

# **The 2<sup>nd</sup> Workshop on High-Speed Rail Operation for Safety and Reliability**

## **Railway Development Plan of Thailand**

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City University of Hong Kong

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National Science and Technology Development Agency

Ministry of Science and Technology

The Kingdom of Thailand

# Economic Background

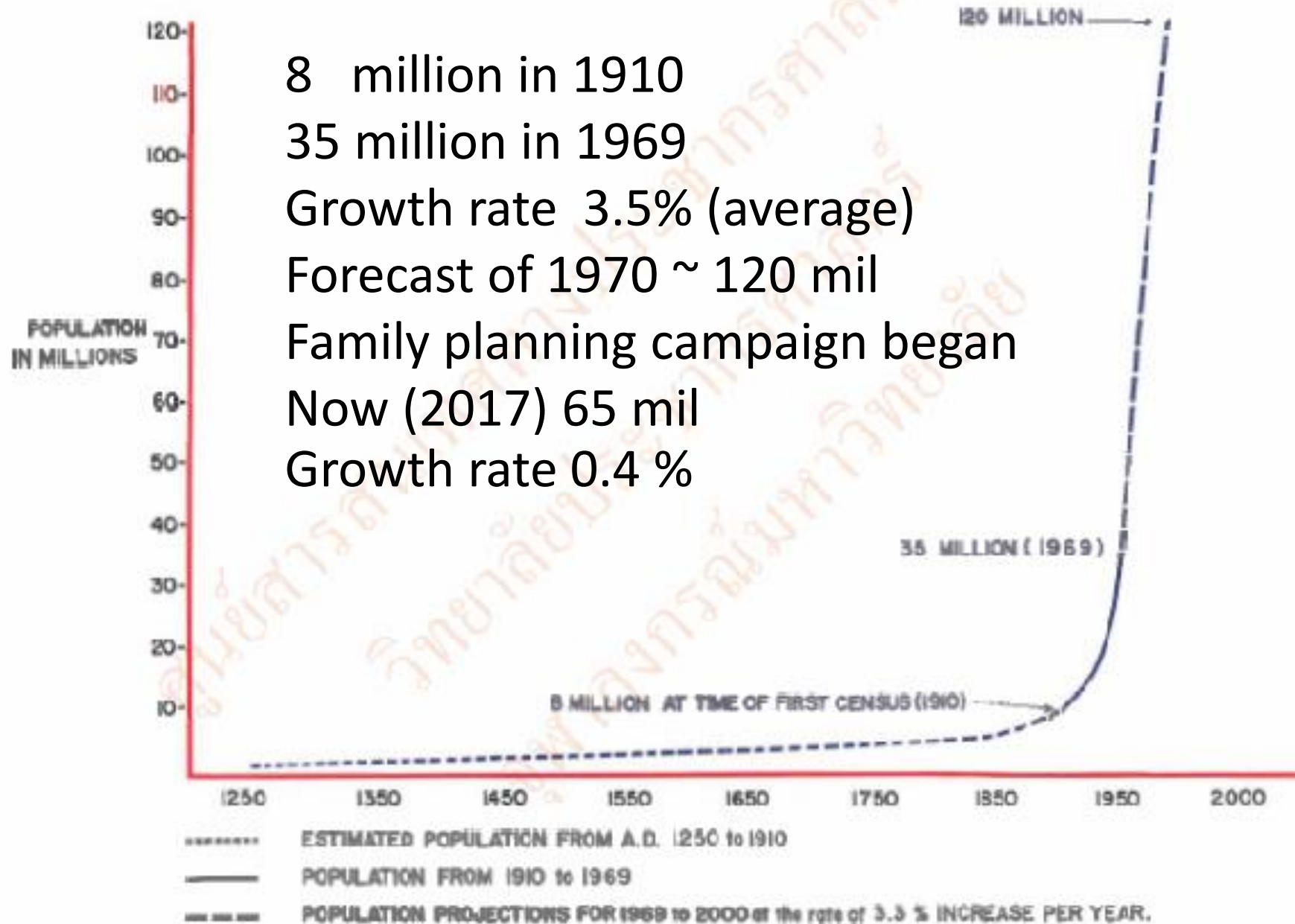


- **Area:** 513,115 sq.km.
- **Population:** 65,931,550
- **Density (average):** 132.1 person/sq.km
- **GDP:** 432.898 Billion USD
- **GDP/Capita:** 6,265 USD

# Sunset of Rail Transport in Thailand

- Railway Act 1951 (after WWII) and Its Impacts
- Expansion of Road Network
- Insufficient Budget for Rail Infrastructure Investment
- Population Growth and Settlement Characteristics
- Ribbon Development and Urban Population

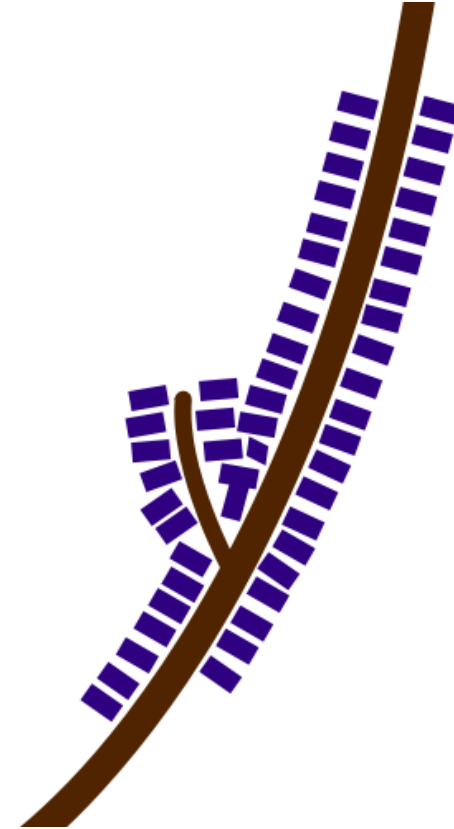
# Population growth by the time railway development has been halted



Ribbon Development > low urban population

## Urban population

Japan	66%	
France	76%	
UK	80%	
Germany	88%	
Spain	77%	
China	47%	(600 m. approx.)
Thailand	31%	
Vietnam	21%	



**“Scattered human settlement is not a place where public (mass) transport can appropriately function”**

# State Railway of Thailand (SRT)

## Over A Century of Existence

(1<sup>st</sup> line open since 1896)

- Single Line Railway
- Primitive and Unsafe Signalling System
- Deteriorated Infrastructure
- Slow Speed/ Speed Restriction
- Road Level Crossing Problems
- Inefficient **Total Integration** Organization
- Accident Prone Railway
- Huge Debt Burden awaiting Government Resolutions

# Existing Railway Network



Network (Meter Gauge) 4,043 km

— Single Track 3,685 km.

== Double Track 251 km.

