

# Challenges of Subway Operation by PPP in Seoul, Korea

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# Korea Transport Institute

# Korea Transport Institute

## Function and Role

### Research & Policy Institute on Transport and Logistics

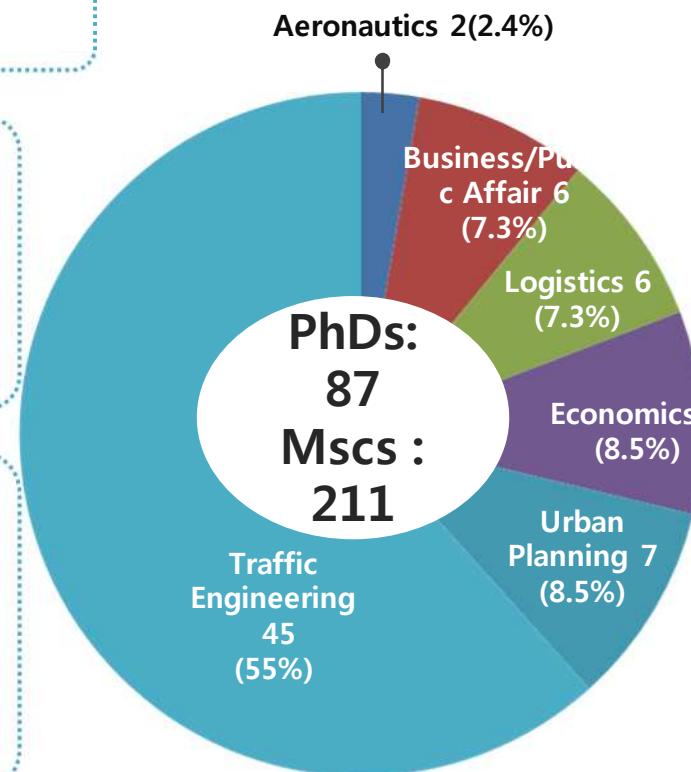
### Role as a National Think-Tank

- Developing transport strategies and future technologies to create a new growth engine

### Global Transport Cooperation

- Managing a Knowledge Sharing Program and promoting global cooperation

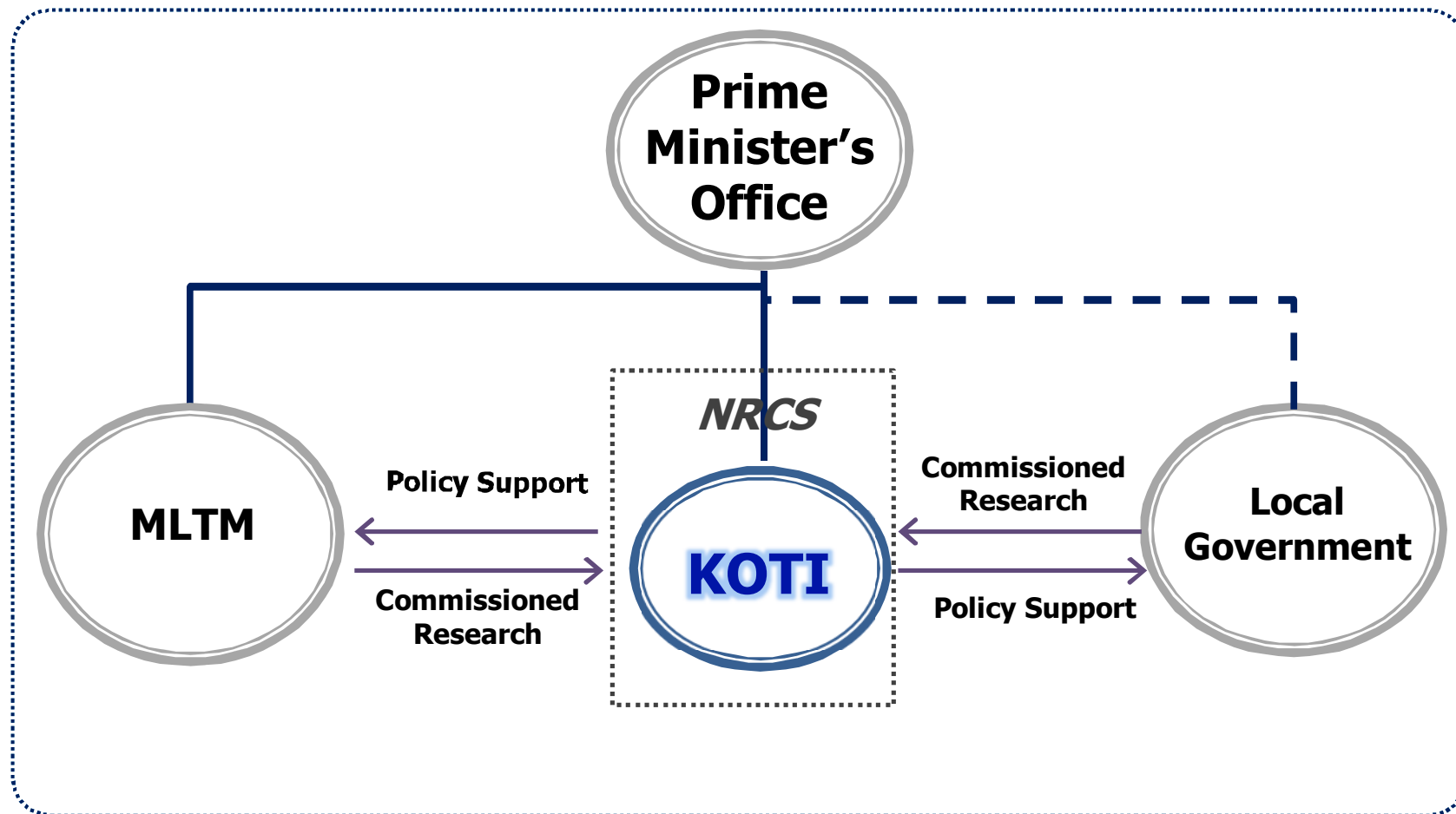
**Total numbers : 298 persons**  
- Research fellows 260(87%)



# Korea Transport Institute

## Relationship with the Korean Government

- Budget support from the national and local governments only



# Korea Transport Institute

## Policy development and Research Areas





# Subway construction and operation in Seoul

# The 1<sup>st</sup> Subway Project

Seoul Station ↔ Cheongnyangni Station  
(Connected with Subway)

