



# **BICYCLE BEHAVIOR CHANGES IN KOREA:**

Effects of Policy and Facility Designs

Hee Cheol SHIN, Ph.D.



**VELO-CITY GLOBAL 2016**  
EVOLUTION OF CYCLING FEB 27-MAR 1 TAIPEI, TAIWAN

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4. Public Bike System
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6. Conclusion

# INTRODUCTION



# WHY IS BICYCLE ISSUE?



## Need green transport

- Auto-oriented system: Traffic congestion
- Even public transport uses petroleum
- Energy crisis, climate change, and health issues

## But, I hate bicycle

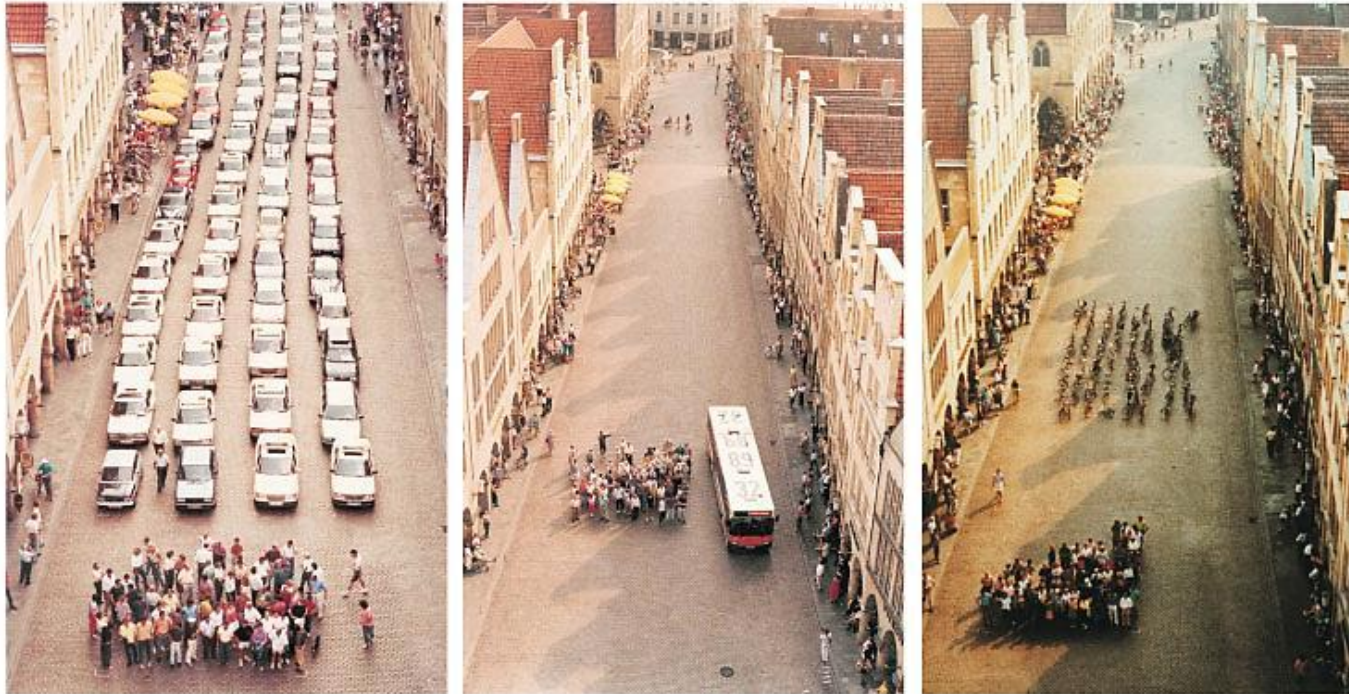
- Cars are convenient
- Rich people do not use bicycles
- Bicycles are dangerous

# Bicycle policy as green transport

# ADVANTAGES OF BICYCLE

- Health benefit
- Economic benefit in urban area for traffic congestion
- Especially, advantages for Elderly and Children

Amount of space required to transport the same number of passengers by car, bus or bicycle.  
(Poster in city of Muenster Planning Office, August 2001)



# BACKGROUND OF THIS PRESENTATION

- We can see more Korean people ride bicycles nowadays
- Is it true that Korean people have changed their behaviors in bicycles for last ten years?
- From surveys, we check if behavior changes are real true
- I am trying to find what are reasons for the bicycle behavior changes in Korea
- Especially, policy effects and facility design effects will be discussed

# BICYCLE BEHAVIOR CHANGES IN KOREA



# THE NUMBER OF BICYCLE MODE SHARE IN KOREA HAS BEEN SURGED OVER PAST YEARS

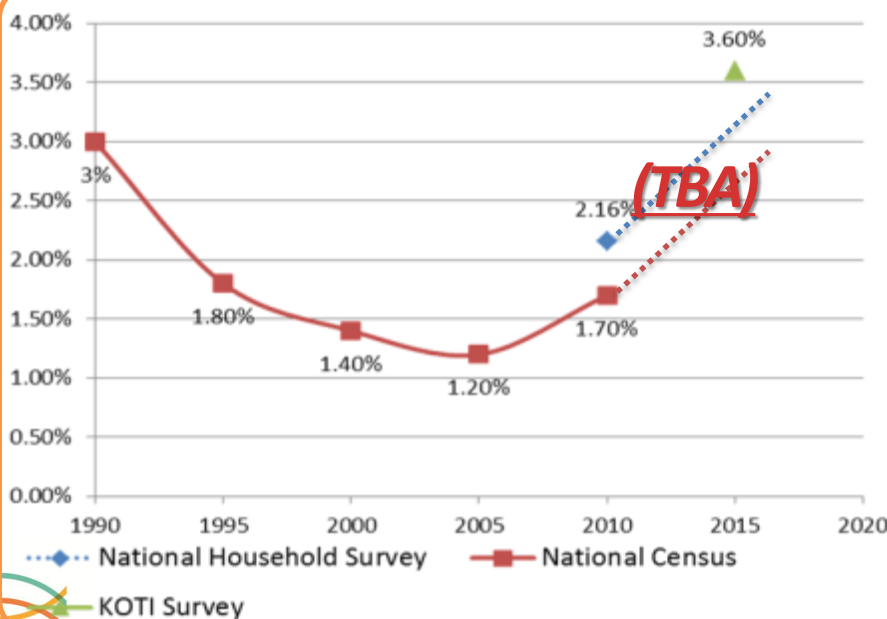
- People chose bicycle as their trip mode more and more

\* National Household Survey will be done in 2016, TBA in 2017

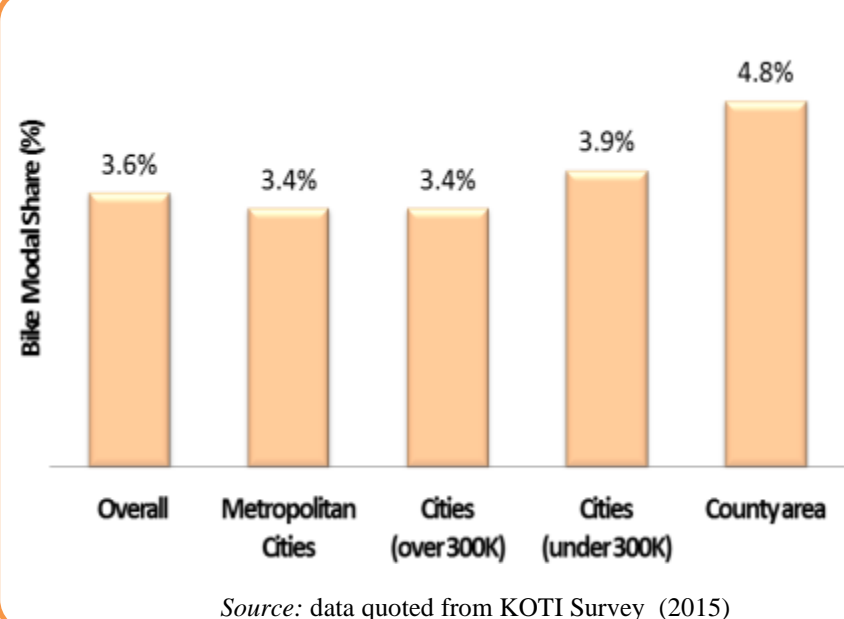
\* National Census surveyed in Oct. 2015, will soon be available

