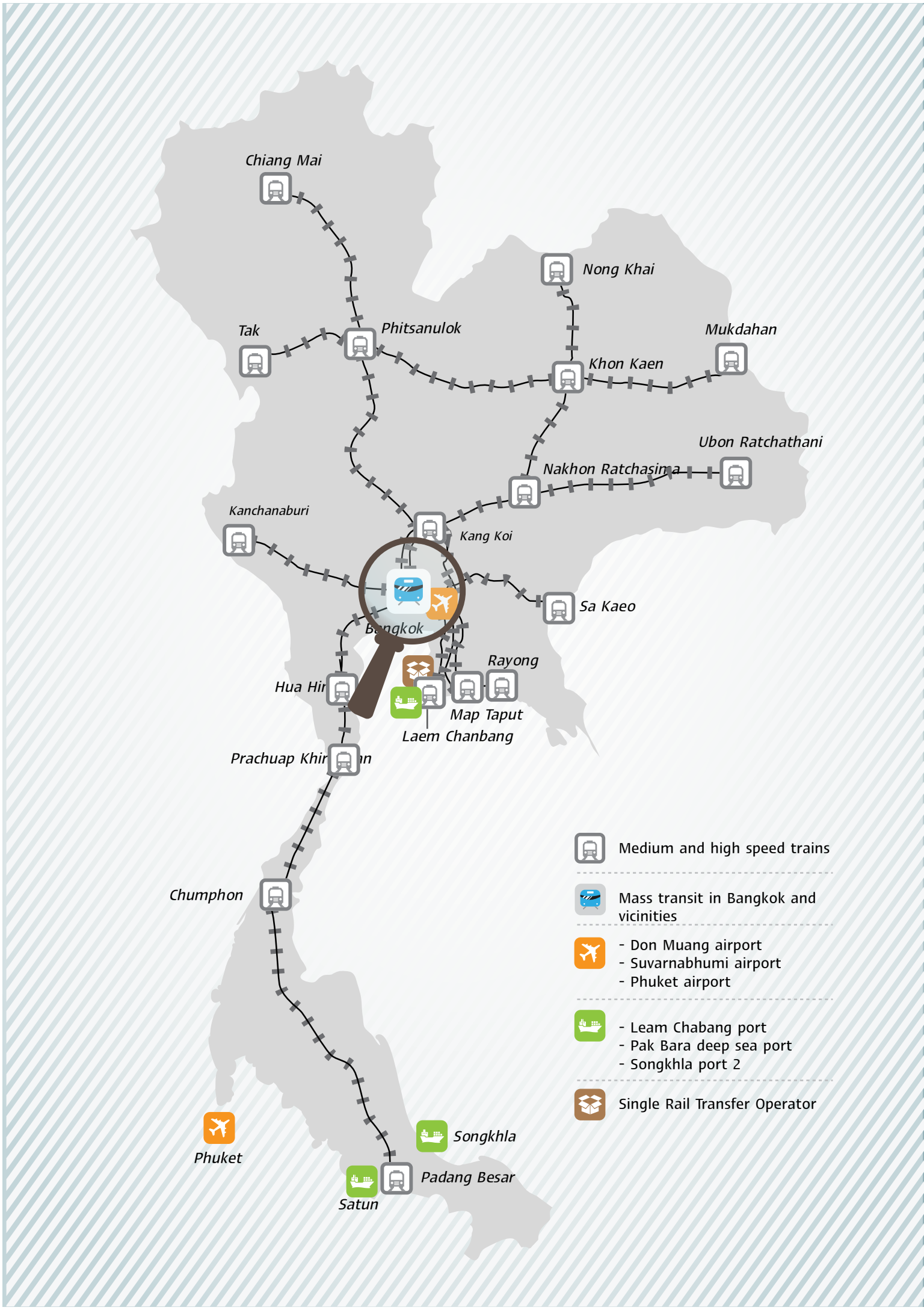
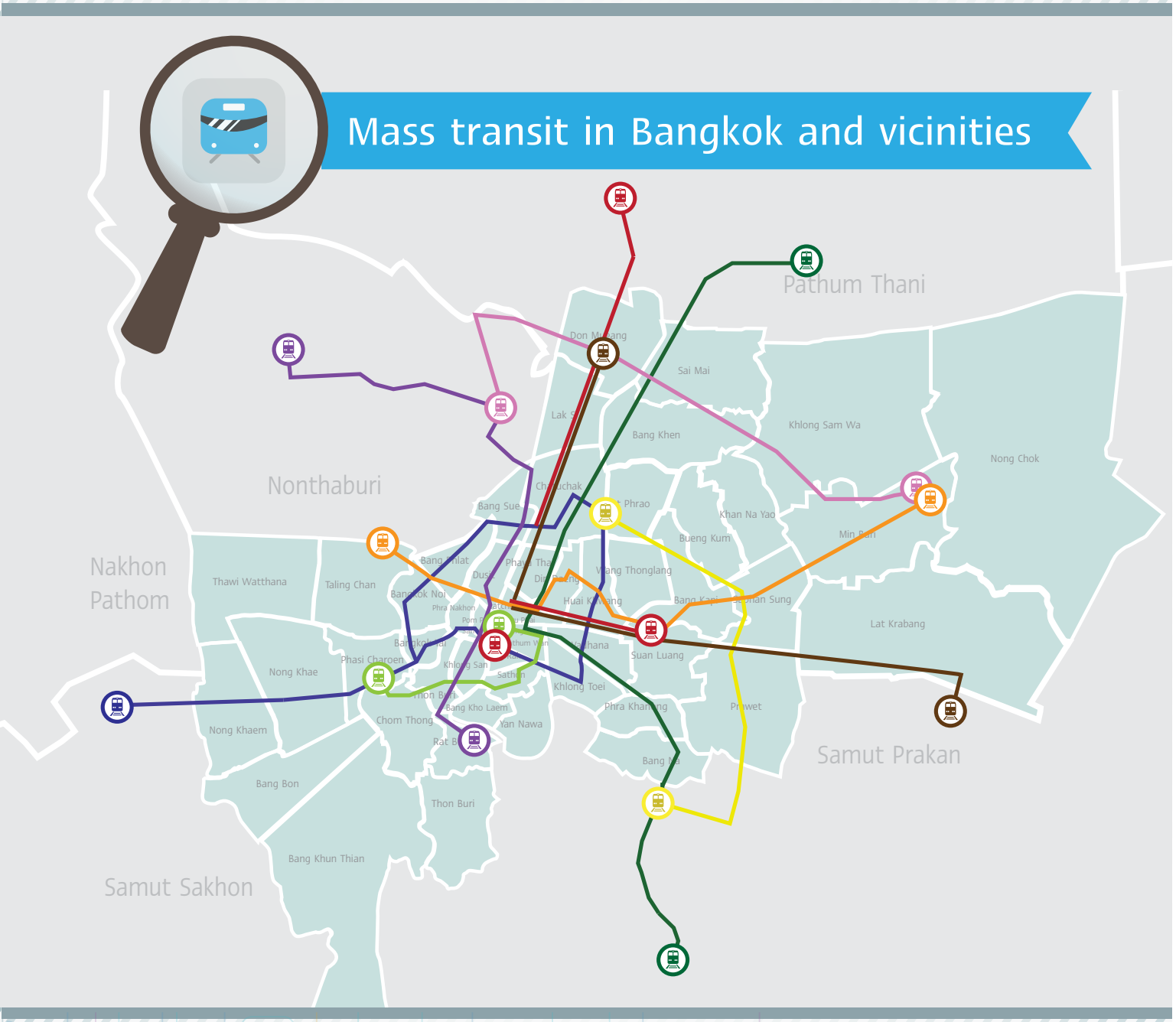
Thai transport mega-projects pave way for countless business opportunities


Chiang Mai
Nong Khai
Tak
Phitsanulok
Mukdahan
Khon Kaen
Ubon Ratchathani
Nakhon Ratchasima
Kanchanaburi
Kang Koi
Sa Kaeo
Bangkok
Rayong
Hua Hin
Map Taput
Laem Chanbang
Prachuap Khiri Khan
Chumphon
Phuket
Songkhla
Padang Besar
Satun
Medium and high speed trains
Mass transit in Bangkok and vicinities
- Don Muang airport
- Suvarnabhumi airport
- Phuket airport
- Leam Chabang port
- Pak Bara deep sea port
- Songkhla port 2
Single Rail Transfer Operator

The future of Thai infrastructure



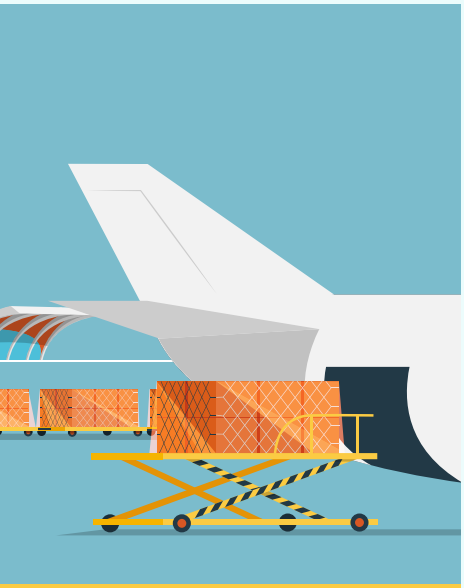
Executive Summary

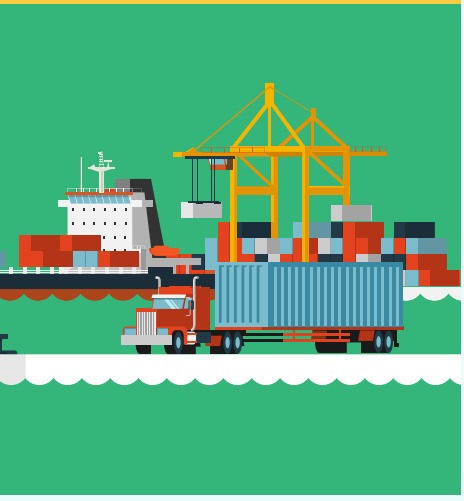
The Thai government is emphasizing development of transportation infrastructure, moving ahead on megaproject investments that will total at least 2.2 trillion baht. In this issue of Insight, EIC discusses the business opportunities that will emerge from these projects, which cover three major transport modes – rail, air and water. We also analyze the short- and long-term impacts of these projects on the Thai economy.

At the initial stage of the megaprojects, the construction contracting and construction materials industries will be the first to reap benefits from this huge spending. Large contractors that have prior experience handing public projects will lead the way. They could subcontract some work to smaller contractors. Businesses in the building materials industry, such as steel and cement, will also benefit.

Railway projects will be a catalyst for urbanization, creating new business opportunities for both the manufacturing and service sectors along the rail lines. The government is prioritizing development of rail transport because it will provide great convenience but using less land and fuel than road transport, making it more environmentally friendly. It is also the least costly mode of transportation. New rail systems will propel urbanization, generating a wide variety of business opportunities in transportation and logistics, real estate, wholesale and retail trade and SMEs. Railway projects will create jobs, both in transport operations and related businesses. Although railway projects have high initial investment costs and low operating profits, they can be combined with property development in a so-called Transit Oriented Development (TOD) plan, which can greatly boost the value of land around the rail lines, creating more economic value.

Air transport projects will strengthen Thailand's airlines and boost related industries. EIC expects that the expansion of Suvarnabhumi, Don Mueang, and Phuket airports will ease the transport of goods and passengers while boosting related industries. For example, contractors and providers of building materials will benefit directly during the construction period. Later, airlines and aircraft maintenance companies will be able to increase capacity. The travel and leisure industries will benefit from more tourists. Industries like jet fuel and aircraft catering will get a boost in demand.

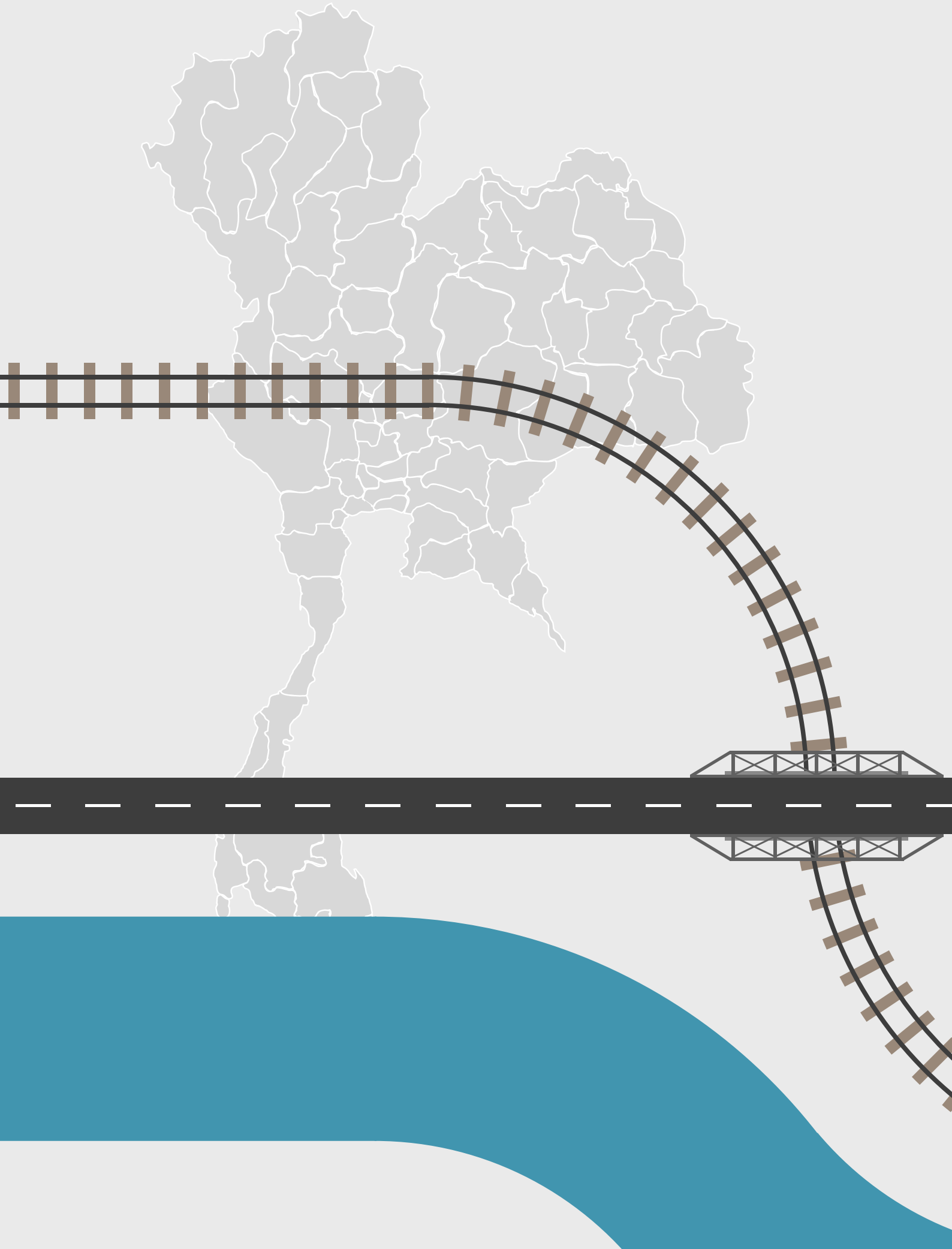




Development of water transport infrastructure will better connect different ports to each other and efficiently link them to other modes of transportation, reducing the cost of doing business. The plan will develop a new coastal terminal pier and the Single Rail Transfer Operator (SRTO) at Laem Chabang port, and install embankments to protect against erosion along the Pa Sak river. It will create opportunities for other sectors in the value chain, from upstream to downstream. For instance, shipbuilding and maintenance companies will gain from more arrivals at the port. Warehouses will receive a larger volume of import and export cargo. Exporters and importers will benefit from lower operating costs and faster transportation time.

In the long run, better transportation infrastructure will benefit the Thai economy and key sectors like energy, technology and logistics. Public investment projects, as well as the private-sector investment that will follow, will stimulate the economy and have long-lasting effects. The Bangkok rapid mass transit systems will increase demand for electricity, while air and water transport projects will boost demand for fuel. As rail systems increase urbanization, workers will move out of the agricultural sector and into service businesses. They will earn higher income, but farm labor shortages may worsen. More sophisticated transportation systems will provide opportunities in information technology that enhances connectivity in transportation and logistics systems. Ultimately, the infrastructure projects will propel Thailand to become the logistics hub of continental Southeast Asia.

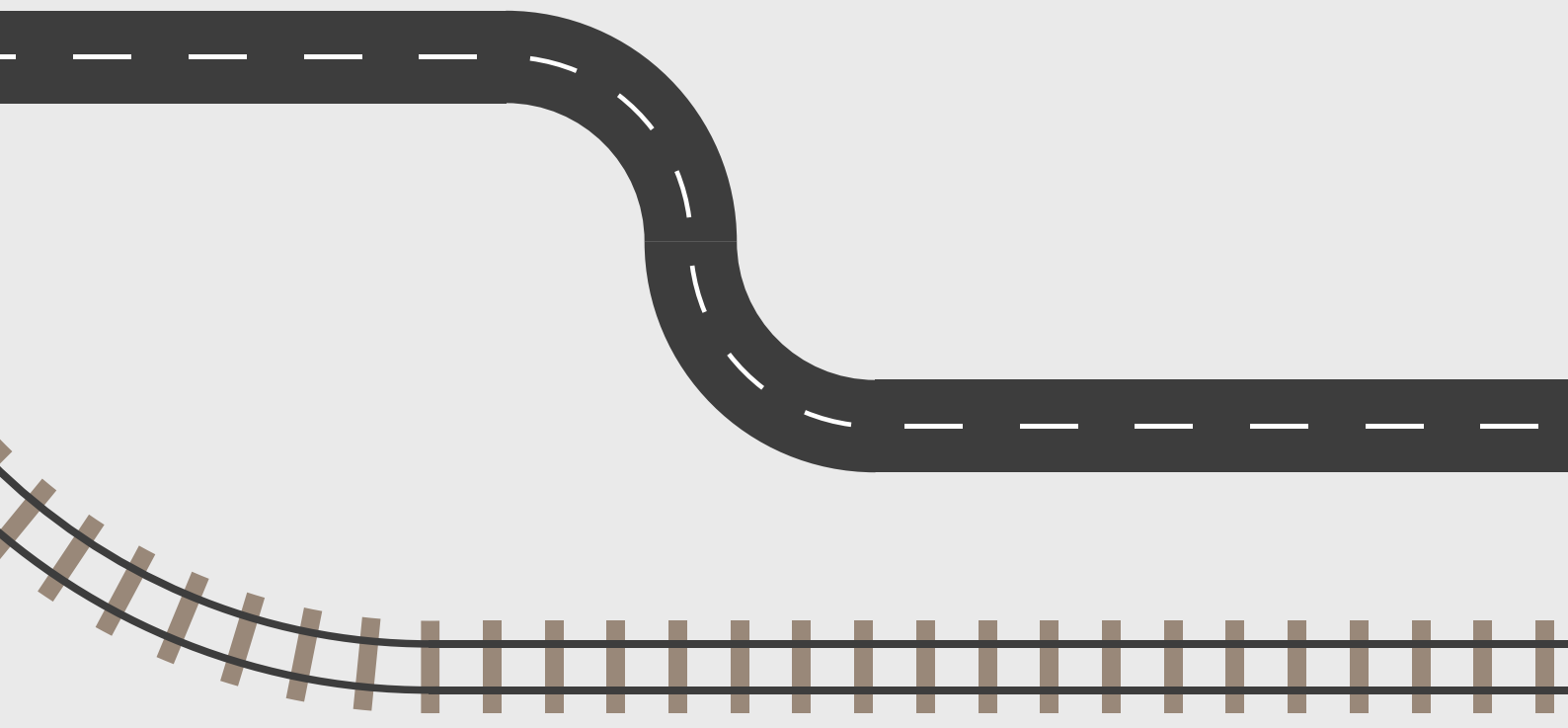
The push to develop transport infrastructure will become a key growth engine of the Thai economy and create plenty of opportunities for the private sector. Businesses in a wide variety of industries that are directly or indirectly related to these megaprojects must prepare. They can start by keeping updated on progress of the projects, and by preparing their strategy, skills and capacities to respond proactively.



1

Infrastructure gap has dragged on Thailand's development

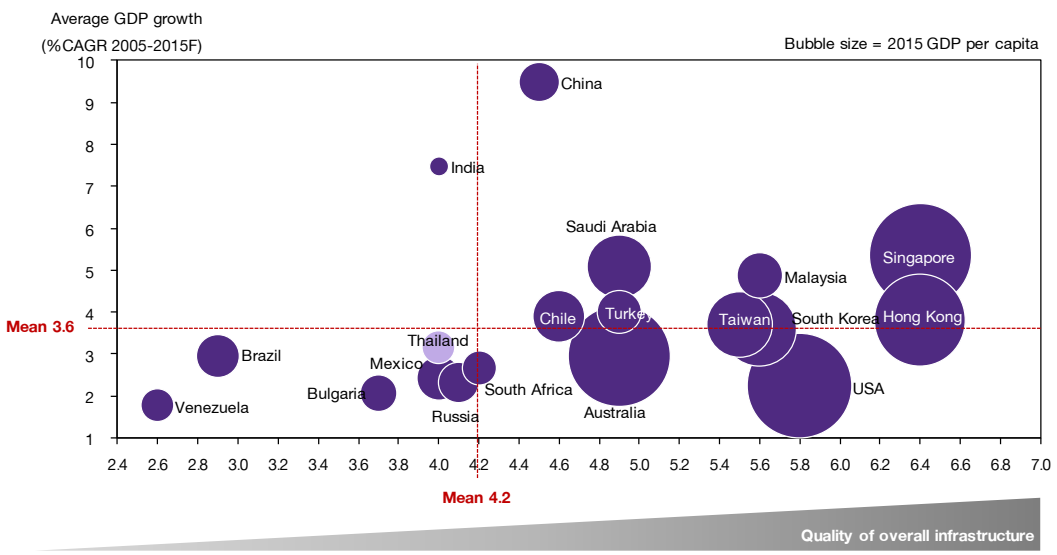
Infrastructure is a pillar of any nation's economic growth. Yet during the past two decades, Thailand's investment in infrastructure has stalled. Now the government intends to catch up by emphasizing development of transport infrastructure of all types, including land, water and air. The current investment plan, totaling over 2.2 trillion baht, aims to boost the efficiency of transportation systems in Thailand and thereby improve the nation's competitiveness on the global stage. Development of these projects will create plenty of business opportunities for the private sector.



Establishing basic infrastructure and increasing its efficiency is the foundation of economic growth. Infrastructure needed for the functioning of a modern society includes transport, such as road and rail transit systems; public utilities, such as electricity and waterworks; and telecommunication systems, such as telephone and internet networks. These are all essential to daily life and economic development. The data show that countries having more and better infrastructure, like Singapore, Malaysia, Taiwan, South Korea, and China, enjoy more rapid economic growth and higher income per capita.

1 Countries with better quality of infrastructures have higher GDP growth and per capita income on average

Infrastructure Quality vs. GDP growth



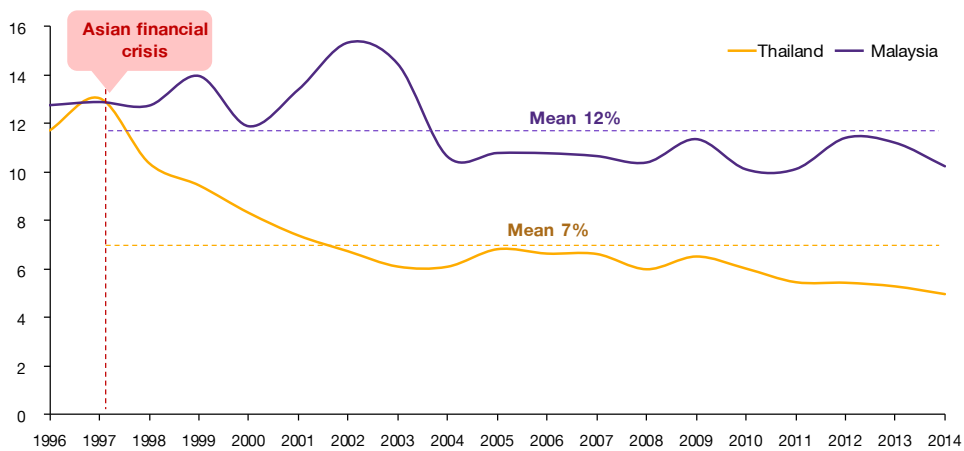
Sources: EIC analysis based on data from the World Economic Forum (WEF) and International Monetary Fund (IMF)

Thailand has lagged behind other countries in the region in terms of infrastructure investment during the past two decades. The relative inefficiency of Thailand's infrastructure is a major factor in Thailand's sinking competitiveness. Since the Asian financial crisis in 1997, investment in large infrastructure projects has been relatively low in Thailand compared to other countries in the region. Thailand's ratio of public investment to GDP has also been in persistent decline over the past 20 years. The result is infrastructure of relatively low quality. According to the competitiveness report for 2015-2016 by the World Economic Forum, Thailand ranked 71st out of 140 countries in terms of quality of overall infrastructure, while neighboring countries like Singapore and Malaysia ranked 4th and 16th, respectively. Thailand's railroad infrastructure is particularly substandard, ranking 78th, below Singapore at 8th, Malaysia at 13th, Indonesia at 43rd and Vietnam at 48th. Inferior infrastructure erodes Thailand's reputation, dampening the confidence of foreign investors, who are instead favoring other nearby countries that have better facilities. Thailand therefore needs to develop its infrastructure to match international standards, in order to drive economic growth and raise the nation's competitiveness.