**Subway Line No. 1**

**Japan Tech. Left heading**

71.4~74.8

Seoul Station

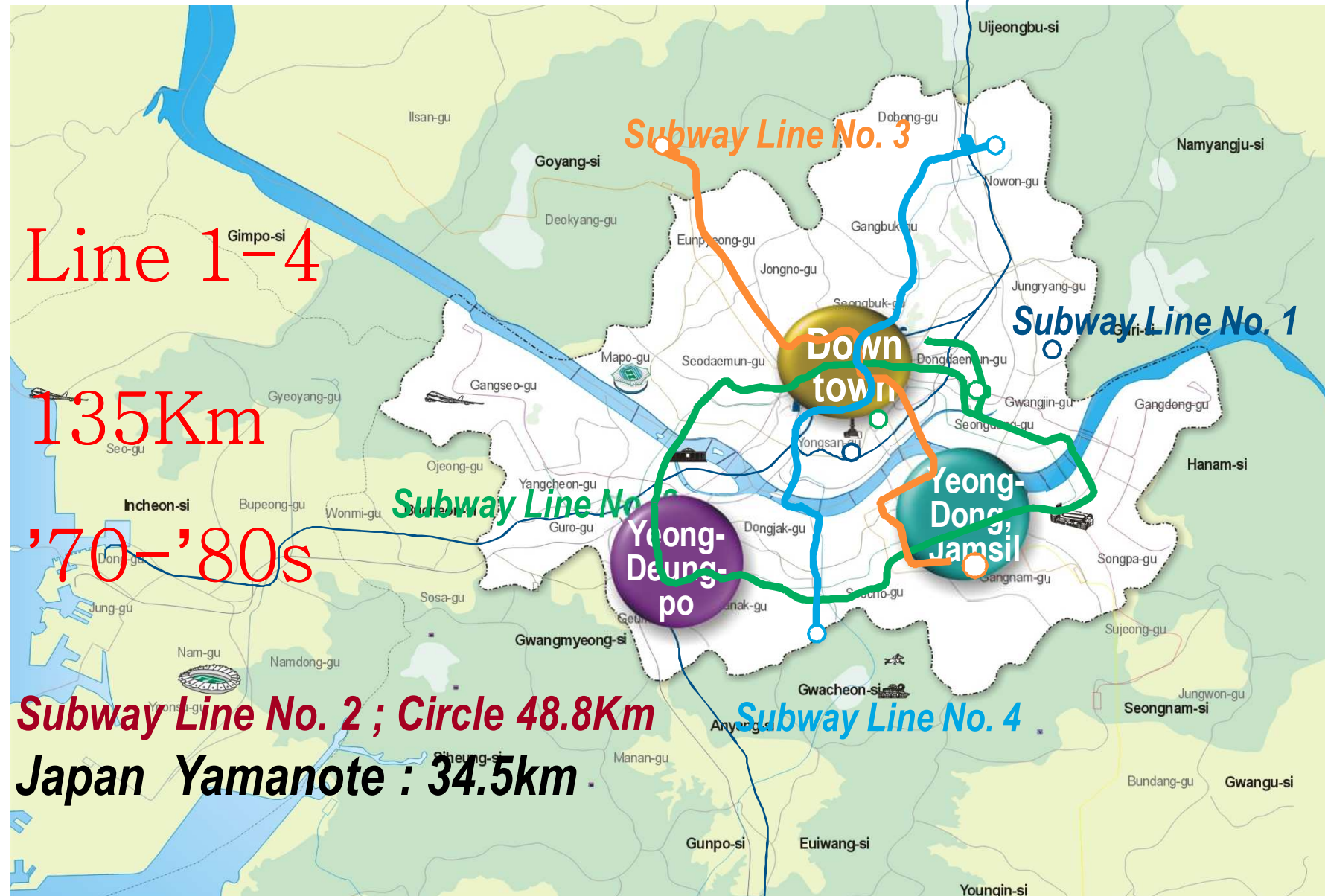
Cheongnyangni Station

Gyeongbu Line

Gyeongwon Line



# The 2<sup>st</sup> Subway Project

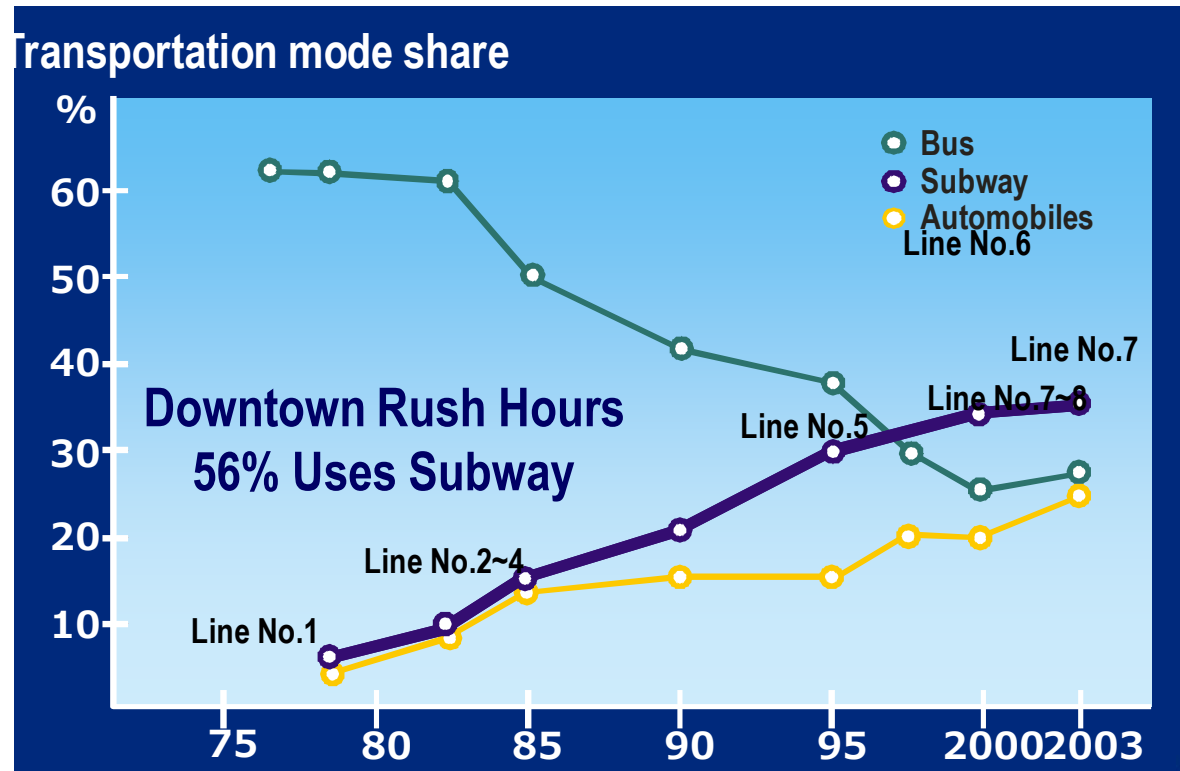


# Poor quality service of bus in 80-90's





# Mode share & Operation (2008)



## Operation

Line No.1~4



Seoul Metro

Line No.5~8



SMRT

## Operating Speed

■ 30 ~ 36 km/h

## Passengers

■ 6.5 million / day

8 Lines

■ Total Length of 287km

Stations

■ 263 Units

# Cost effective OPERATION ?

## Why do SMG make another operation company?



**1) Competition** each other :  
To reduce operation cost  
Self-learning Public Company

**2) Labor's strike :**  
Alternatives for **continuous service**



# Historical Review

## # of Passengers and Operation cost

# Only one provider(bus) at the market in good days

□ 30~40 years' ago('60-70), public transport is only one service for moving ; no need to promote it.....



# New shop(Private car) was opened

□ But strong rival came to the market : private car

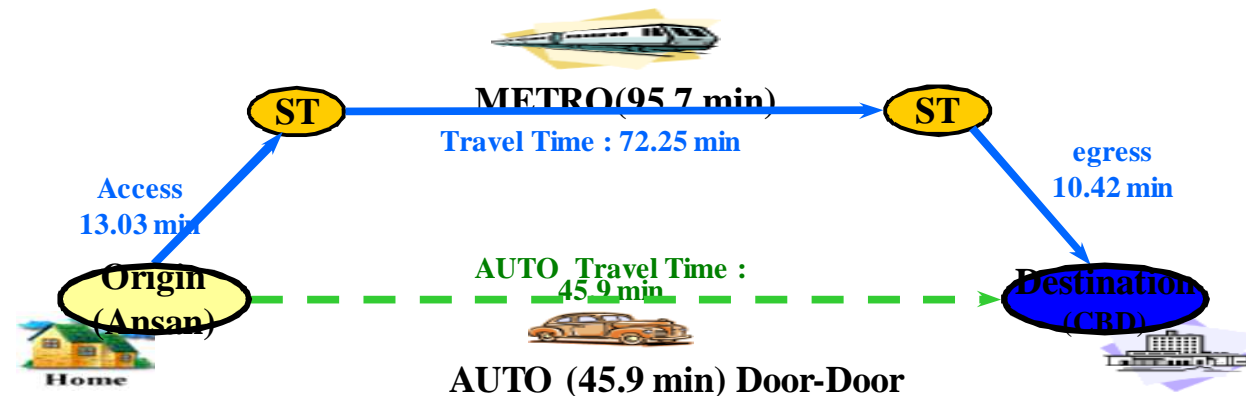
.....



# S-Metro has not been a good provider

□ People want **competitive public transport service** ;

- easy to use,
- cheaper cost than car
- comfortable
- less travel time than car
- safe

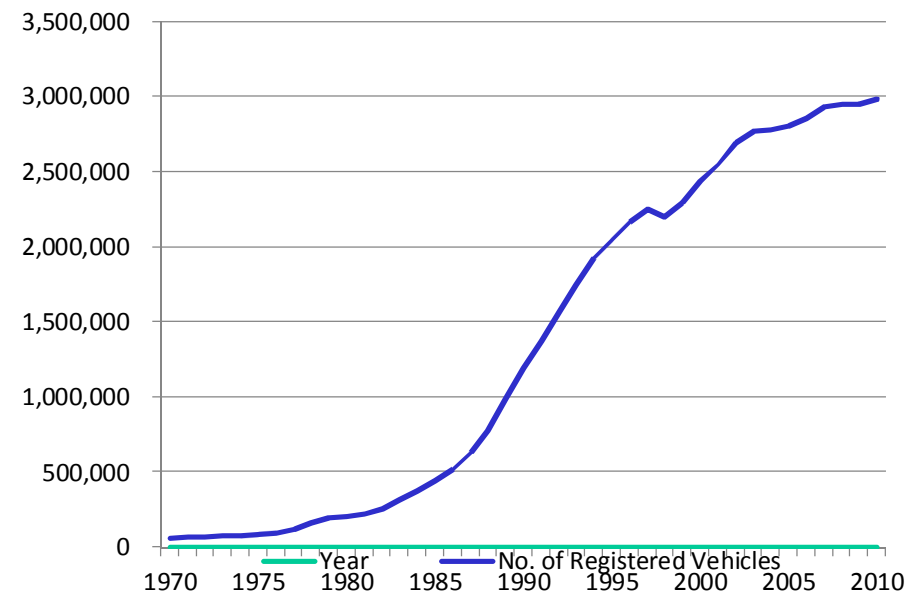


□ But **failed to satisfy buyers (users)** with **enough money to buy their own car....**

# Have we been a good shopkeeper?

- **Registered vehicles Increase: 50 times**  
-→ 1970 : 60 thousands, 2010 : 2.98 millions

[Registered Vehicles in Seoul]