- Bicycle is chosen more in smaller cities to trip

Increasing Bicycle mode share



Bicycle mode share in KOTI Survey (2015)



Source: data quoted from KOTI Survey (2015)



Source: data quoted from

1. National Census (1990~2010) / 2. National Household Survey (2010) / 3. KOTI Survey (2015)

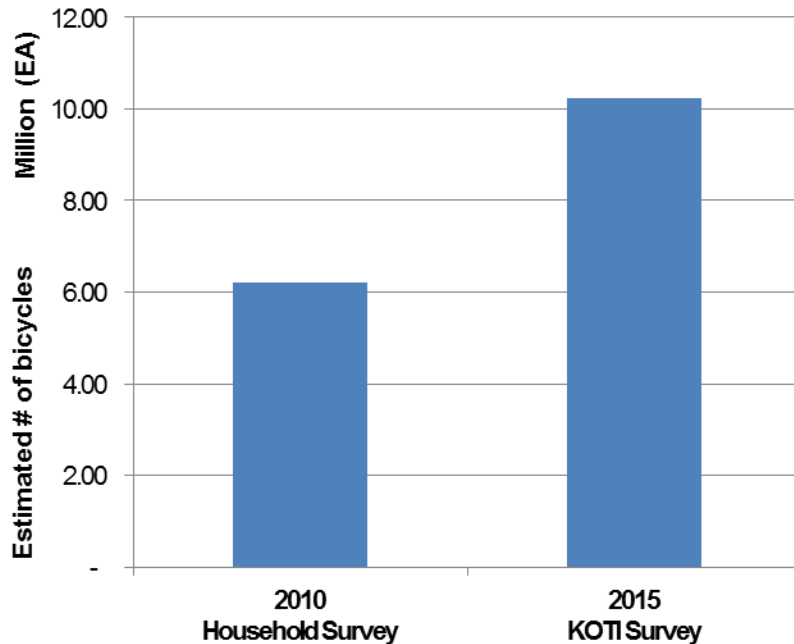




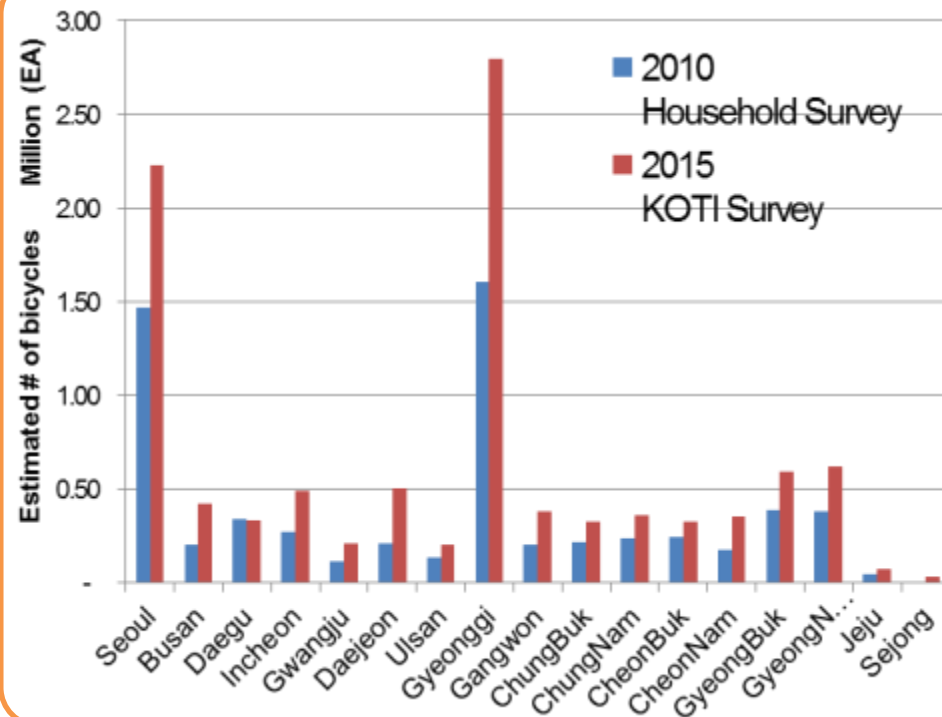
# THE NUMBER OF BICYCLES IN KOREA INCREASED IN 2015 COMPARED TO THAT OF 2010

- The number of bicycles: 6 Million (2010) → 10 Million (2015)