2 Thailand's investment in infrastructure has declined consistently over the past 17 years after the 1997 Asian Financial Crisis. The share of public investment budget to GDP during the period averages to 7%, much lower than that of Malaysia at 12%

Public Investment per GDP

Unit: %



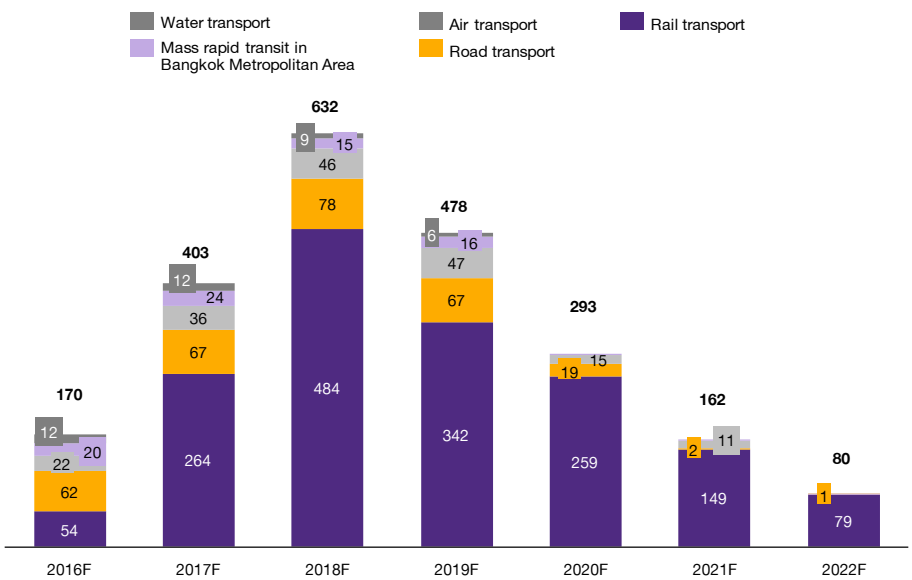
Sources: EIC analysis based on data from CEIC

Among the various types of infrastructure, transportation projects deserve to top the government's agenda, because they reduce business costs and generate sizeable economic activity in many business sectors. Energy used for transportation accounts for 40% of Thailand's total energy consumption. The share is higher than in many countries, because Thai businesses rely mainly on road transport due to a lack of more energy-efficient alternatives, such as rail and water transport. The launch of the AEC, with its emphasis on speeding up trade, has prompted the Thai government to prioritize investment in connecting the domestic transportation network with those in bordering countries. The planned megaprojects integrate various modes of transportation including land (road and rail), air (airports), and water (seaports and river ports). These new and improved networks will generate business opportunities in such industries as real estate, wholesale/retail and tourism.

3 Total investment plan for transportation infrastructure amounts to 2.2 trillion baht. Most of the budget comprises 1.9 trillion baht investment in railroad systems. The rest is investment in air and water transport of 0.3 trillion baht. EIC expects the amount of budget disbursement to peak during 2017-2019 at 400-600 billion baht annually

Estimated Public Infrastructure Investment 2016-2022

Unit: Billion baht



Sources: EIC analysis based on data from Office of Transport and Traffic Policy and Planning

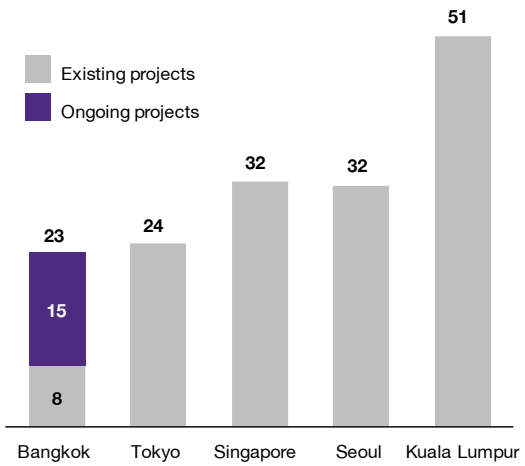
Thailand's coming new wave of infrastructure development will be a big leap toward global standards. For example, Bangkok will eventually have as many kilometers of rapid mass transit lines per 100,000 persons as Tokyo, which is at or near the top world level of mass transit density. Airport capacity will be higher than that of Singapore, which is currently the global airport hubs. Logistic costs per GDP will drop from 14.2% to 12.2%, on par with the European average.

Infrastructure development and economic growth are closely intertwined, and transport infrastructure is especially transformative. Companies and consumers should prepare to benefit from Thailand's coming era of logistics and transportation advancement.

4 When the new mass rapid transit system in Bangkok is completed, the ratio of its length of routes to population will be close to that of Tokyo

Metro Network Length per City Population

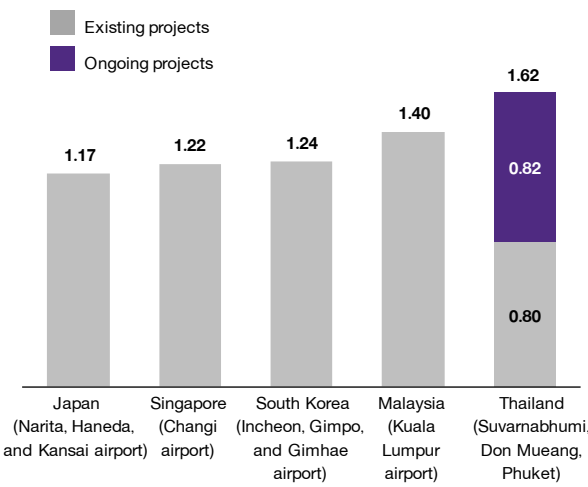
Unit: Kilometer per million people



Sources: EIC analysis based on data from World Bank

5 Expansion of Suvarnabhumi, Don Mueang, and Phuket airports will raise Thailand's air passenger

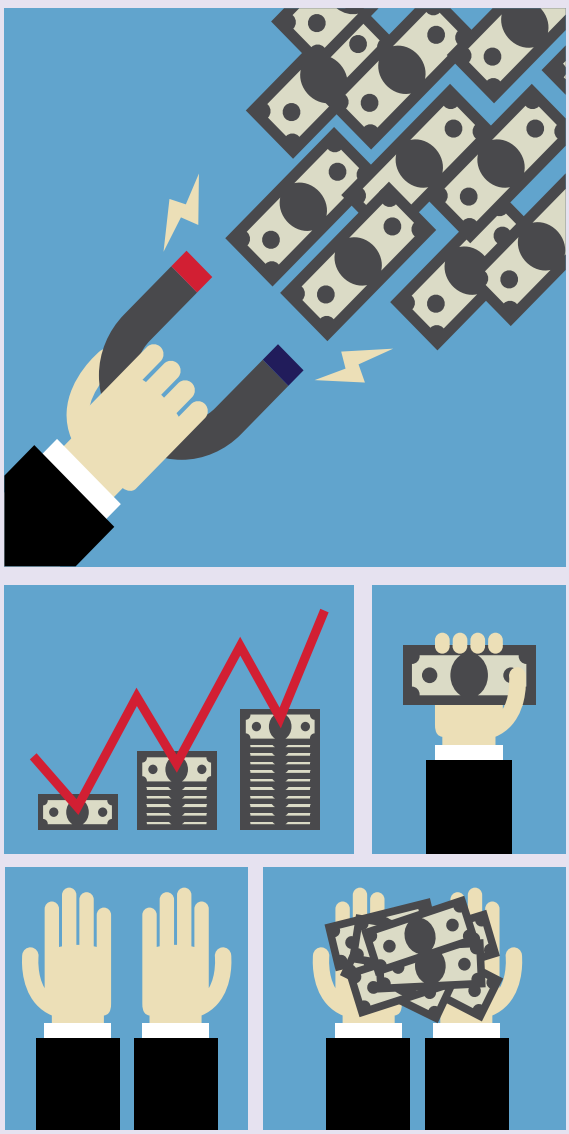
Airport Handling Capacity per Annual Passengers



Sources: EIC analysis based on data from the airports

BOX: The private sector's role in infrastructure development under the public-private partnership (PPP) scheme

Joint investment schemes play an important role in infrastructure development, because they reduce the public sector's investment burden and increase operational efficiency by bringing in the expertise and financial resources of the private sector. These schemes are one of the three ways that the Thai government can allocate funds for construction and operation of infrastructure projects. (The other two sources are the annual budget and funds sourced under the Public Debt Management Act B.E. 2548.)



Joint investment funds are sourced under the Public-Private Partnership (PPP) in State Enterprises Act B.E. 2556 (PPP Act B.E. 2556). Unlike funds from the annual budget or funds sourced under the Public Debt Act, PPP funds allow the government to pare down debt to a manageable level. Construction and operation of a PPP project are normally undertaken by a joint venture between a private company and a state enterprise, e.g., the Mass Rapid Transit Authority (MRTA) or the State Railways of Thailand (SRT) in the case of rail projects; CAT Telecommunications Plc in telecommunication projects; and the Port Authority of Thailand (PAT) in port development projects.

The government has laid down its strategy and guidelines on public–private partnerships, to address private sector concerns over the investment process. But the private sector is still waiting for clarification on the project screening process and government regulations and laws. The State Enterprise Policy Office (SEPO), which is responsible for proposing supervision and development policies for state enterprises, has bolstered private–sector confidence by designating 65 projects, worth a

total of 1.4 trillion baht, under the PPP framework. Over 60 percent of these projects by value are rail infrastructure projects – eight mass rapid transit projects for Bangkok worth 600 billion baht, and the Bangkok-Rayong and Bangkok–Hua Hin high-speed train projects worth 250 billion baht. Other types of projects in the plan include port development, motorway construction and telecommunication networks. SEPO has issued PPP-related rules, such as guidelines and methods for calculating project costs or amending joint-venture agreements to shorten the project consideration and amendment timeframe.

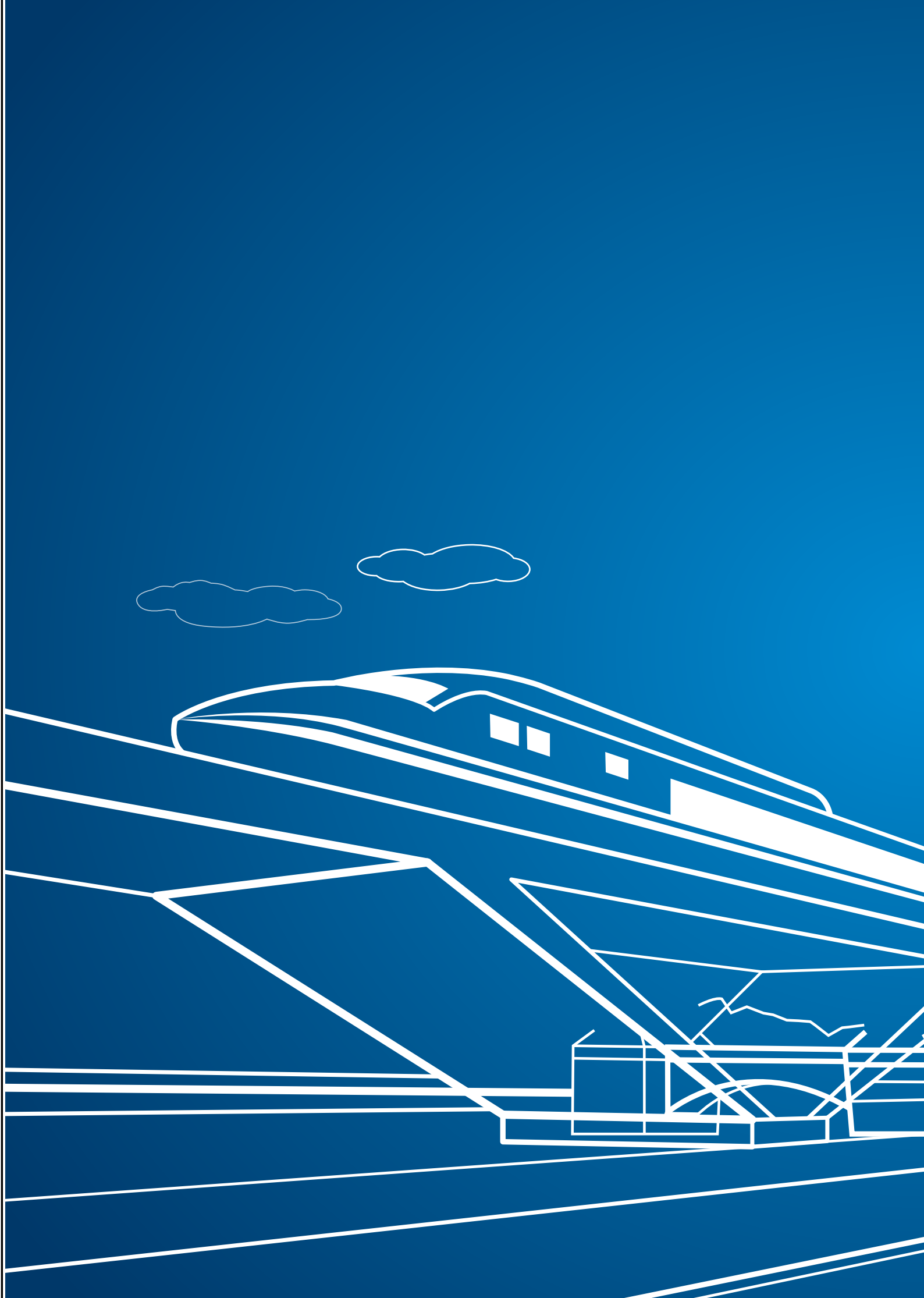
Designing joint-venture models and income-sharing schemes that are attractive to the private sector is critical for the success of PPP projects. In the past, there were four main models of public-private joint investment: 1) Build-Transfer-Operate (BTO) 2) Build-Operate-Transfer (BOT) 3) Build-Own-Operate (BOO) 4) Operation and Maintenance (O&M) contract. Models 1-3 clearly differ with respect to when the transfer of project ownership takes place; whereas under model 4, the private operator does not normally invest in the infrastructure, but is responsible for service-related investments and provision of services. However, in all four models, the private sector is mainly responsible for post–construction operations and income collection, as well as designing the form and standards of service under the main framework stipulated by the government.

There are three main income-sharing models: 1) Net cost scheme - the concessionaire collects income, which will be shared with the state according to an agreed-upon contract 2) Gross cost scheme – the state collects income and makes fixed payments to the private operator, whereby this payment is not linked to operational income 3) Modified gross cost scheme - the state collects income and makes fixed payment to the private operator as well as shares a portion of income linked to operations, e.g., number of passengers. For future projects, income sharing is more likely to use the net cost model because this scheme not only reduces the government's financial burden but also creates more opportunity for the private sector to get involved.

Government support and encouragement of joint public-private investments will create opportunities for private companies to earn more income, as well as enhance their skills and capabilities in the management of large-scale projects. For instance, in the case of mass rapid transit projects in Bangkok, the government requires the private sector to invest in rolling stock, signaling and control systems and electrical and mechanical systems, including operation and maintenance. Such investment accounts for 30-40 percent of the total project cost. The private concessionaire collects income from ticket sales, commercial development of the surrounding areas, and advertisements in stations and trains, over the time period allowed in the contract. In addition, the private sector can benefit from transfer of advanced technology from foreign manufacturers of

trains and equipment, for both maintenance and specialized technical trouble-shooting. This transfer of know-how will serve to reduce Thailand's dependence on foreign companies in the long term.

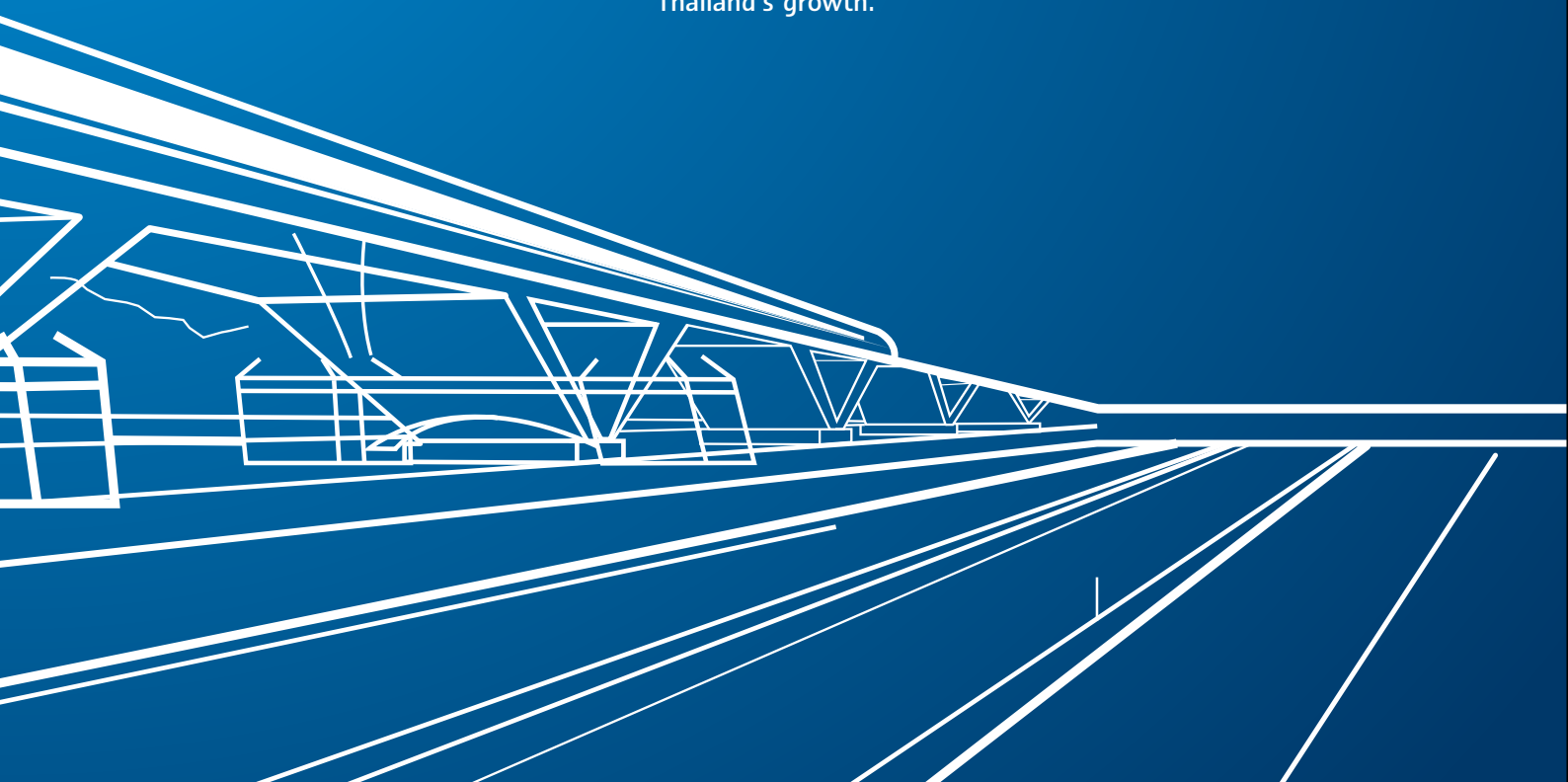
However, the private sector's opportunities are mostly in the form of project operations, for which appropriate preparations must be undertaken in terms of personnel, machinery, equipment and financing. In most PPP projects, the private sector's role will begin after the projects are completed, or 3-7 years after construction starts, acting as train operators or toll collectors. Companies that are interested in PPP projects have to regularly follow tender news, prepare appropriate personnel and equipment for the projects of interest, as well as secure sufficient funding for both pre- and post-project operations.



2

Off the roads, onto rails: putting Thai transport on track to efficiency

Rail transport tops the new infrastructure development agenda because it will do so much to increase efficiency and reduce logistics costs. Investment in rail projects will also directly support construction contractors and construction materials makers, while indirectly benefitting such other businesses as transportation and logistics, real estate, wholesale and retail trade, tourism and leisure. Positive spillovers in both the short- and long-term will expand Thailand's growth.



70% of the total investment in infrastructure will be spent on rail projects. Thailand's rail infrastructure began to be built more than 100 years ago. Although railroads have long served Thailand as a significant mode of transport, they are largely confined to inter-city routes. Better rail systems would improve both commuter and freight transport for three reasons:

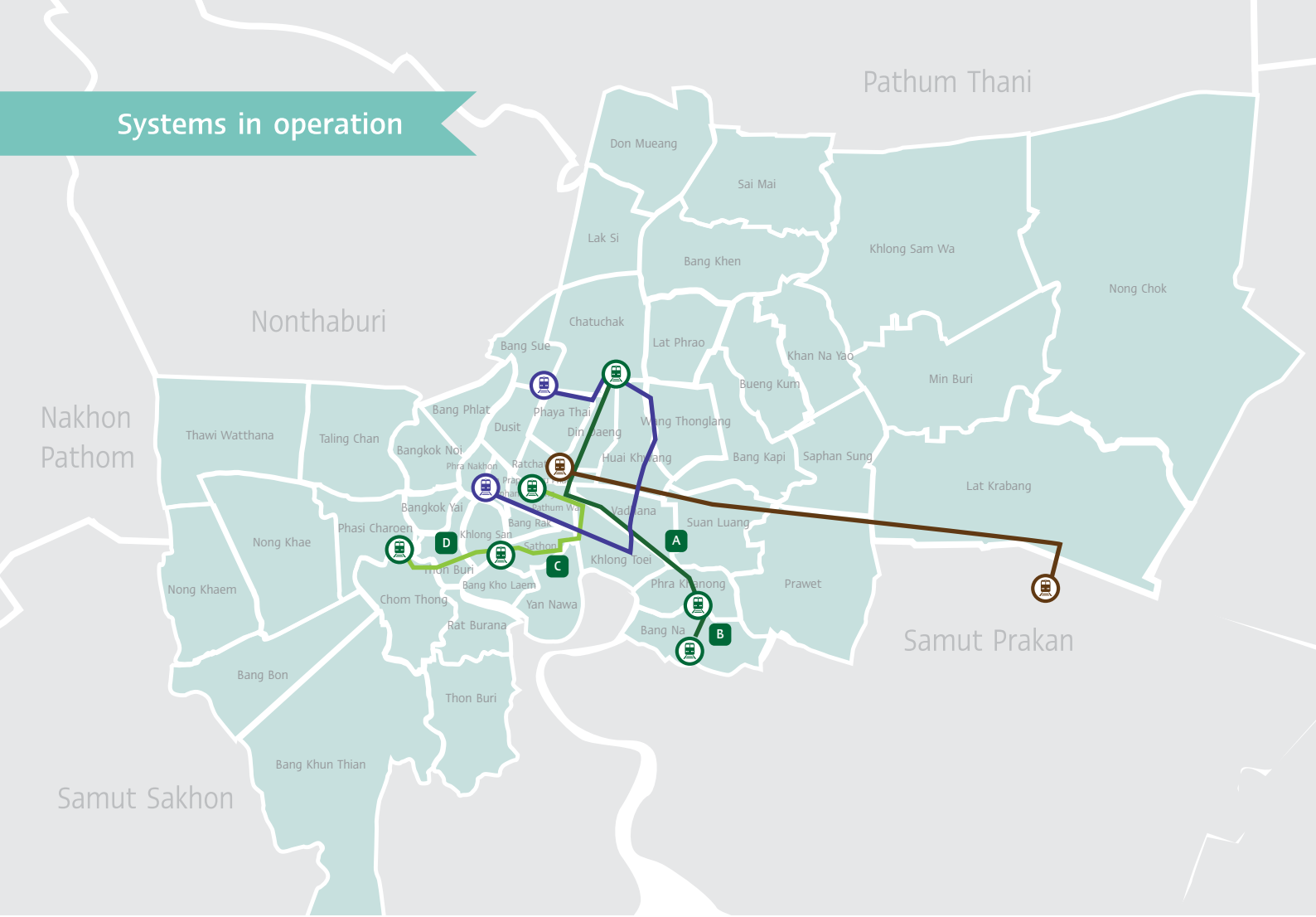
1) Rail transportation requires less construction space than do roads, but has greater transport capacity. In the case of urban mass transit, an electric train viaduct is just one-fourth as wide as a road but can carry twice or three times as many passengers, reducing traffic problems. As for inter-city cargo transportation, plans call for constructing new tracks parallel to Thailand's existing single-track ones to create a dual-track system, which will increase cargo transport capacity as much as the addition of a six-lane road, but requiring much less space.