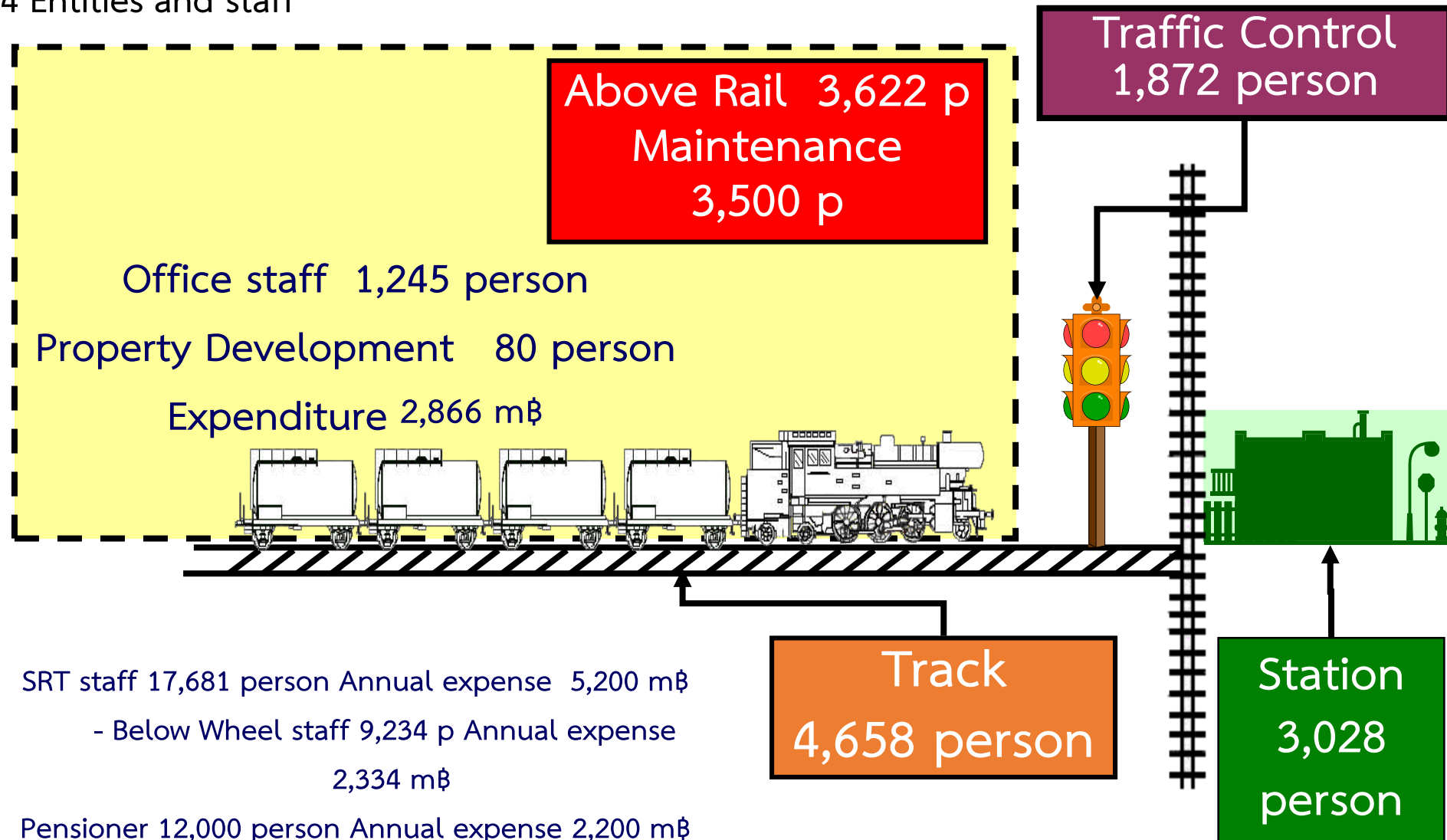
=== Triple Track 107 km.

Service area 47 Provinces

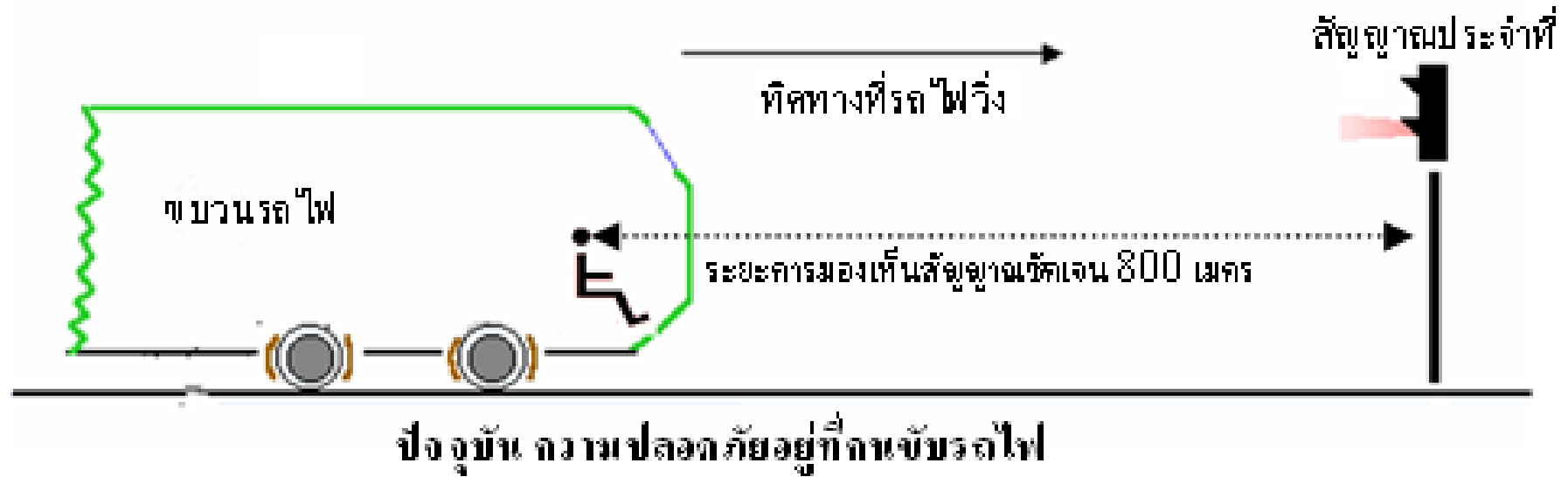
# Monolithic organization-no regulatory regime

## Current Management Structure

4 Entities and staff







การบังคับขบวนรถไฟอยู่ที่การมองเห็นสัญญาณ คือความหมาย และตัดสินใจบังคับขบวนรถไฟโดยไม่มีระบบอื่นสนับสนุนการทำงาน