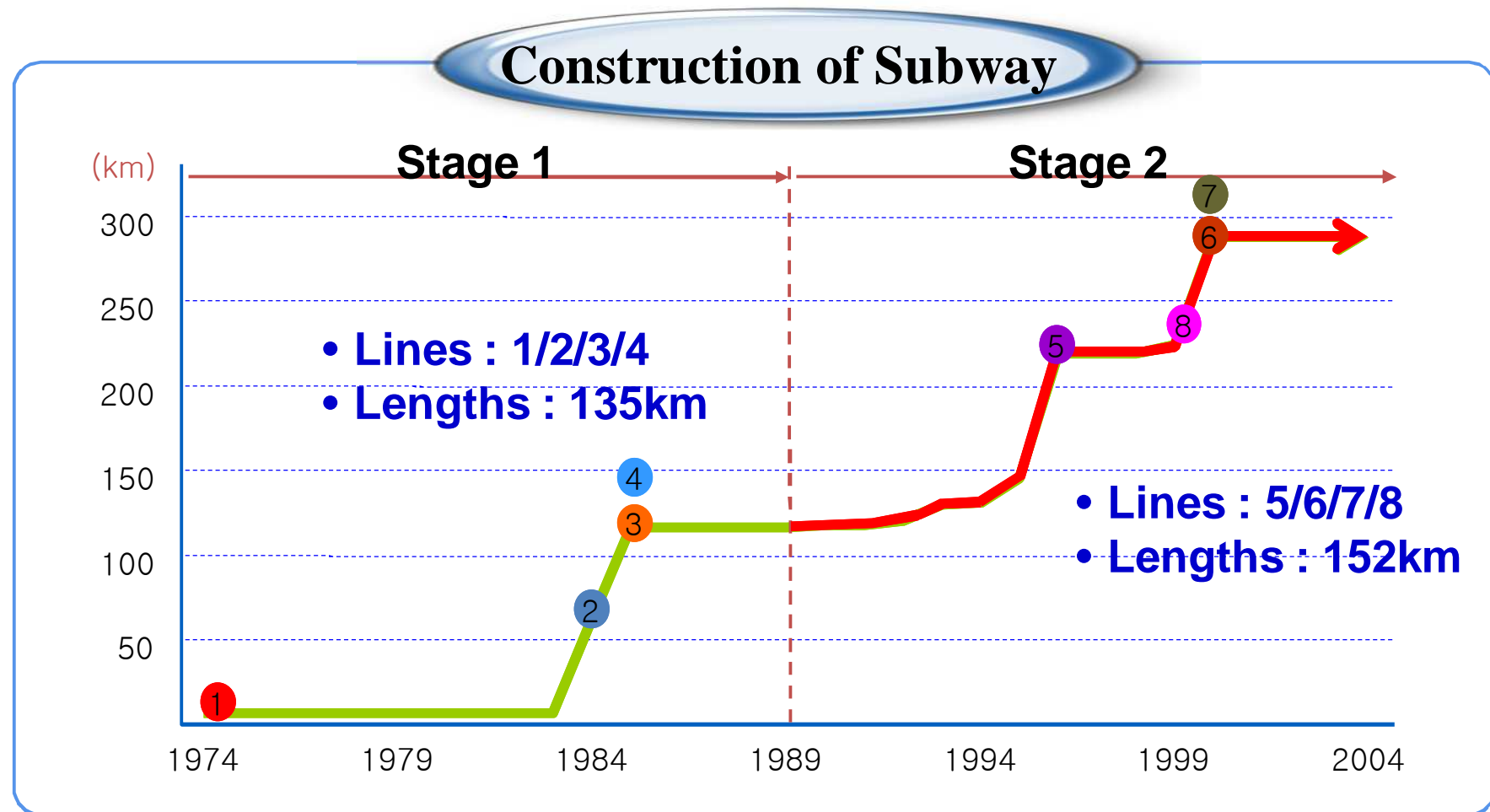
# Another new shop(BRT) was opened

If Bus and Subway travels as same speed,  
which do you prefer?

BRT = +27km/h, HOV = + 80 km/h

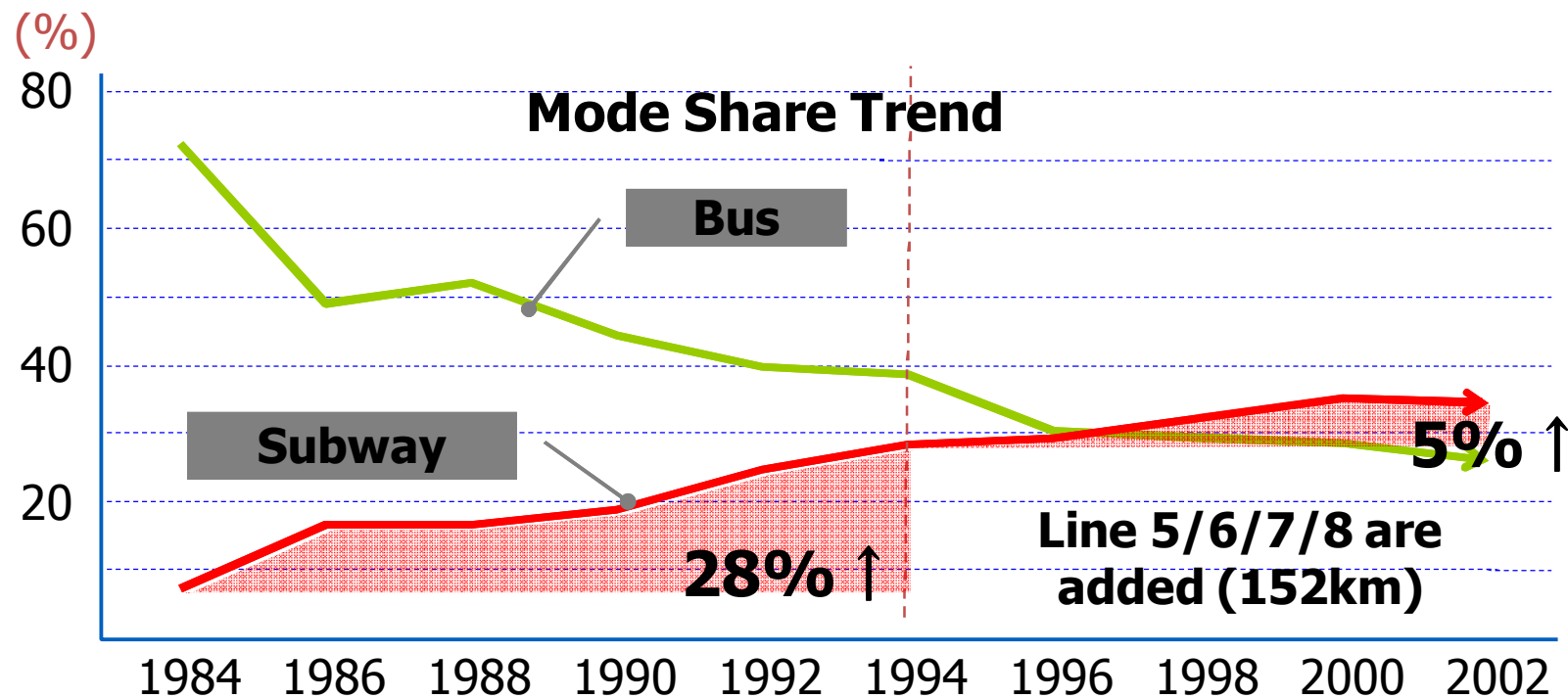


# ■ Seoul has constructed a subway network of 287km (1971-2000).



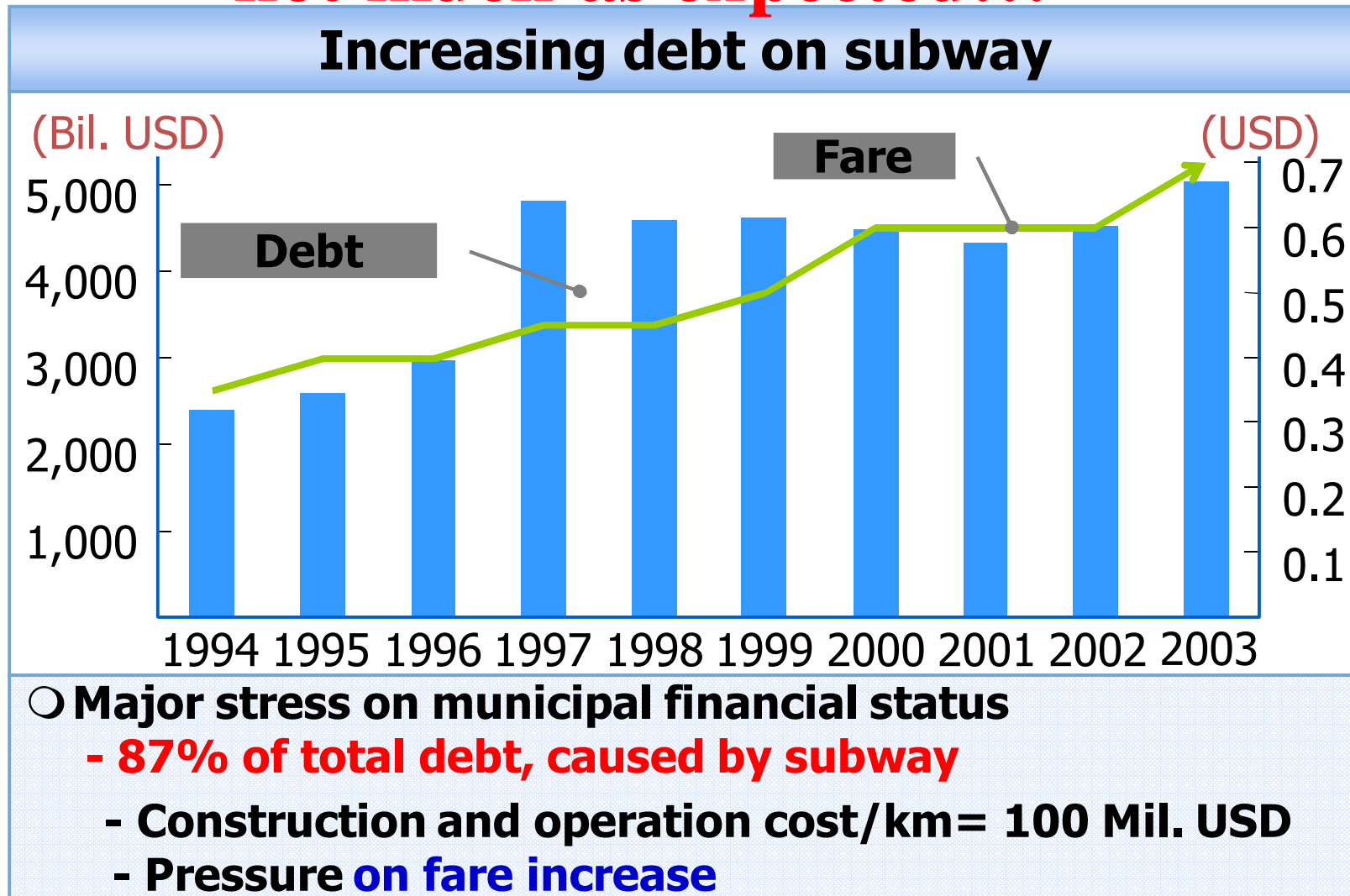
**But also increase of passengers was  
not much as expected...**

## **Inefficient in investment ?**



- **# of passengers below expectation : for line 5, 23,000 passenger/km expected → 11,000/km realized**
- **Operation cost for each trip of subway and bus:**  
**\$1.148 vs. \$ 0.7**

# But also increase of passengers was not much as expected...



# Background for Private Investment Project

- **SMG Debt in 1999 (Seoul Metropolitan Government)**

(Unit: billion won)

Total Debt of SMG	Debt related to Subway (construction + operation)
5,560	4,846 (87.15%)

→ Requires new approach for future subway construction

→ **Private Capital Inducement**

# Subway Challenges

- **Competition** with private **CAR** and **BUS**
- **High -Operating Costs**
- **Low Customer Satisfaction**
- **Unsustainable Finances**

\* S-Matro : deficit 211,400m Kwn(2011),  
Cost/p = 1049Kwn, A average fare /p= 725Kwn

