World Congress on Mobility
for the Future of Sustainable Cities

EcoMobility Changwon 2011

Case Studies and Lessons Learned from Bike-sharing Programs in Japan

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Pursuing Excellence

IDE
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Tokyo Institute of Technology

Contents

1. Background

Bike-sharing

- environmentally friendly public transportation
- rent from one port and return to any other port

Taken by the Author

1. Background

Generation	Components	Characteristics
1st No Tech	・Bicycles	・Distinct colors ・No docking stations ・Bicycles unlocked ・Free of charge
2nd Low Tech	・Bicycles ・Docking Stations	・Distinct bicycles ・Specific docking stations ・Bicycles have locks
3rd High & Smart Tech	・Bicycles ・Docking Stations ・Kiosks / User Interface Tech.	・Distinct bicycles ・Specific docking stations ・Bicycles have locks ・Electric bicycles with solar power ・Mobile phones & smart cards

(Revised by Author based on the source: S. Shaheen, S. Guzman, and H. Zhang 2010)

1. Background

Research Questions

1. Why are there so many different bike-sharing systems around the world?
2. What is necessary for success in Japan?

Hypothesis

1. Funding and revenue streams differ by venue
2. In Japan, integration with other related policies is crucial.
3. NPOs play vital roles under the integrated policies

2. Management

Suppliers and Operators

Source: each homepage

bixi

CLEAR CHANNEL

B cycle

next bike

JCDecaux

System & Supplier	Example
Cyclocity by JCDecaux	France, Australia, Belgium, Ireland, Spain etc
Smart Bike by Clear Channel	France, Norway, Spain, Mexico, Japan etc
Bixi	Canada, USA, UK
Next Bike	Germany, Austria
B-Cycle	USA
Bicincitta’	Italy, Spain

2. Management

City (Since)	Bike	Port	Operators
Paris, France (2007)	20600	1451	JCDecaux
Barcelona, Spain (2007)	6000	400	Clearchannel
London, U.K. (2010)	6000	400	Bixi
Lyon, France (2005)	4000	340	JCDecaux
Washington, U.S.A (2010)	1100	114	Local government & private
Rennes, France (2009)	900	81	Public transport agency
Denver, U.S.A. (2010)	600	40	Local government company & NPO
Rio de Janeiro, Brazil (2010)	194	19	Private company
Toyama, Japan (2010)	150	15	MCDecaux
Kitakyushu, Japan (2010)	116	10	K-TMN
Alessandria, Italy (2008)	74	6	Bicincitta’

2. Management

City	Staff	# of Bike		# of Port		Daily users	
		Total	Per staff member	Total	Per staff member	Average	Per staff member
Paris	400	20600	52	1451	3.6	70000	175
Lyon	40	4000	100	250	6.3	15000	375
Rennes	4	200	50	25	6.3	320	80
Kita kyushu	5	116	23	10	2	25	5

Only Electric-assisted bicycles

2. Management

Business Models - For profits

- Provide profitable bike-sharing services with minimal government involvement
- Public-private partnership
- Government subsidies
- Member/nonmember usage fee

Provider	Revenue Sources	Program Example
Advertising Company	Advertising funding from city street furniture, billboards, bikes, and BS stations	• SmartBike (U.S.) • Cyclocity (France)
Public Transport Agencies	Ads on bikes and BS stations	• Hangzhou Public Bicycle (China) • Call a Bike (Germany)

(Revised by Authors based on the source: S. Shaheen, S. Guzman, and H. Zhang 2010)

2. Management

Local gov't or NPO initiative Models

- Public-private partnership
- Government subsidies
- Member/nonmember usage fee

Provider	Standard Operating Model	Program Example
Local Government /Public Authority	Directly design and operate a BS program for the well being of cities or a local gov't purchases BS services provided by others	•City Bikes (Denmark) •Bicincittà (Italy) •Nubija (South Korea) •YouBike (Taiwan) •Shanghai Public Bicycle(China)
Non-Profit	Provide BS services with the support of public agencies or local councils	• BIXI (Canada) • Hourbike (UK) • Wuhan Public Bicycle (China) •City Bike (Kitakyushu)

(Revised by Authors based on the source: S. Shaheen, S. Guzman, and H. Zhang 2010)

3. Case studies in Japan

As of 2008, 208 cities have 388 **rental bicycle stations** and 21977 **rental bicycles** near train stations(Cabinet Office 2008).