A primitive signaling system with  
wayside and no track side back-up



# SRT Liabilities: year end September 2016

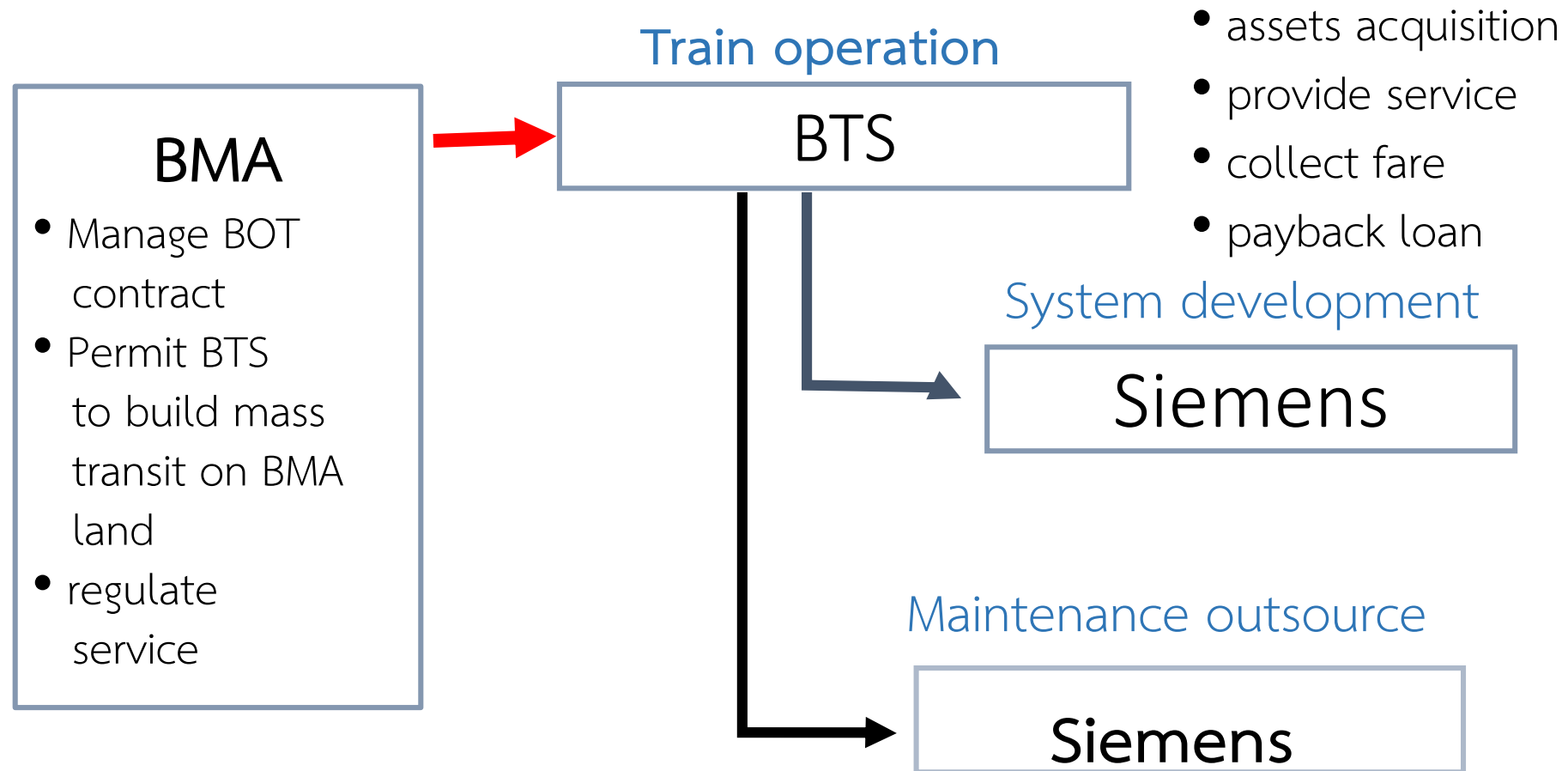
Local liability	143,082 mB
Foreign liability	35,603 mB
Total liability	178,685 mB
Loss in SRTET	20,000 mB
Grand total	198,685 mB

# **The Railway Renaissance:**

## **The Birth of Electrified Mass Transit System**

- Desperate need for better urban commute (traffic jam; long and unpredictable traveling time; inconvenient bus; expensive private car etc.)
- 1st Mass Transit line of Bangkok (BTS) in 1999 was a new face of metro rail transportation - thanks to the diligent and transparency of Major General Chamlong Srimuang, the then BKK Governor
- New technology – modern signalling system with automatic train protection and cab signal – guarantees safe operation
- New management structure (BOT) ensures efficient and safe operation
- BTS suffers financially for almost 15 years bearing all capital investment burden
- New contract (Gross Costs Contract) for the extended network together with favorable operating conditions makes BTS healthier