2) Mass transit emits less carbon dioxide (CO_2) and other pollutants than other modes of transport do. According to Hitachi, the level of CO_2 emissions by electric rail systems is 30-70 grams/passenger/kilometer, compared to 150 and 170 grams/passenger/kilometer for cars and aircraft.

3) Rail transport is cheaper than other modes of transport. The Office of National Economic and Social Development Board (NESDB) estimates that the cost of shipment by rail is half that of truck transport. Rail cargo transport costs 0.90 baht/ton/kilometer, compared to 2.12 baht/ton/kilometer by truck. Of course, trucking is a necessary complement to rail service because trains do not run door to door, and so these systems need to be integrated. But reducing reliance on trucks reduces costs.

As for the opportunities that the new rail investment will generate, EIC has analyzed two main groups of projects, one for Bangkok and one upcountry:

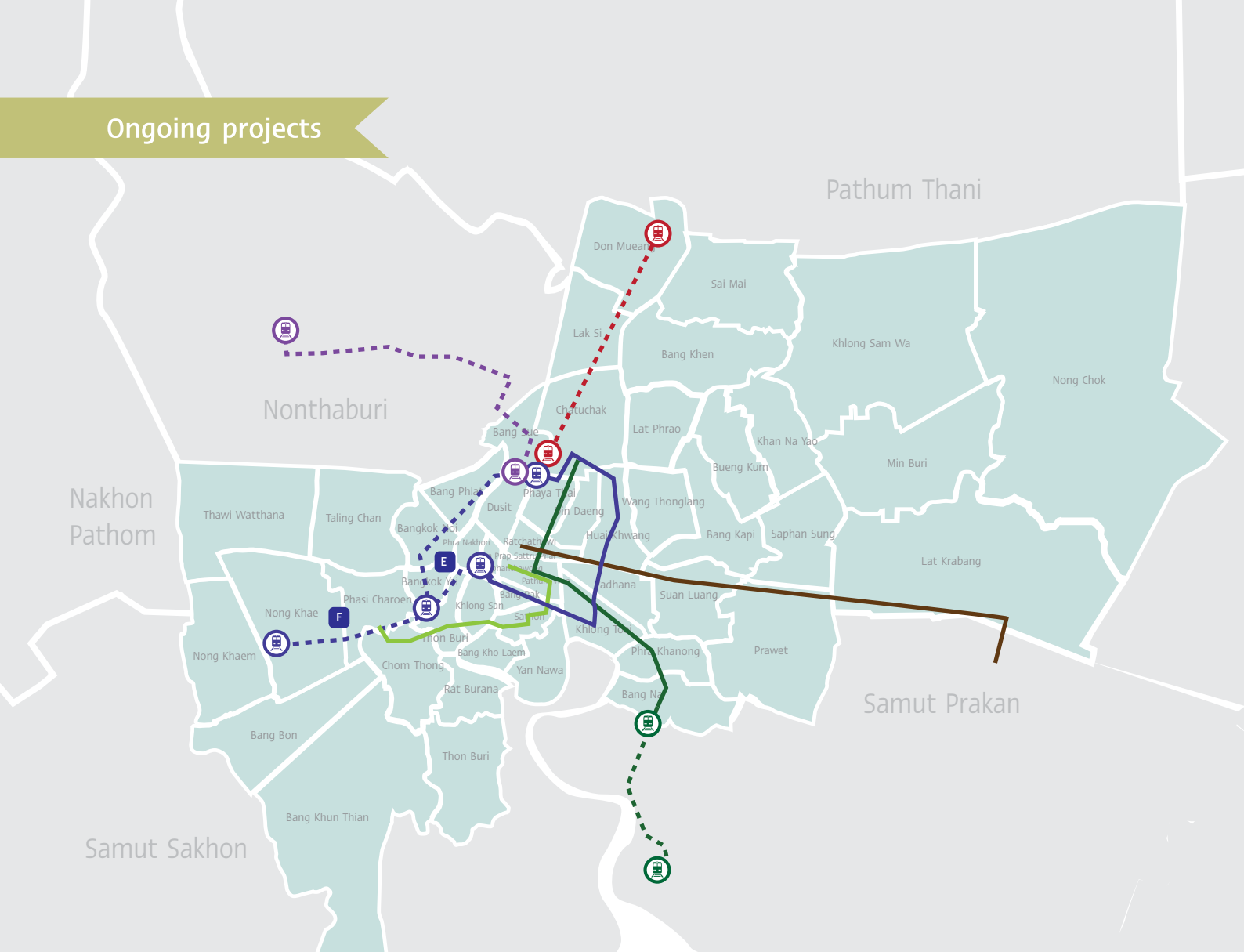
Systems in operation



Green Line	Operated since	Number of stations	Distance (km)	Owner	Concessionaire	PPP type/ Revenue sharing	Ridership (trips/day)
A. Mo Chit-On Nut	1999	17	16.5	BMA	BTSC	BTO[1] (civil work), BOT[2] (M&E)/Net cost[3]	~650,000
B. Extension: On Nut-Bearing	2011	5	5.3	BMA	BTSC	O&M contract[4]	
C. National Stadium-Tak Sin	1999	7	7	BMA	BTSC	BTO/Net cost	
D. Extension: Tak Sin-Wongwian Yai/Bang Wa	2009 และ 2013	6	7.5	BMA	BTSC	O&M contract	
Blue Line							
Hua Lamphong-Bang Sue	2004	20	18	MRT	BMCL	BOT/Net cost	~250,000
Airport Rail Link							
Phayathai-Suvarnnabhumi Airport	2010	8	28.5	SRT	SRTET	N.A.	~60,000

[1] *Built-Transfer-Operate (BTO) -a private concessionaire is responsible for construction of the project. When completed, ownership is transferred to the state. A private operator then undertakes project operation.*
[2] *Built-Operate-Transfer (BOT) - a private concessionaire is responsible for construction of the project and operations during the concession period. Afterwards, ownership is transferred to the state.*
[3] *Net cost - a private concessionaire is responsible for collecting service fees and sharing them with the state according to the concession agreement.*
[4] *Operation and Maintenance (O&M) contract - Project operation and maintenance are contracted to a private operator.*
Source: EIC analysis based on data from the Office of Transport and Traffic Policy and Planning (OTP)

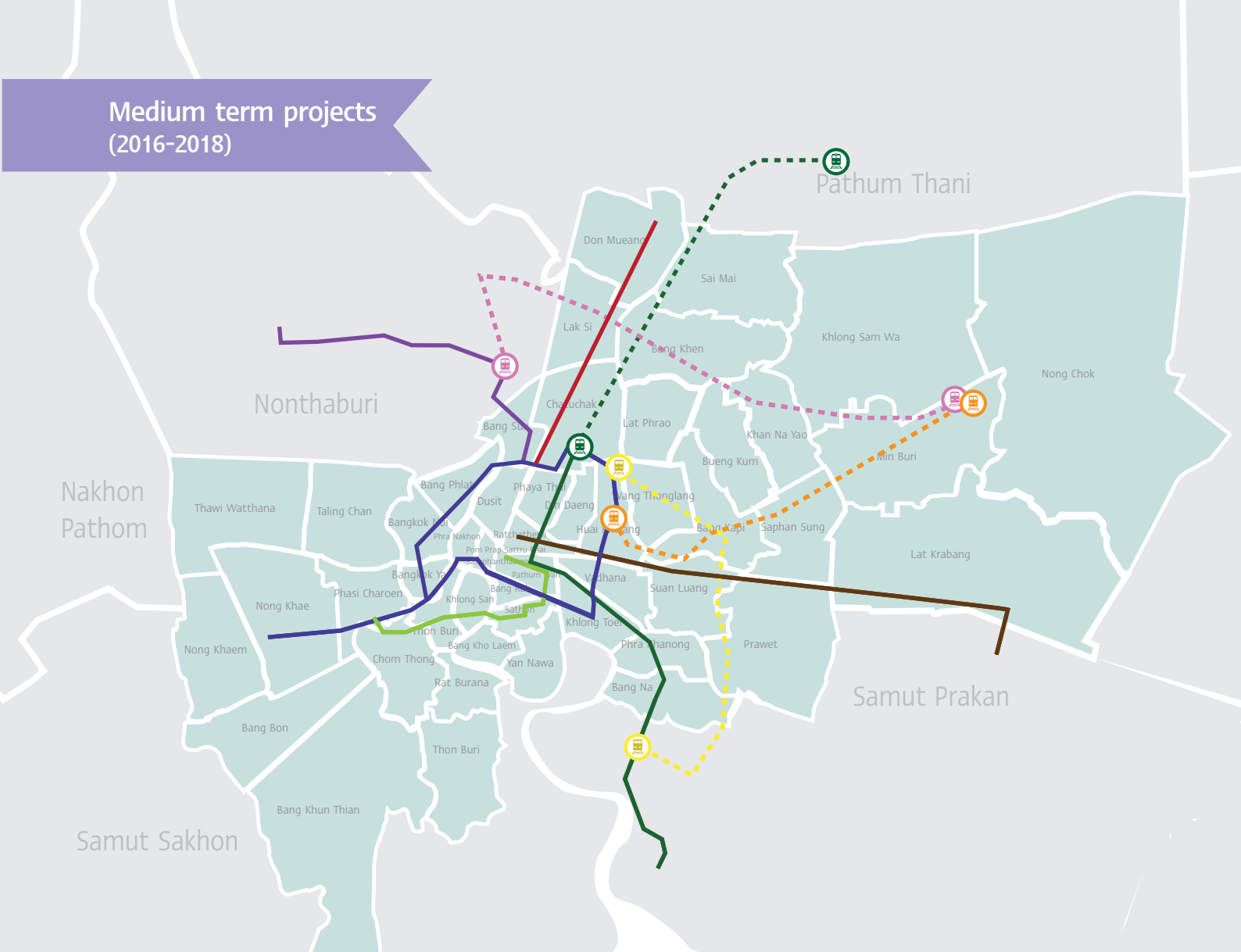
Ongoing projects



Purple Line	Cost (THB Mn)	Expected launch	Number of stations	Distance (km)	Owner	Concessionaire	PPP type/ Revenue sharing
Bang Sue-Bang Yai	60,000	2016	16	23	MRTA	BMCL	O&M /Gross cost[5]
Blue line							
E. Bang Sue-Tra Prah	82,500	2019	8	11.1	MRTA	N/A	N/A
F. Hua Lamphong-Bang Kae			11	15.9		N/A	N/A
Red Line							
Bang Sue-Rang Sit	77,000	2019	8	26.3	SRT	N/A	N/A
Green Line							
Bearing-Samut Prakarn	24,500	2020	9	13	MRTA	N/A	N/A

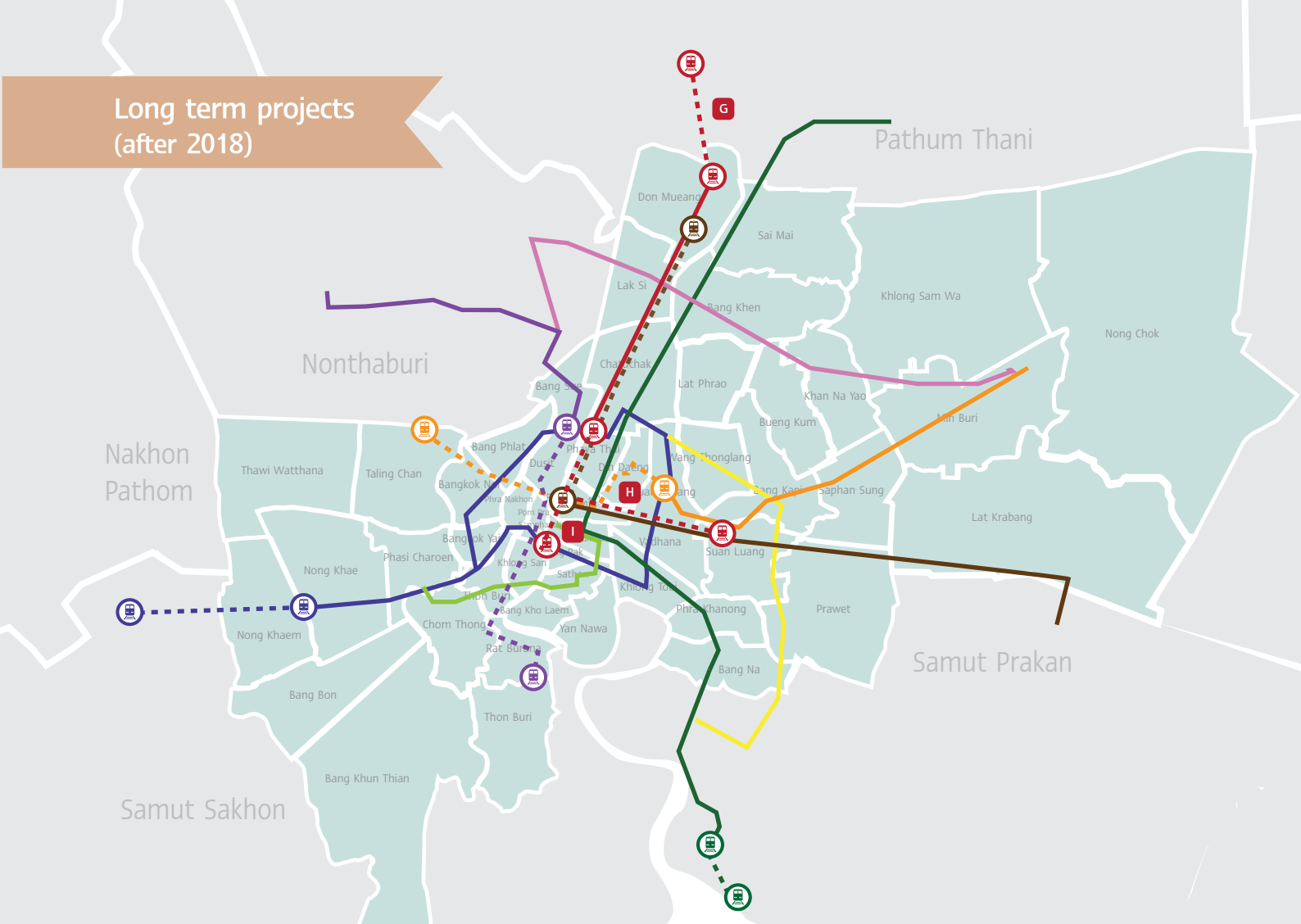
[5] *Gross cost – the state collects income and makes fixed payments to the private operator, whereby this payment is not linked to operational income;*
Source: EIC analysis based on data from OTP

Medium term projects (2016-2018)



Green line	Cost (THB Mn)	Expected construction	Expected launch	Number of stations	Distance (km)	Owner
Mochit-Sapan Mai-Kukot	59,000	2016	2020	16	18.5	MRTA*
Orange line						
Cultural center-Min Buri	110,000	2016	2021	16	21.2	MRTA
Pink line						
Khae Rai-Min Buri	57,000	2016	2021	30	34.5	MRTA
Yellow line						
Lat Phrao-Samrong	56,000	2016	2021	23	30.4	MRTA

** During the transfer of asset to BMA*
Source: EIC analysis based on data from OTP



	Cost (THB Mn)	Number of stations	Distance (km)	Owner
Green line				
Samut Prakan-Bang Pu	13,000	4	7	MRTA
Purple line				
Tao Pun-Rat Burana	104,000	17	23.6	MRTA
Red line				
G. Rangsit-Thammasat university (Rangsit campus)	6,000	3	10.3	SRT
H. Bang Sue-Hua Mak	39,000	8	19	SRT
I. Bang Sue-Hua Lamphong		6	6.5	SRT
Airport Rail Link				
Don Mueang-Phaya Thai	31,000	N/A	21.8	SRT
Blue line				
Bangkhae-Phutthamonthon Sai 4	17,500	4	8	MRTA
Orange line				
Taling Chan-Cultural Center	64,000	14	18.6	MRTA

Source: EIC analysis based on data from OTP

Business opportunities from electric train projects in Bangkok and vicinities

Mass rapid transit service has become essential in the daily lives of residents of the Bangkok metropolitan area during the past 15 years. The city's modern rail systems provide over one million rides per day now, allowing commuters to avoid the traffic congestion that slows travel by car, bus or motorcycle. The elevated and underground mass transit systems are environmentally friendly, since they reduce petrol consumption and pollution. In addition, they enhance the development potential of areas surrounding the stations and create new business opportunities, such as advertising media in stations and on trains, as well as security services. However, at present, only 537 square kilometers of Bangkok, or one-third of the city area, is served by the mass transit systems. Thus, the government is trying to push the development of mass rapid transit projects to provide more complete service, which will in turn generate greater economic and social benefits.

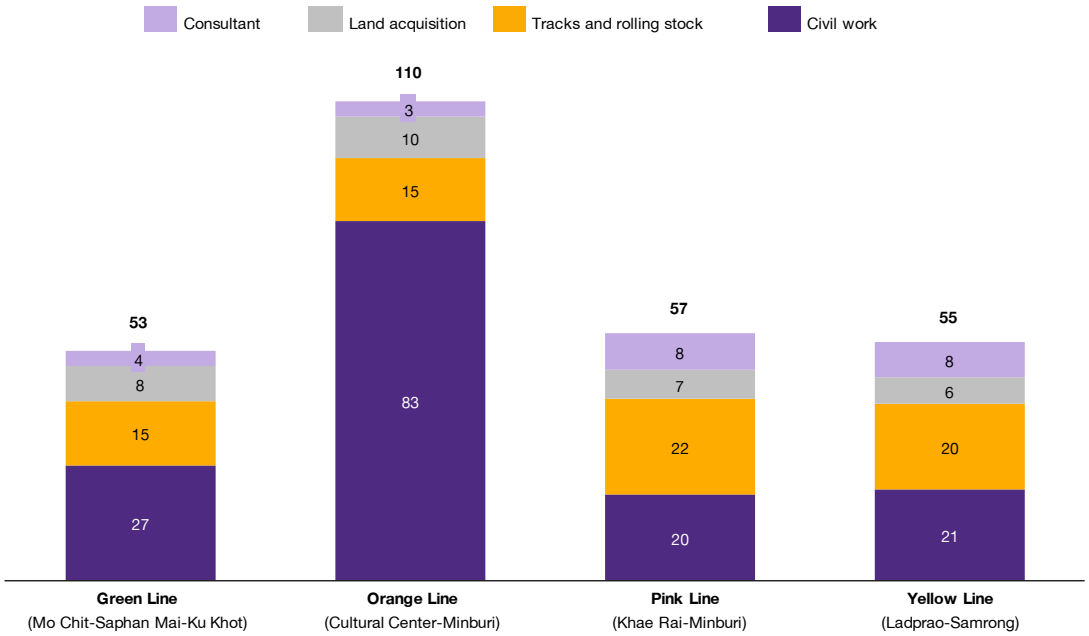
EIC believes that the expansion of mass transit lines in the Bangkok area over the next three years will first benefit train operators, construction contractors and construction materials manufacturers, as well as businesses involving electrical, signaling and communications systems. Then, as construction is completed, the city will begin to expand along the rail lines, in particular around intersections. This will create new opportunities for property development, wholesale and retail businesses, as well as SMEs, all of which will give rise to employment opportunities.

The construction of the four new mass rapid transit lines (Green, Orange, Pink and Yellow) in Bangkok will benefit construction contractors and construction materials companies by as much as 150 billion baht. The four new mass rapid transit projects include the Green Line extension, Orange, Pink and Yellow lines. Large contractors with skills in the advanced technologies required for the new rail system will gain the most from the projects. Such benefits will also spill over to subcontractors of engineering work such as construction foundation. Meanwhile, small and medium-size companies may participate in design and decoration of stations, also as subcontractors. Providers of cement and steel, the main construction materials, will also clearly gain, as EIC predicts a minimum of 867,000 cubic meters of cement worth 1.56 billion baht, and 280,000 tons of steel worth 5.6 billion baht, will be used in construction of the four lines. Although the majority of the trains and systems will initially be imported, when operators later expand and upgrade service, then local producers of machinery and parts can start supplying these parts. EIC believes that producers should begin with basic parts such as windows, seats, handrails, electric cables or air conditioning, then gradually move into more sophisticated technology, such as electrical systems and rail-signaling systems, as well as assembly of imported train parts.

6 In the medium term, the construction of the four new mass rapid transit lines will generate total investments of 280 billion baht

Value of investment in the four new transit lines that will begin construction in the medium term

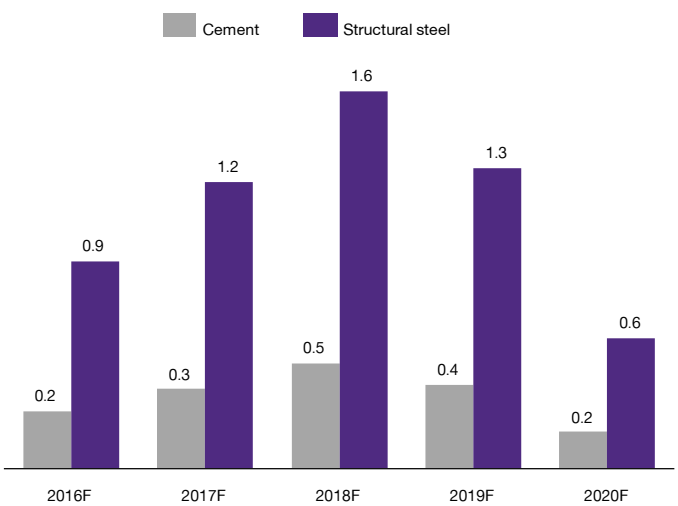
Unit: billion baht



Source: EIC analysis based on data from Mass Rail Transit Authority (MRTA)

Value of construction material expected to be used in the construction of the 4 mass transit lines

Unit: million baht



Source: EIC analysis based on data from Office of Transport and Traffic Policy and Planning (OTP)

When the mass rapid transit lines commence operations, system operators will be the first to earn ticket fares, operating fees, and commercial use of station space. Currently, there are three models of rail operation: 1) The government fully invests in both infrastructure and train systems and is also in charge of the operation and maintenance of the trains. This model is used, for instance, for the SRT's Airport Rail Link. 2) The private sector invests jointly with the government and is in charge of system operation, in exchange for a concession to manage the commercial space in the stations. In such case, a revenue-sharing agreement needs to be settled beforehand. Examples of this model are the elevated Green Line operated by BTS and underground Blue Line by BMCL. 3) The government outsources rail system operation to a private company. An example of this is the elevated Green line extensions, including the On Nut–Bearing and Saphan Taksin-Bang Wa projects, where the Bangkok Metropolitan Administration has contracted BTS as the operator.

Regardless of the models, train operators stand to benefit directly from fare collections and operating fees, as well as indirectly from rental of retail space in stations and related businesses such as advertisements. EIC predicts that the total ridership of all mass transit lines will increase from one million rides/day in 2015 to 1.9 million rides in 2020 and 2.3 million rides/day by 2025. As a result, businesses involved in ticketing systems, such as ticket machines, ticket scanners and fare deduction systems, will also gain from the train line extensions. However, it is important to note that these operators will also be responsible for the cost of procuring additional trains, as well as maintenance of trains and electrical systems. The cost of general maintenance of electrical systems (excluding the cost of any major overhaul) is approximately 3-5% of total initial investment cost. In light of increasing demand for transportation services in Bangkok, and the fact that alternative modes of public transportation such as buses still require major improvements, EIC believes that the outlook for mass rapid transit operators is bright. However, since the business involves advanced skills and large investment, only a small number of companies can hope to qualify for this opportunity.

As mass transit lines near completion, the density of population and businesses will start to grow along the rail lines, especially around intersections. These prime areas are likely to see development of new businesses and residential projects. When all the planned rail routes are completed, there will be many intersections, such as in the Kaerai and Min Buri area, the intersections between the Purple and Pink lines, and between the Orange and Pink lines, respectively. These stations will become points of interchange between different train lines or transfer to other modes of transport. Therefore, these areas are expected to draw more passengers than other stations. More traffic will lead to more spending, such as on food, from passengers waiting for their next ride. Furthermore, these areas will also attract new residential projects like condominiums in the long term, which will in turn attract more businesses into the area.