Increasing Est. # of Bicycles



Provincial Comparison

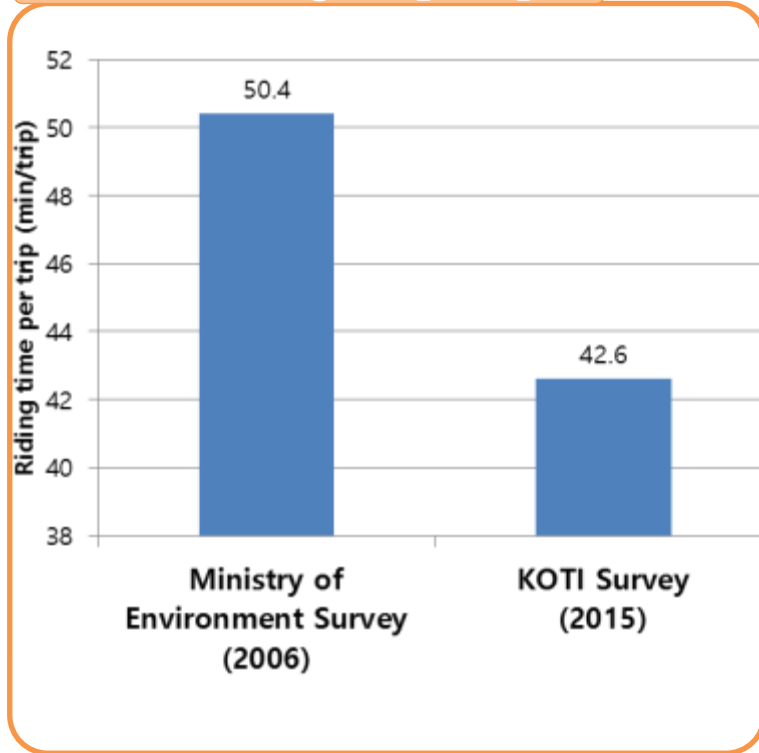


\* Sejong was newly established from ChungNam in 2012

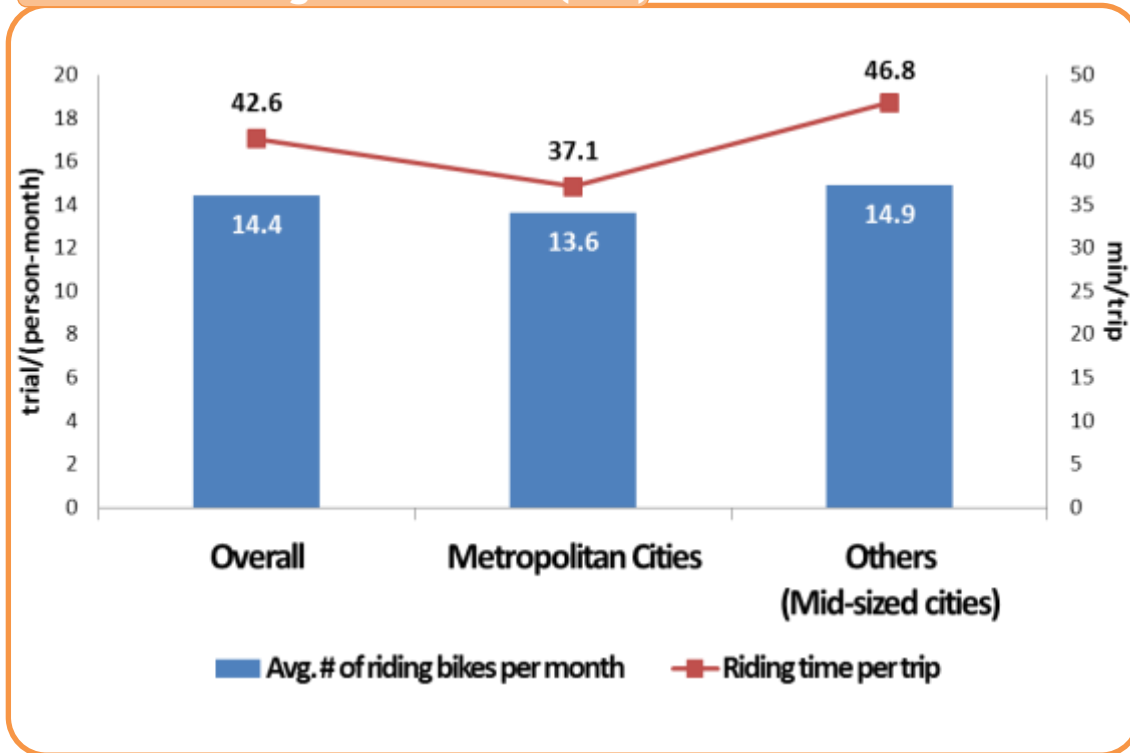
# THE RIDING TIME PER TRIP GETTING SHORT

- The riding time per trip has been shortened  
: Interpreted that more people use bicycle for transport purpose