# BTS-BOT (ppp net costs) Business structure



# The Railway Renaissance:

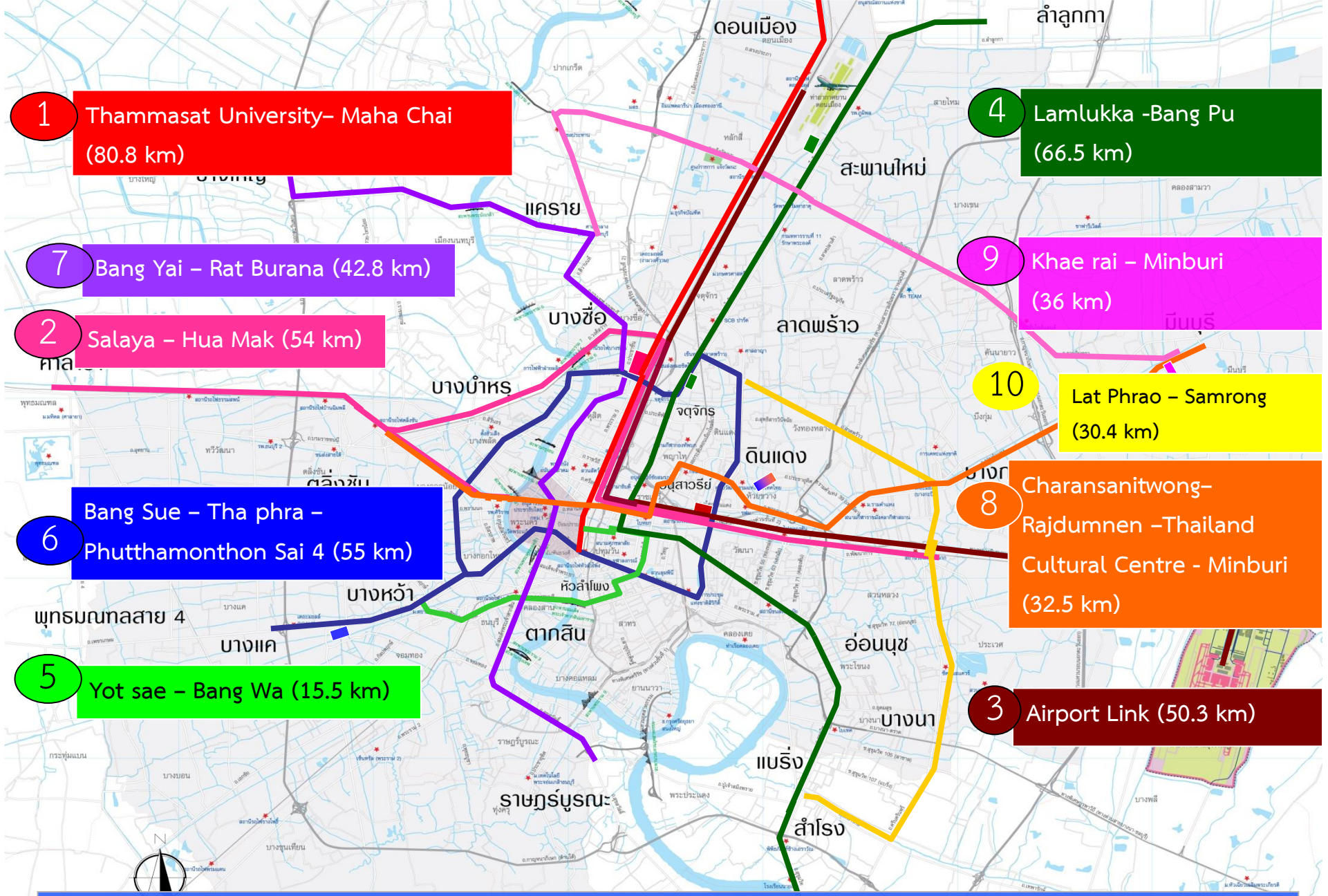
## More Mass Transit Line Plans

- MRTA, established in 1992, manages development of new lines in BKK
- The impetus of popularity gained makes mass transit more favourable. The BKK Urban Mass Transit Master Plan (URMAP), proposed in 2001, included 10 lines, totaling 375 km
- M-MAP, endorsed in 2010, incorporated URMAP lines and additional lines for the Metropolitan Bangkok, totaling 556 km, to be completed in 2029
- 2<sup>nd</sup> mass transit line – the first ever underground line - open in 2004
- Private operator and modern signaling ensure efficient and safe operation
- Concession agreement based on Net Costs Contract means operator bearing operating risk

# The Railway Renaissance:

## More Mass Transit Line Plans

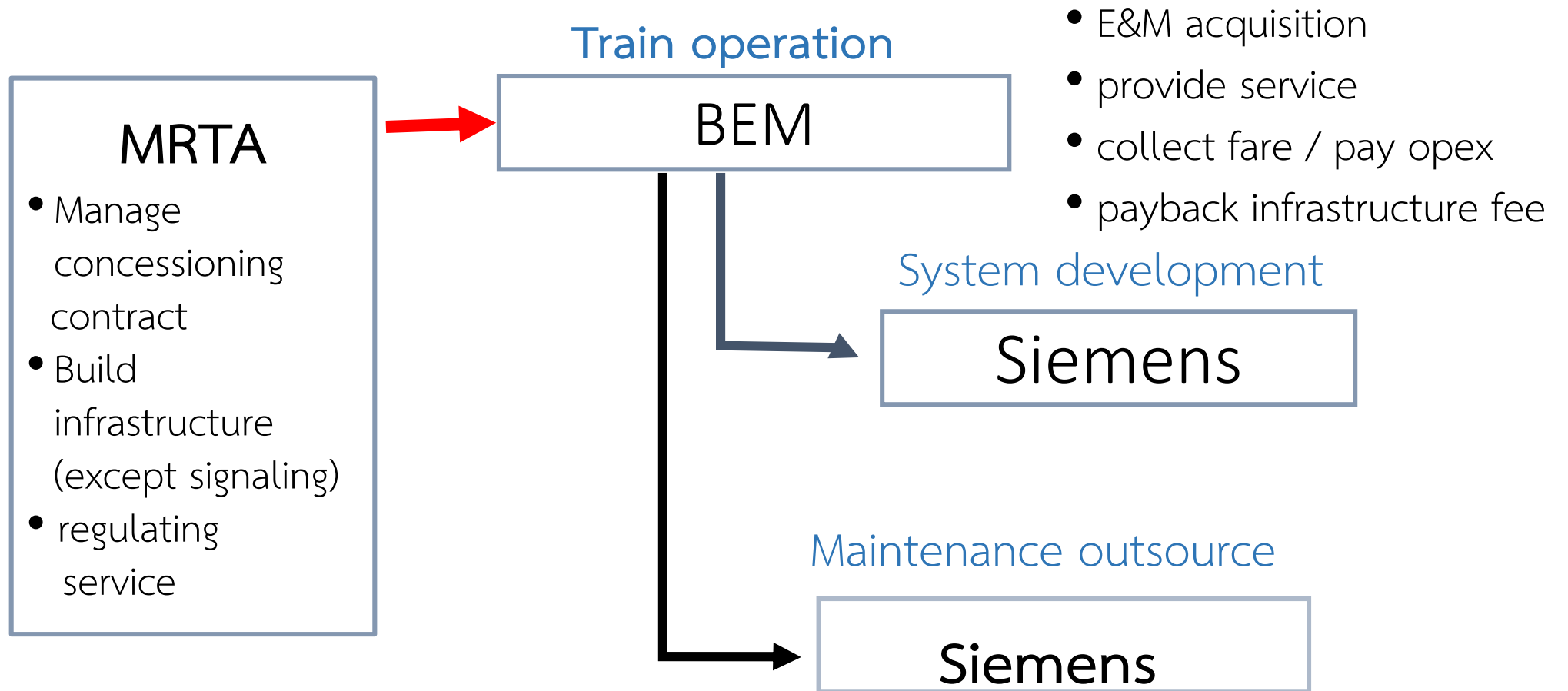
- BMCL, the operator, suffers accumulating loss over THB 10 billion before restructuring and amalgamation with BECL (express way operator) to become BEM
- BEM, the operator of newly open Purple line (2015), based on the past experience, signed a Gross Costs Contract to safeguard operating risk
- In order to get the contract under Article 44 of the interim Constitution for soon-to-open extension of Blue line, BEM accepts the Net Costs Contract hoping that complete network of Blue Line will bring overall benefits
- MRTA's first MONO Rail Lines – Pink and Yellow Line – were granted to BEM under PPP contract