**Challenges : Operation cost with Attractiveness**

# SMG(Seoul Metropolitan Government)'s decision

## Productivity UP, Reduce Operating COST

- SMG decided to invite **private partners** for the new line:  
Why? **set benchmark for public operators**

Issues	Seoul Metro (1~4 Line)	SMRT (5~8 Line)
• Operating manpower/Km	75 pax	44 pax
• Station work	Station resident system on 24-hour shifts	
• Station master system	A station master assigned for each station	
• Type of Working Schedule	24-hour shifts	
• Driver' s working hours	4:40 ~ 5:00 Hours	

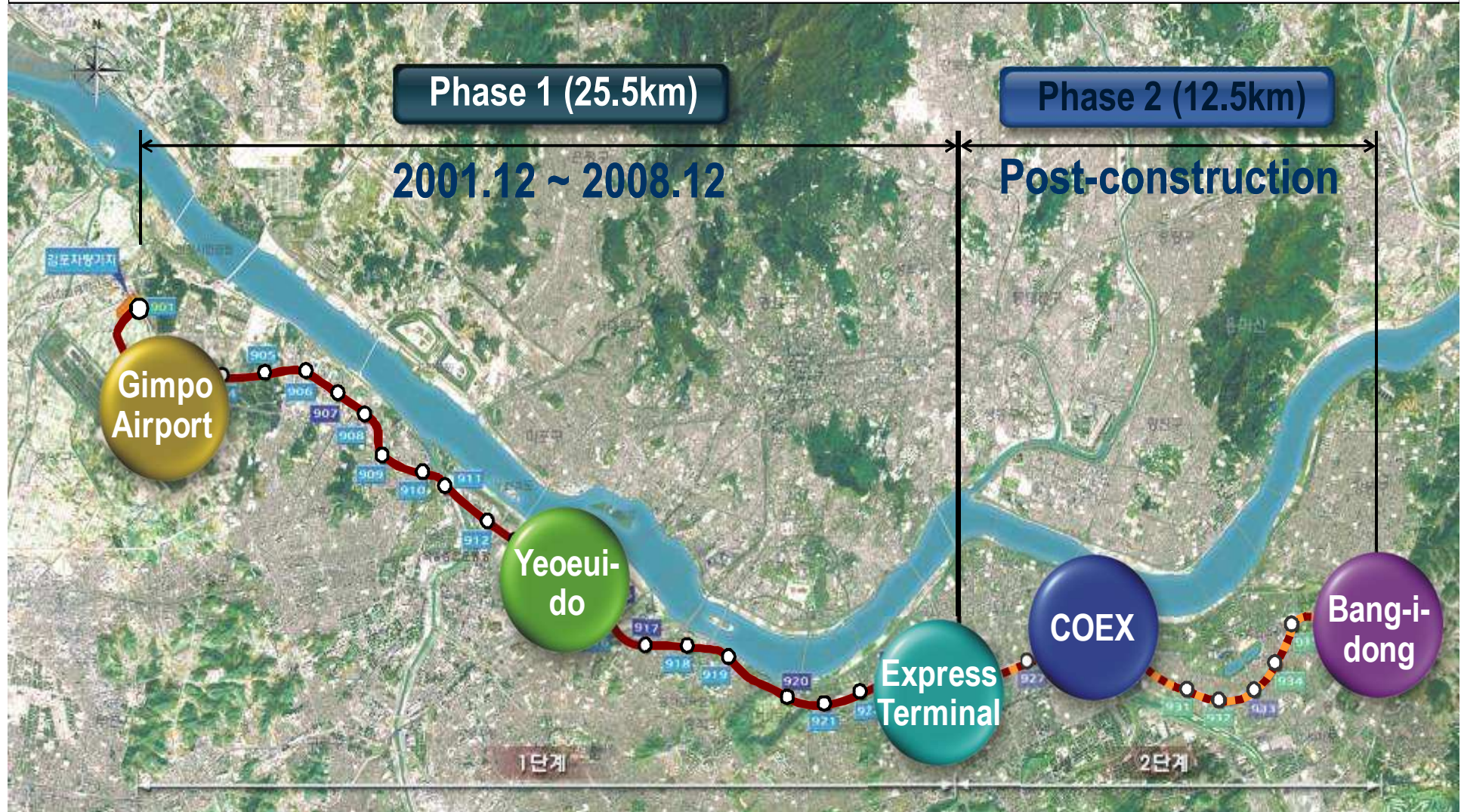
# Sustainable Operation ?

## *CASE STUDIES*

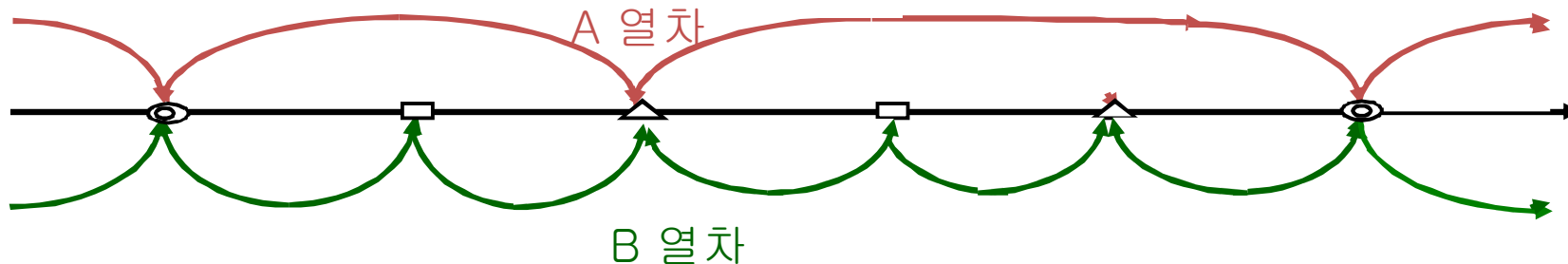
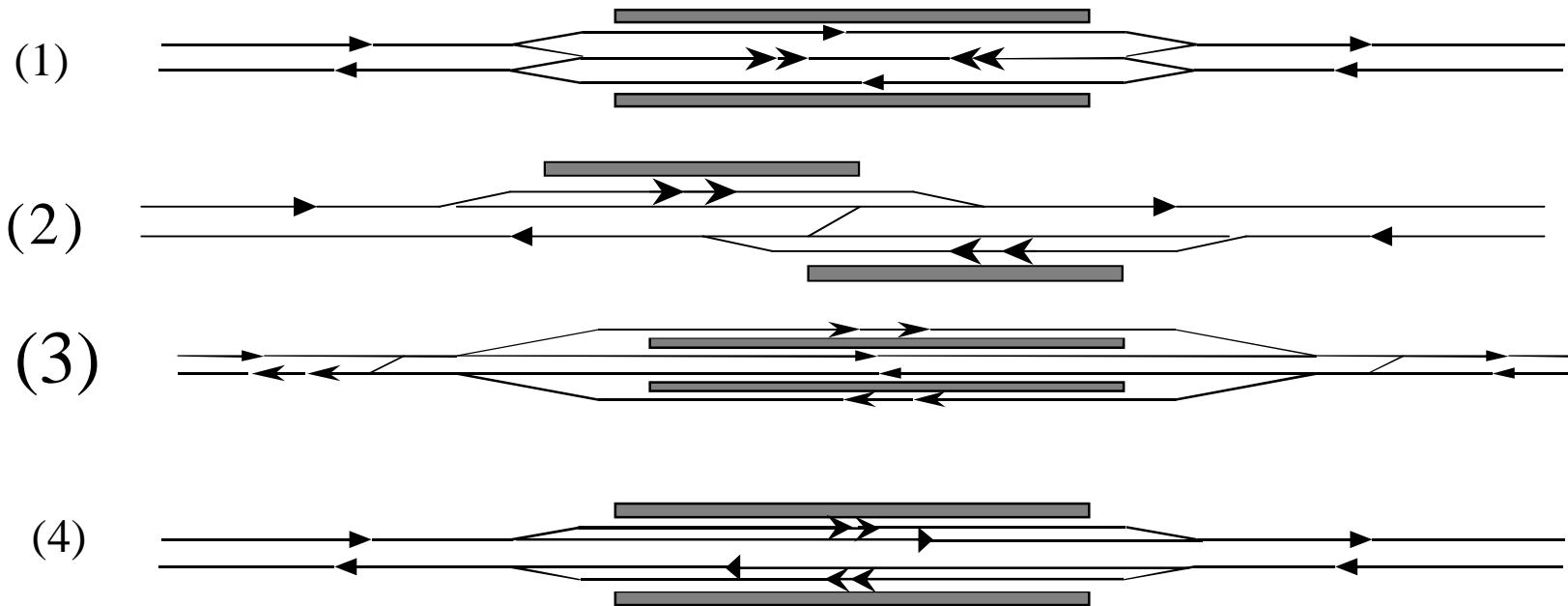
### Seoul line #9 PPP project