### Trend in Riding time per trip

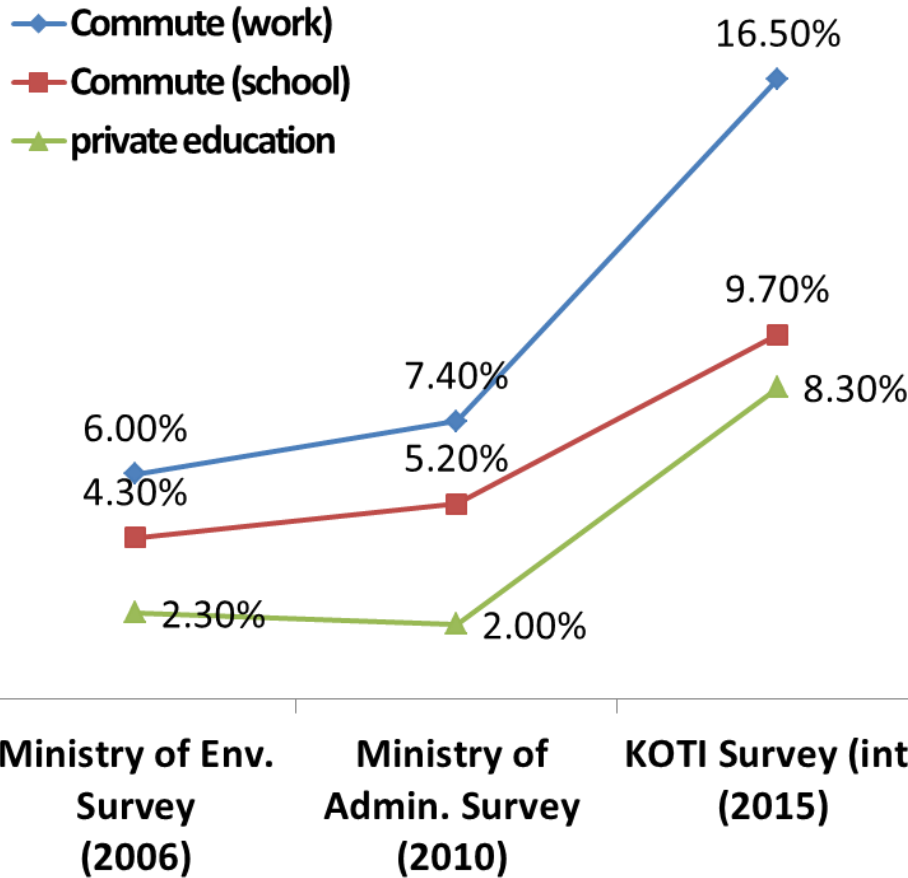


### Bike-rider's riding characteristics (2015)

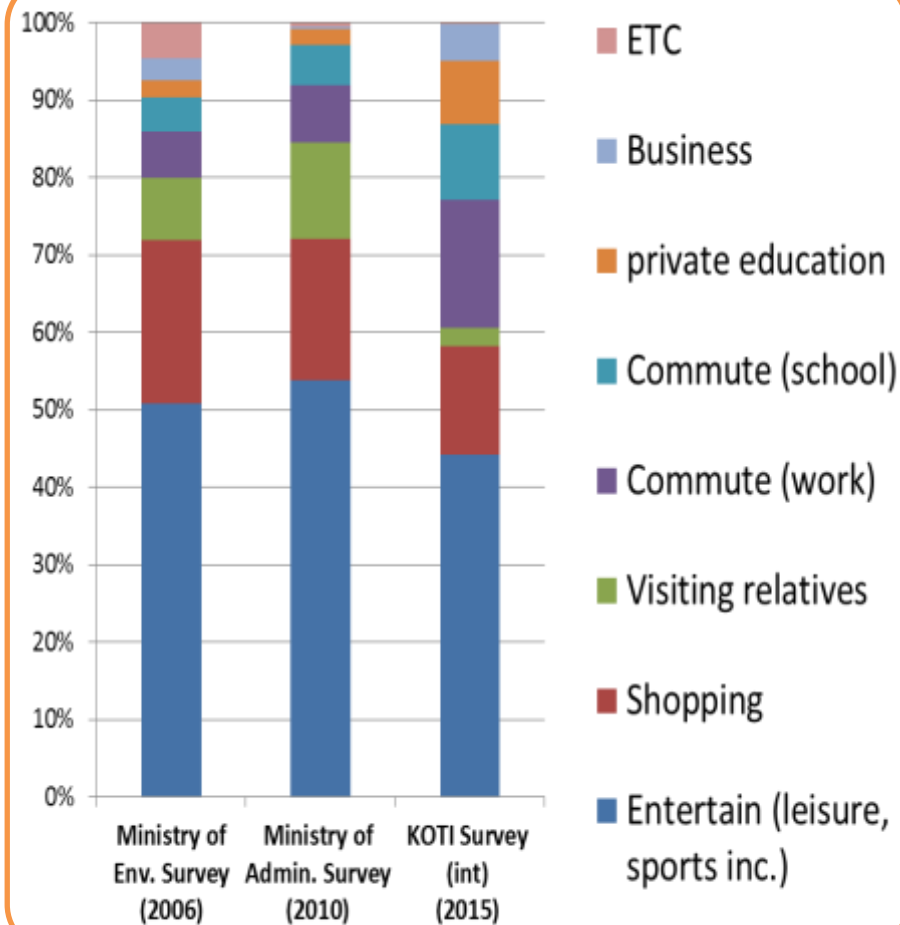


# THE BIKE-TRIPS ATTACHED TO THE EVERYDAY LIFE

Soaring commuting trip with bicycle

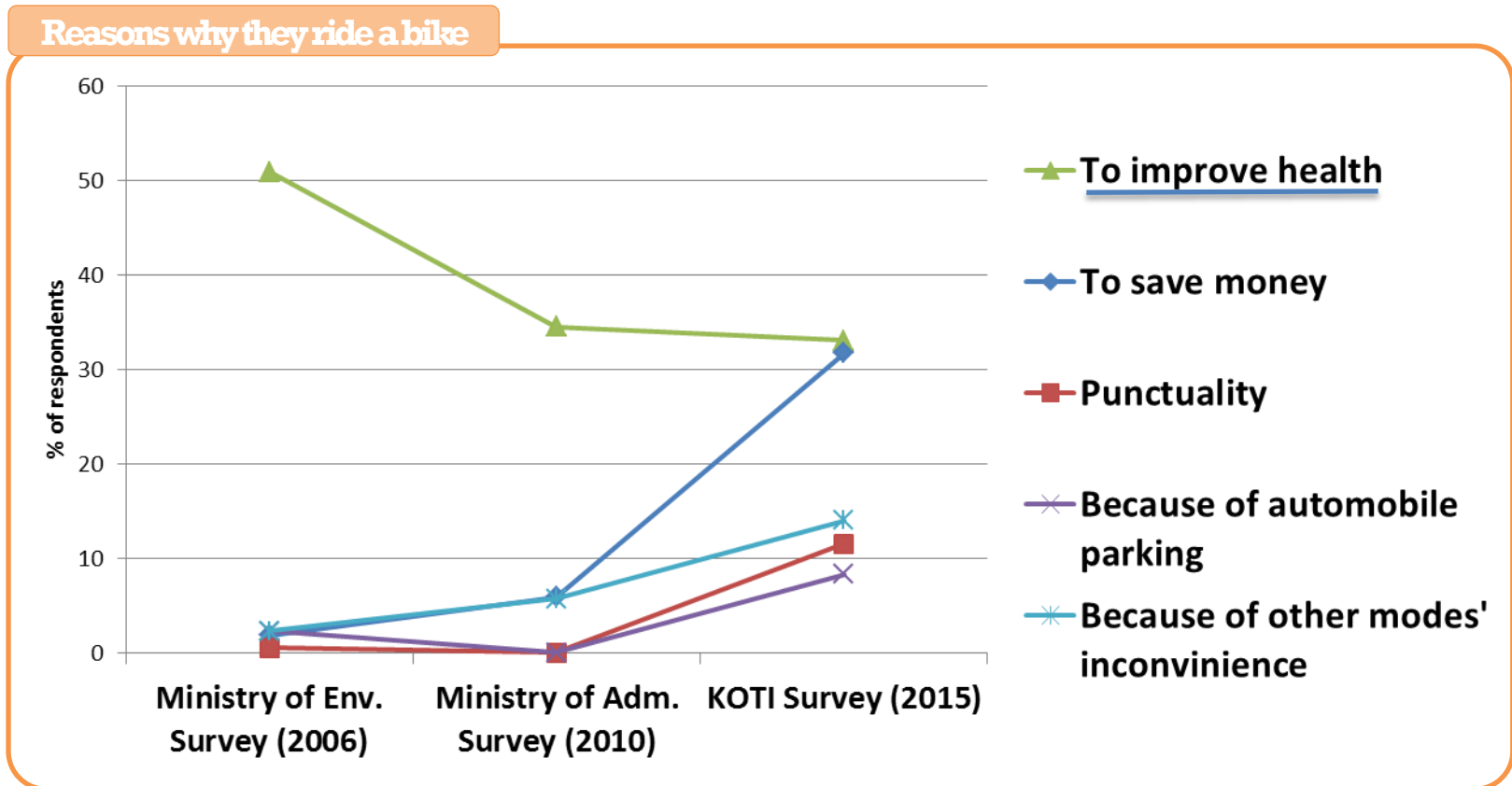


Bike Riding Purposes



# REASONS WHY THEY RIDE A BIKE

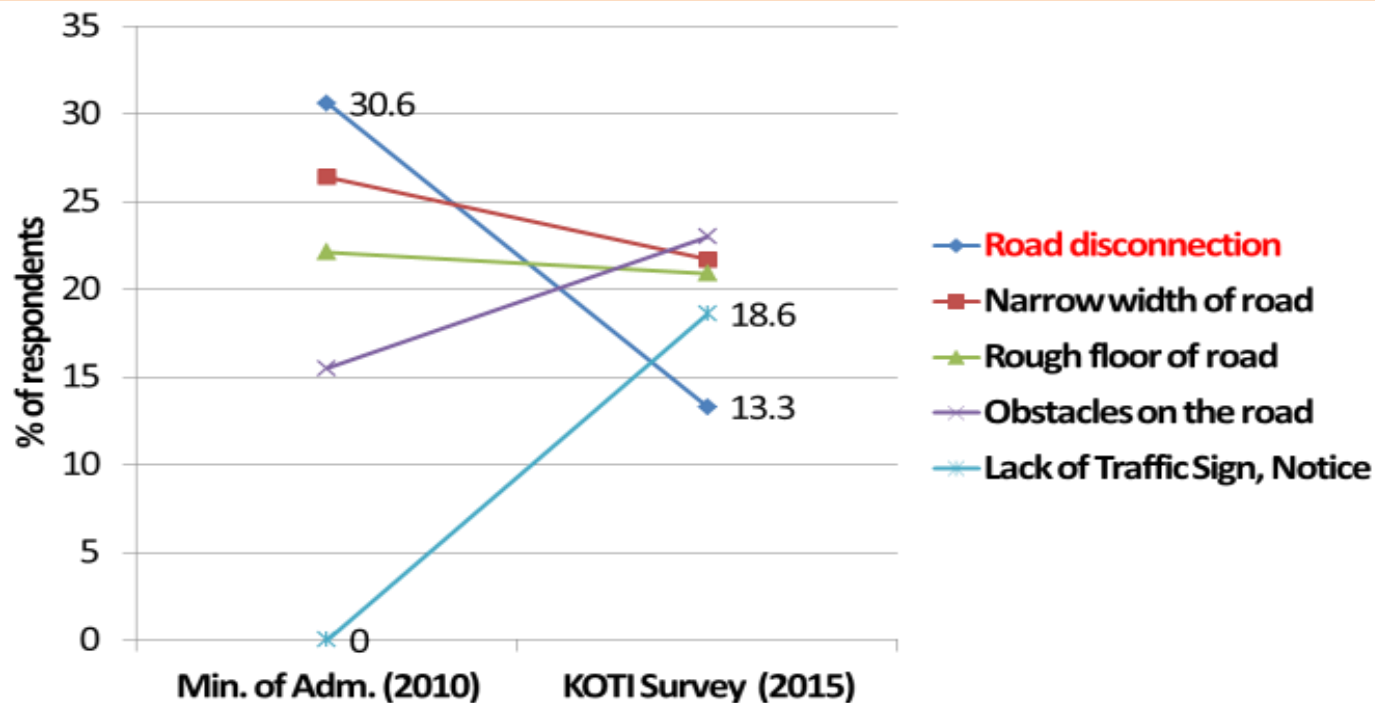
- Bicycle has several advantages to compete with the other transit modes in some conditions (distance, congestion ...)