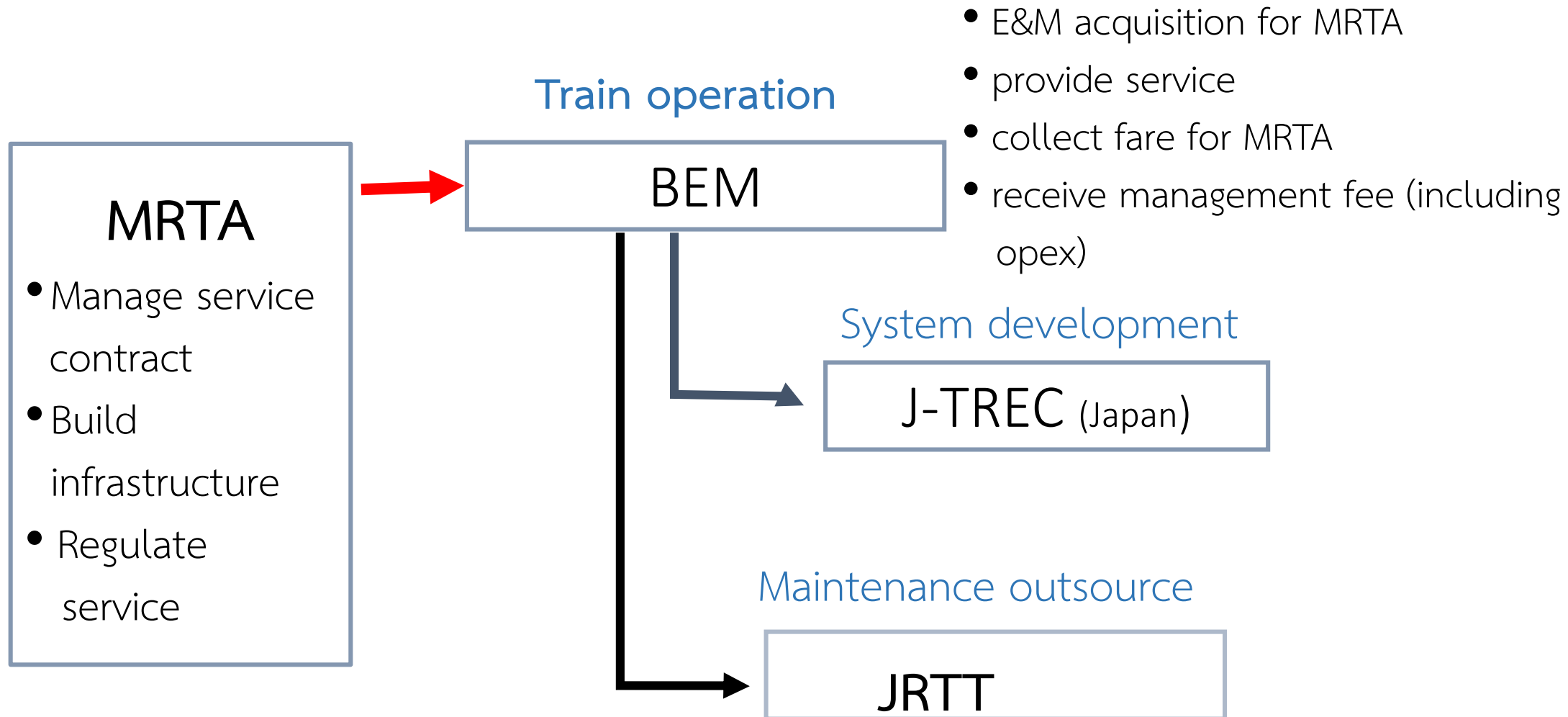
10 lines 464 km Bangkok Mass Transit plan



# BEM-ppp net costs business structure



# BEM-ppp gross costs (service contract) business structure (purple line)



# **The Railway Renaissance:**

## **Airport Rail Link**

- Open in 2009, Airport Rail link to Suvarnabhumi Airport is the first AC 24 kv overhead wire electrified line in Thailand
- SRTET, the operator, is a sister company of the national state enterprise SRT
- Design and Built approach incorporated modern technology hence considerably safe system, yet service offered has been rather unreliable
- Under the circumstances, ARL has around THB 20 billion accumulated loss causing further accumulated debt of approx. THB 200 billion to SRT
- The new Eastern Economic Corridor (EEC) of the Thai government plans to incorporate ARL into the express line network connecting 3 Airports:  
Donmuang – Suvarnabhumi – U Tapao