Rail lines intersections

1. Bangwa
2. Wongwian Yai
3. Wang Burapha
4. Hua Lamphong
5. Silom
6. Asoke
7. Phetchaburi/Makkasan
8. Cultural center
9. Phaya Thai
10. Ratchathewi
11. Democracy monument/Phan Fa
12. Bang Khun Non
13. Tao Poon
14. Bang Sue
15. Mo Chit
16. Lat Phrao
17. Lam Sali
18. Phatthanakan/Hua Mak
19. Sam Rong
20. Government Complex Nonthaburi
21. Lak Si
22. Wat Phra Sri Mahathat
23. Min Buri

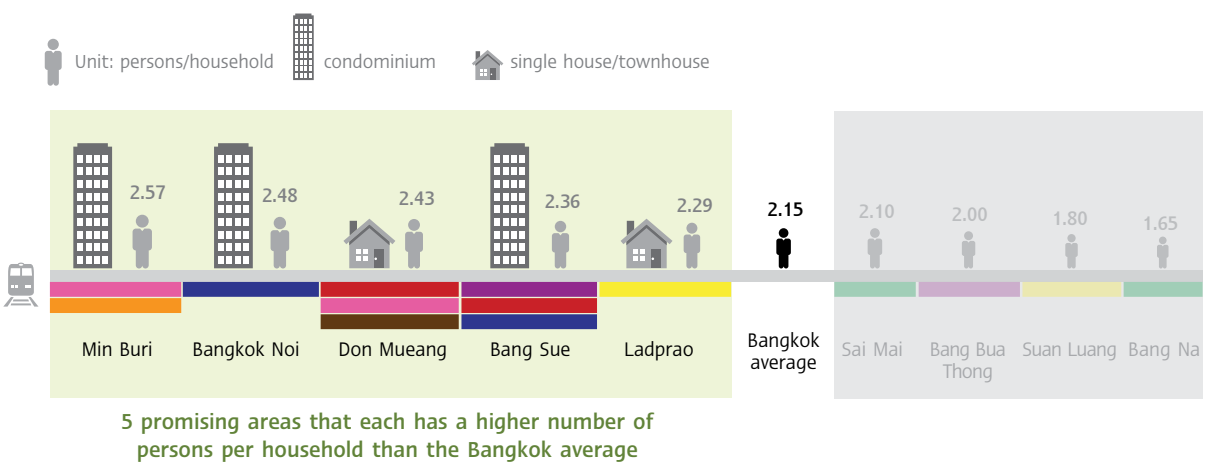
Property development should be another winner as mass transit networks expand throughout Bangkok and its metropolitan area. EIC has identified at least five locations that have high potential for development of residential property. Most home buyers today prefer properties near rail lines, especially condominiums, for ease in commuting. Moreover, families who already live near the lines tend to get priced out, because they can no longer afford to expand their properties as values climb, so they move into nearby condominium units instead. This surge in demand explains the growing number of condominiums along mass transit routes.

EIC has identified five promising areas that each has: a higher number of persons per household than the Bangkok average (2.15 persons per household); a population greater than 100,000; and a location near a mass transit route.

These five promising areas are: 1) Minburi District (2.57 persons/household), where the Pink and Orange lines will operate. Densely populated and designated by city planning for commercial activities, Minburi is appropriate for the construction of condominiums, particularly within 500 meters of the rail line. For areas further away, which are low-density residential zones, town houses and single houses are more suitable. 2) Bangkok Noi District (2.48 persons/household), where the extension of the Blue line is being constructed. This area is designated for medium- to high-density housing, which makes it suitable for condominium development. 3) Don Mueang District (2.43 persons/household), where the Red line, Pink line, and Airport Rail Link will operate. In proximity to Don Mueang Airport, this area has remained a low-density residential area due to regulations limiting building height. Consequently, property development has been confined to townhouses and single houses, with the exception of areas further away from the airport where condominiums are permitted. 4) Bang Sue District (2.36 persons/household), where the Purple line will soon operate, and the Red and Blue line is currently under construction. This is another area suitable for condominium projects, as it is classified as a medium-to-high-density residential area. 5) Ladprao District from Soi 43 onward (2.29 persons/household), where the Yellow line will be built. Currently a low-density residential zone, the area can accommodate development of single houses, townhouses and condominium projects. However, due to the high price of land and competition from existing residential developments, newcomers ought to consider carefully before investing.

7 The 5 areas of high potential for property development in Bangkok are those along the train lines in Min Buri, Bangkok Noi, Don Mueang, Bang Sue and Ladprao Districts

Ratio of population per household in areas with mass transit services that hold great potential for property developments.

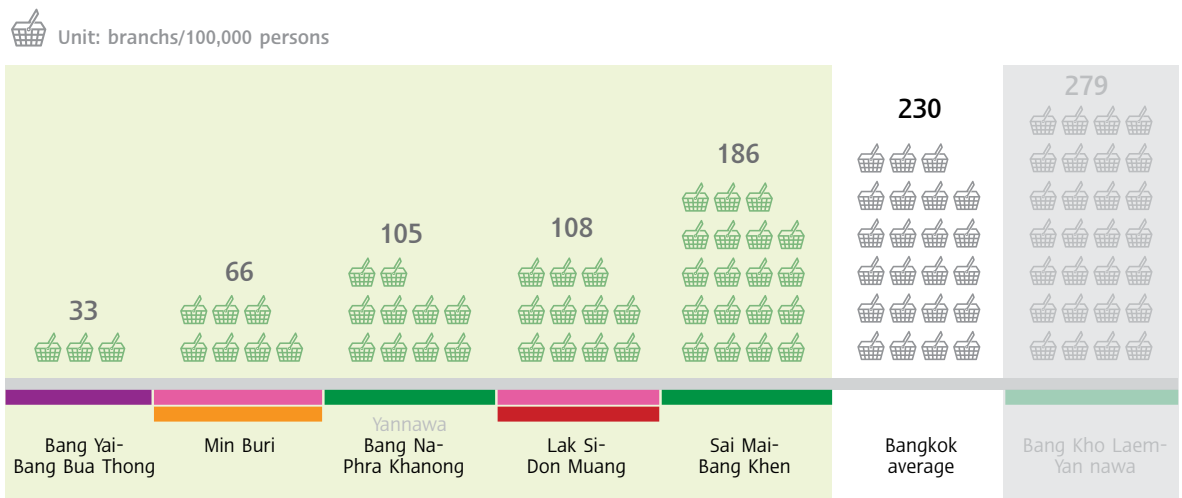


Source: EIC analysis based on data from Bangkok Metropolitan Administration

With regard to retail businesses, EIC sees potential expansion of supermarkets[6] in certain areas of Bangkok where mass transit projects will be expanded. The growth of real estate projects will bring in new consumer spending. Because families in Bangkok tend to be small in size and make more frequent purchases, demand for supermarket services is sure to rise. Despite the industry's rapid growth rate and fierce competition, EIC still notes a number of areas along the transit routes where the number of supermarkets has not reached saturation. The locations with smaller ratios of supermarket branches to population than Bangkok's average (which is 230 branches per 100,000 people) include :1. Bang Yai and Bang Bua Thong, Nonthaburi Province (33 branches/100,000) where the Purple Line will operate in 2016. 2. Min Buri District[7] (66 branches/100,000) with 170,000 people and where the Pink and Orange Lines will run. 3. Bang Na[8] (105 branches/100,000) where the southern extension of the Green Line will operate. 4. Lak Si and Don Mueang districts (108 branches/100,000) on the routes of the Red and Pink Lines. 5. Sai Mai[9] district (186 branches /100,000) served by the northern extension of the Green Line. What's more, most of the districts mentioned boast populations of more than 100,000, which will continue to grow, thanks to the new transit lines.

8 Supermarkets in Bang Yai, Bangbuatong, Minburi, Bangna, Laksi, Donmueang, and Saimai should see further expansion as a result of future rapid rail services

Density of supermarkets in districts with lower than average number of establishments and with rapid rail services in the future.



Source: EIC analysis based on data from National Statistical Office and retail and wholesale firms

Apart from the direct benefits of mass rapid transit, the projects will also lead to a proliferation of new types of businesses. For example, advertising media in the BTS Skytrain stations and trains earned more than 2.5 billion baht in annual revenue in 2014, which is expected to increase to 13 billion in 2020 and 32 billion in 2023. Producers of LED/LCD monitors will enjoy indirect benefits. Other businesses that will expand with the rail network may include security, cleaning and parking services.

[6] A supermarket, such as a branch of Big C, Tops, Villa, Foodland or Maxvalu, typically operates on a 900-2,000 square meter area inside a department store, community mall, residential project or commercial building.
[7] Weighted average between Minburi and Klongsamwa districts which are adjacent.
[8] Weighted average between Bangna and Prakanong districts which are adjacent.
[9] Weighted average between Bangkhen and Saimai districts which are adjacent.

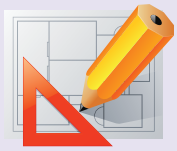
BOX: Green Line: BTS Skytrain introduced Bangkok to modern mass transit in 1999

The capital's mass rapid transit systems in operation today were officially begun in February 1992, when the Bangkok Metropolitan Administration (BMA) signed a partnership agreement with the Bangkok Mass Transit System Public Company (BTSC) to set up the city's first elevated train. The first line to be launched was the Green Line of the BTS Skytrain, in celebration of His Majesty the King's 72nd Birthday, in 1999. It was a public private partnership (PPP) in the form of a net gross concession, where the BMA as the government agency overseeing the project was in charge of land procurement and appropriation. The BTSC had the concession to invest in all relevant infrastructure, namely tracks, station buildings, maintenance centers, rolling stock, signaling systems and electrical systems, as well as all system operations and maintenance. The total investment was 50 billion baht, and the BTSC as the main investor is entitled to revenues from ticket sales and commercial development of the area in the stations for 30 years (from 1999 through 2028).

BTSC recorded losses during its initial operations, but results improved after the company adjusted its approach. When the sky train was first launched, this new mode of transportation was unfamiliar to Bangkok commuters and thus was slow to gain ridership. Moreover, BTSC's finances

were hurt by the 1997 economic crisis. But by providing shuttle services to bring passengers to the rail stations, ridership nearly doubled within five years, from around 60 million in 2000 to 120 million in 2005, and the number has grown steadily since. In addition, BTSC founded VGI Global Media to manage all advertising business in the stations and on trains. In 2014, the revenue of VGI raised over 2.9 billion baht, nearly 700 million baht more than BTSC's ticket revenues the same year.

Beyond the growth of BTSC itself, its Green Line spawned a proliferation of businesses along its route. An economic impact analysis of the Green Line over the 2000-2014 period reveals that the system brought growth not only to the transportation and logistics sectors related to the rail operation (i.e., feeder buses, taxis, parking lots, etc.), but also to other sectors. For example, the real estate sector enjoyed 10% annual growth in supply of new condominium units along that route, while the number of retail stores there grew at 6% annually. Moreover, selling out-of-home ad space around the BTS stations and along the rail line produced over 2 billion baht in income in 2014.



Pre-construction phase

Construction phase
(1995-1999)

Post construction phase

Engineering consulting firm
- Feasibility study
- Environmental Impact Assessment

Real estate agent
- Land
- Housing

Constuction
- Civil work 17,000 THB Mn
- Track work 100 THB Mn

Building material suppliers
- Steel 1,600 THB Mn
- Stainless 600 THB Mn
- Cement 330 THB Mn

Rail system suppliers
- Signaling
- Power and cable
- Telecom-munication

17,000 THB Mn

- Rolling stock 7,000 THB Mn

Others
- Elevator/Escalator 150 THB Mn
- Platform screen door 40 THB Mn/station

Train operation
- Avg. revenue: 3,600 THB Mn/year*
- Avg. ridership: 140 Mn trip /year*
- Maintenance cost: 500-600 THB Mn/year**

Electricity business
- Electricity: ~400 THB Mn/year**

Transport and logistics business
- Bus revenue: 120 THB Mn/year* ▼
- Metro share increase by 7%* ▲

Real estate business
- Land value: 8% per year* ▲
- Condo supply: 10% per year* ▲

Department stores and retail stores
- Number of retail stores: 6% per year* ▲
- Shopping malls: 4 new malls (90,000-140,000 sq.m.) ▲

SMEs
- Advertising: 2,000 THB Mn/year**
- Maid: 30 THB Mn/year**
- Guard: 70 THB Mn/year**
- Car parking: 36 THB Mn/year**

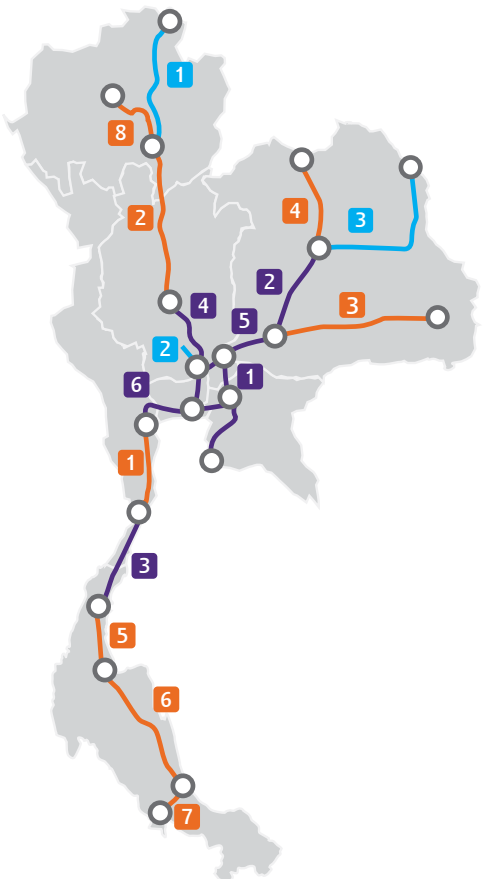
* Avg. Year 2000-2014 | ** Year 2014

Business opportunities from inter-city rail projects

Thailand's inter-city train system currently stretches about 4,000 kilometers, over 90% of which is single-track line of 1-meter wide. Rail-track switching between inbound and outbound trains often slows down transportation of passengers and goods. The government propose to solve this problem by constructing an additional track along the existing one. The government has now approved this "double track" plan for 17 routes, for an investment of around 570 billion baht. Beyond the double track plan, an extra track of 1.435 meters wide will be built for medium- and high-speed trains to accommodate the growing number of inter-city passengers. This involves six different routes, with investment totaling at least 1 trillion baht. When the projects start, the construction sector and providers of rail system equipment will benefit right away from new sales and contracts. Then in the long run, when the double-track, medium-speed and high-spe ed services are completed, the expansion of cities and growth of many sorts of business sectors will follow. For example, real estate, wholesale and retail business, and logistics will flourish at rail intersections, especially in the northeastern region.

The double-track rail service will enhance the efficiency and flexibility of passenger and goods transportation. By adding a 1-meter (e.g., "meter gauge") track alongside the original lines, the double track service will reduce time now lost when switching between northbound and southbound trains, making transportation more efficient. According to the government's plan, 17 double-track projects will be built, together worth 570 billion baht. Three of those projects are currently in preparation for auctions, namely 1. Chachoengsao-Khlong 19– Kang Koi Saraburi route (11 billion baht investment), 2. Chira junction Nakhon Ratchasima– Khon Kaen route (27 billion baht), and 3. Prachuap Khiri Khan–Chumphon route (17 billion baht). The next three projects in the pipeline for auctions include: 1. Lopburi–Paknam Po route (25 billion baht), 2. Mab Kabao–Chira Road station (30 billion baht), and 3. Nakhon Pathom–Hua Hin (20 billion baht).

9 Three double-track projects are currently in preparation for auctions, namely 1. Chasherngsao-Klong 19-Kaeng Khoi Saraburi route, 2. Chira Road Nakhon Ratchasima-Khon Kaen route, and 3. Prachuap Khiri Khan-Chumphon route



		Route	Distance (km.)	Investment (THB Mn.)
Phase 1	1	Chachoengsao-Klong 19-Kaeng Khoi	106	11,272
	2	Thanon Chira junction-Khon Kaen	185	27,007
	3	Prachuap Khiri Khen-Chumphon	167	17,293
	4	Lop Buri-Paknampo	148	24,842
	5	Map Krabao-Thanon Chira junction	132	29,855
	6	Nakhon Pathom-Hua Hin	165	20,038
Phase 2	1	Hua Hin-Prachuap Khiri Khan	90	9,437
	2	Pak Nam Po-Den Chai	285	29,822
	3	Thanon Chira junction-Ubon Ratchatchathani	309	32,399
	4	Khon Kaen-Nong Kai	174	18,244
	5	Chumphon-Surat Thani	167	17,510
	6	Surat Thani-Song Kla- Padang Besar	339	35,544
	7	Hat Yai-Padang Besar	45	N/A
	8	Den Chai-Chiang Mai	217	N/A
Phase 3	1	Den Chai-Chiang Khong	326	77,485
	2	Ban Phachi junction-Nakhon Luang	15	2,934
	3	Baan Phai-Nakhon Phanom	347	60,512

Source: EIC analysis based on data from Office of Transport and Traffic Policy and Planning (OTP)

The medium- and high-speed services, which will travel at speeds above 150 kilometers/hour, will require an additional track of 1.435 meter wide (standard gauge), mostly along the existing routes. The government has so far proposed six medium- and high-speed rail lines, costing at least 1 trillion baht.

Future Medium-Speed and High-Speed Railway Projects

Medium-Speed Railway: Bangkok-Kang Khoi-Nakhon Ratchasima-Nong Khai Route and Kaeng Khoi-Map Ta Phut Route

Connects Laos at the border with Nong Khai Province, which had a gross provincial product (GPP) growth rate of 7% in 2014, to Bangkok and Map Ta Phut Industrial Estate, an important petrochemical industrial estate south of the capital. In the future, the route could extend into Laos and Southern China.

Increases efficiency in distributing goods to northeastern Thailand and Laos, especially petroleum products from Map Ta Phut and cement products from Saraburi Province.

Status: negotiations on design and funding sources in progress

Total distance: 875 kilometers
Investment budget: 400 billion baht
Type: medium speed (160-180 kilometers per hour)
Track gauge: 1.435 meter (standard gauge)

High-Speed Railway: Bangkok-Phitsanulok-Chiang Mai Route

Connects Bangkok and Chiang Mai Province, a major tourist destination with more than 7 million domestic and international visitors annually and growing. The route also runs through such historic capitals as Sukhothai and Ayutthaya.

Provides an alternative to flying between central Thailand and northern Thailand, allowing passengers to stop along the way.

Status: feasibility study in progress

Total distance: 670 kilometers
Investment budget: 450 billion baht
Type: high speed (more than 200 kilometers per hour)
Track gauge: 1.435 meter (standard gauge)

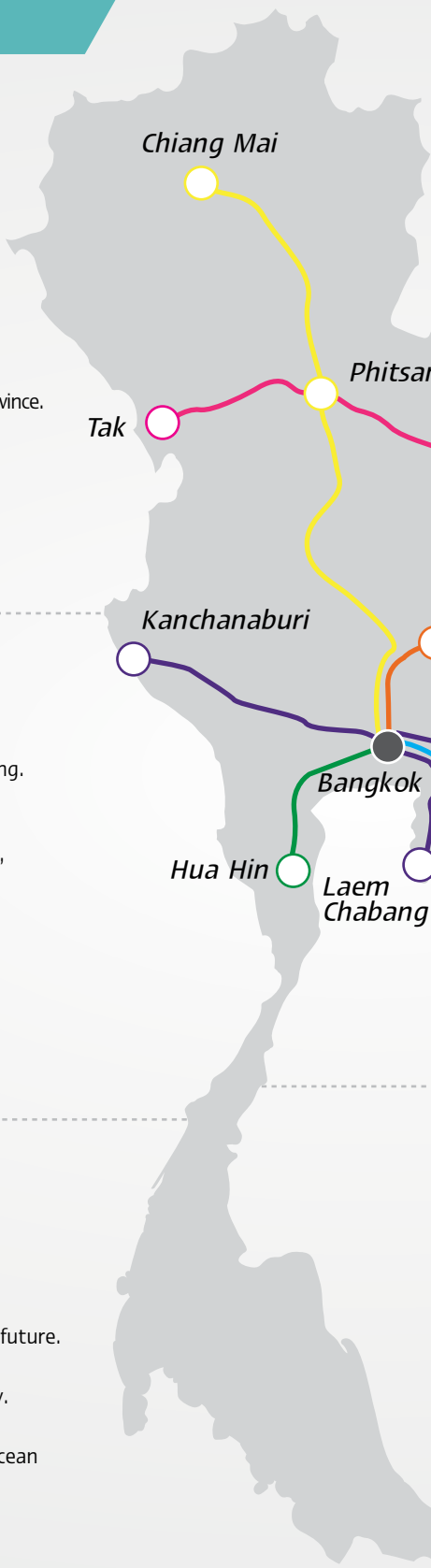
Kanchanaburi-Bangkok-Laem Chabang Port Route and Bangkok-Sa Kaeo Route

Connects Laem Chabang Port, via Bangkok, to Phu Nam Ron in Kanchanaburi, which leads to Myanamar's Dawei Special Economic Zone and Industrial Estate. This will be both an important deep-sea port and a major production base in the future. On the Sa Kaeo route, the route could extend into Phnom Penh, Cambodia and Ho Chi Minh City, Vietnam, which have populations of 1.5 and 8 million respectively.

Develops Thailand into a land bridge for transporting goods between the Indian Ocean and the Pacific Ocean, which reduces transportation time by 1-3 days.

Status: under consideration

Total distance: 575 kilometers
Investment budget: under study
Type: normal speed (average of 40-100 kilometers per hour)
Track gauge: 1 meter (meter gauge)



Tak-Phitsanulok-Khon Kaen-Mukdahan Route

Connects Tak Province in western Thailand to Mukdahan Province in the nation's northeastern region. Both provinces are being slated for development of special economic zones, allowing for more businesses to flourish there in the future. The route could extend further into already established special economic zones of neighboring countries, such as Savan-Seno Special Economic Zone in Laos and Myawaddy Special Economic Zone in Myanmar.

Transports textiles, sporting clothes and equipment and electronic parts between Myanmar, Thailand and Laos for both domestic consumption and exports.

Status: feasibility study in progress

Total distance: 660 kilometers
Investment budget: feasibility study in progress
Type: feasibility study in progress
Track gauge: feasibility study in progress

High-Speed Railway: Bangkok-Rayong Route

Connects Suvarnabhumi Airport in Bangkok, through Chonburi Province (a home to many key tourist destinations including Pattaya), to Rayong Province, an important manufacturing base. The route also passes near various ports and industrial estates.

Focuses on serving tourists travelling between Bangkok, Pattaya and Rayong and workers at industrial estates along the route.

Status: under consideration

Total distance: 220 kilometers
Investment budget: 150 billion baht
Type: high speed (more than 200 kilometers per hour)
Track gauge: 1.435 meter (standard gauge)

High-Speed Railway: Bangkok-Hua Hin Route

Connects Bangkok to Hua Hin, a resort town attracting 2.5 million domestic and international visitors per year year. The route could also expand further into southern Thailand in the future.

Focuses on serving tourists travelling to Hua Hin. These visitors now mainly travel by car to reach Hua Hin.

Status: under consideration

Total distance: 220 kilometers
Investment budget: 95 billion baht
Type: high speed (more than 200 kilometers per hour)
Track gauge: 1.435 meter (standard gauge)

Future Railway Projects

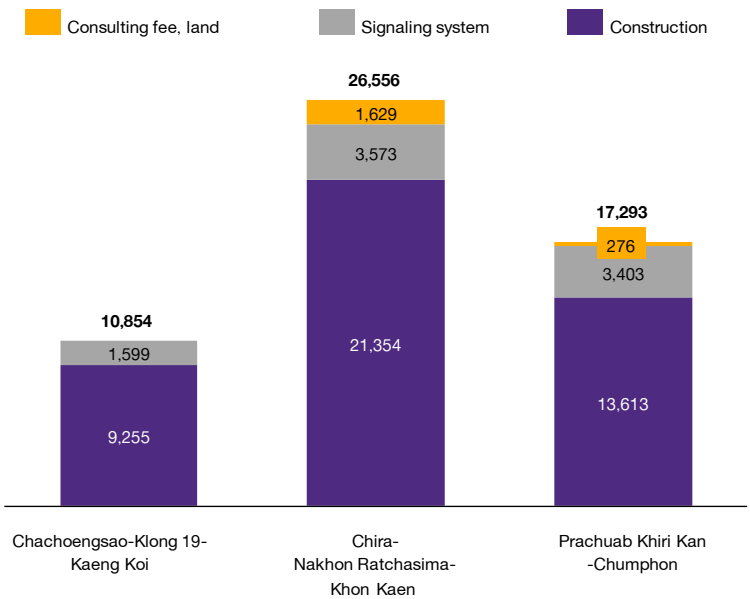
EIC expects that the inter-city railway projects most likely to begin construction within the next three years are the three double-track railway projects, due to their relatively low investment budgets. The investment budget for the three double-track railways is 55 billion baht, much lower than the medium-speed or high-speed rail projects. This will not put a large financial burden on the government. In addition, the three routes already have existing single-track lines. The additional track will be built on land already owned by State Railway of Thailand, which reduces the expropriation costs.

Out of the 55-billion-baht to be invested in the three double-track railways, about 40 billion baht will flow into the construction sector and about 10 billion baht to railway signaling system providers. The second track will be built on ground and in parallel with the existing single track. This differs from the construction of city railways in Bangkok that require elevated tracks or underground tunnels. Thus the cost of building double-track railways is much lower. The main materials used to lay the new track are cement railroad ties (also known as railway sleepers) and steel rails. We expect the initial phase of the three railways to use 76,000 railroad ties (worth 76 million baht) and 45,000 tons of steel rail (worth 1,660 million baht). Because Thailand now produces its own concrete railway sleepers, the projects are an opportunity for this domestic business to grow. As for steel rails, Thailand will have to rely on imports for the first three projects. However, if more railway projects happen in the future, Thai steel entrepreneurs should not overlook this opportunity. Railroad ties, rails and other parts need to be assembled to form the railway before the level crossing and the railway signaling system are set up for traffic control.