# INCONVENIENCE WHILE BIKE-RIDING

- Expanded bicycle-road routes thanks to the governmental investments allows the road to lengthen
- However, there are several operational issues to be solved

Inconvenience while bike riding



# CYCLING PROMOTION POLICIES



# THE 1<sup>ST</sup> NATIONAL PLAN

## Formulated the campaign plan for cycle use (April 1993)

- Ministry responsible: Ministry of Home Affairs
- Origin of Ministerial Directives for development of cycle infrastructures

## Promulgated the Law for Cycle Use Activating (Jan. 1995)

- Ministry responsible: Ministry of Home Affairs
- Origin of implementing ordinance and enforcement regulation

## Announced national cycling use activating plan

- Ministry responsible: Ministry of Home Affairs
- 5 years plan focused on infrastructures

# THE 2<sup>ND</sup> NATIONAL PLAN

## Announced the Second national plan for cycling use activating

- Ministry responsible: M. of Government Administration and Home Affairs
- Based on the assessment of 1<sup>st</sup> national plan

## Some briefs of the Assessment of 1st national plan

- Total budgets used: 478 billion KRW (National 30%, Local 70%)
- Infrastructures: Bikeway 4,419km / Cycle parking for 190,000 cycles

## Objectives of 2nd national plan

- Budgets: 500 billion KRW (National 40%, Local 40%, Other 20%)
- Infrastructures: Bikeway 4,000km, cycle parking for 80,000 cycles
- New: National campaign, education for safety



# THE 3<sup>RD</sup> NATIONAL PLAN

## Lee Myung-bak administration announced new era

- Announced green growth strategy (Aug. 2008)
- National Initiative plan was released (Jan. 2009)

## National initiative plan

- Modal share target: 5% for 2012
- Total budgets: 1.2 trillion KRW (national only, local independently)
- Infrastructures target: Bikeway 17,000km for 2019

## Bicycle master plan

- Comprehensive master plan was finalized in 2010
- Central government focuses on bike for urban transportation use
- Includes not only infrastructure but also campaign and education

# BICYCLE MASTER PLAN

## Visions and Objectives (target year of 2019)

### Vision 1. Easy & safety

#### Build safe bikeways

- decrease 30% of bike accidents
- build 30,000km of bikeways

### Vision 2. Efficiency

#### Increase bike mode share

- achieve 10% of bike mode share
- achieve 30% of commuting ratio

### Vision 3. Exchange

#### Integrate with other transit modes

- secure central government subsidies of 50%
- increase 100% transferring ratio

### Vision 4. Environment

#### Improve bike environments

- decrease 30% of air pollution

### Vision 5. Economy

#### Stimulate regional economy related with tourism

- achieve 20% of bike tourism among total

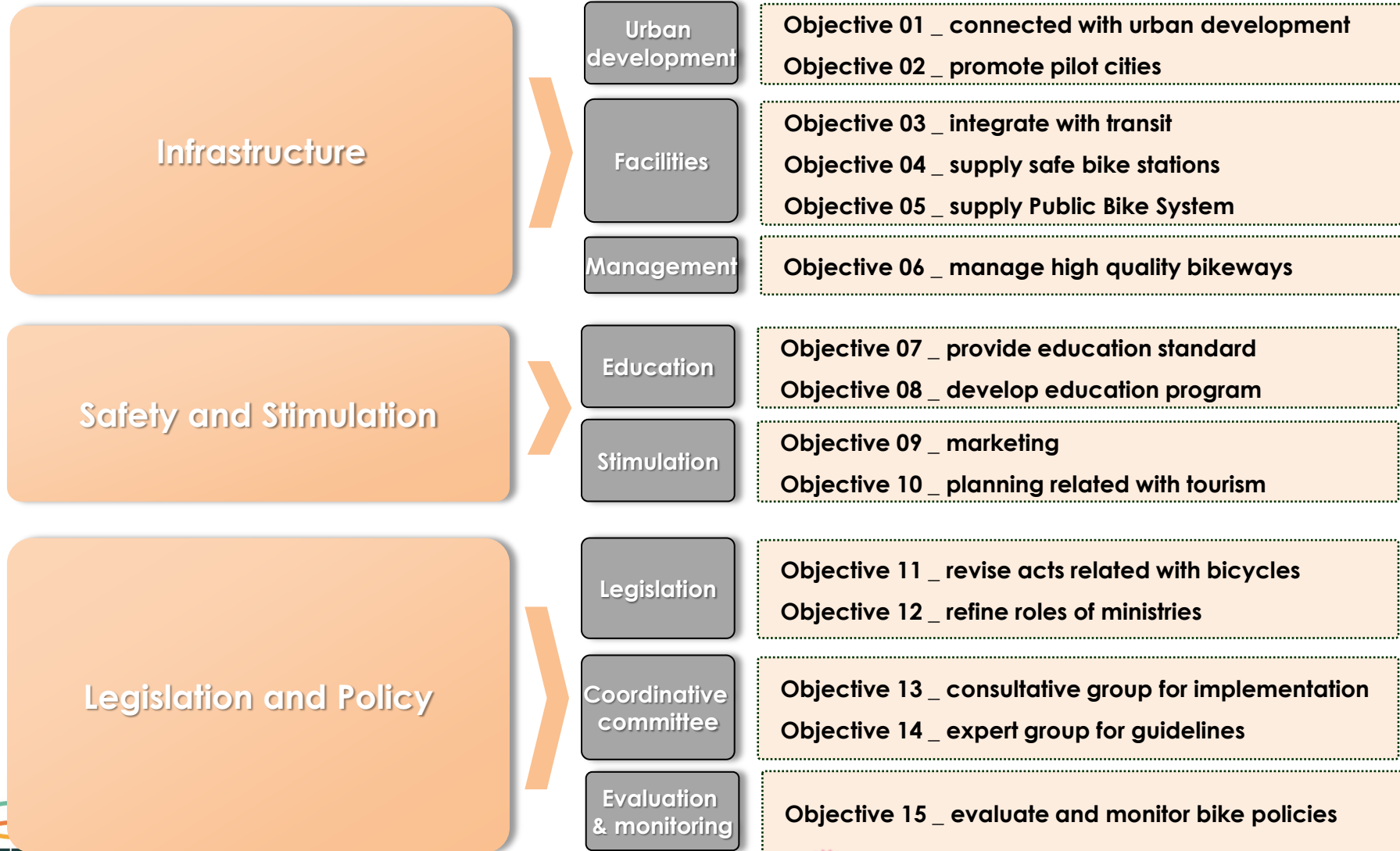
### Vision 6. Experience

#### 10 pilot cities chosen, and expands the experiences to other cities

- achieve 15% of bike mode share for pilot cities



# CONTENTS AND OBJECTIVES OF THE MASTER PLAN



# KOREA NATIONAL CYCLE ROUTE



### 국토종주 자전거길 현황

**한강종주자전거길(서울구간)**  
(아라한강길-발당대교, 56Km)  
한강을 따라 도시 속 휴식처를 달리는 신쾌하고 편안한 아늑한 자전거길

**아라자전거길**  
(아라새해길-아라한강길, 21Km)  
경인아라새길을 따라 활주로처럼 일직선으로 달릴수 있는 자전거길

**오천자전거길**  
(흥촌교차로~함강중점, 105Km)  
다섯 개 하천을 따라 새재와 금강을 잇는 오천자전거길

**금강자전거길**  
(대청댐-금강 하구둑, 146Km)  
택재의 습길을 따라 자연의 조화로운 모습을 느낄 수 있는 여유로운 자전거길

**영산강자전거길**  
(담양댐-영성강 하구둑, 133Km)  
남도풍경에 떠오르며 사치며 그윽치며 유유자적한 황홀한 자전거길

**섬진강자전거길**  
(전북임실 섬진강생태속관광-전남광양 태일수면공원, 149Km)  
자연 그대로의 모습을 간직한 섬진강의 아름다움을 그대로 심연 뿜출 자전거길  
※ 국토종주노선 148km, 영산강-섬진강 자전거길 연결노선 26km