# of bicycles

5000000
4500000
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0

1977 1981 1985 1989 1993 1997

Bicycle parking capacity

or

Provision of Bicycle parking lots & Rental bicycle service

3. Case studies in Japan

Japan's History

First – Kurume City "Light Blue Bikes"

1st generation bike-sharing (manual) like "white Bike" in Netherlands → **Unsuccessful**

Taken by the Author

In recent days… projects and many public experiments began

Toyama

- Well-known French system (MCDecaux)

Taken by the Author

Setagaya, Tokyo

- Sanyo's electric bicycles & solar parking lots

Taken by the Author

Kyoto

- With mobile phone company (Softbank)
- Point card "Felica"
- IT "Twitter"

Taken by the Author

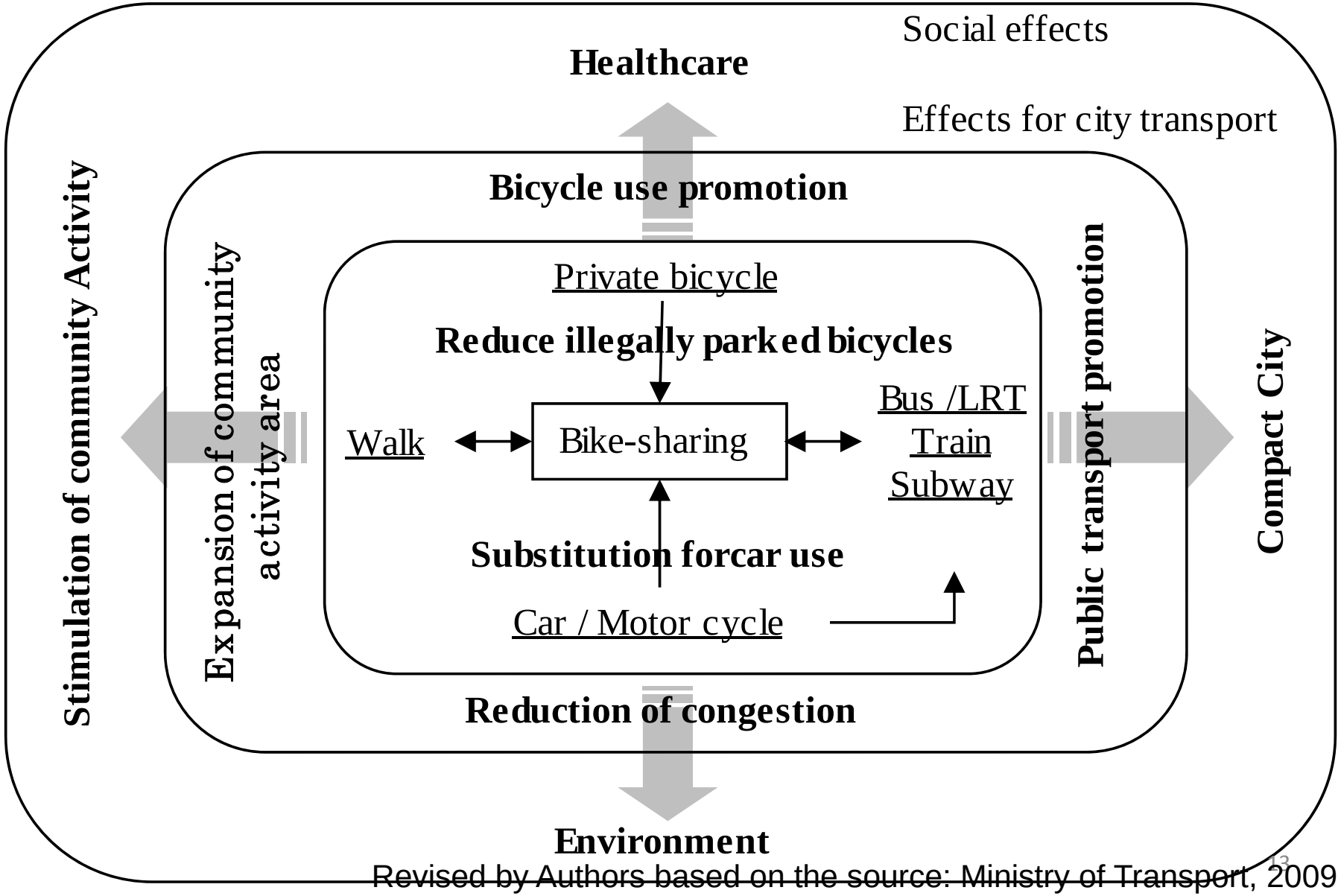
Kitakyushu

- Integration of car-sharing & bike-sharing system
- Electric bicycles
- Eco-point
- Reeducation