10 Total investment budget for the three double-track railways are about 55 billion baht with an expected annual investment of 10 billion baht between 2017-2019

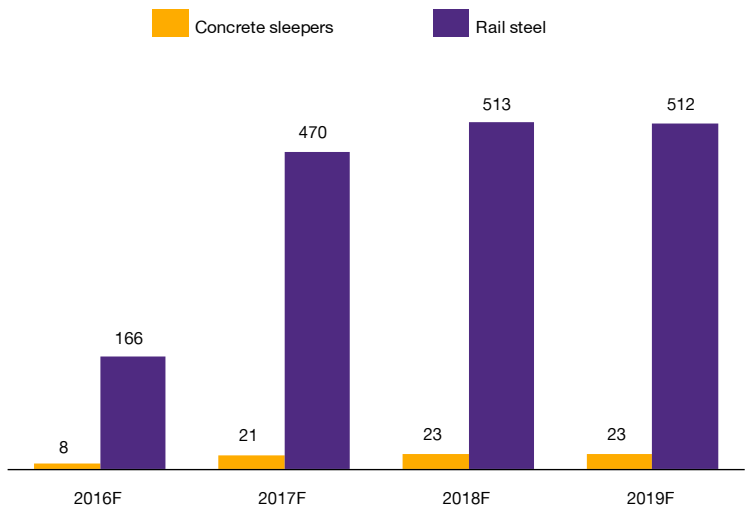
Breakdown of the investment in double-track railways likely to commence by 2019.

unit: million baht



The costs of main construction materials for the three double-track railways

Unit: million baht

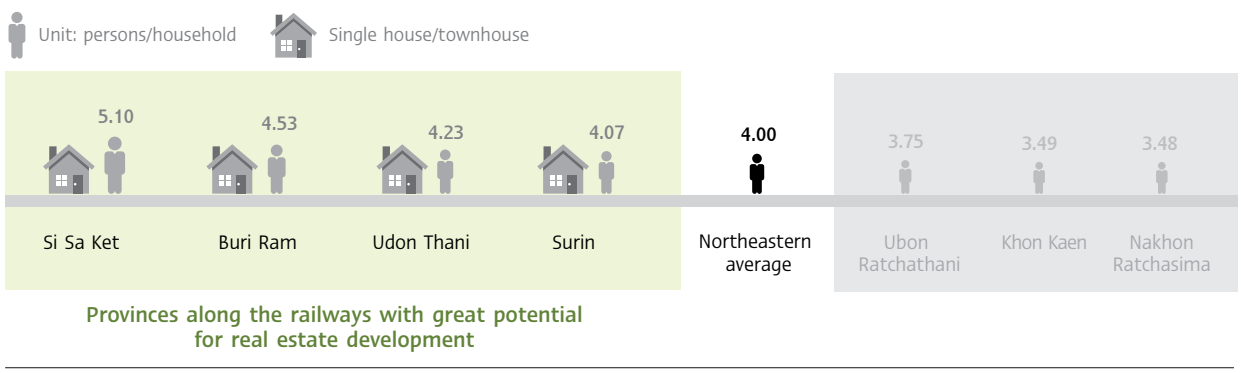


Source: EIC Analysis based on data from OTP

In the long run, EIC expects that the real estate sector in areas around the double-track lines in the northeastern provinces will gain the most growth, for demographic reasons. Growth will result from higher spending by current residents and new spending by new residents who move in from other areas to work. We have compared each province's average household size to the average in the northeast region to estimate the density and propensity to form new nuclear-family households. The average household size in the Northeast is higher than other regions, at 4 persons per household. Moreover, there are four provinces in the region having a population of more than 1 million and a higher average household size than the region's average. These are: 1. Sisaket (5.1 persons/household), 2. Buriram (4.53 persons/household), 3. Udon Thani (4.23 persons/household), and 4. Surin (4.07 persons/household). Real estate developers should search these four provinces for business opportunities, especially in lower-priced properties such as detached homes and townhouses. EIC expects that many potential buyers will be workers in the service and agricultural sector having relatively low purchasing power.

11 In the long run, the real estate sector in the northeastern provinces along the railway will boast the most growth thanks to the double-track railways

The average household sizes in provinces along the railways with great potential for real estate development

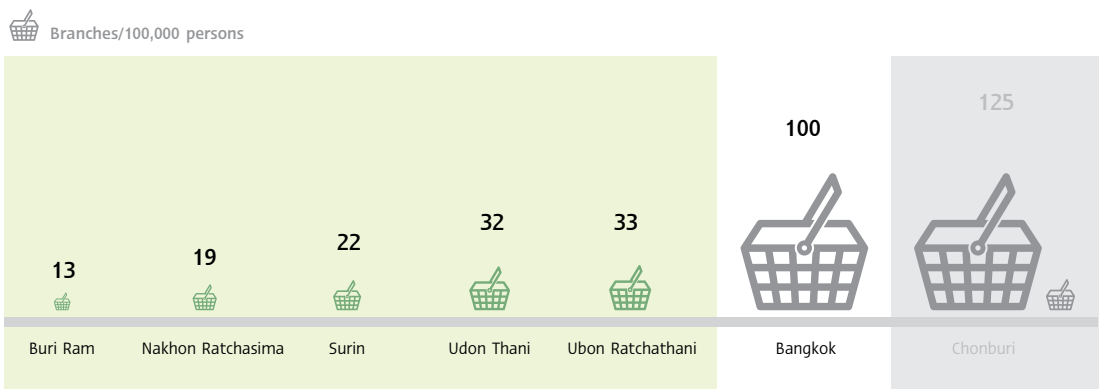


Source: EIC Analysis based on data from Department of Provincial Administration, Ministry of Interior

Regarding the wholesale and retail industry, EIC expects to see hypermarket[10] businesses expand in the northeastern provinces along the new railways While consumers in Bangkok shop more frequently and for fewer items, consumers in provincial areas buy more goods per trip but make fewer visits to a store. The nature of hypermarkets therefore matches the behavior of these provincial consumers. Yet the density of hypermarket branches in the region is currently much lower than the average ratio for big cities, which is 50 branches per 100,000 persons. EIC sees great potential for hypermarkets in certain northeastern provinces along the railway projects, where economic activity will rise in the long run. These provinces include: 1. Buriram (13 branches/100,000 persons), 2. Nakhon Ratchasima (19 branches/100,000 persons), 3. Surin (22 branches/100,000 persons), 4. Udon Thani (32 branches /100,000 persons), and 5. Ubon Ratchathani (33 branches/100,000 persons). This is a great business opportunity for both large companies from Bangkok and local entrepreneurs.

12 The wholesale and retail markets in Buriram, Nakhon Ratchasima, Surin, Udon Thani and Ubon Ratchathani have room for further development and expansion

The current hypermarket densities in provinces along the future double-track railways



Source: EIC Analysis based on data from the National Statistical Office and wholesale and retail companies

[10] A hypermarket, such as a branch of Big C Jumbo, Makro or Tesco Lotus Extra, usually has a service area of more than 10,000 square meters, located in a suburban area or near a populated area, if not constrained by city-planning legal restrictions.

Transportation and logistics businesses will burgeon in provincial areas near railway crossings and borders upon the completion of the dual-track railways. People will then start to rely on railways as a major mode of cargo transport and travel. Yet cars and trucks will still play a crucial role in transiting passengers and goods from train stations to final destinations. Warehouse businesses that stock goods for distribution will also play a major role. EIC views that major cities at railway crossings such as Nakhon Ratchasima, Khon Kaen, and Phitsanulok, and major cities on the borders such as Chiang Rai, Nong Khai, Ubon Ratchathani and Songkhla are places where logistics facilities and distribution centers can be developed in the future. Local logistics operators should not overlook this golden opportunity.

Tourism and recreation will also greatly benefit from the transport upgrade. The improved system will increase the volume of traffic, raise demand for temporary accommodation and increase spending by tourists. Restaurants and hotels in those cities will be major beneficiaries.

Hotel businesses will flourish as the volume of tourists and business travelers rises. Main tourism provinces such as Chiang Mai and Surat Thani can expect a surge of visitors thanks to more convenient transportation. Boutique hotels can expand business by attracting high-end tourists who demand high quality and superior services. According to a survey by STR Global, a hotel market research agency, boutique hotels that sell on decor, top service and luxury achieve higher occupancy rates than other hotels, by 13%. Hotel owners in provincial areas can join the trend by offering unique decor that marries localism with modernism to attract high-end tourists. Lower-tier hotels can focus on attracting backpackers who care about convenience more than luxury by locating near train stations. More businessmen and salesmen will also flock to major regional cities such as Nakhon Ratchasima, Khon Kaen, and Nakhon Si Thammarat for routine business trips. These provinces should focus on mid-tier hotels as well as serviced apartments for business travelers.

Prepared food and fast food businesses will expand to serve tourists and business travelers who need grab-and-go meals, as in countries with extensive railway networks. Japan, for example, has its ekiben, or boxed meals sold at train stations. Ekiben feature local cooking that not only tastes good but also represents local identity. Thai businesses can adopt this strategy to create value-added for take-away food sold at train stations. For instance, packaging could be made to resemble a traditional Thai food container (pinto) and OTOP products from the surrounding province can serve as main ingredients to appeal to tourists visiting different destinations by train.

The dual-track lines upcountry and the city lines in and around Bangkok will both benefit businesses. But the dual-track rail network, with coverage all over the country, will generate activity in a wider geographic area. Spending during the initial phase of construction in all three routes will pump 40 billion into the construction industry and 10 billion baht into train systems providers. In the long run, EIC views that real estate and retailing will especially flourish in the Northeast, in Buri Ram, Surin, Nakhon Ratchasima, and Ubon Ratchathani. Transport and logistics as well as tourism and recreation also have high growth potential.

Rising business opportunities from rail projects

Mass transit in Bangkok and vicinities

Double track railways

Construction

- 4 ongoing projects
- 4 medium term projects
- 6 long term projects

- 17 double track railways projects
- 6 new train lines

Building materials

- Cement
- Steel

- Concrete railroad tie (railway sleeper)

Electrical, signaling, and communication

- Signaling system
- Control system
- Electrical system
- Ticketing system

- Signaling system
- Control system
- Electrical system

Transport and logistics

- Operation
- Maintenance

- Logistics
- Warehouse

Real Estate

- Condominium
  - Min Buri
  - Bangkok Noi
  - Bang Sue
  - Ladprao
- Single houe/ townhouse
  - Don Mueang
  - Ladprao

- Single house/townhouse
  - Si Saket
  - Buri Ram
  - Udon Thani
  - Surin

Retail

- Supermarket
  - Bang Yai/Bang Bua Thong
  - Min Buri
  - Bang Na/Lak Si/Don Mueang
  - Sai Mai

- Hypermarket
  - Buri Ram
  - Nakhon Ratchasima
  - Surin
  - Udon Thani
  - Ubon Ratchatani

Others

- Advertisment
- LCD/LED
- Security guard
- Maid
- Parking lot
- Electricity

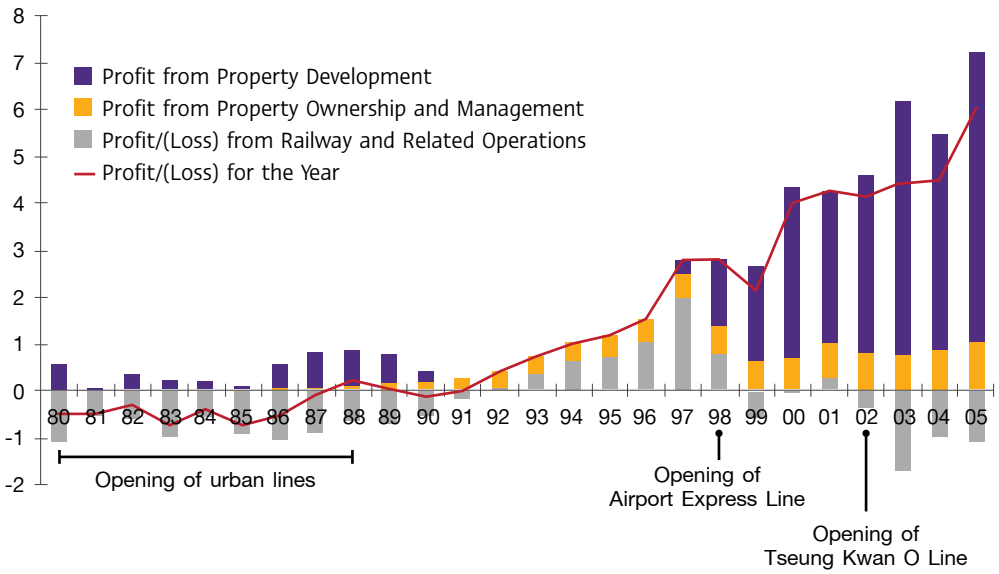
- Hotel
- Tourism
- MICE
- Food and Beverage

Both for intra- and inter-city trains, the profit margin of railway development does not come primarily from fare revenues, since the development is capital intensive and aimed to provide services to the public. A collection of studies show that it takes about 15 years at minimum for a railway operation to start making profits, if relying on ticket revenue alone. These operations typically take longer to turn a profit than other infrastructure businesses. For instance, electricity plants only take seven to ten years to profit. Also, train fares cannot be raised easily, since it is a public service often subject to regulations and consumers' spending constraints; as a result, these projects usually make losses for quite some time in the beginning. Railway business operators therefore resort to auxiliary services to enhance their operating margins, such as by leasing retail space at train stations and selling ad space in stations, in train cars and on train exteriors. These are important opportunities to seize, and space in and around the railway development areas may not yet be fully utilized.

One concept in urban development combines real estate and mass transit together, or so-called Transit Oriented Development (TOD). This approach to land development aims to generate the highest utility from land around train stations and along railways. Land is the first real estate business to benefit from railway development, as seen in land price spikes after any rail project is announced. To reap the most benefits from train projects, TOD, or city development that combines and synergizes public mass transit and real estate development, has become hugely popular abroad, as seen in Hong Kong and Japan. The private sector get permits from the government to develop real estate such as building residential buildings, schools, offices, hospitals, concurrently with the railway business. The government takes part of the revenue from the real estate development to support train service. A higher population around train stations also creates higher demand for railway transit. Their commutes therefore continually support railway service operations and development.

The TOD concept has proven successful in both economic and social terms. For instance, in Hong Kong, extensive property has been developed around the train stations at Hang Hua and Lohas, which was previously unutilized space. The Hong Kong Mass Transit Railway designed their train stations to be situated in both the central business district and the residential suburbs to ensure sustained real estate development. Zoning of land development around train stations is classified into condominiums, commercial space, offices and "green" zones. Most of the projects target middle-income people, who have enough purchasing power and rely on public transit as their main mode for commuting. After the design planning, the Hong Kong MRT opened auctions for the private sector to invest. Investments are split into phases in accordance with demand that rises gradually. As a result of real estate development, the Hong Kong MRT turned profits within eight years and generated steady income growth.

13 With the integration of investment in real estate development around Hong Kong train stations, it only took 8 years to start making profits.



Source: Presentation document "Rail+Property+Pedestrian Model (RPP): case study of Hong Kong and implication for Thailand," Dr. Agachai Sumalee.

14 Design of Lohas park station, combining rail development and real estate in Hong Kong, results in maximum utilization of the railway systems

Source: EIC analysis based on data from LOHAS Property

EIC regards TOD development as a concept that Thailand can borrow to boost development of mass transit. Many areas in and around Bangkok can adopt TOD for real estate development. For instance, the Bang Ping area in Samut Prakan Province, with the coming Green Line railway in the south and Bang Kae and Phutthamonthon 4 with the coming Blue Line. This is a great business opportunity for railway operators now as well as for future real estate developers.

In addition to the various business opportunities already discussed, the expansion of mass transit in Bangkok and its periphery as well as all three projects of the dual-track railway system will in the initial phase create more than 28,000 and 21,000 jobs, respectively. EIC estimates that, in the process of constructing the four lines, the initial phase will create 2,200 jobs for engineers and architects, as well as 25,000 jobs for skilled and unskilled workers. In the operation phase, there will be demand for more than 500 station officers, 350 security guards and 170 cleaning staffs. Not only does this create employment in provincial areas, it will also spur spending in those provinces and boost gross provincial product (GPP).

Railway infrastructure development will not only enhance efficiency in transport of passengers and goods, but will also create many business opportunities in various sectors. This includes real estate and retailing, both in and around Bangkok and other provincial areas; transportation and logistics; warehouses; as well as hotels and restaurants. It is estimated that more than 40,000 jobs in adjacent businesses will be created, indirectly stimulating the economy and distributing income more evenly and widely. All the railway projects will face losses in the beginning of operations due to the very high intensity of capital and manpower required for these projects. However, using the TOD concept will help enhance investment to be more efficient and systematic, and relieve financial pressures.

3

Airport upgrades likely to lift economy

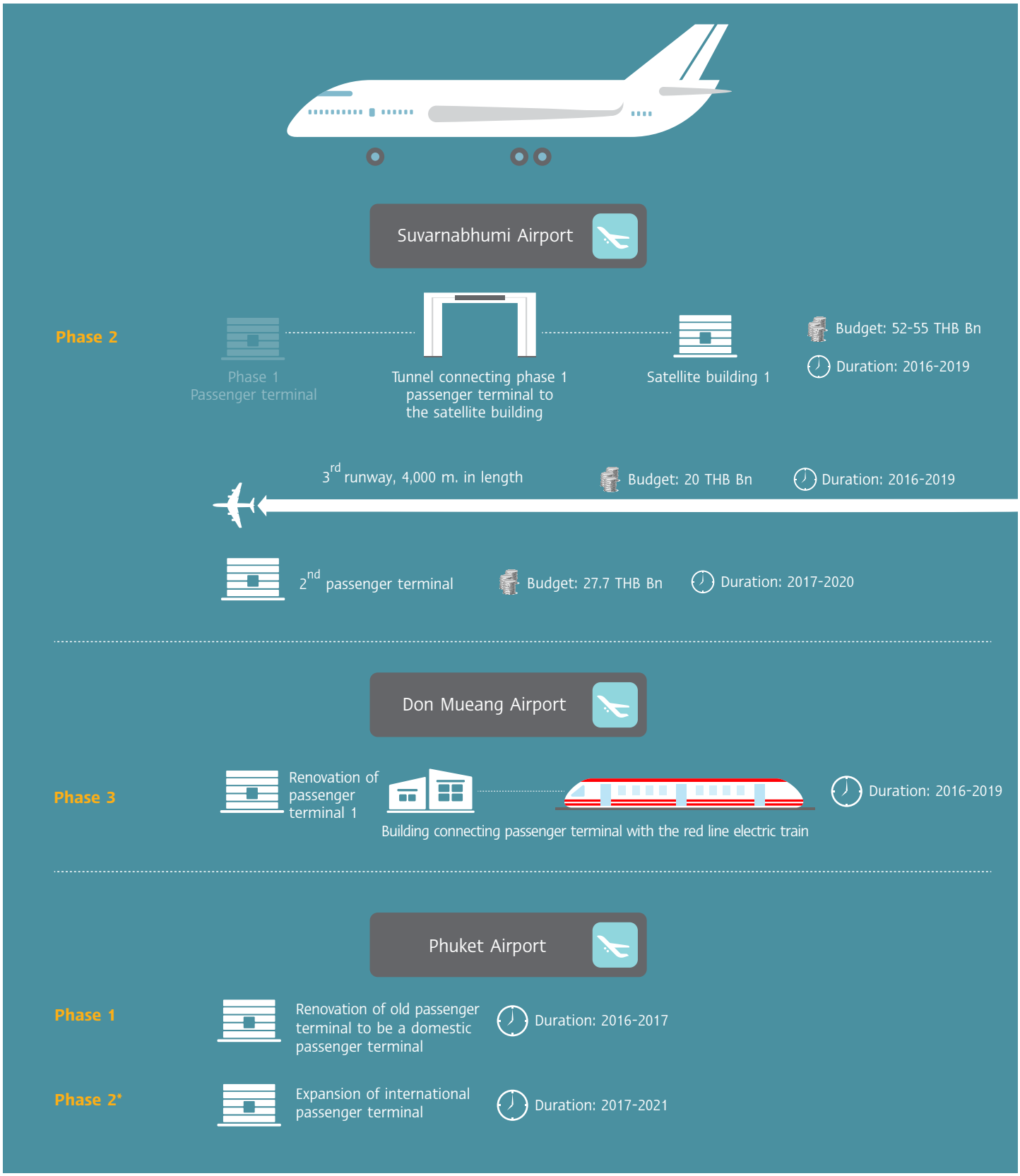
The fast growth and high importance of air travel and air shipment has prompted the government to prioritize expansion of the Suvarnabhumi, Don Mueang and Phuket airports. Expansion will make traveling easier, boost the overall economy and support businesses like construction, air-freight services, tourism and more. The nation's airport development plan will provide important business opportunities for private-sector companies.

International airports have become more and more economically important over time. The number of passengers travelling through all airports in Thailand rose by 11% per year on average from 2009 to 2014, according to data from the Airports of Thailand Public Company Limited (AOT). Air travel is the main mode of transportation for Thailand's international visitors, accounting for 82% of all arrivals. Air travel is safer as well. The International Civil Aviation Organization (ICAO) reports that there are 200-500 fatalities from air travel per year on average around the world, very low compared to road fatalities of over 1 million per year. Transforming Thailand into an international hub for aviation would greatly raise the number of flights and visitors, generating higher income from tourism and boosting economic growth.

Thailand's three main airports – Suvarnabhumi, Don Mueang and Phuket – can now handle 70 million people per year. But the projected number of passengers in 2016 is 95 million. This has prompted Thailand's airport expansion plans. The three largest are: 1) Suvarnabhumi airport, where international passengers have been growing 6% per year in the past five years, 2) Don Mueang, which has rapidly become the world's largest hub for low-cost carriers, handling over 22.5 million passengers per year, and displacing the budget airline leadership of Malaysia's LCCT airport, and 3) Phuket, where arrivals have grown 18% per year in the past five years.

EIC expects expansion of the three airports to finish in 2021, doubling their capacity of domestic and international passengers to 138 million per year.

15 When the airport expansion plan is complete in 2021, the passenger capacity will double.



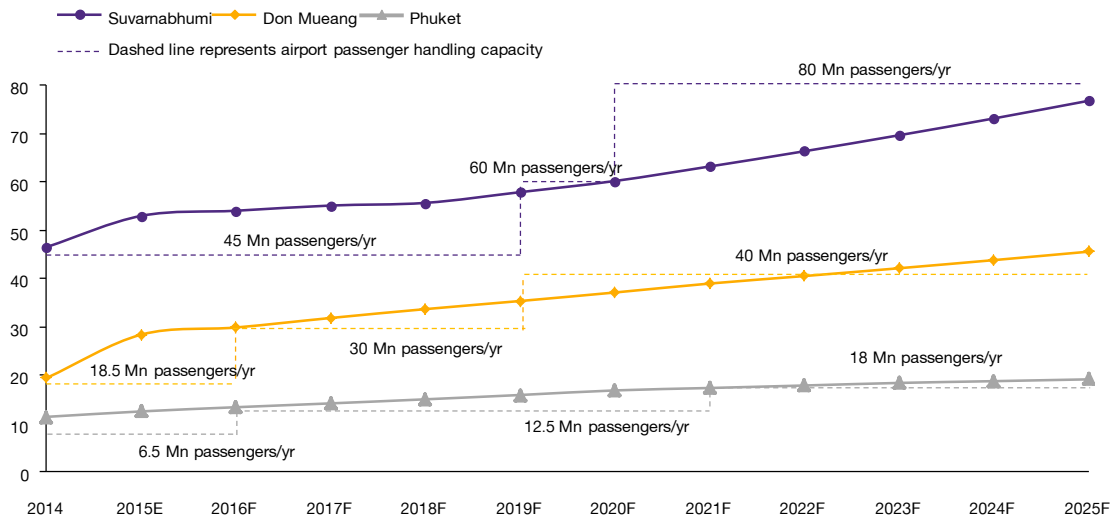
** During the plan revision*

Sources: EIC analysis based on data from the Ministry of Transport (MOT) and Airports of Thailand (AOT)

16 Capacity of top 3 airports will double by 2021

Projection of Air Passengers at Suvarnabhumi, Don Mueang and Phuket Airports vs. Airport Handling Capacity

Unit: Milliion people



Source: EIC analysis based on data from AOT

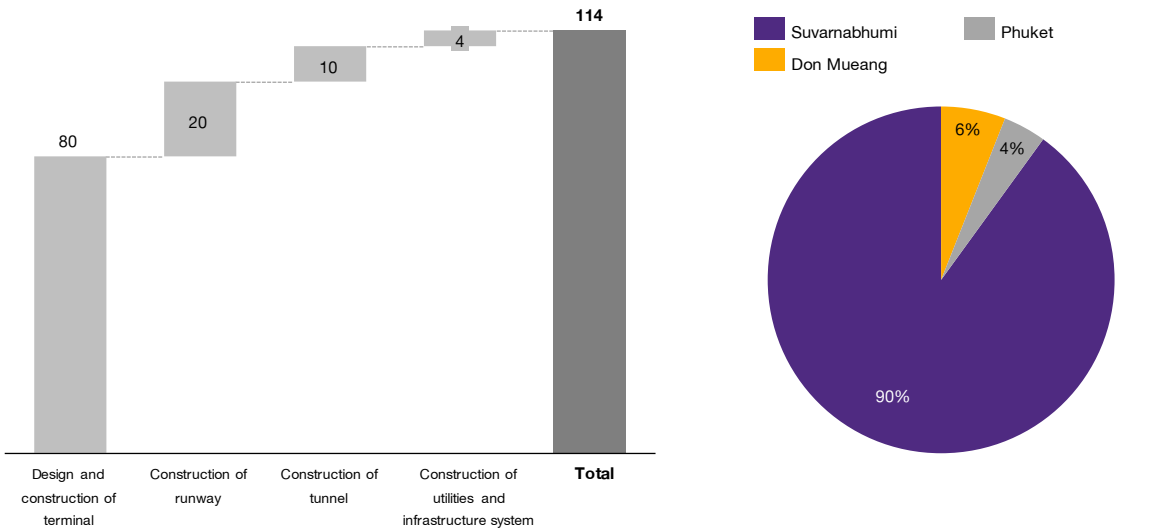
The expansion plan will benefit Thai businesses and the economy. During the implementation period, construction contractors and building-materials manufacturers will benefit directly. After completion, related businesses such as airlines and tourism industries will also gain from higher traffic.