**제주한상자전거길**  
(제주도 해안도로 일주 234Km)  
해안도로를 따라 제주도의 아름다운 해변과 송악산, 최소곡, 상산암술봉 등 멋진 자연경관을 감상할 수 있는 자전거길

**동해안 자전거길(강원구간)**  
(고성 통일전망대 - 삼척 교포마을, 242Km)  
급별 모래가 펼쳐진 해변길과 잘 보존된, 대오항 등의 항구도시의 활기찬 모습을 체험할 수 있는 자전거길

**북한강자전거길**  
(함흥 광장 - 춘천 신해대교, 70Km)  
경춘선 폐철교와 북한강 강변을 활용한 자전거길

**국토종주 남한강자전거길**  
(발당대교-충주한강대, 132Km)  
옛 충장선 폐철도 구간을 달리는 수려한 경관의 이색적인 황홀 자전거길  
※ 한강종주 자전거길 (아라한강길-충주대, 192km)

**새재자전거길**  
(충주한강대-상주 상봉교, 100Km)  
한강과 낙동강을 잇기위해 위해 여하한 고개를 넘는 파란한 자전거길

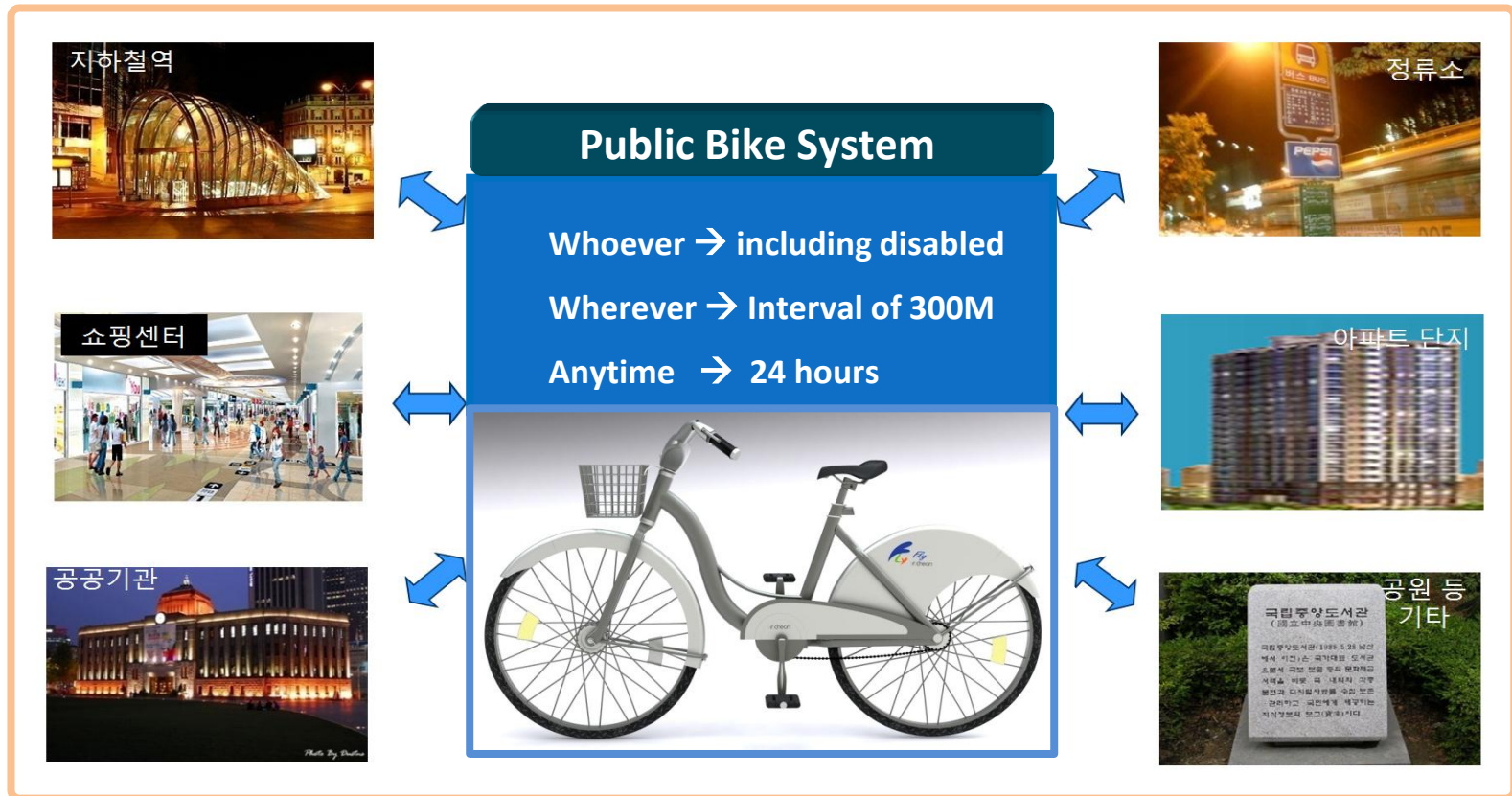
**국토종주 낙동강자전거길**  
(상주 상봉교-낙동강 하구둑, 385Km)  
국내에서 가장 긴 자전거길로 다양한 경관과 볼거리가 가득한 즐거운 자전거길  
※ 낙동강종주 자전거길 (양동댐-낙동강 하구둑, 389km)

인증구간 길이 1,777km

# PUBLIC BIKE SYSTEM

# PUBLIC BIKE SYSTEM (PBS)

“PBS is to rent a bicycle anywhere and any time”



# KOREAN PBS OPERATION



City	Area (km <sup>2</sup> )	Population (1000)	Name	No. of Bicycles	No. of Stations	Open Year
Changwon	736.3	1,080	Nubija	6000	247	2008
Goyang	267.4	960	Fifteen	3,000	125	2010
Daejeon	539.9	1,500	Tashu	1,909	144	2009

City	Operation	Description
Changwon	Changwon Public Racing Authority	- Subsidy by Changwon city (5 billion KRW)
Daejeon	Daejeon Public Facilities Authority	- Plan to expand
Goyang	SPC	- Operation company: ECO-Bike

- Ansan, Seoul and other cities implemented recently
- Suwon and other cities will operate soon

# COSTS OF PBS

- **Changwon**
  - Initial costs: 10 Million USD (Bike + Terminal + Control system)
  - Operation costs: 2 Million USD
- **Initial costs per bike: 3.5-3.9 Million KRW**
- **Operation costs per bike · year: 0.9~1 Million KRW**

	Changwon	Goyang	Daejeon
No. of Bikes	3,000	3,000	1,000
No. of Stations	165	125	22
Initial Costs (B KRW)	12.0	11.7	3.5
Initial Costs per bike (M KRW)	3.64	3.90	3.50
Operation Costs per Year (B KRW)	3.0	3.0	.9
Operation Costs per Year Bike (M KRW)	.91	1.00	.90



# PBS OPERATION COSTS AND PROFIT SYSTEM

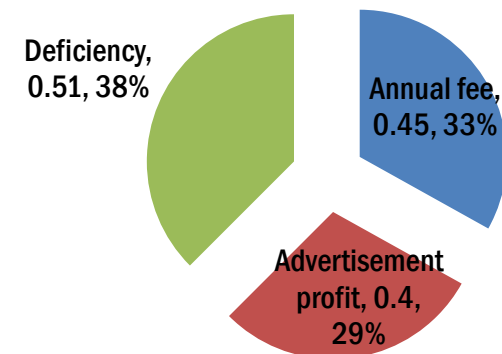
## ■ Operation costs

- From our experiences PBS **cannot be operated** with membership and advertisement only
- Recommend public support and private investment together

## ■ Estimated profit (KOTI estimate)

- If total costs 1.36 B KRW
  - Annual fee : 0.45 B KRW
  - Advertisement profit : 0.40 B KRW
  - Deficiency : 0.51 B KRW

KOTI Estimated Profit (B KRW)  
(if total costs 1.36 B KRW)



# PBS ECONOMIC BENEFITS

- **Estimating economic benefits for PBS**
  - Contingent Valuation Method was used to estimate economic benefits of PBS
  - Using the average WTP per household, which was estimated on the basis of survey outcome, the total economic benefit of bike sharing was estimated as below
  - B/C ratio is estimated greater than one, so PBS is believed to have economic benefits compared with costs

City	Model	Sort of WTP	Mean Annual WTP/household (KRW)	# of household	Mean Annual net profit (B KRW)
Changwon	One-bound model	C+(C'')	6,644	376,075	2.5
		C++	10,424	376,075	3.9
	Two-bound model	C+(C'')	7,939	376,075	3.0
		C++	9,982	376,075	3.8
	Spike model	C+(C'')	7,618	376,075	2.9
		C++	10,035	376,075	3.8