# Subway Line No. 9



# Installs Passing track at Subway



✓ **ISSUE (Attractiveness) : Speed-up**

## Track Layout plan

급행/일반정차역 일반열차정차역

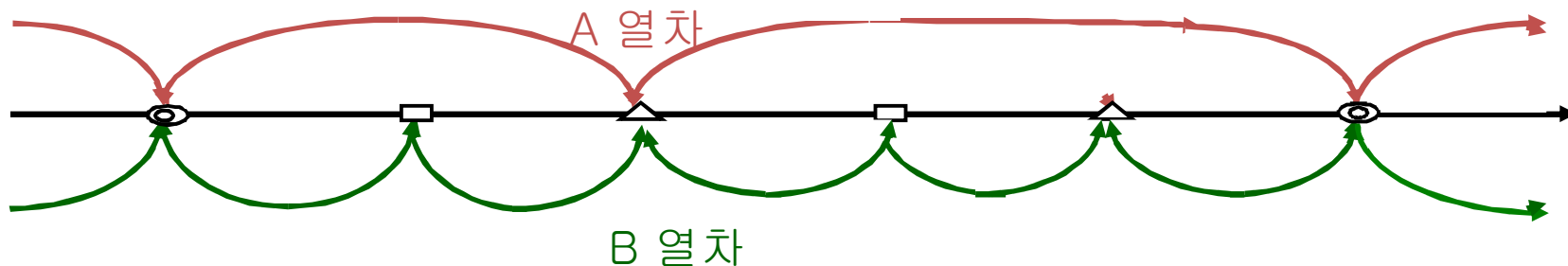
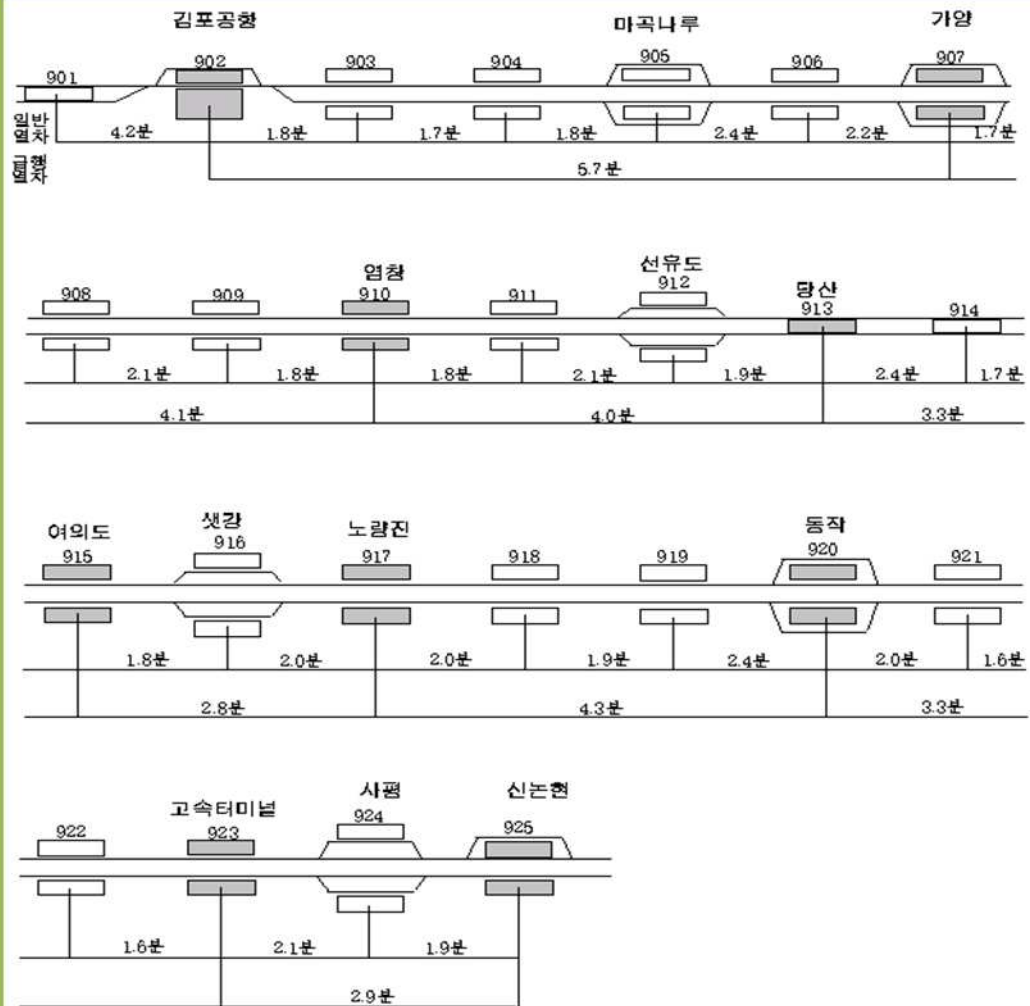
# Expected Speed

## Express :

### 50 k/h (30min)

## Local :

### 32 k/h (50min)



## Operation Method : Alternation of All-stop / Skip-stop Express

#901 Gaehwa Sta. #902 Kimpo Airport Sta.

#925 Shinnonhyun Sta.

**Express : about 30min, only stops at 9 stations**

**Regular : about 53min, stops all 25 stations**

## Number of Operating Vehicle : 96 cars (24 trainsets × 4 cars)

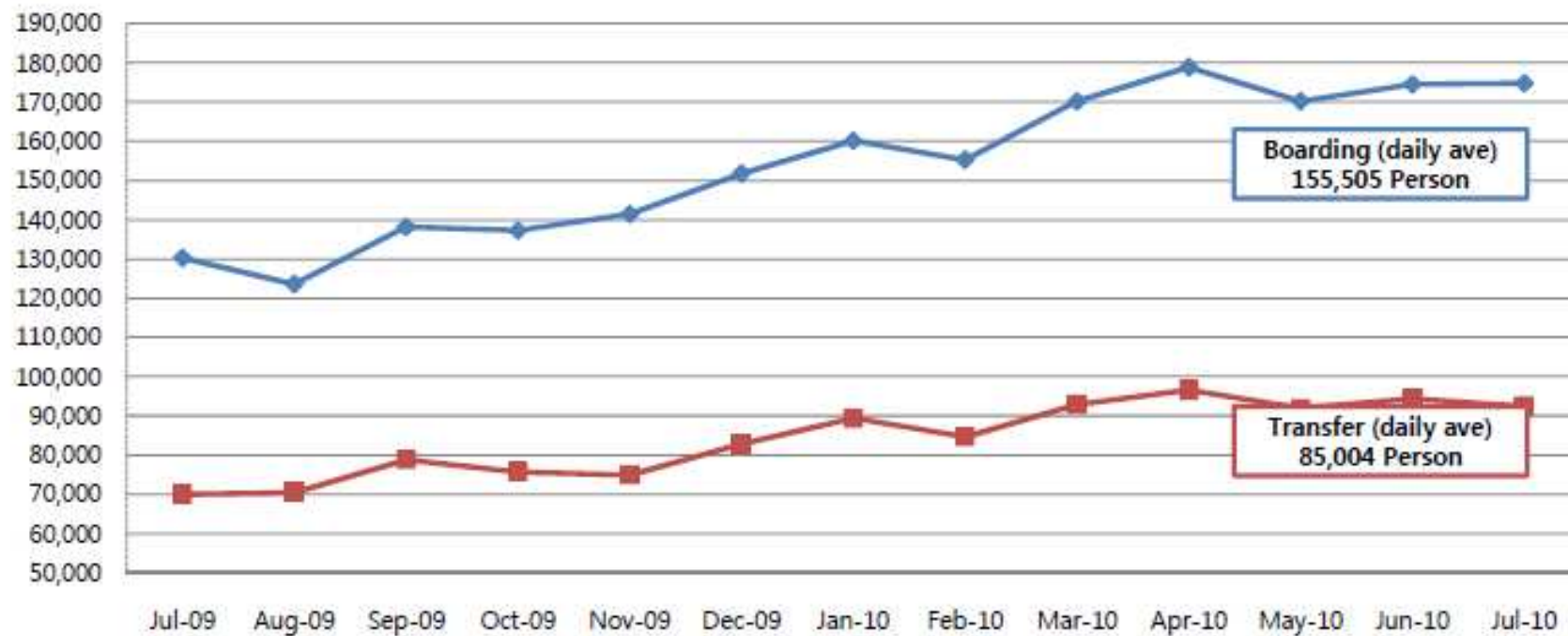
- 156 trains by 2011 (26 trainsets × 6 cars)
- 216 trains by 2013 (36 trainsets × 6 cars)



# Traffic Status



Description	Boarding	Transfer	Total
Average Traffic Demand (Person / day )	155,505	85,004	240,509



✓ **ISSUE (Attractiveness) : Speed-up Result**

# Subway Line 9 Project Summary



## Route (Phase I)

Gimpo Airport~Gangnam (25.5km, 25stations & 1 Depot/Phase II-12km, 12stn)

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## Details of Work Scope for **private SPC**

E&M, Test & Commissioning, Operation & Maintenance

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## Budget

USD 4.5Bil. Civil by SMG, USD 1.2Bil.(E&M+O&M) by **Private SPC**

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## Construction Period for phase1

May 2004 ~ April 2009 (5 years)

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## Type of Project

Korea's First Private Investment Project under **BTO scheme**  
(under 30 year concession agreement )

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# Cost effective CONSTRUCTION & OPERATION ?



**Who is the best?**

- 下 : Infrastructure

**Frame Construction : Public Sector**

- 上 : Non - Infrastructure

**Operation Part : Private sector**

# SMG's decision : BTO Model

- Forming a consortium to respond to the first public-private partnership metro project

- Investment scheme

→ SMG : infrastructure ( 下 )

→ Private consortium : ( 上 )