# Existing : Open Services

Mo Chit – Onnut  
National Stadium – Taksin  
Bridge  
24 km



Bang Sue -  
Hualumphong  
20.8 km



Bang Sue – Taling Chan  
15 km

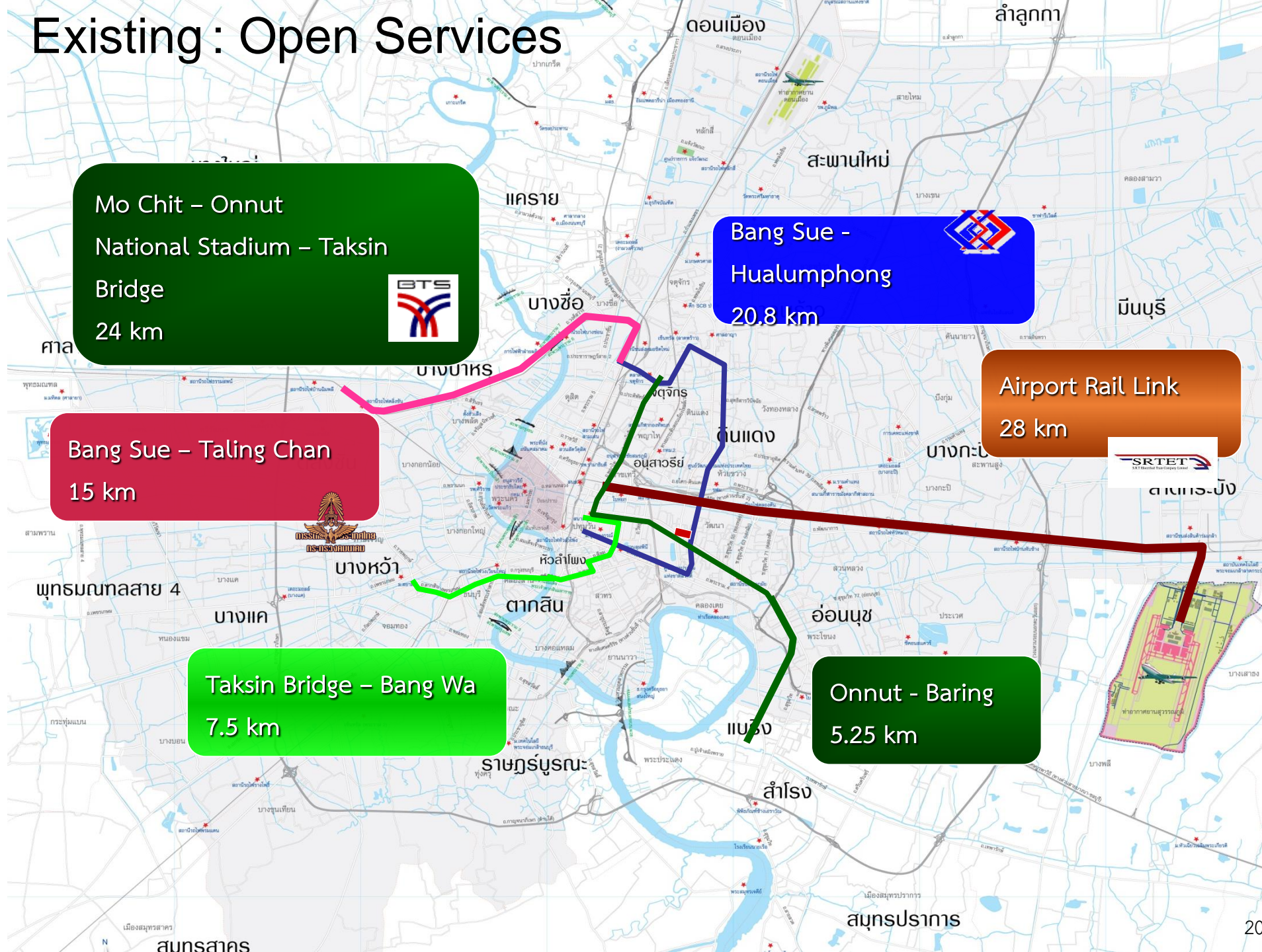


Airport Rail Link  
28 km

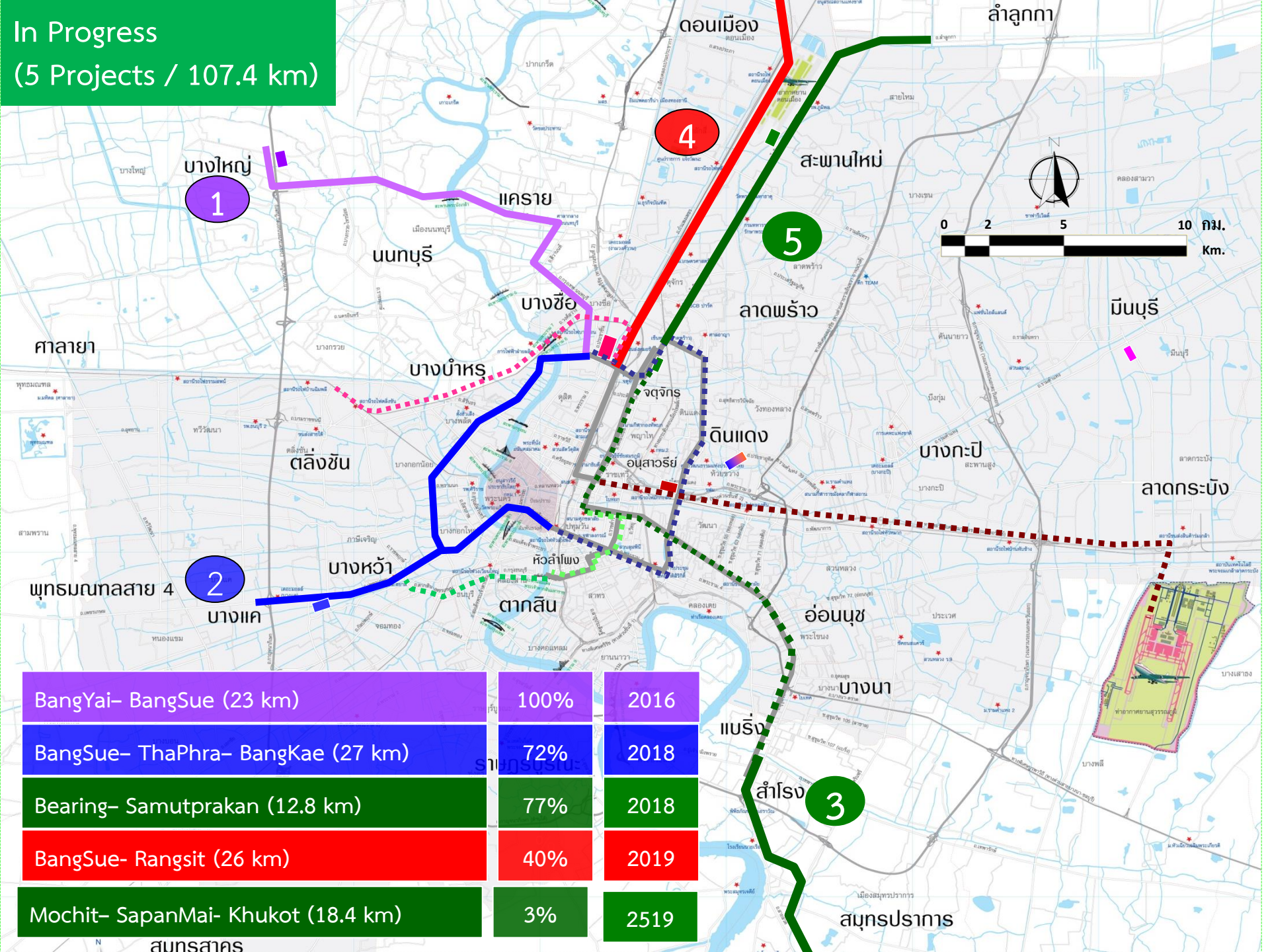


Taksin Bridge – Bang Wa  
7.5 km

Onnut - Baring  
5.25 km

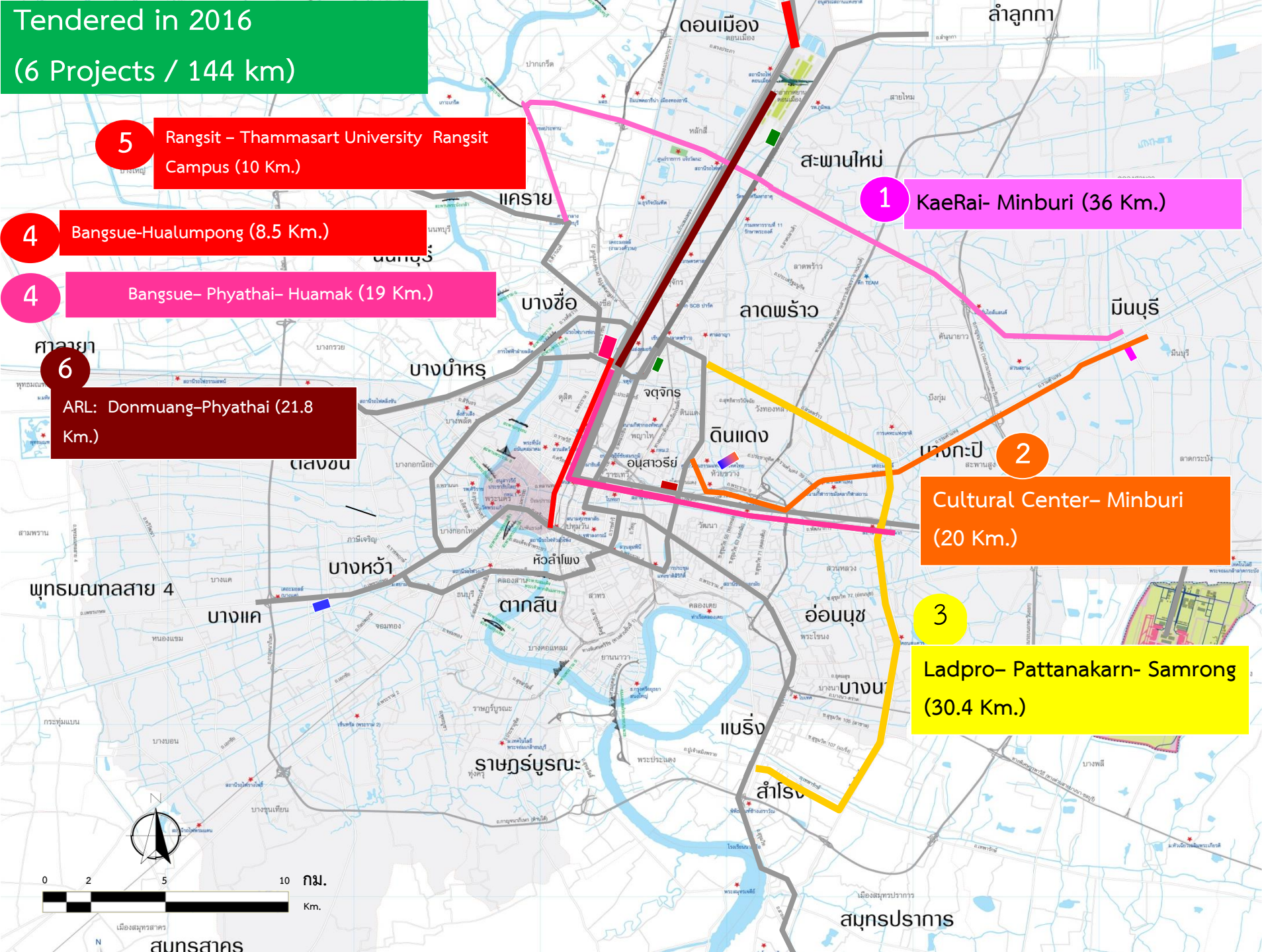


**In Progress**  
**(5 Projects / 107.4 km)**



BangYai- BangSue (23 km)	100%	2016
BangSue- ThaPhra- BangKae (27 km)	72%	2018
Bearing- Samutprakan (12.8 km)	77%	2018
BangSue- Rangsit (26 km)	40%	2019
Mochit- SapanMai- Khukot (18.4 km)	3%	2519

**Tendered in 2016**  
**(6 Projects / 144 km)**



**5** Rangsit – Thammasart University Rangsit Campus (10 Km.)

**4** Bangsue-Hualumpong (8.5 Km.)

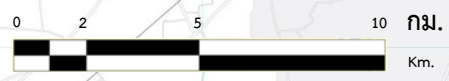
**4** Bangsue– Phyathai– Huamak (19 Km.)

**6** ARL: Donmuang–Phyathai (21.8 Km.)

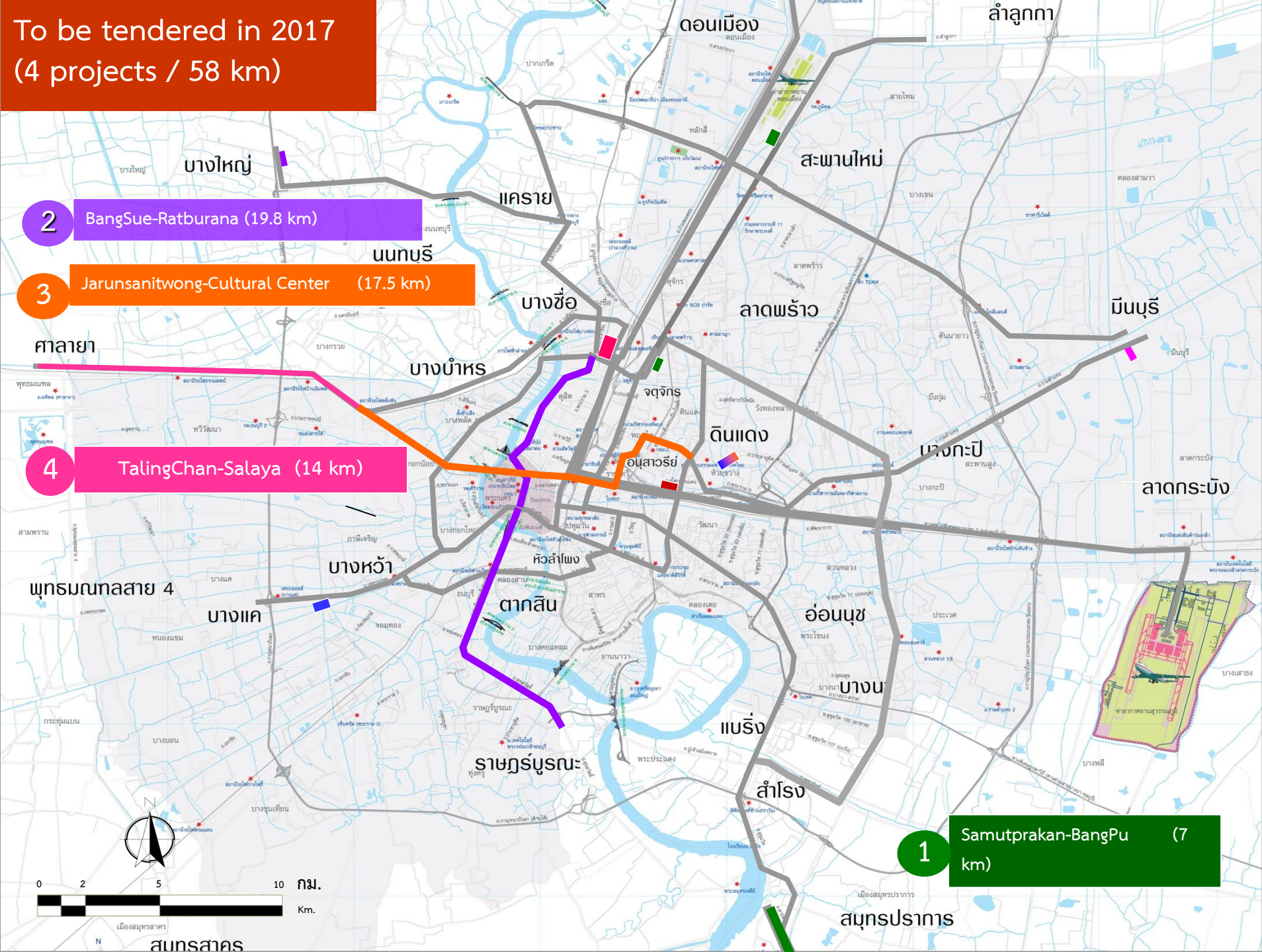
**1** Kae Rai- Minburi (36 Km.)

**2** Cultural Center– Minburi (20 Km.)

**3** Ladpro– Pattanakarn- Samrong (30.4 Km.)



To be tendered in 2017  
(4 projects / 58 km)



2 BangSue-Ratburana (19.8 km)

3 Jarunsanitwong-Cultural Center (17.5 km)

4 TalingChan-Salaya (14 km)

1 Samutprakan-BangPu (7 km)

# **The Railway Renaissance:**

## **Consumer's Point of View**

- Current investment scheme implies burden of capital costs from investment on operators causing high OPEX resulting in high ticket price which poses as access barrier for some
- Considerably poor service area coverage and connectivity
- Long awaiting common ticket not yet fully implemented
- Lack of TOD which requires long planning and developing period
- Car usage is considered relatively cheap thus more enforcement required if public transport, railway mass transit in particular, is to be the backbone of urban transport