Taken by the Author

3. Cases in Japan

Expected effects of bike-sharing system



Revised by Authors based on the source: Ministry of Transport, 2009

3. Case studies in Japan

City	Since	Ports	Bikes	Notes
Edogawa (E Cycle)	2009	3	400	
Setagaya (Gayarin)	2010	3	108	Run by NPO: Electric assisted bikes, rental cycle, bicycle parking & solar charging
Yokohama	2011	10	100	
Toyama (Cyclocity)	2010	15	150	Run by Advertising company
Kyoto (Minaport)	2010	4	90	Bicycle parking lots
Sakai	2010	4	450	
Hiroshima (Norincycle)	2011	10	150	
Kitakyushu (City Bike)	2010	11	116	Run by NPO: Electric-assisted bikes, bicycle parking lots, bike-related education, rental cycle, car-sharing, Ecopoint & solar charging
Naha	2006	6	50	Run by NPO: Electric assisted bikes & rental
Sapporo (Porocle)	2011	7	50	

Revised by Authors based on the source: Ministry of Transport, 2009

3. Case studies in Japan

Results of Correspondence Analysis

3 groups

A small number of bikes
Less than 51 bikes

Main group
Public-private partnership

A small number of ports &
A large number of bikes

less than 51 bikes
Sapporo City
Naha City
Partnership with an advertising company
Toyama City
Kitakyushu City
Hiroshima City
Yokohama City
Partnership with NPO/NGOs
With other projects
Electric Bicycles
Setagaya-ku
Kyoto City
Sakai City
less than 6 ports
Edogawa-ku
less than 501 bikes
Dim 1
Dim 2

3. Case studies in Japan

		Setagaya ,Tokyo	Toyama	Kitakyushu
Provider		Local Government	Local Government/ Cyclocity	NPO K-TMN
Management		Setagaya-ku Silver Jinzai Center	Local Government/ Cyclocity	NPO K-TMN
Bikes		Bikes: 108 Ports: 3	Bikes: 150 Ports: 15	Bikes: 116 Ports:11
Cost	Capital	\88,000,000	\150,000,000	\116,590,000
	Manage-ment	\15,600,000 /5years		\500,000/ month
Revenue Source		・Subsidies ・Usage Fee	・Subsidies ・Usage Fee ・Advertising	・Subsidies ・Usage Fee