financing of system,  
rolling stock, E&M,  
provision of O&M

**\*\*?- What about TRACK?**

**Operation and maintenance?**



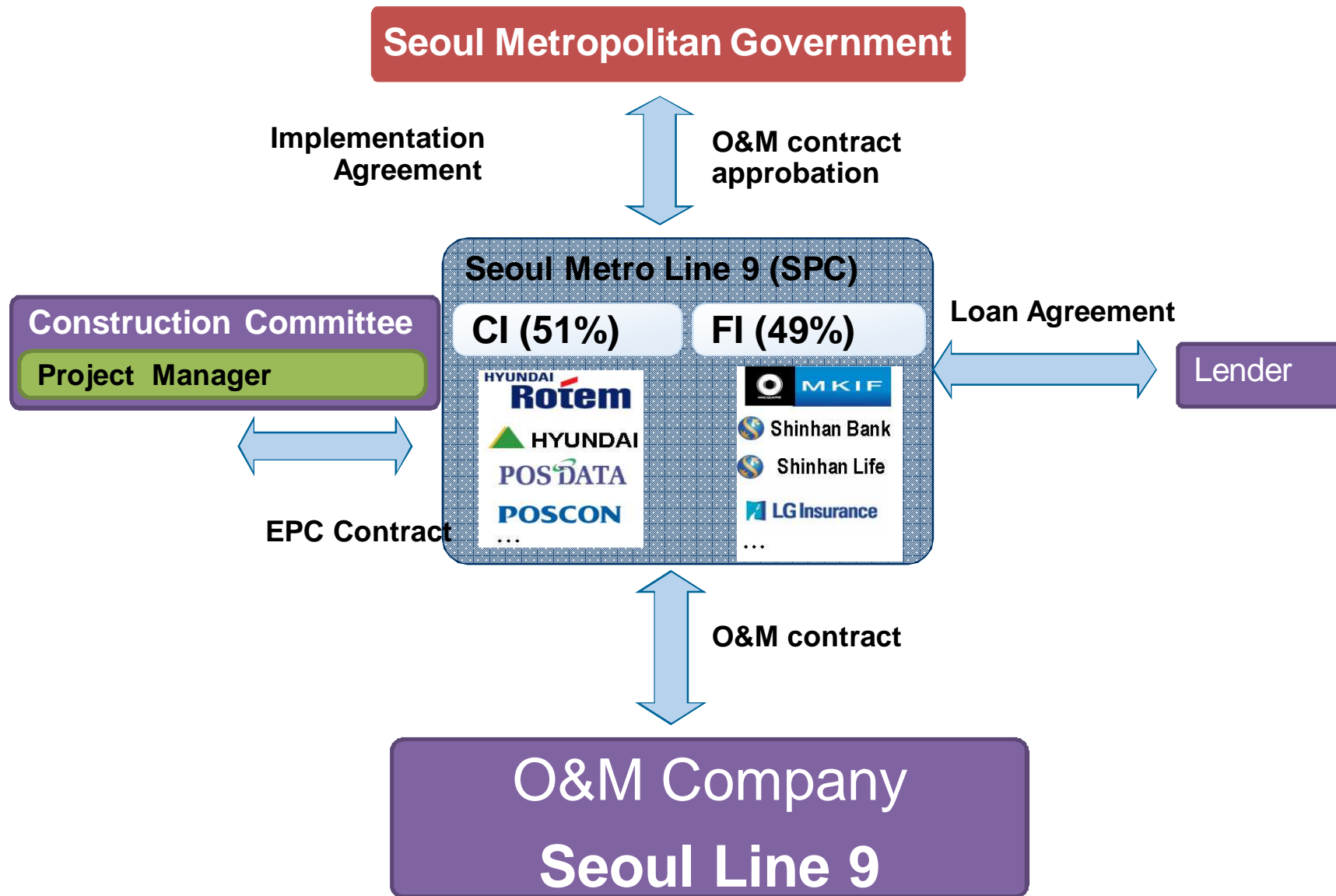
## **Decision of Scope for Private Capital Inducement**

	<b>Public Sector</b>	<b>Private Sector</b>
<b>Full Private Capital Inducement</b>		<b>every construction and operation</b>
<b>Partial Private Capital Inducement</b>	<b>construction of lower structure</b>	<b>construction of upper structure and operation</b>

# Public Support Strategy for Private Investment Project

- In case of partial private capital inducement with upper-and-lower divided structure
  - **The public** supports fixed rate of cost about rolling stock, system, and supplementary in the construction period of upper structure.
  - **The private** constructs upper structure, and the public provides subsidy in operation period.

# BTO Contractual Framework (proposed 2000)



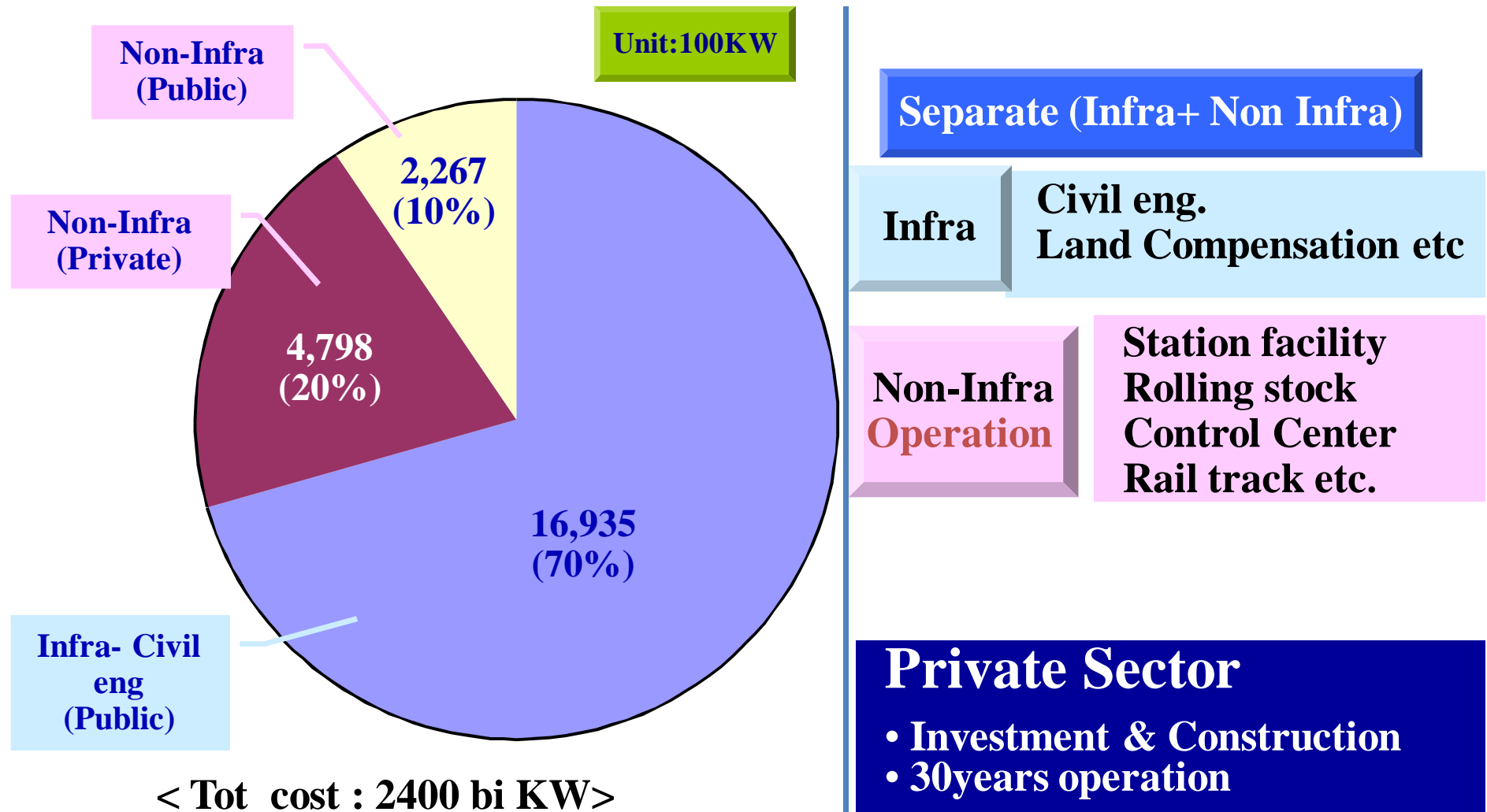
# Final Layout of SML9 Project

(Unit: billion won)

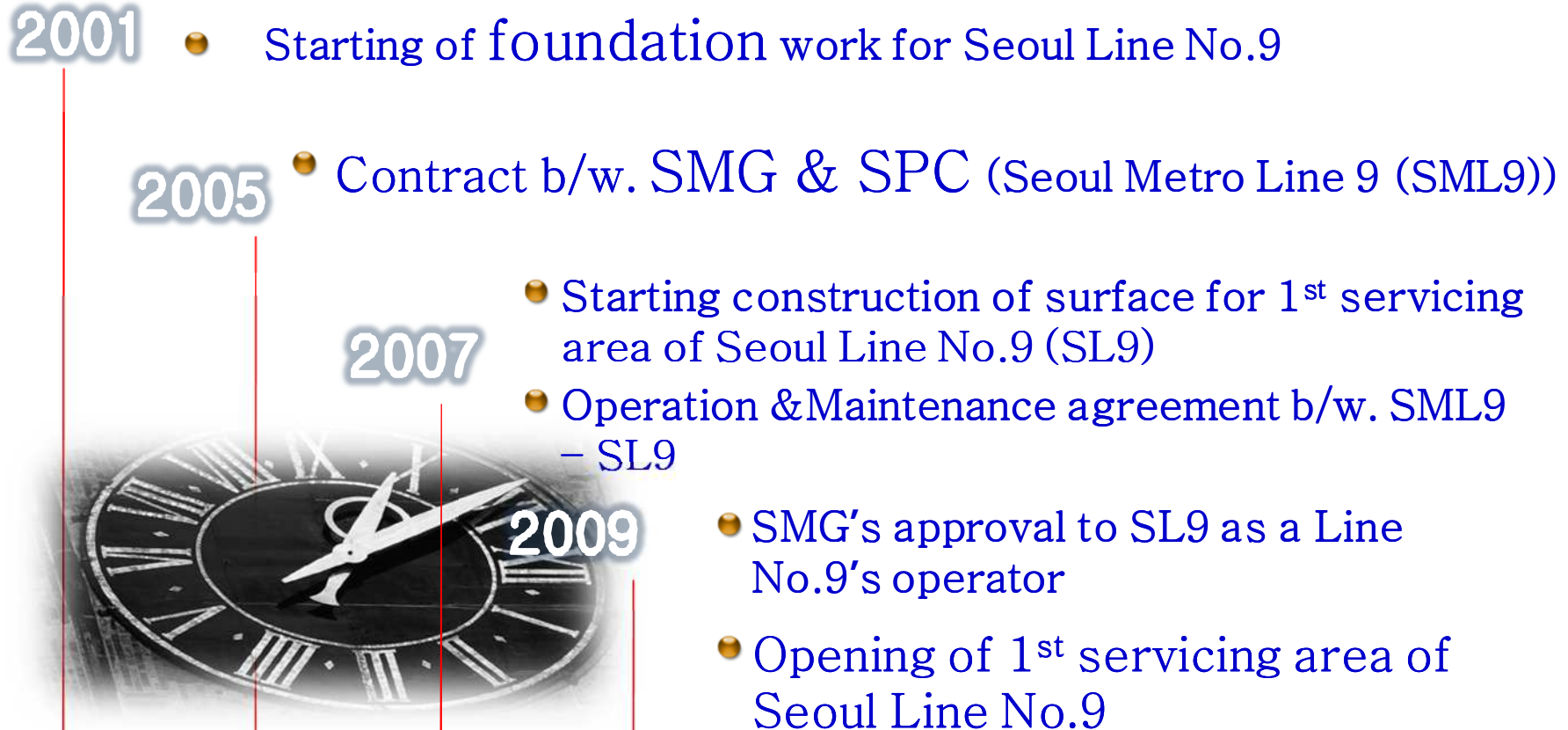
Total Project Cost (2,416)		
<b>Lower Structure (1,566)</b>	<b>Upper Structure (850)</b>	
substructure ( site preparation and ground consolidation work for depot )	rolling stock, system, station interior work, track work, depot, traffic control center, etc.	
<b>Public (100%)</b>	<b>Public (31.7%)</b>	<b>Private (68.3%)</b>
<b>1,566</b>	<b>356</b>	<b>494</b>
<b>Total Public Cost (80%) : 1,922</b>		<b>Total Private Cost (20%) : 494</b>