# **The Railway Renaissance:**

## **The Yet to Realised Double Track Rail Project**

- Ironically, development of BKK mass transit has created trend for railway in passenger transport
- Thailand competitive stance measured by logistics index emphasizes the importance of freight transport by rail
- Long planed Double Track and new line projects gain impetus from the current ruling government
- Operating design speed will be raised to 160 km/hr while level crossing will be eliminated
- Elevated Red Line will remove at grade level crossings within BKK area
- Newly constructed lines indicate modernized train control system to ensure safety and reliability
- Yet challenges still await, mostly concern turn around of inefficiency and overwhelming liabilities for SRT

# The Investment Plan for Six Double Track Projects (Meter Gauge)

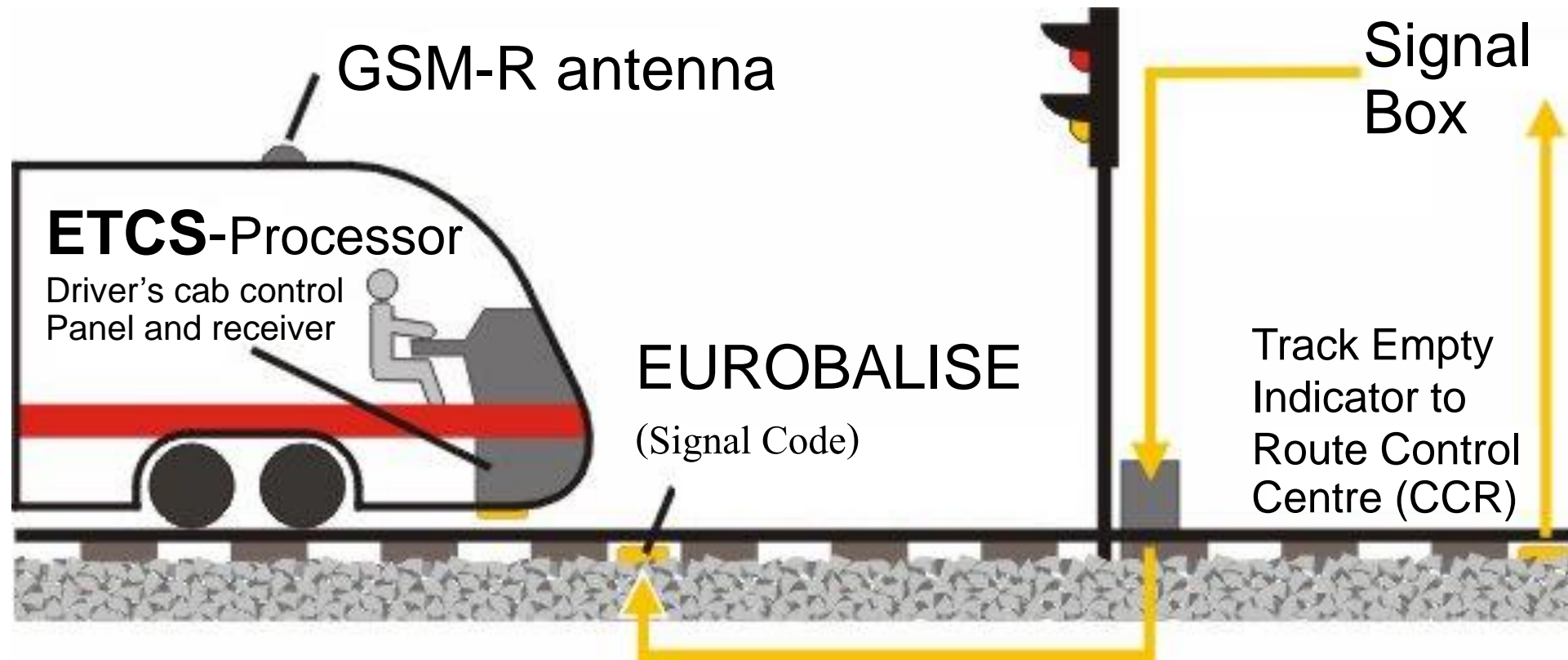


# Long term plan of track doubling projects



	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 Ratchathani	309	32,399
	4 Khon Kaen-Nong Khai	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

# Signaling for newly built track will be ETCS – Level 1



# High Speed Train in Thailand

**Feasibility study showed that the four studied routes were derived with projected low ridership and inviable rate of return on investments**

- Bangkok - Chaing Mai route, 749 km with approximately 42.6 billion baht
- Bangkok - Nakornrachasima route, 600 kilometers with approximately 410 billion Baht
- Bangkok - Hau Hin route, 211 km with approximately 98 billion Baht
- Bangkok - Rayong route, 194 km approximately 100 billion Baht



# Progress of HSR Projects

- Thai government has entered into a G2G agreement with the Chinese government
- BKK - Nakornrachsima (Phase 1 of Bangkok - Nongkhai route) route length of 253 km
- Total Budget 179 billion baht (1.7 billion baht for design work, 3.5 billion baht for project supervision, 113 billion baht for civil works and 66 billion baht for E&M)
- JICA is currently reviewing the HSR study of Bangkok - Chaing Mai route
- In the Eastern Economic Corridor (EEC) framework, the Thai govt wants to have HSR linking 3 International Airports and also wishes to invite private investment under the PPP scheme
- the government also wishes to invite private investment under the PPP scheme for Bangkok - Hauhain High-Speed Rail yet no apparent progress.

# The Railway Renaissance:

## The Challenge of High Speed Train

- Could HSR development get pass the development of a long time neglected and deteriorated conventional railway?
- Could a long time development car-oriented society be turned into railway-oriented overnight?
- Could a deep functional silo culture be turned into a more globalize awareness working culture?
- Could a sparse and scattered human settlement be shortly successful with rail transport especially HSR?
- How much would the government need for investment capital to allow people with current incomes to access the system? Should subsidy be needed for HST operation and if so, where would the compensation come from?

**Thank You**



**Create awareness:** Engineering point of view  
regarding safe operation of HSR

- High Technology involvement
- Small mistake can cause big trouble
- Derailment is disaster
- Need standard and good engineering practice
- Need time to establish foundation for safety

# ICE Crash 03.06.1998 Eschede



**Broken wheel tyre**

# Train accident in China 2011



**Following train hit the back of stationary train in front  
Under investigation**

Safety is vital for high speed operation

To establish foundation  
for standard and good engineering  
practice, time  
and elaborated training  
would be required

**Bottom line: High cost!!!!**

# **Railway Development Plan of Thailand :Abstract**

Despite over a century of railway existence in Thailand, its development path was disrupted by WWII and the change of status to that of state enterprise. Insufficient investment over a long period has resulted in a network of deteriorated mostly single track network with primitive signaling system and uncontrollable number of at grade crossings. Rail has fallen behind other modes of transportation until 1999 when the first electrified sky train came into operation serving midtown of Bangkok. Metro train has been perceived as efficient means for commute amidst the worsening metro traffic condition. The increasing demand for more electrified rail lines led to a more elaborated mass transit master plan and construction of many lines. Development of conventional long distant train has gained momentum as evident by the approval and construction of the Red Line and double tracks across the network. However, the development of high-speed train is still widely discussed with relations to cost of investment, technology, geographical and demographical aspects and financial viability of the project.