*\* note : mean annual WTP per household was estimated with 90% confidence level.*

# PBS –AS PUBLIC TRANSPORTATION SUPPLEMENT

- Improves accessibility to public transportation
- A supplement for public transportation if that of region is not enough
- Social benefits
  - Promotion of health
  - Traffic congestion reduction
  - CO<sub>2</sub> emission reduction
- More social benefits than costs
- Therefore, PBS is transportation mode which has enough publicness

**➔ Central Government needs to subsidize like Publics transport!**

# INTEGRATION OF PBS AND PUBLIC TRANSPORTATION (DAEJEON)

- **Bikesharing Mileage System linked with Public Transportation**
    - Ta-shu users can save 200 miles/day (100 miles/each and up to two transfers per day) and accumulate the mileage up to 20,000 miles per year in each of their accounts
    - When Ta-shu users transfer to the public transportation such as bus and metro from the bike with the RFID card (e.g. T-money) in 30 minutes, they can save their mileage into their accounts. (To save their mileage, they should buy the 1-year pass)
- ※ The mileage cannot be used to get a discount of bus or metro fare.

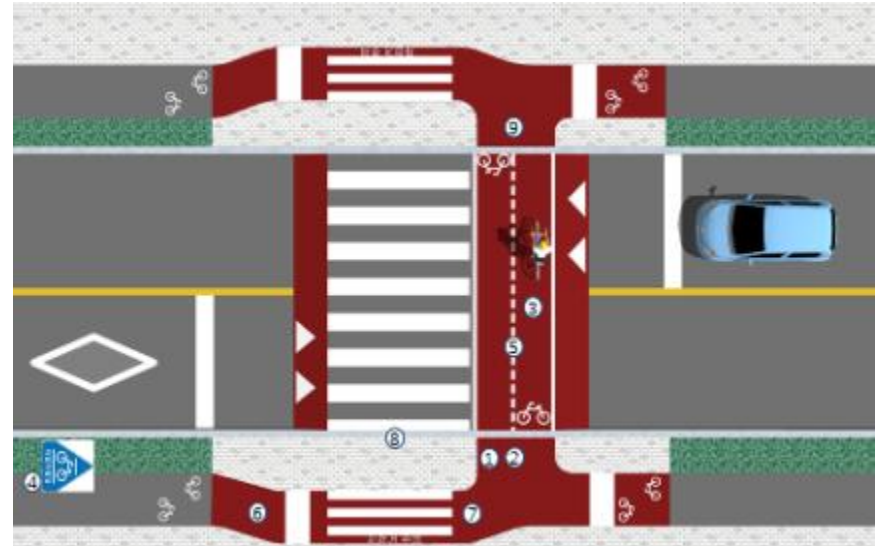
# BICYCLE FACILITY DESIGN

## DESIGN CONSIDERATIONS

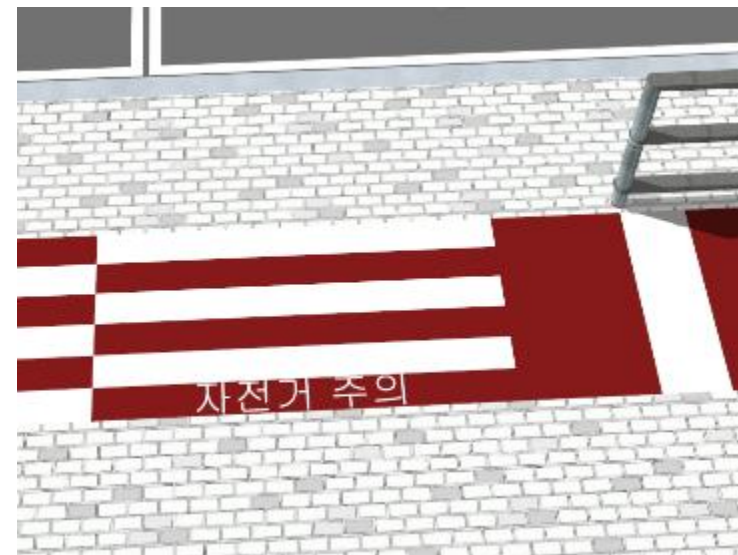
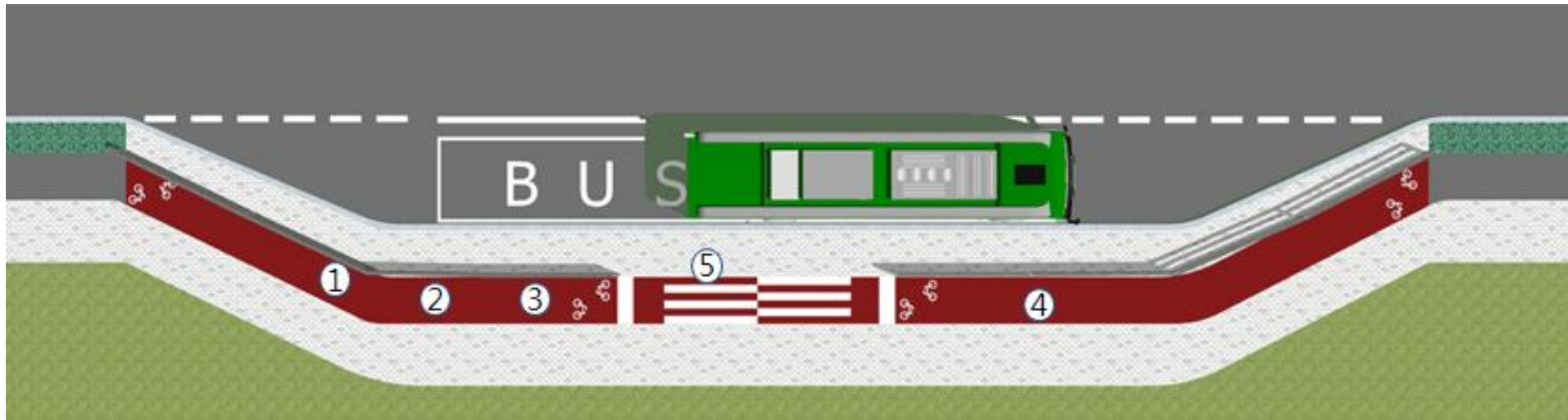
- **Minimize the conflict between ‘cars and bicycles’ and ‘bicycle and pedestrians’**
- **Seamless bicycle path or lane**
- **Make a bicycle and pedestrians waiting area**
- **Improve the visibility of bicycle path or lane**
- **Integrate bicycle facility and public transportation**