*Subway Fare should be same level of Fare ( under 1USD)*

# PPP of Construction of Subway Line No. 9






# History of Line No.9



# Cooperative Structure of Line No.9



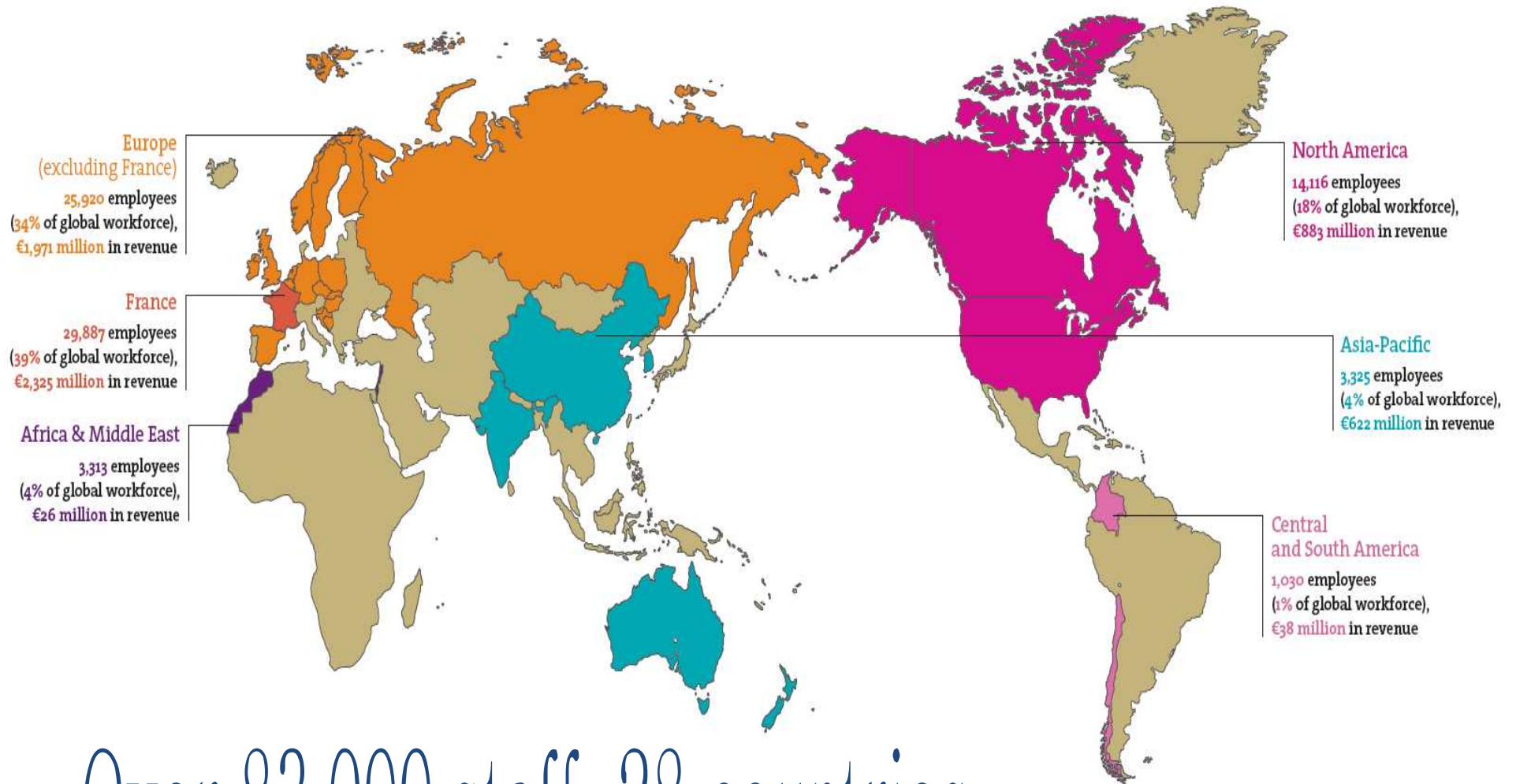
 <b>SML 9</b>	<b>Revenue &amp; Facility Management</b>
 <b>SL9</b>	<b>In charge of Line9's Operation &amp; Maintenance</b>
 <b>Maintrans</b>	<b>Maintenance of Cars and Cleaning Services</b>

**Competition : Veolia vs. Hongkong MTR**

# Veolia : Mode Integration



# Where is Veolia Transport around the world?



Over 83,000 staff, 28 countries

# Sydney Operator : WHO?



# BRT/GRT Operator?



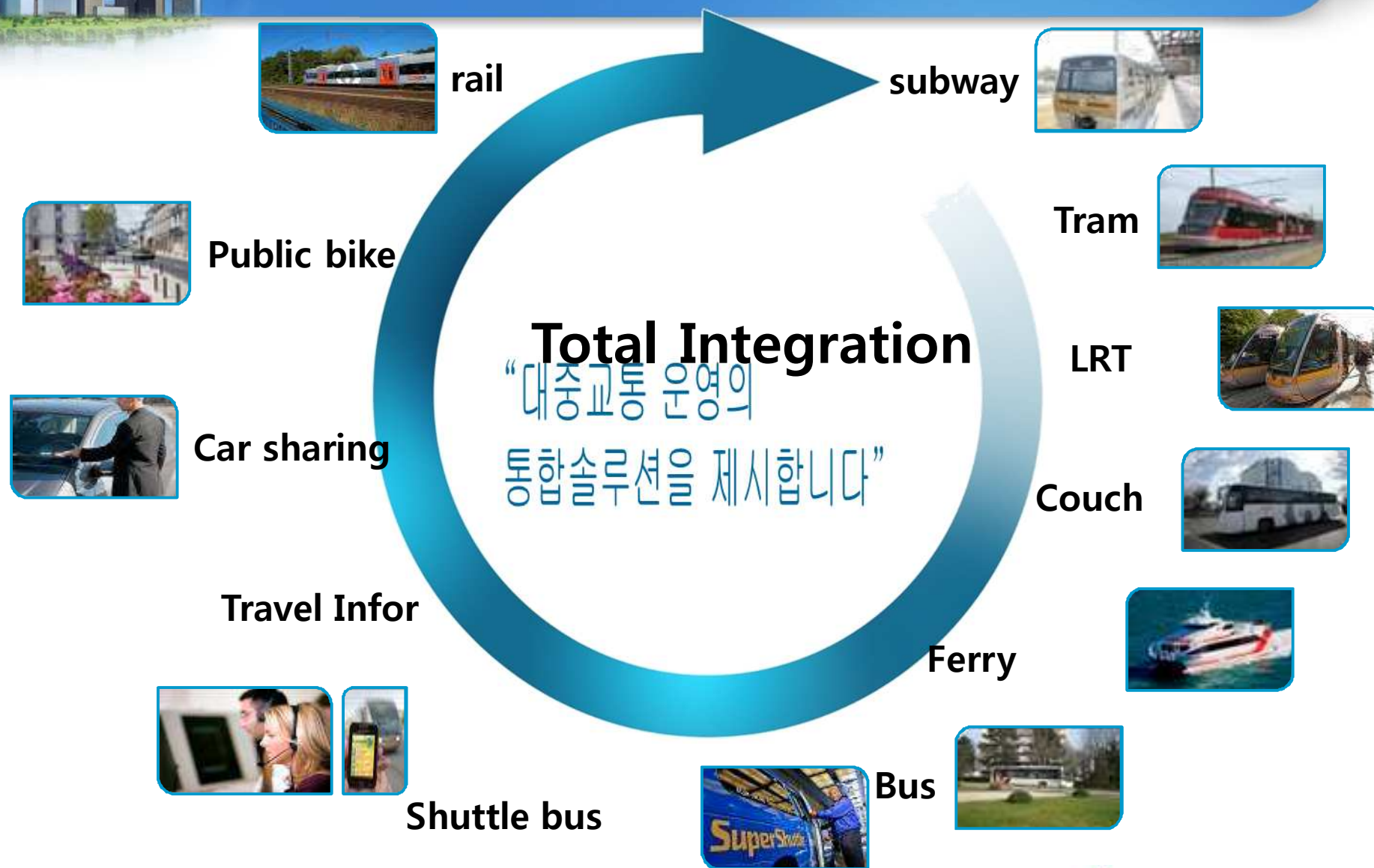
# RAIL Operator



Netherland, Germany, USA,  
Sweden, Italy,.....



# Veolia Transport - Integration



# Lesson Learnt from Seoul

## **Conclusion: Why new private operator?**

- Because **competition creates** incentives to performance & productivity
- To have a professional taking charge of the **O&M risks**
- To benefit from the diversity of expertise of **a worldwide operator**
- To ensure **transparent** relationships with SMG

## **Conclusion: Why new private operator?**

- To **improve the image** and quality of service
- To have targeted and responsive solutions to **passengers' needs and expectations**

*\* But some issue was raised as follows*

# Who get the responsibility of ....

**1. Fare : GOV(Ministry of strategy and finance)**

**2. Interval : Operator → but need Approval**

**3. Risk : Gov. vs. M9, L9 ( if clash then ???)**

**M9(SPC) vs. L9 (Operator)**

**\* L9 vs. MainTrans ( Maintenance company)**

**4. L9(Operator) get profit?**

**→ Commission fee + @ (Evaluation performance, . .  
Dividend, yes or not?**

# Some PFI Issues (1): MRG and MRR

( Minimum Revenue Guarantee, Maximum Revenue Redemption )

	2009-2013	2014-2018	2019-2023
MRG	90%	80%	70%
MRR	110%	120%	130%

- **MRG (MRR ) = f (Fare, # of Pax)**

→ **Fare(won) : 1,250 vs. 900 + Non Payment**

**\* Subsidy from SMG : around 300m USD(2011)**

→ **Pax( 2011, p/day, not include transfer)**

**: 177,679 (Forecast) vs. 172,840 (Actual)**

## Some PFI Issues (2): Indexes of PF

### - Interest Rate, Foreign Exchange Rate

→ IR : 6-7%(2004) vs. 3-4%(2011)

→ FER : Negotiation is not easy.

what is the big variation?