During the airport development period, contractor and building material industries will benefit the most. The value of construction contracts for new buildings, runways, tunnels, and airport utilities totals 114 billion baht. Up to 80% of the building materials needed are cement and steel that can be sourced and produced domestically. This will be an opportunity for Thai building materials companies.

17 Contractors and building-material producers will benefit directly from airport development projects worth up to 114 billion baht

Budget for Suvarnabhumi, Don Mueang, and Phuket Airport Expansions

Unit: Billion baht



Sources: EIC analysis based on data from AOT

Airlines, aircraft maintenance and other aviation-related businesses will get a big makeover. EIC expects that airlines will benefit from a 50% rise in passengers by 2025, to 140 million, up from 95 million today. This translates to 280,000 additional flights per year. Air freight operators will gain from rising demand. Besides higher income, this industry will be able to reduce costs by exploiting economies of scale. At present, airfreight volume at Thailand's smaller airports remains limited, accounting for less than 10% of all air shipments. In view of the high growth potential, businesses in this industry should grab the opportunity and take advantage of Thailand's favorable locations in the center of the region. For example, airfreight operators could use provincial airports that are close to the new special economic zones as distribution hubs. These include airports at Hat Yai, Nakhon Phanom and Tak.

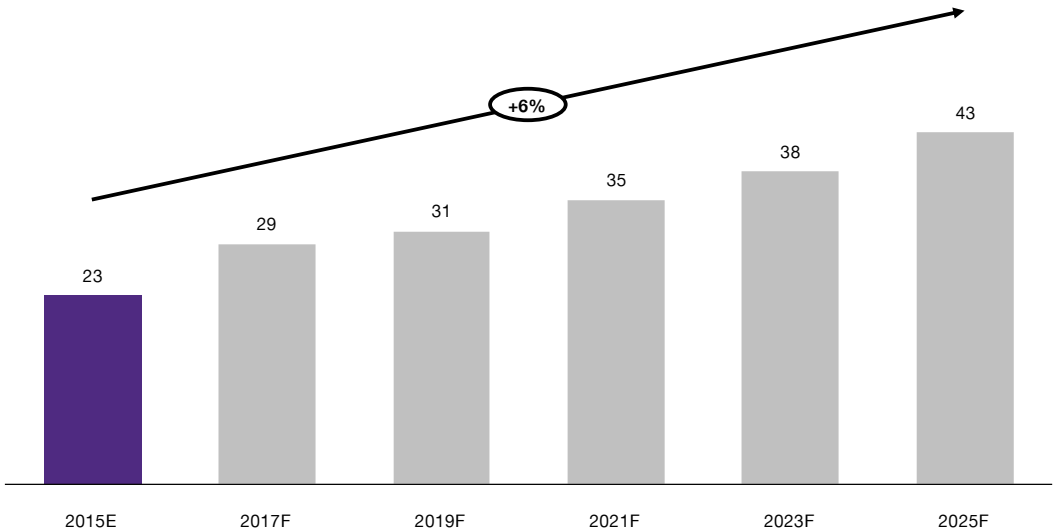
Other ancillary businesses, such as jet fuel and airline catering services, will also enjoy rising demand. The cost of jet fuel accounts for as much as 30-40% of total airline expenses. Annual jet fuel consumption in Thailand will reach 36 million barrels in 2015, growing by 50% to 54 million barrel per year by 2025, as the number of flights increases. Airline catering services in Asia will expand 6% annually by 2020, according to Global Industry Analysts Inc., a market research firm. This growth rate is the highest of all world regions.

Demand for aircraft maintenance will rise. As of 2015, Thai airlines have a total fleet of 250 planes. Their aircraft maintenance needs are served by domestic and international facilities at a total annual service cost of 23 billion baht. This figure will grow 6% per year in line with expansion of airlines. As for the Asian region in total, Boeing expects that carriers here will need 16,000 new aircraft by 2025, up 70% from 2015. These new vessels will need regular maintenance based on usage, but the region's maintenance capacity is inadequate. One reason is that ASEAN's largest maintenance center, in Singapore, is constrained by limited space.

18 The aircraft maintenance industry in Thailand will likely continue its high growth of 6% annually following the growth of the airline industry

Projection of Aircraft Maintenance Spending in Thailand

Unit: Billion baht



Sources: EIC analysis based on data from the Office of Transport and Traffic Policy and Planning (OTP)

Given the industry's bright growth prospects, Thai businesses should take this opportunity to set up an all-in-one aircraft maintenance, repair and overahaul (MRO) center. Thailand has the advantage of being the regional production base for machined aircraft parts and other equipment. Existing maintenance services for aircraft parts and engines can build on this advantage to create more value-added. EIC recommends Thai companies to invest in maintenance services for narrow body planes such as Boeing 737-MAX and Airbus 319/320/321. This type of aircraft is popular and more frequently used, and thus will require more servicing as well as parts like landing gear. Currently, the government is considering U-Tapao airport as the best location for aircraft maintenance industry, and foreign companies like Air France and Lufthansa have already shown interest in setting up maintenance bases in Thailand. Thai businesses can start by working together with big international companies to strengthen their expertise and bring in new technology that will upgrade their capabilities and reduce costs.

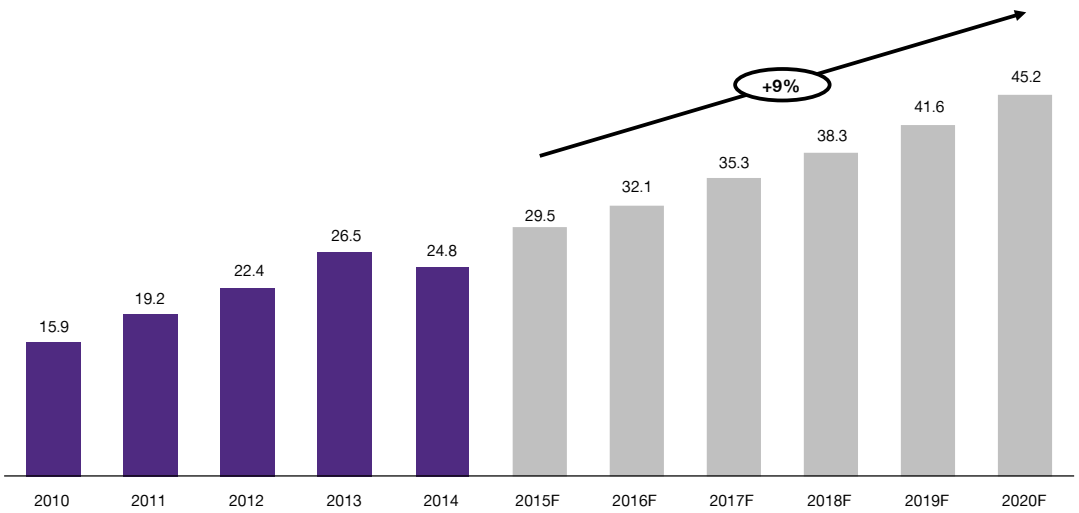
Aircraft maintenance is a highly specialized industry requiring high-quality service to ensure confidence among airline customers. The government and the private sector should cooperate with Thai educators to produce enough skilled labor to supply this industry. One of Thailand's advantages is that skilled labor is six times cheaper here than in Singapore.

Tourism and recreational services such as convention and exhibition organizers, hotels, tour agencies and restaurants will benefit after the airport development projects are completed. EIC estimates that by 2020 there will be more than 120 million people travelling through Thailand's three major airports – Suvarnabhumi, Don Mueang and Phuket. International tourists will increase from 29.5 million to 45 million per year, or a 10% annual increase. This is equivalent to 1 trillion baht in revenue per year. Related businesses should seize this opportunity to create new products and raise their incomes.

19 The number of international tourists in Thailand will increase to 45 million people per year by 2020

Number of International Inbound Tourists in Thailand

Unit: Million people



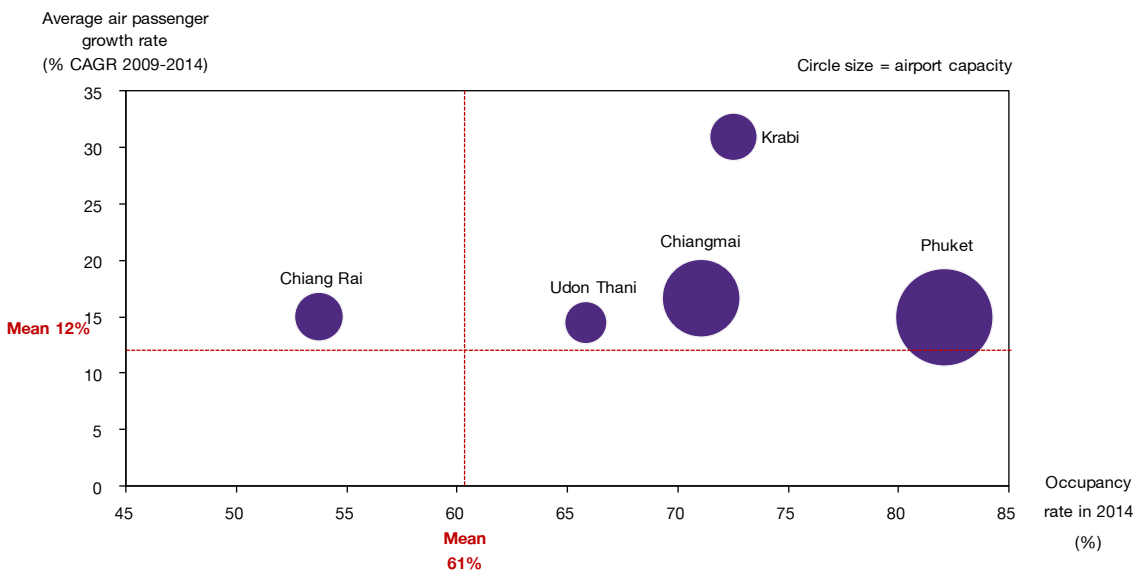
Sources: EIC analysis based on data from Tourism Authority of Thailand (TAT)

One successful Thai industry with high potential is the meetings, incentives, conventions and exhibitions business, MICE, which has seen strong growth, especially in Chiang Mai and Phuket. This key tourism segment has excellent growth prospects with a potentially important national economic impact in terms of jobs and income. EIC estimates that over 1 million MICE tourists will arrive in Thailand in 2015. Among others, Phuket and Chiang Mai are two key destinations that will receive a large share of spending from this tourist segment, thanks in part to expansion of their airports as well as their existing MICE facilities. Chiang Mai has 13 convention centers, 1 exhibition center and 3 unique venues. Phuket has 9 convention centers and 3 unique venues. If MICE tourists continue to increase over the long term, more exhibition and convention centers will be needed in these two provinces. Bangkok, for example, has 48 convention centers, 7 exhibition centers and 15 unique venues.

Thai hotels should invest in destinations with high potential and high air passenger growth, such as Phuket. In the past five years, Phuket's air arrivals rose at an annual rate of 15%. In addition to a huge number of European tourists, Phuket also receives many tourists from China, Malaysia and India, whose growth is also moving fast. The room occupancy rate in Phuket is relatively high today compared to other destinations. Nonetheless, the major constraint is that good locations are difficult to find. Hotels will therefore have to add special features to distinguish themselves from competitors.

20 Phuket has a high growth level of air passengers and maintains a relatively high room occupancy rate compared to other destinations

Growth of Air Travel and Hotel Industry in Cities with International Airport



Sources: EIC analysis based on data from MOT and TAT

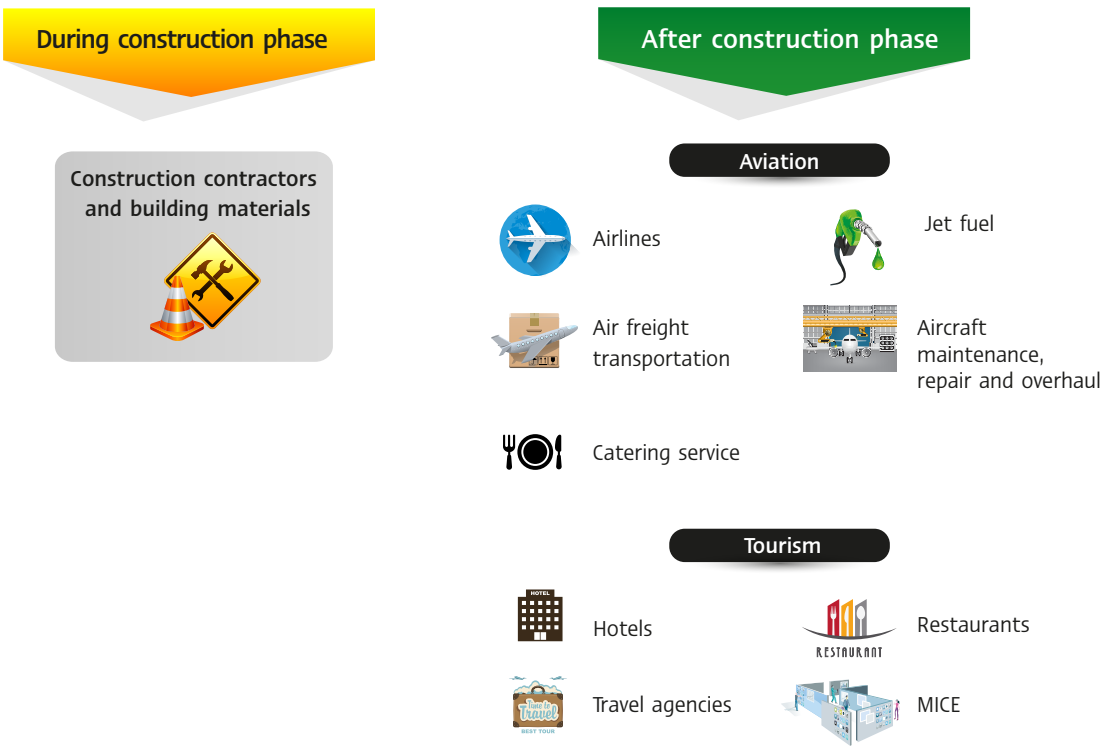
The capsule hotel is a special lodging format suitable for areas near airports, and it can be operated by an SME. Developed in Japan, this type of hotel has tiny compartments, each just large enough to hold a small mattress. Rooms are rented out by hour or by night to transiting passengers at economical rates. This business is starting to spread beyond to Japan to new markets like the United Kingdom. It serves the needs of a passenger who has a very early flight or a long layover time who does not want to pay for an expensive airport hotel room. Capsule hotels are also in demand from backpackers in Thailand, who are generally on a tight budget and booking their own accommodations. SMEs can ride this trend by opening capsule hotels close to airports or linked mass-transit stations, such as the Airport Rail Link train station at Bangkok's Petchburi and Makkasan station. A capsule room provides limited amenities such as a pillow, blanket and alarm clock, so operating costs and room rates are low. This targets the needs of a specific type of customers and distinguishes a capsule hotel operation from competitors.

Thai tour agencies should focus on Chinese tourists, who account for a third of all tourists to Thailand, with high growth potential. Inbound Chinese tourists are forecast at a 9.4 million people in 2016, a 22% increase from 2015. Nonetheless, tour agencies nowadays focus only on the low-cost segment of Chinese tourists. Thai tour companies should adjust their strategies. They can provide high-end tours and specialties like health tourism because there is a large number of middle-class and wealthy Chinese travellers interested in these offerings.

Similarly, restaurants should provide more creative menus to attract international customers. EIC suggests developing new dishes and new menus based on Thai cuisine. One successful example is Mango Tango in Siam Square, Bangkok. This restaurant creates a variety of desserts made from Thai mangoes, such as pudding and ice cream. Leading travel website, Trip Advisor, highly recommends it. Another interesting case is a noodle shop in Chiang Mai, called "Kau Kai Nim Marn," that serves stir-fried noodles with chicken on a hot plate, a unique approach that has become highly popular among Chinese, Japanese and Korean tourists.

In addition to generating more trade and investment activity, airport expansion projects will also create jobs in related businesses. EIC estimates that when the three airport expansion plans are complete, up to 68,000 jobs will be created directly and indirectly. This translates to monthly salaries and wages of 1.5 billion baht, which will stimulate the provincial economies around the airports.

21 Airport development will create opportunities for many industries during the construction period and after its completion



Source: EIC analysis based on data from MOT and TAT

Yet some industries might be negatively affected by the airport development plan, such as air-conditioned intercity bus services. Better air transportation will attract more passengers who need to save time, directly reducing demand for bus travel. Being in direct competition, intercity bus services risk losing market share, especially to low-cost airlines that can match ticket prices. Bus operators should therefore adjust their strategies to cope with the coming change. They can focus on operating in destinations that lack airports and introduce new innovations and efficient technology, such as online ticket sales, to reduce employees and costs.

Several mid-size airports, such as in Surat Thani and Ubon Ratachathani, have high growth potential and may be developed in the future. Companies could plan ahead and start renting the limited vending space in these facilities. Surat Thani is also a tourist destination, with 5 million arrivals in 2015, up 18% year-on-year. Moreover, the transportation infrastructure there is well connected to nearby provinces, making Surat Thani airport a convenient choice for people in Phang Nga and Ranong when travelling to Bangkok. EIC believes that hotel and tourism businesses are still attractive investments due to high demand. Several airlines have increased flights to Surat Thani airport, which received 20 flights per day in 2015, up from 12 flights per day the year before.

Similarly, Ubon Ratchathani airport has high growth potential, thanks in part to its large passenger handling capacity and its rail and road connections to Laos and Cambodia. The number of people who travel through Ubon Ratchathani has been growing at over 10% per year. Apart from this, Thailand and Laos have agreed to build a 6th bridge across the Mekong River in this province., which will certainly encourage Laotians from nearby areas like Pakse to choose this airport when travelling to Bangkok. Five airlines now operate at this airport, including both low-cost and full service carriers. It offers more flights than Pakse airport, which has only one airline serving Bangkok and this carrier charges twice as much as flights from Ubon Ratchathani. Businesses should aim to provide services for arriving passengers. For instance, rental cars, shuttle bus service and food and beverages will be in demand for the rising number of passengers.

22 Surat Thani and Ubon Ratchatani airports are mid-size airports with high growth potential. Therefore, businesses may consider reserving space in the airports

● High ○ Low

Airport	Airport passenger handling capacity	Visitor growth rate	Quality of transport networks connecting with other provinces or neighboring countries	Overall outlook for the airport
Surat Thani	◕	◕	●	◕
Ubon Ratchathani	●	◕	●	◕
Khon Kaen	◕	◕	●	◕
Udon Thani	◕	◕	●	◕
Nakhon Si Thammarat	◔	◑	●	◕
Lampang	◔	◑	◕	◑
Nakhon Phanom	◑	◑	◕	◑
Nan	◔	◕	◑	◑
Sakon Nakhon	◔	◑	◑	◑
Loei	◔	◑	◑	◑

Source: EIC analysis based on data from MOT and TAT

Clearly, the development of airports has a big economic impact and benefits a wide variety of businesses, including airlines, tour companies and other services. All of this will help improve the economies of nearby cities and provinces. Moreover, maximizing connections between airports and other transportation modes like roads and rails will fully utilize the development benefits. Thai businesses should wake up to the importance of new and expanded airports and try to cash in.

BOX: Case study: Amsterdam's Schiphol turns airport into 'aerotropolis'

Thai aviation can take a big step ahead by transforming each of the nation's key airports into an "aerotropolis" – a hub not only for air travel but many other businesses and activities. In the past, the functions of an airport were limited to travel in and out of a country. Over time, airports evolved into shopping malls, business centers, and even industry clusters serving demand from various types of passengers and companies. Airports became airport cities.

Schiphol airport in Amsterdam, Netherlands, is one of the world's foremost aerotropolis success stories It has the geographical advantage of connecting western and eastern Europe. Each year, 55 million passengers travel through this airport. As the number of passengers increased, the Schiphol Group, the airport operator, started to develop nearby areas to attract more businesses and better serve the changing needs of passengers. The Schiphol Group added convention centers and five-star hotels. It offered reduced rental rates for land and buildings around the airport as an incentive to attract large companies like Microsoft, Unilever and Boeing to set up offices. Thus the business of an airport becomes more than travel. It becomes a full-fledged hub for productivity, playing an important role in driving the economy. In the case of Schiphol, businesses in the surrounding areas created over 65,000 jobs and produce over 4% of the country's GDP.

EIC has identified three key factors as necessary to the development of an aerotropolis like Schiphol:

First, an aerotropolis needs to be well connected with infrastructure. Schipol's public transportation infrastructure was robust even prior to the development of areas around the airport. There were two motorways and an underground subway station that efficiently linked the airport to the center of Amsterdam and other parts of the Netherlands. Leading companies therefore decided to set up offices there instead of the center of the city thanks to the convenience of travel to both domestic and international destinations.

Second, close collaboration between the government and local communities is crucial. The government of the Netherlands formed the Schiphol Group to manage the airport areas. The stakeholders of the company are the central government, the city of Amsterdam and the city of Rotterdam. The Schiphol Group divides its various business tasks into several categories, such as aviation system management, consumer products and services, and real estate, to improve the overall management of the airport areas.

Furthermore, the Schiphol Group also worked with local communities like the cities of Amsterdam, Noord-Holland province and the municipality of Haarlemmermeer to set up a company called Schiphol Area Development. The purpose was to develop areas beyond the airport to serve incoming demand. For example, there

are shopping malls and restaurants that increase the airport's potential and attract offices.

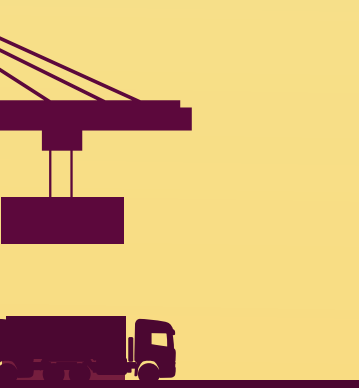
Last but not least, businesses should try to analyze consumer behavior. The Schiphol Group understands the specific demands of different types of businesses that need rental space around the airport. The company therefore does not fix the rental rate, but offers varying prices to fit each rental contract. For example, a long-term contract, called "Sure2Stay," is suitable for large companies that need more private space. Another type of contract, called "ShortStay," is designed for smaller clients whose business may be seasonal, such as tour companies that are busy mostly during Holland's tulip season.

These three factors show that Schiphol's success comes from good planning and close collaboration among the government, the private sector and local communities. Stakeholders in Thailand should therefore adopt this case study as a guideline so that they can achieve a more concrete and sustainable plan to build an airport city here.

4

Port expansion: harnessing the power of water transport

Thailand's transport sector, and the overall economy too, will get a significant boost from the ongoing development of new and improved water transportation infrastructure. The new push aims to better facilitate multimodal shipment, which connects service by ships to logistics using other transport modes like road and rail. This will reduce logistics costs for business operators, enhance the efficiency of importing and exporting goods and create business opportunities for related sectors. The construction contracting and construction materials businesses will be the first sectors to reap gains, as construction commences, while shipping, shipbuilders, warehouses and distribution centers will benefit after the infrastructure is completed. The government has planned several water transport projects that will soon get started. For instance, Laem Chabang deep sea port will be upgraded, as will its linked rail transport hub. Companies should closely monitor the project and be ready to adjust their business strategies according to any changes.