3. Case studies in Japan

Setagaya-ku

Setagaya-ku

Service Contract

Furniture Contract

Sanyo's Energy Policy & Local NPO

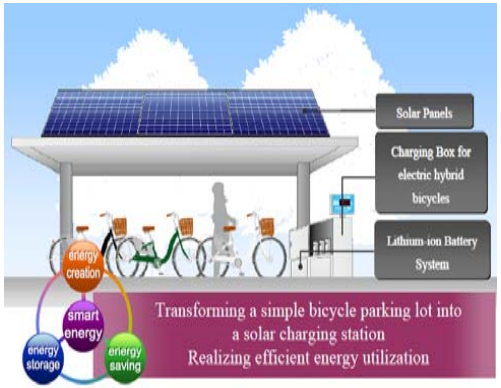
Setagaya Seniors' Human Resource Center

Technical Operability

SANYO

Source: Sanyo's website

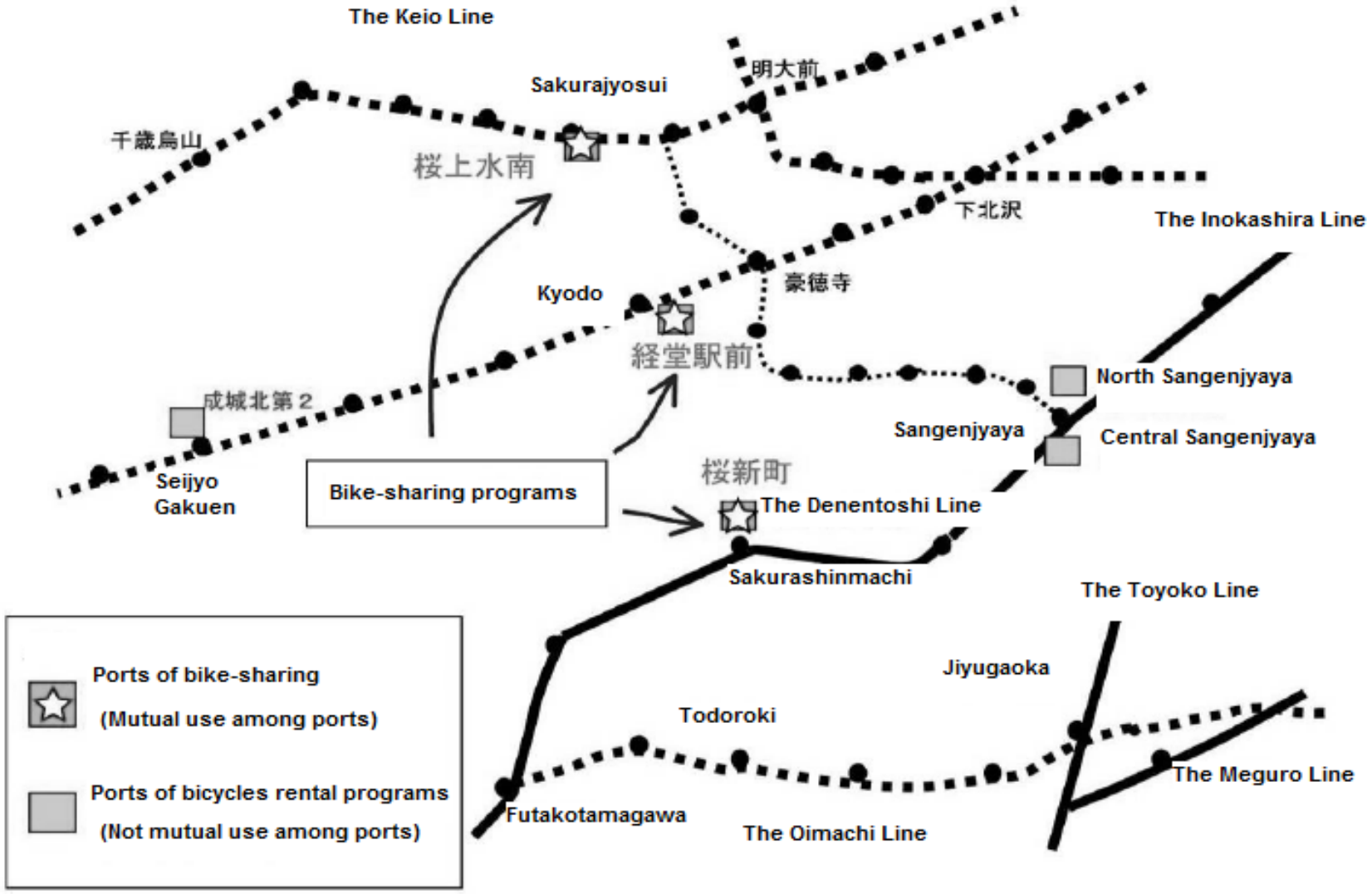
SANYO's "Smart Energy System" Electric Bicycles & Solar Parking lots



Pictures: taken by Authors

3. Case studies in Japan

Setagaya-ku



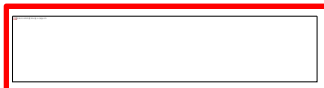
3. Case studies in Japan

Kitakyushu

NPO
Town Mobile
Network
Kitakyushu

Technical Operability

Management



Electric Bicycles

Locker, Battery

Car-sharing

Mobility for older people

Reeducation

Bicycle Manners

Parking

Eco Points projects

Cycle tour

Source: Relevant websites Pictures: taken by Authors

3. Case studies in Japan

(Kokura: 7 ports 92 bikes,
Higashida: 3 ports 24 bikes)