: Standard Rate, Period



\* SMG ask the refinance negotiation to adjust the variation of PF indexes.

# Other Issues(3): Private Operator?

## 1. Private Operator? Some “Con”



→ No experience in rail sector in Korea

\* Aviation and Bus industry : “YES”

## 2. Foreign Operator

→ “Con” from Labor Union

→ Out of box for **operation planning**

\* *Long term benefit of operation industry*

→ **Competitiveness-UP** like other industry?

# Ex1) Efficiency Operation; Line No. 9

## 5-NO Concept

1. **Chief officer** of every station → NO
2. **Office space** for staff of every station → NO
3. **Sale ticket** by staff → NO, **private Kiosk**
4. **Supplementary office** for maintenance of every station → NO, HQ + 5 station team
5. **Sleep** at station → NO

# Productivity UP, Reduce Operating COST



**Kiosk or  
Ticket office**



# Essentials ( Productivity )

	Metro 9	Current operators
Organization	Customer-oriented	Production and staff-oriented
Productivity	~30 staff/km	Over 50 staff/km
Service	express & all stop	All stop
HR Policy	Promotion based on performance & seniority	Promotion based on seniority
Ticket booth	At convenience store	Ticket booths with full staff

## Ex 2) Operation scheme



- **Multi task job for staff**

  - AFC + Repair of electric sys +..

  - (ex; Ticket officer + Driver is OK?)

  - or Sectorism

  - (ex; daily vs. monthly maintenance )

- **Driving hours?**

  - 4-5 hours or 7 hours

# # of Staff, Efficiency from Line No. 9

**Seoul Metro (Line 1-4, 1974-2008) :**  
**100→80→75 p/km**

**SMRT (Line 5-8, 1996-2008) :**  
**70→55→45 p/km**

**Metro 9 (2008- ) : around 30 p/km**

- Tokyo Metro : ??? p/km /
- Paris metro : 77 p/km (2000)

# Comparison of Operating Man-Power



[2010. 4. 1 기준]

Descript	A company	B company	C company	Metro9	etc
Operating Kilometers	134.9	152.0	24.1	27.0	
Station	117	148	23	25 (24)	Magok-naru Station Not open
Man-Power	9,694	6,436	1,143	603	
Man-Power / Km	71.9	42.3	47.4	22.3	
Man-Power / Station	82.9	43.5	49.7	24.1 (25.1)	

**Productivity UP, Reduce Operating COST**

- **Big Impact** already :

1. **Resolve the public opinion of Dinosaur**

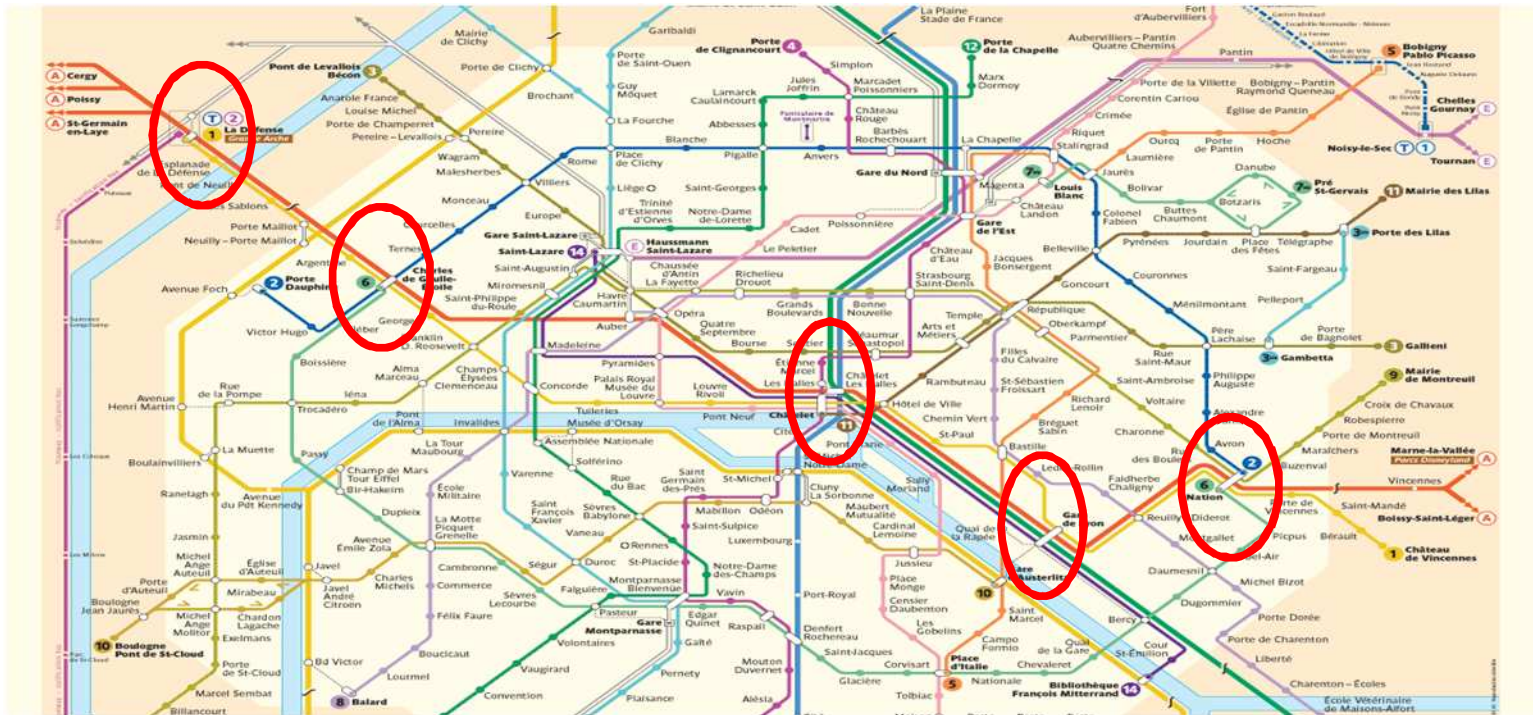
- **Eating Budget**

**which protect new subway construction.**

2. **Hold down Labor's STRIKE.**

# BP ex) Full driverless in Metro 1, Paris

- Headway : 3min → 1.5 min, Capacity **200% up**. 10 years process from 2002. (2 man → 1 man → Driverless )
- Operation cost : 20% reduction.



# Full driverless in Metro 1, Paris

- How can we do the **INNOVATION**?



# L9 Impact to Shinbundang line(new)

- *Full driverless operation:*

1. Operation cost reduction

2. Technology enhancement

*How much invest and cost reduction?*

*Everybody know  $1.0 < B/C$*

**Decrease of safety???**

**Accidents incurred by human error .**

*Even Heavy Metro:*

*Paris #14, Beijing #4..*



## L9 Impact to other (old) lines ?

- *Full driverless operation??*
- *How much reduce their operation cost?* -- # of Driver's portion is less 2%, but convention one is about 15-25 % of total staffs.

\* Screen-door → **Driverless ???**



Decrease of suicide

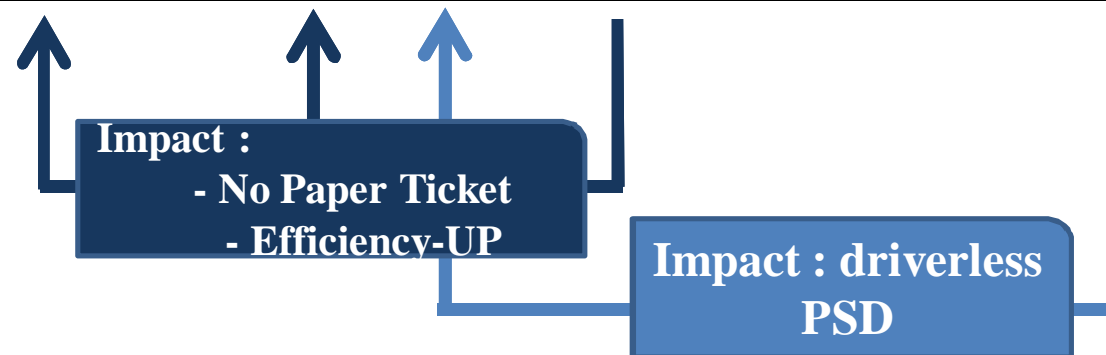
*Energy cost*

*Train-wind*

*Dust*

# Innovation of Operation Scheme

STAGE	1974~1990 Stage 1	1990~2005 Stage 2	2005~2010 Stage 3	2011~Present Stage 4
LINE	Line 1~4 Seoul Metro	Line 5~8 SMRT	Line 9	Shin Bundang Line
INNOVATION	2-drivers	1-drivers	PFI Project	Driverless



▷ We can do, #8 operation driverlessly.

Nobody talk about it before..

**Nobody talk about it before..  
but,**

**▷ We try to open eyes, and think  
the unthinkable with a long-term  
view.**

**▷ We have a dream as same as  
other leading industry like .....**

# Need for Cooperation and Knowledge Sharing

- KOTI can share our **best practice and errors** to minimize the learning cost.
- KOTI may have joint workshop to benchmark each others transport infrastructure policy.

▷ **Let's have together special forum to find best solution!!**

*Take Transit, Enjoy more time for your Life*

Thank You

金敬喆

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What time is  
it ?

It is **TIME** to **change** to efficient  
Transit Operator

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