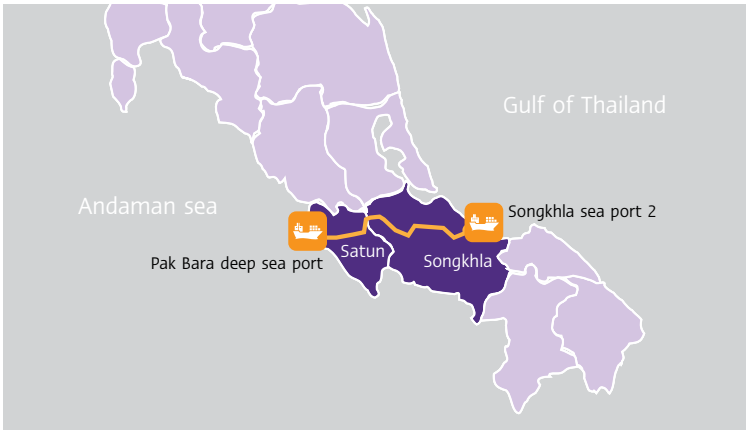
The seaports at Laem Chabang and Bangkok are Thailand's main ports for both imports and exports. Bulk cargo, containers and large shipments like cars and machines, all pass through these ports. In 2014, more than 94 million tons of imports and exports were shipped through the two ports: 8 million TEUs[11] containers, and 1.2 million cars. The volume will continue to grow by 5-7% each year, in line with the growth of the economies of Thailand and its trade partners. Laem Chabang port, in Chonburi Province south of the capital, is the worlds' 22nd largest port, and the 5th largest in Asia, that can support large container ships. Bangkok port is the 88th largest port in the world that can support container ships, and the 9th largest in Asia.

Both ports are now overcrowded and have problems with multimodal freight transport connections. Freight coming through the Bangkok port will total 1.5 million TEUs in 2015, which exceed the port's capacity of 1.34 million TEUs per year. Laem Chabang port can accommodate its rising volume of traffic for the time being. But within 2020, its freight may reach 9 million TEUs for the year, exceeding its annual capacity of 8 million TEUs. This overcrowding reduces efficiency. The ports also suffer from a lack of efficient transfer between ships and other modes of transport. For instance, Laem Chabang port has no separate pier dedicated for use by the coastal freighter and river freighters that transport cargo via domestic waterways. This forces coastal and river freighters to wait to dock until after international cargo ships have finished unloading. This delays transfers, slowing Thailand's imports and exports. Moreover, large river vessels cannot transport cargo from Laem Chabang port via inland waterways such as the Pa Sak river and Chao Praya river, due to the shallow water during dry season and riverbank erosion. Also rail transport from Laem Chabang port lacks efficient transfers to the inland container depot (ICD) at Ladkrabang.

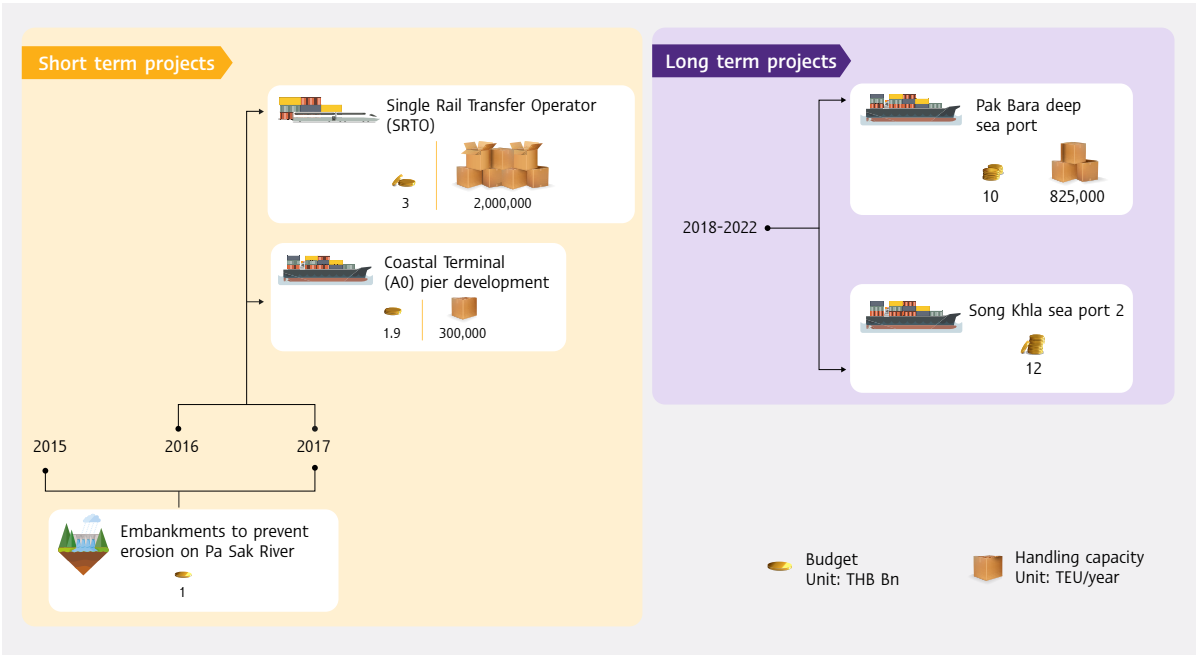
With these issues in focus, the government is upgrading ports and developing facilities to better connect them with other modes of transport. The government plans to build embankments to prevent riverbank erosion, and dredge Pa Sak River to enhance the efficiency of navigation through inland waterways. Meanwhile, a new special-purpose pier, Coastal Terminal A0, is being constructed in Laem Chabang port to accommodate coastal and river freighters. The port plans to install a Single Rail Transfer Operator (SRTO) to connect ship cargo with rail transport. The rail service will operate from Laem Chabang train station to the unloading yard in the port, and on-rail cranes will be set up to transfer containers from trains to the piers. When completed, this service will greatly enhance the efficiency of cargo handling within the port.

[11] Twenty-foot Equivalent Units: TEU

23 Rail construction as a land bridge between Andaman Sea and the Gulf of Thailand will significantly reduce transport time



24 In the short run, the government plans for three water infrastructure projects, totaling 6 billion baht, to be constructed between 2015 to 2017. Meanwhile, long term investment projects are worth 20 billion baht



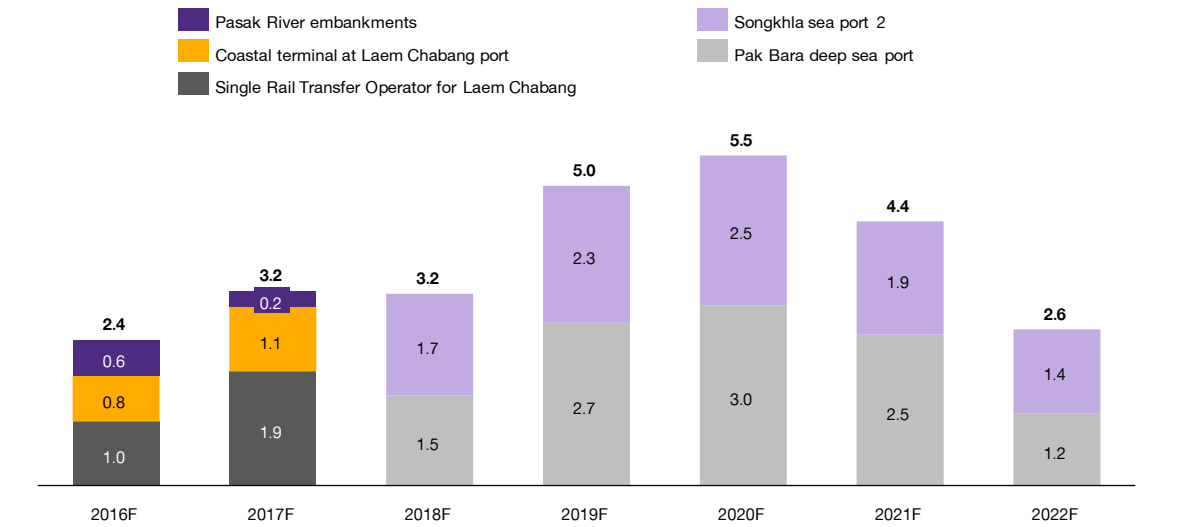
Source: EIC analysis based on data from the Ministry of Transport (MOT)

In the long term, many other water infrastructure projects are being considered, including a deep sea port at Pak Bara in Satun Province, as well as a land bridge connecting Pak Bara port on the Andaman side with Song Khla Sea Port 2 on the Gulf of Thailand side. This would reduce shipping time between the Gulf of Thailand and the Andaman Sea. Goods that are transported to the west, such as to India, the Middle East, Europe and Africa, could be transported from Song Khla port 2 to Pak Bara port via rail within only six hours, compared to taking a roundabout through Malacca Strait that takes at least one day.

25 Water infrastructures construction worth as much as 27 billion baht

Projected Investment Budget for Water Transport Projects

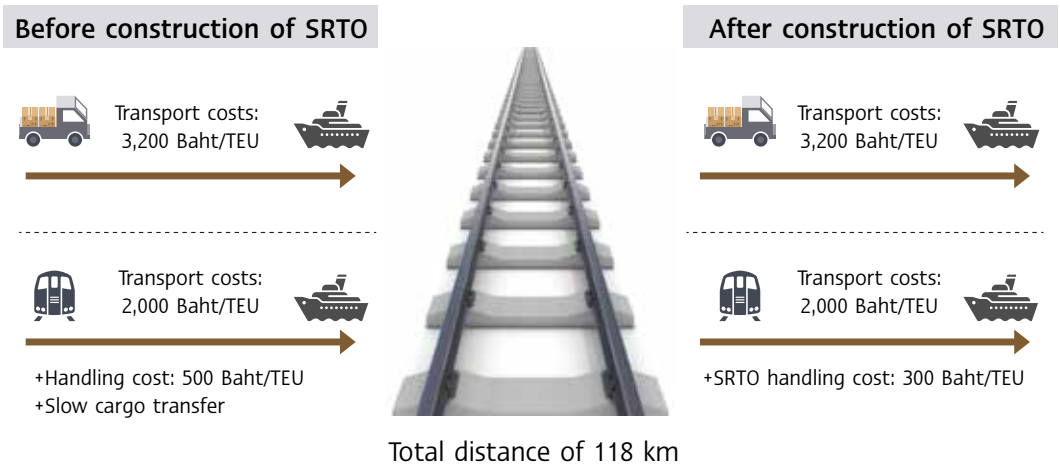
Unit: Billion baht



Source: EIC analysis based on data from MOT

Port construction and multimodal connections from ports to rail services will significantly reduce transportation costs as well as boost growth of transportation and logistics businesses. Business operators now typically choose trucks for transport to Laem Chabang Port, because these vehicles can deliver shipments directly to the port, with no additional service needed. On the other hand, transfer of shipping containers via rail, usually via the Ladkrabang ICD to Laem Chabang Port route, requires an additional fee for the transfer from rail to pier. Once the single rail transfer operator (SRTO) is completed, logistics service providers (LSPs) will be able to transfer cargo via rail to Laem Chabang Port more conveniently. This will significantly reduce the cost of transportation between Ladkrabang ICD and Laem Chabang Port, a distance of 120 kilometers. In addition, the upgrade from trucks to rail will reduce transport costs by at least 900 baht per 1 TEU. Within 2032, we expect business operators to increase their use of rail transport by 1.1 million TEUs, which will reduce transport costs by a total of 1 billion baht per year.

26 Using trains instead of trucks as a transport mode between Ladkrabang ICD to Laem Chabang Port will reduce costs by at least 900 baht per 1 TEU

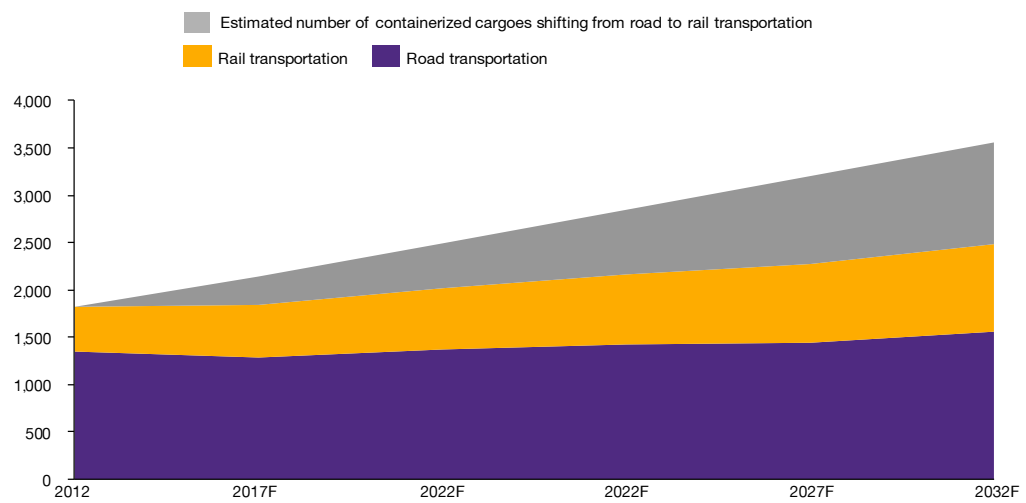


Source: EIC analysis based on data from OTP

27 With an efficient transit between ports and rails, more business operators are expected to shift 1.1 million TEUs of shipments to rail transport by 2032

Estimated Volume of Containerized Cargo Transported from Inland Container Depot Lard Krabang to Laem Chabang Port

Unit: Million TEU



Source: EIC analysis based on data from OTP

Likewise, logistics service providers can utilize inland waterways and coastal waterways to reduce transport costs. For now, water transport is not used much, even though it is the cheapest mode, costing only 0.64 baht per ton per km, or 45% cheaper than rail transport and 300% cheaper than road transport. Several problems have impeded inland water transport such as shallow waterways during dry season and riverbank erosion. As a result, domestic water transport only accounts for 15% of all domestic transport. Nonetheless, after the Coastal terminal port is finished and embankments of Pa Sak River are reinforced, EIC expects inland and coastal water transport to become a viable alternative, with lower cost and greater capacity for large shipment volumes. Moreover, Thailand has the geographical advantage of having rivers that run through every region, as well as more than 2,000 kilometers of seacoast. Water transport networks can thus be developed to interconnect the nation's East, Central, West and South regions.

EIC believes that three water transport options are the most beneficial and workable: 1) From Pa Sak River to Chao Phraya River, onward to Bangkok port and Laem Chabang port. This route is most suitable for rice, sugar, and tapioca, which are grown mainly in the Pa Sak and Chaophraya river basins. 2) Along the coast between Laem Chabang port and Bangkok port. This option is not only less costly, but also faster, because it avoids road congestion at the entrance to Laem Chabang. 3) Up along the southern coast, such as from Song Khla port or Surat Thani port, then transfer onto bigger ships at Laem Chabang for distribution to other parts of the country or export. Goods suitable for this option include rubber, wood and furniture, because these are hinterland goods with high export volume, high weight and little urgency.

28 แนวทางการขนส่งสินค้าทางน้ำ ภายในประเทศที่มีความเป็นไปได้ 3 รูปแบบ

Source: EIC Analysis

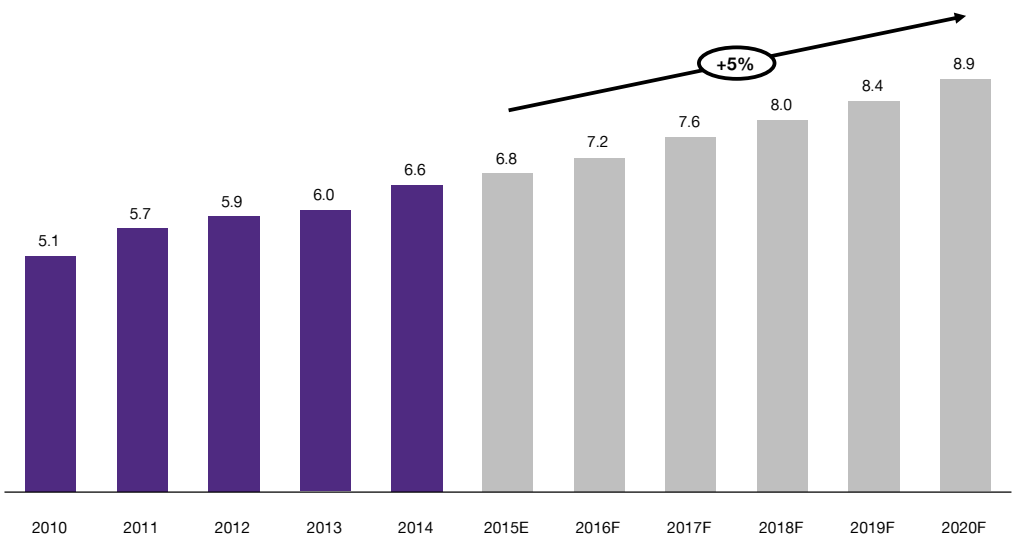
However, a few problems with water transportation remain to be tackled. For example, the areas surrounding some ports, such as Song Khla port, have only limited space for development. As such, businesses ought to consider all aspects carefully in order to choose the most appropriate transport options.

Warehouses and distribution centers will also benefit from the development of ports. EIC estimates that by 2020, the volume of imports and exports at Laem Chabang will reach 9 million TEUs per year. This would require 3-5 million square-meters of additional warehousing space, a prime opportunity for such businesses. They should find locations near the ports and manufacturing centers, in order to facilitate transportation of goods from ports to other regions. Potential locations include Chachoengsao Province, situated strategically between Laem Chabang Port and Ayutthaya Province, a manufacturing hub; and Hat Yai District, located near the two ports in Song Khla Province, and well connected to the southern region as well as neighboring Malaysia.

29 By 2020, the volume of imports and exports at Laem Chabang port with reach 9 million TEUs per year

Projected Volume of Cargo Handled at Laem Chabang Port, Per Annum

Unit: Million TEU

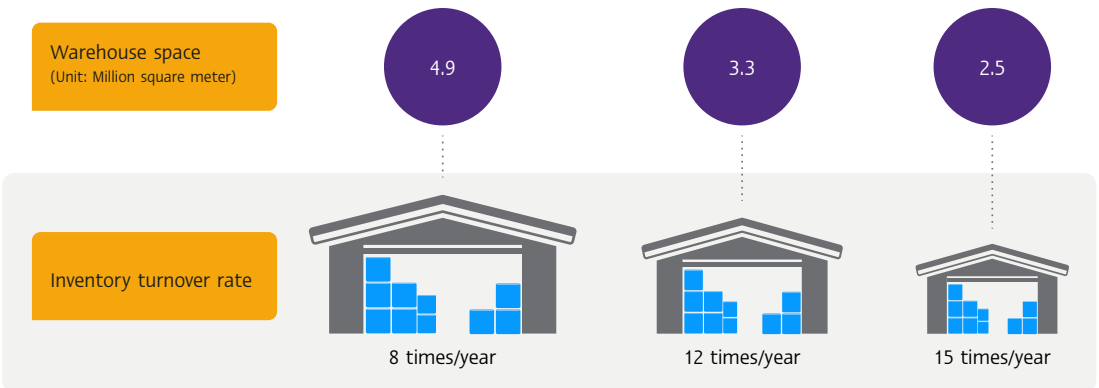


Source: EIC Analysis based on data from Port Authority of Thailand (PAT)

30 By 2020, 3-5 million square-meter of additional warehouse space will be needed to accommodate the rising volume of goods at Laem Chabang port

Estimated Warehouse Space to Accommodate Goods and Containers at Laem Chabang Port

Unit: Million square meter



Source: EIC Analysis based on data from Avison Young.

Development of water transport infrastructure will also benefit the shipbuilding and ship maintenance businesses, which could have high growth potential if supported by the government. Shipbuilding is a large industry with potentially huge economic benefits. For example, in South Korea, the industry generates over $30 billion per year, or as much as 10% of GDP. In Thailand, however, shipbuilders are only capable of building smaller ships that accommodate 20,000 tons of cargo, or around 1,300 TEUs containers. Vietnam has greater capacity for building large ships, with capacities between 30,000 and 100,000 tons of goods, or up to 2,000-7,000 TEUs containers. Thus, in order to be able to compete internationally, Thai businesses should focus on the following three markets: 1) Ship maintenance. Thai workers are more skilled at maintenance work than at shipbuilding. Moreover, since large-scale shipbuilding requires high-level technology, Thai businesses could be at a disadvantage compared to competitors that are better equipped. 2) Ships for special purposes. If Thai businesses want to enter the shipbuilding industry, they should focus on the ships for special purposes, such as offshore patrol vessels, or coastal petroleum tankers commonly used for domestic transportation of petroleum. 3) Small ships for domestic water transport, which are within the capacity of Thai workers and shipyards. In the long run, the government should support the industry through various measures, such as organizing roadshows to demonstrate the potential of Thai shipyards and maintenance services, or financing research and development of shipbuilding technology, in order to foster sustainable growth of this industry.

Import and export industries stand to benefit from more efficient water transport. Today's congestion at the entrance of Laem Chabang port and overcrowding at other ports are causing delays in imports and exports, leading to tremendous opportunity costs. According to Chulalongkorn University's study of traffic at Laem Chabang port, morning and evening congestion can last as long as 1.5-2 hours, causing up to 42,000 baht of opportunity cost per hour, based on an opportunity cost of 300 baht per hour per truck.

Nevertheless, some industries, such as trucking, may lose out. As businesses depend less on road transport and more on water transport, trucking companies will lose some market share. The Ministry of Transport expects that within 2020, development of water transport infrastructure will raise the share of domestic water and coastal transport to 20%, up from 15% today. Thus truckers will need to adjust their strategies. For example, they can specialize in providing feeder service on shorter routes, connecting other modes of logistics.

These are the impacts of the new development of ports. Some sectors stand to benefit, such as construction, transportation and logistics, shipbuilding and maintenance, as well as importers and exporters. But a few others, such as trucking companies, may lose out. Thus businesses should pay close attention to progress of these developments and grasp whatever opportunities they can.

BOX: Singapore writes its own success story as trade hub

Although Singapore is a small country, its ports play a crucial role in global trade thanks to its strategic location. Singapore expects to handle over 29 million TEUs containers, or around 6% of global water transport, in 2015. These shipments arrive in Singapore to be distributed to various regions around the world, making it the world's largest and most important hub for transshipment of containers. The shipping industry and related businesses play a vital role in the domestic economy, providing over 170,000 jobs and produce up to 7% of GDP.

Five other factors besides location give Singapore its logistics edge:

1) High-quality infrastructure The Port of Singapore Authority Corporation (PSA Corporation) has developed four ports that can accommodate all types of ships and shipments, and receive up to 35,000 TEUs containers at a time. Other supporting facilities have also been optimized, including large cranes for transferring cargo to and from large ocean liners and over 500,000 square-meters of warehouse and distribution center space to facilitate massive imports and exports. These warehouses provide shipment preparation services, including tagging, packaging, and product quality control.

2) Advanced technology and management systems for highly effective service. The PSA's PortNet system tracks ships and provides notifications of arrivals and departures, shipment volumes and positioning of containers on board, so that staff can plan ahead for more efficient transfer of goods using Computer Integrated Terminal Operations System

(CITOS). Remote-control systems for cranes allows each operator to control over six cranes at the same time via real-time video camera, enhancing efficiency and safety.

3) Human resource quality PSA emphasizes human resource development. Employees receive over 50 hours of training each year, along with special customer training such as "key customer manager course" that enhances managers' understanding of customers' needs.

4) Tax incentives The government provides tax incentives to bring in shipping businesses, such as exemption of corporate income tax for shipping companies and their crews, and priority berth for companies registered in Singapore.

5) Corporate independence In 1997, the ports of Singapore were privatized as PSA Corporation, responsible for the management of all ports. The Maritime Port Authority (MPA), a government agency in charge of water transport policy and planning, administers port regulations. By standing on its own as a corporation rather than government agency, PSA can operate at maximum efficiency.

Because Singapore has an optimal location and all essential infrastructure in place, shipping companies favor its ports. This infrastructure includes new technology, strong human resources and attractive tax incentives. Singapore has built upon its geographic advantage to become one of the world's most important centers for trade.

5

Moving on: transport investment push will create both pressures and gains

The coming transport projects will have indirect impacts on a wide range of businesses and the overall economy in both the short- and long-term. Macroeconomic benefits will come from increased public investment, later followed by private investment that will result from the "crowding-in" effect. Yet public investment must stay aligned with fiscal discipline and heed the public debt ceiling. We expect that rail transport will increase demand for electricity while air and water transport will lift usage of petroleum, causing an overall rise in Thailand's energy consumption. Increasing urbanization will likely shift labor from farming to the service sector. More sophisticated transportation and logistics systems will increase Thailand's reliance on information technology togather, transmit and process large flows of data more efficiently. The transport revamp will ultimately give Thailand the opportunity to develop into a regional logistics and transportation hub in the future.