# BICYCLE PEDESTRIAN SHARED PATH DESIGN

## - CROSS SECTION

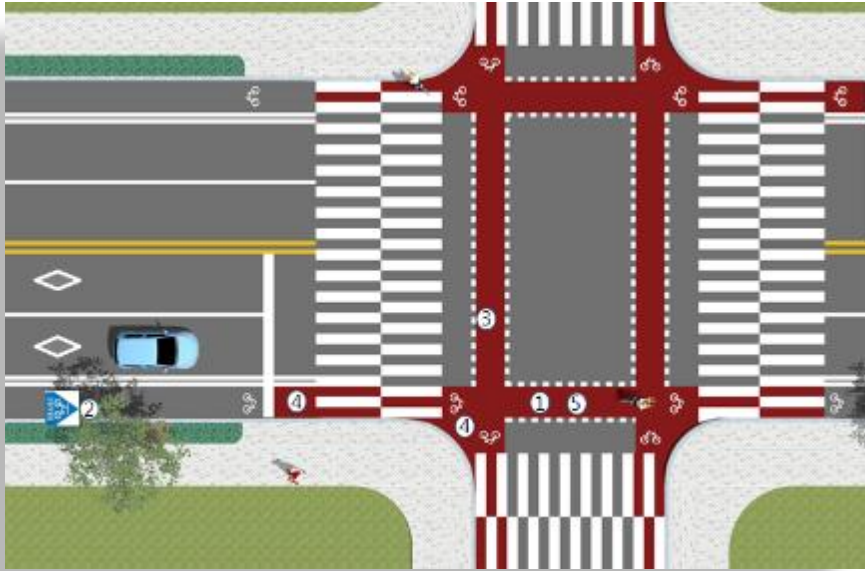


# BICYCLE PEDESTRIAN SHARED PATH DESIGN-BUS BAY

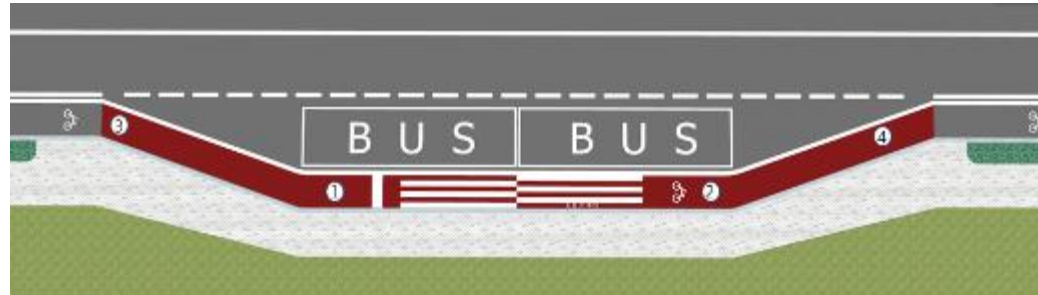
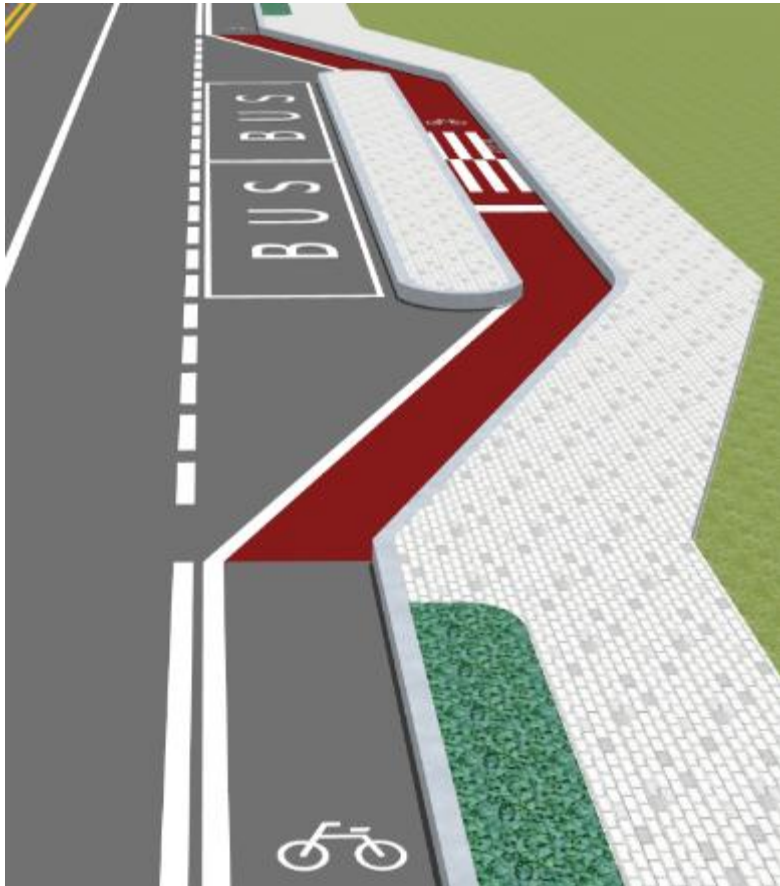




# BICYCLE LANE DESIGN-CROSS SECTION



# BICYCLE LANE DESIGN-BUS BAY



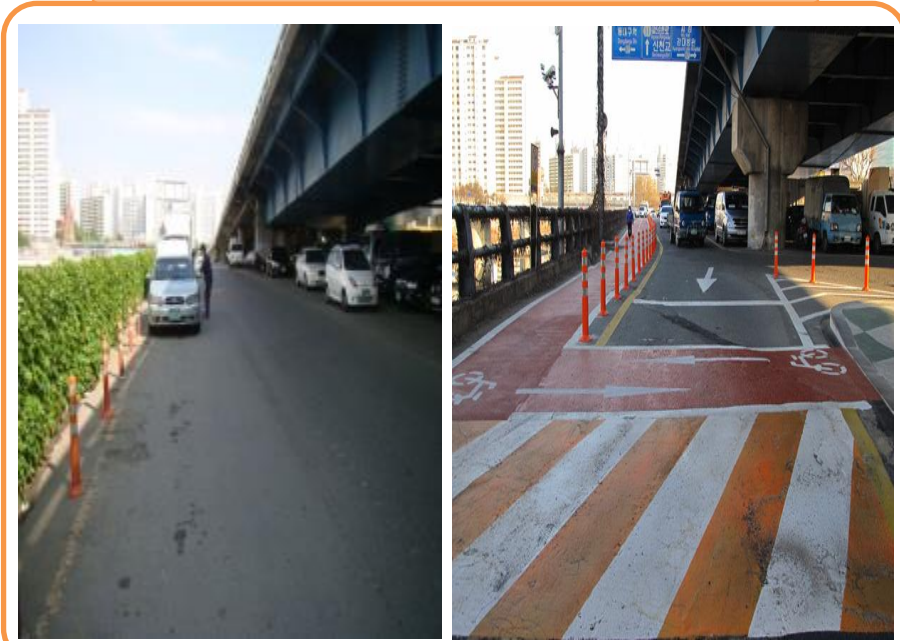
# IMPROVED DESIGN EXAMPLE (DAEGU)



Bicycle lane from riverside to downtown



Bicycle track and crossing for safety



# IMPROVED DESIGN EXAMPLE (DAEGU)



Bicycle crossing (coloring)



# INTEGRATION OF CYCLE AND PUBLIC TRANSPORT

## On Transit

Train



Subway



Bus



## Station

Parking space



Bicycle pull way



Info Sign



Bicycle gate



## Access Road

Easy access to station



Info sign



# SOME PICTURES TO SHARE

## Solar panel covered bike way (8km, 1.8MW/day)

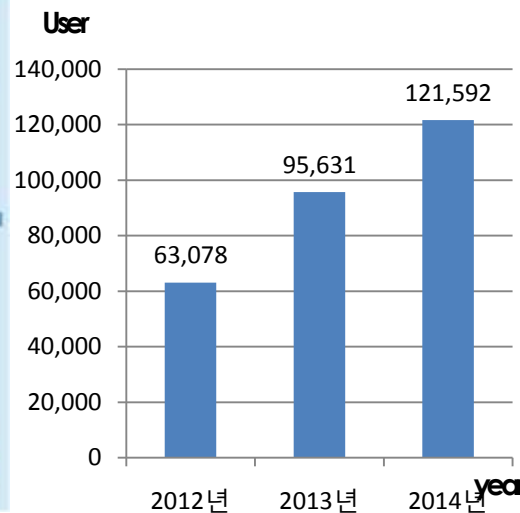


It was a railroad before....



# SOME PICTURES TO SHARE

## 4-River side bike way



# CONCLUSION



# CONCLUSION

- Koreans have changed their behaviors in bicycle
- More and more people are using bicycles for transportation purpose
- Partial reasons will be national and city governments' efforts
- More efforts to integrate public transportation and bicycle is needed



# Thank you

Hee Cheol SHIN, Ph.D.  
hcshin@koti.re.kr