The proposed infrastructure projects will generate business and investment opportunities worth at least 2.2 trillion baht. Thailand's freight and passenger transport will be dramatically transformed in the coming decade, with unprecedented long-term impacts. EIC estimates that new transportation infrastructure will have five major impacts on the Thai economy and businesses during the next 5-10 years:

1) Public investment in infrastructure projects will significantly lower transportation costs and stimulate more private investment, as long as fiscal discipline remains steady.

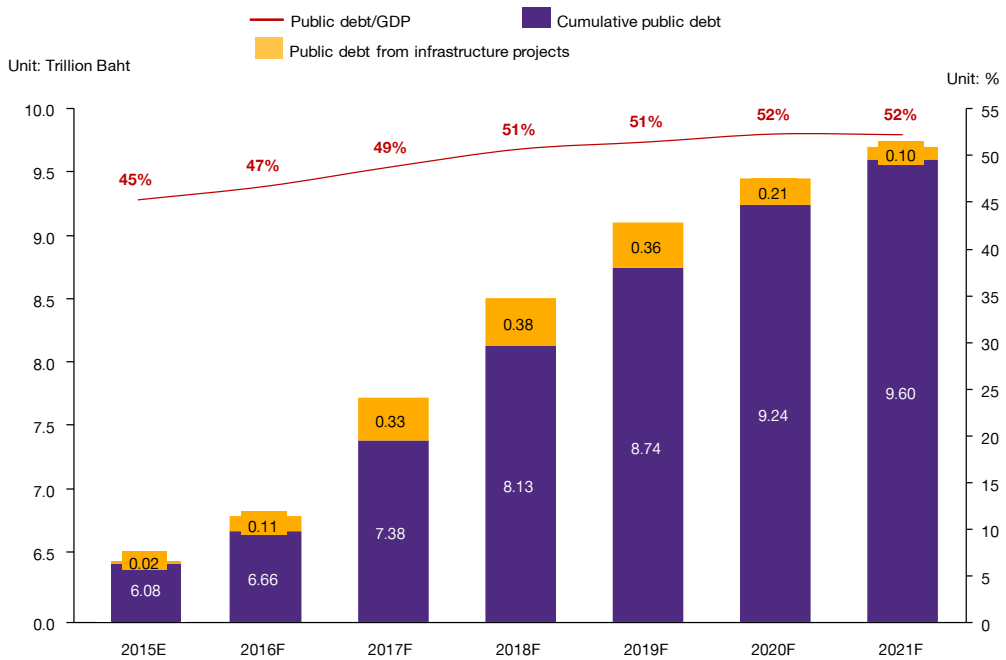
Infrastructure megaprojects do indeed require tremendous public spending and investment. The pay-off is short-term stimulus from construction work and long-term gains from reducing logistics costs as well as from "crowding in" many types of private investment. In the first round of benefits, government spending on the projects will enter the economy through the construction contracting sector and construction materials sector as well as the service and consumer goods sector. This will generate economic stimulus through public investment, employment, production and private consumption. EIC expects that about 200-500 billion baht will be invested during the first four years of the projects, boosting annual GDP growth by 0.3% - 1.0% each year. Then comes the second-round effect as public investment produces a crowding-in effect on private investment, both during and after construction. Crowding-in means that higher public spending creates higher demand for products, prompting industry to invest more in order to produce more. Credit Suisse found that a 10% increase in investment in infrastructure projects raises private investment by 3% within the following six months. In addition, higher efficiency will lower transportation and logistics costs from 14.2% of GDP to 12.2% of GDP, at a low level comparable to the average among European countries.

Nonetheless, the investment in megaprojects will increase public debt, while imports of goods and raw materials will affect the nation's balance of payments. These effects are not, however, likely to be a worry. A large proportion of the investment will be financed under the Public Debt Act. This would affect the country's fiscal discipline, which has so far helped maintain economic stability by capping public debt at 60% of GDP. But EIC estimates that debt from the new projects, combined with existing debt, will not exceed 52% of GDP during the period of construction. Moreover, if some financing is managed through public-private partnerships or an infrastructure fund, the debt-to-GDP ratio will be less. As for the balance of payments, EIC expects that 10-60 billion baht worth of capital goods will need to be imported for the projects during each year of construction. This would have only a small impact on Thailand's trade balance, which has averaged a surplus of 535 billion baht during 2010-2014. EIC thus predicts that the capital goods imports would have a limited effect on the balance of payment.

Finally, the investment will likely have both short-term and long-term effects on interest rates, especially for projects financed by the private sector, which will increase competition for and demand for loans. This will put pressure on interest rates to rise, which is a situation that both the government and the private sector should watch out for.

31 Throughout the construction period, the nation's ratio of debt to GDP - including both new debt from the projects and accumulated debt - will likely be within the country's fiscal sustainability framework.

Public-debt-to-GDP ratio



Remark: Source of funding excludes government's annual budget and PPP
Source: EIC Analysis based on data from the Public Debt Management Office (PDMO)

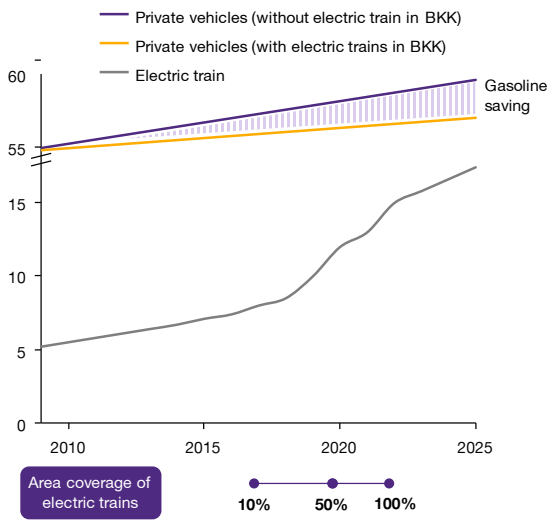
2) Domestic energy consumption will likely increase. The new airport and seaport projects will raise demand for petroleum, while expansion of electric rail systems will raise demand for electricity.

Development of the transport infrastructure will inevitably raise consumption of oil and electricity. EIC estimates that by 2025 the number of flights in and out of Suvarnabhumi Airport, Don Mueang Airport, and Phuket Airport will rise to about 280,000 per year. This will spur a 50% increase in demand for jet fuel, from 36 million barrels in 2015 (90 billion baht per year) to 54 million barrels in 2025 (132 billion baht per year), for average annual growth of 4%. Similarly, the development of seaports will boost demand for fuel oil, a main petroleum product, from 5 million barrels in 2015 (6.7 billion baht per year) to 10 million barrels in 2025 (13 billion baht per year), for average annual growth of 7%. Electricity demand will grow from the development of city rail systems in the Bangkok Metropolitan Region. EIC expects that the 10 new lines will add 300 megawatts to existing electric demand, which would require at least 10 additional substations for power storage and for boosting the voltage required for effective transmission. On the other hand, when the city rail network is complete, many people will likely shift from travel by car to instead use the transit system, which will lead to a 3% reduction in personal car usage per year, or about 70 million liters of gasoline (2.1 billion baht) per year by 2025.

32 The expansion of the city rail network will reduce personal car usage and about 70 liters of oil consumption per year by 2025.

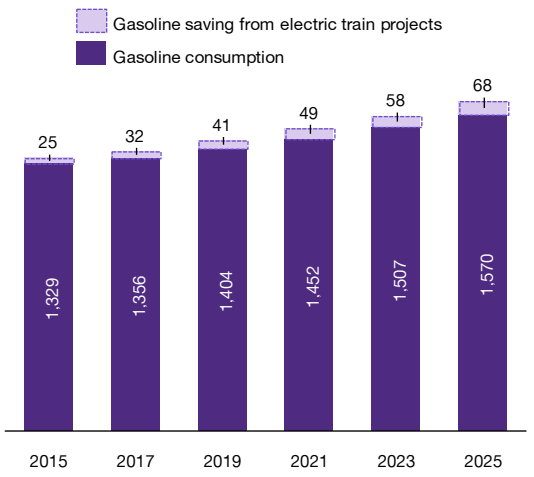
Transport Mode Share in Bangkok

Unit:%



Gasoline Consumption by Private Vehicles in Bangkok

Unit: Mn Liter/year

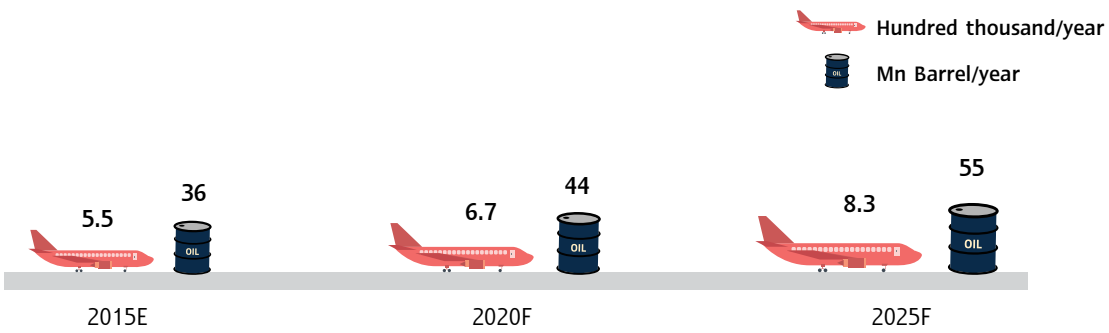


Source: EIC analysis based on data from Ministry of Transport

Energy entrepreneurs should prepare to expand their businesses to meet the growing demand. Sellers of jet fuel (for air transportation) and fuel oil (for water transportation) should start looking into building large oil storage terminals to meet rising demand. They should also track oil prices closely and get appropriate oil-price hedges. Electric power businesses should closely follow progress of the city rail plan and look for opportunities in the power plant and substation parts of the project.

33 By 2025, jet fuel consumption will likely grow 50% from 2015, an average annual growth of 4%

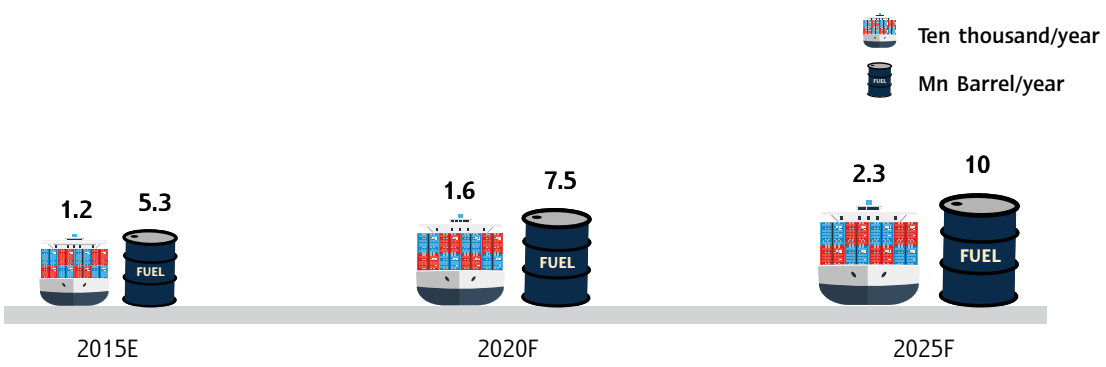
Projection of Jet Fuel Consumption in Thailand



Source: EIC Analysis based on data from the Office of Transport and Traffic Policy and Planning

34 By 2025, consumption of fuel oil used in freighters will grow about 100% from 2015, an average annual growth of 7%

Forecast of Marine Fuel Consumption in Thailand



Source: EIC analysis based on data from EPPO and PTT

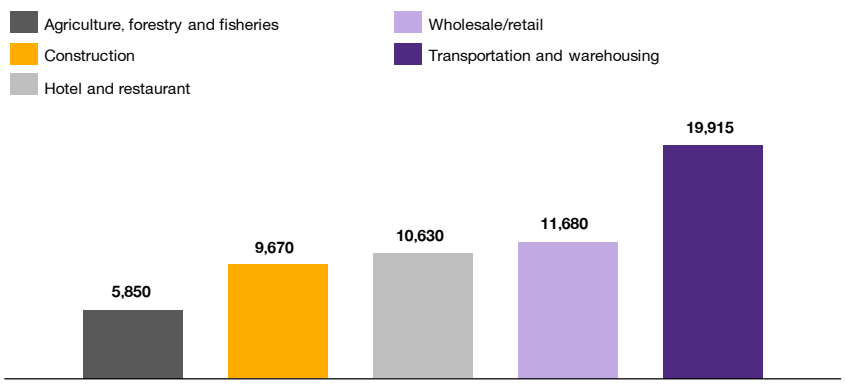
3) Farm workers will likely move into the service sector following development of the regional rail system

The growth of business in provincial cities along the double-track railways will likely draw labor out of the agricultural sector and into the service sector. EIC forecasts substantial expansion of retail businesses such as hypermarkets and supermarkets as well as hotels and restaurants. These businesses will need more labor and can provide compensation that is about 2-4 times higher than the agricultural sector. Unlike farming, jobs in these sectors face little risk from uncertain weather, natural disasters or volatile agricultural prices. Thus, these provide strong incentives for labors in the agricultural sector to move to the service sector.

35 The average wages of service sectors are many folds higher than the average wage in the agricultural sector

Average Salary in Each Sector

Unit: Baht/month



Source: EIC Analysis based on data from Bank of Thailand (BOT)

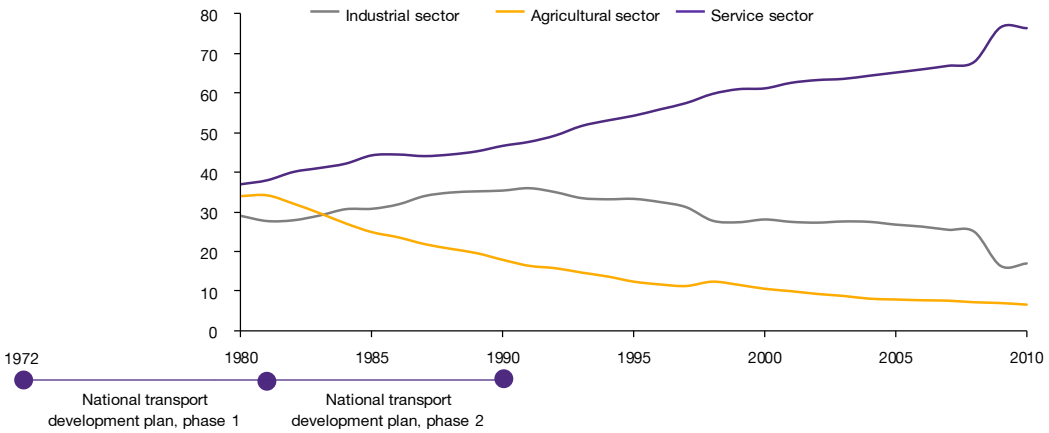
A case study of more developed nations like South Korea shows that infrastructure development tends to speed up the transition of labor from agriculture to the industrial and service sectors. During Korea's infrastructure boom in the 1980s, the nation's share of labor in the agriculture sector was still only slightly lower than the share in the service sector, at 35%. But when the infrastructure was completed, many of these workers started to leave farming to take jobs in service businesses. This dragged the share of labor in agriculture below 10% and increased the ratio in the service sector to above 70%.

Structural change of the labor force will pose a challenge that will require counter-measures to prevent shortages in farming. In South Korea, machinery replaced human labor in agriculture, increasing output growth to 2.6% per year on average during 1970-2009. This increase in agricultural productivity was the third highest in Asia after China and Pakistan, and it helped ease the impact of labor shortages. Thailand can use a similar strategy to tackle the labor transition problem by using innovation and technology to increase productivity as well as research in crop breeding to increase value-added of farm products.

36 Extensive infrastructure developments aggravated the labor transition from agriculture to service sector

Proportion of Employment in Main Sectors in South Korea, 1980-2010

Unit: %



Source: EIC analysis based on data from the World Bank

4) Information technology will become crucial to logistics systems in the future

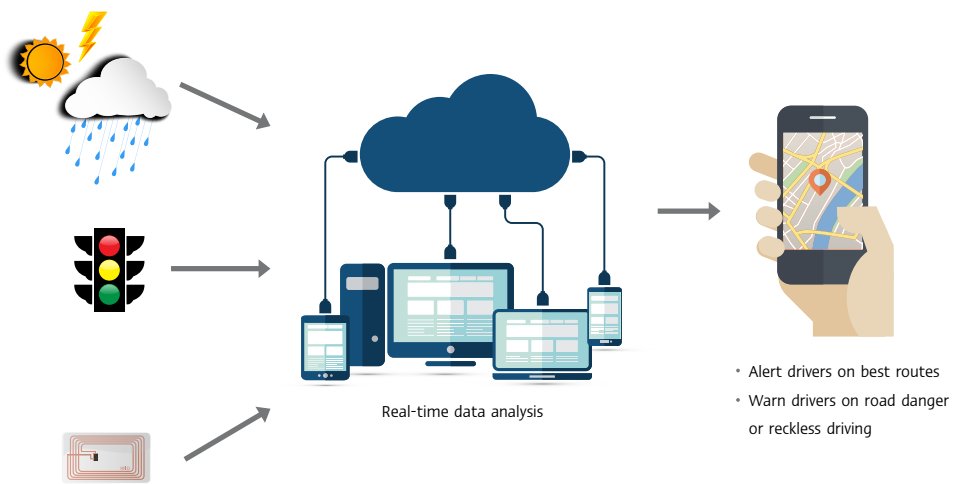
Both service providers and consumers will use technology to enhance the efficiency and reliability of logistics systems. Information technology (IT) is already integral to the current system of transport and logistics. Examples are the global positioning system (GPS), used for real-time tracking of the location, speed and capacity of a vehicle carrying passengers and goods, or warehouse management systems (WMS) that increases efficiency and accuracy in product storage. Nevertheless, improvements in all transport modes, including rail, air and water, will create a more complex and diversified transport system that will require an upgrade of related IT systems. IT will be required to handle larger data transmissions and faster and more precise data processing in order to speed up delivery of goods from producers to end-users. For example, IT integration is helpful in planning transportation routes and schedules, evaluating performance and calculating service fees.

As for public transport, common ticketing systems are an example of technology that shares massive amounts of data at high speed. A common ticketing system centralizes the management of multiple public transport passes, such as rail and water transport tickets, and tolls for expressways, by combining them into a single card. In this type of system, IT supports data transmissions from ticket scanning machines to the central clearing house, and links up to banking systems to channel deposits of collected fees into service providers' accounts. Thus a powerful data processing system with large storage capacity is needed to provide fast response time of less than 0.3 seconds, at the ticket scan, and to facilitate data flows of at least 1 million transactions per day.

Technology of the emerging "Internet of Things," or IoT, will likely play a bigger role in improving the distribution of goods. IoT refers to the systems that connects all types of products, devices, machines, and vehicles via the Internet, and is now being used to track cargo. A good example of the application of IoTin transport and logisitcs involves connecting RFID (radio-frequency identification) chips, which attached with cargoes, with the internet. This enables the business owners to identify, track and monitor the cargoes globally and in real time. IoT also provides weather forecasts and traffic information that help drivers avoid congested routes. It even evaluates driving behavior. The system is a good example of integrating existing technology with the Internet to help business owners monitor and optimize distribution channels.

37 IoT will enable business owners to be able to monitor and optimize distribution channels.

Application of IoT in Transportation



Source: EIC analysis

Although these transport innovations will impose short-term costs on business owners, the investment will pay off in time. Technology now plays a large role in improving transport services by reducing costs and time. Innovation can also substantially raise businesses' capabilities in cargo transport and logistics planning. For instance, UPS, the global parcel service, has been collecting delivery data since the early 1980s. UPS has deployed "big data" analysis to study its 1.6 million gigabyte database at a cost of 200-300 million dollars. This process helped UPS streamline delivery routes, which saved 1.5 million gallons of gasoline in 2013. The project will be expanded to cover all delivery areas in the United States by 2017, saving $50 million per year.

5) New infrastructure likely to position Thailand as the region's logistics hub in the future

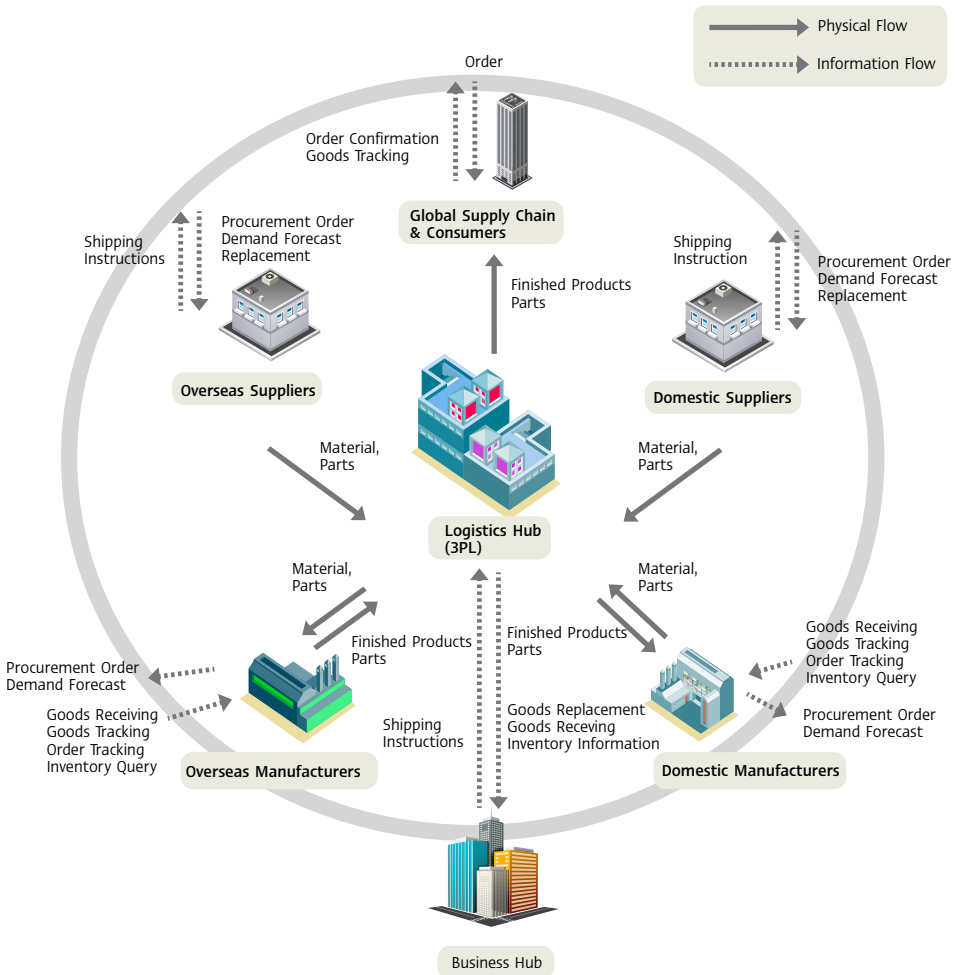
A logistics and transportation hub needs good transport infrastructure as well as integration of different transportation modes and strong human resources. Infrastructure development will improve the quality of domestic transportation services and advance toward Thailand's goal of becoming the region's logistics and transportation hub.

Existing infrastructure and the nation's central location already give Thailand an advantage. But EIC believes that three other factors need to be put in place. Thailand should: 1) develop multimodal transport systems to be used domestically and internationally. This will smooth the transition between rail, water and air logistics and ease the distribution of goods via multiple modes, 2) introduce measures to promote businesses in trade and logistics, such as tax incentives to foreign investors, and 3) improve academic and language skills to reach or surpass regional standards.

Becoming a regional logistics hub will open doors for Thailand to become a center for product distribution, trade and finance. Economies of speed and economies of scale will lower the prices of domestically produced goods. This will boost Thailand's trade competitiveness, increase income and advance Thailand's capacity as a new center for trade and finance.

The private sector should seize this opportunity to expand supply chain networks in order to create value-added when Thailand becomes a logistics hub. If Thai suppliers miss this opportunity, Thailand will merely serve as a point of transit to neighboring countries. EIC believes that Thai business owners should build on the benefits of having a logistics hub and aim to become the region's center for production and trade. A similar case is Taiwan, which developed an integrated logistics and business hub development project during 2004-2008. The project brought suppliers and tradesman closer together, helping them pool production and logistics information. For example, such information as plans for importing raw products and for logistics and warehousing of finished goods, helped many industries improved business results.

38 Integration of information and news from producers, distributors, consumers and stakeholders helped enhance the distribution and production efficiency in Taiwan



Source: EIC analysis based on data from "The Analysis and Development of Taiwan's Industrial Logistics Hub" by Trappey C.V. et al.

Infrastructure development across all modes of transport will ease personal travel and distribution of goods. In the short run, this will benefit the construction and construction materials industries. In the long term, it will create opportunities for logistics, property, wholesale and retail businesses as well as SMEs that are the future engines of growth. Nevertheless, such investments will pose a wide range of challenges, namely a fiscal burden, higher power consumption, a labor force transition and a need for better technology. It will take effort to become a logistics and transportation hub. These realities are key factors in Thailand's economic outlook. Both the public and private sectors need to prepare to adapt to changing circumstances in order to survive and attain sustainable growth.

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