Japan Railway (JR)
Nishi Kokura Station
(8 bikes)

Mobility Center

2 4 hours auto management system

World 1st

City ward (20 bikes)

JR Kokura North (8 bikes)

JR Kokura South (20 bikes)

Kita-ku ward (20 bikes)

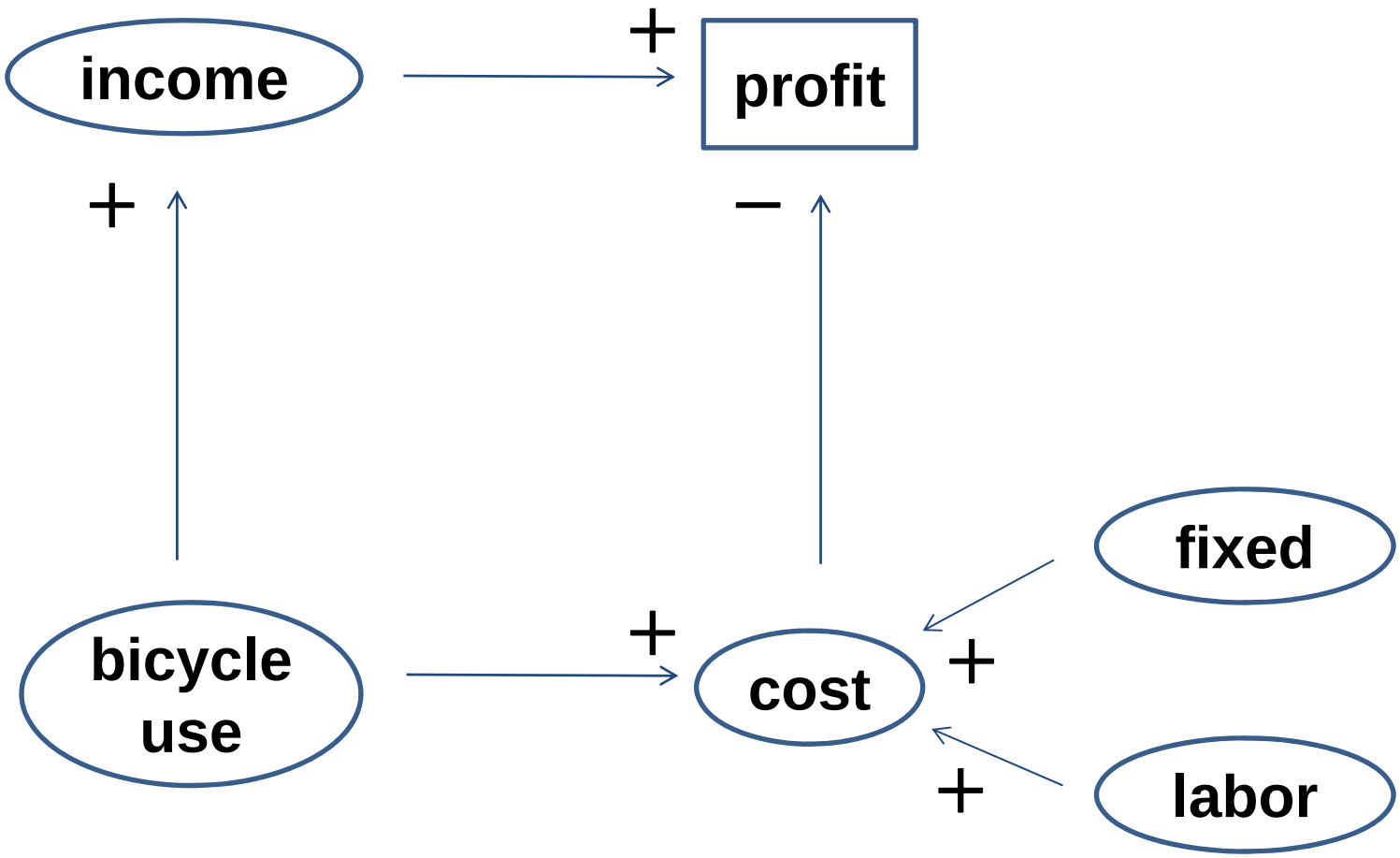
City plaza (8 bikes)

Municipal center (8 bikes)

Total 92 bikes

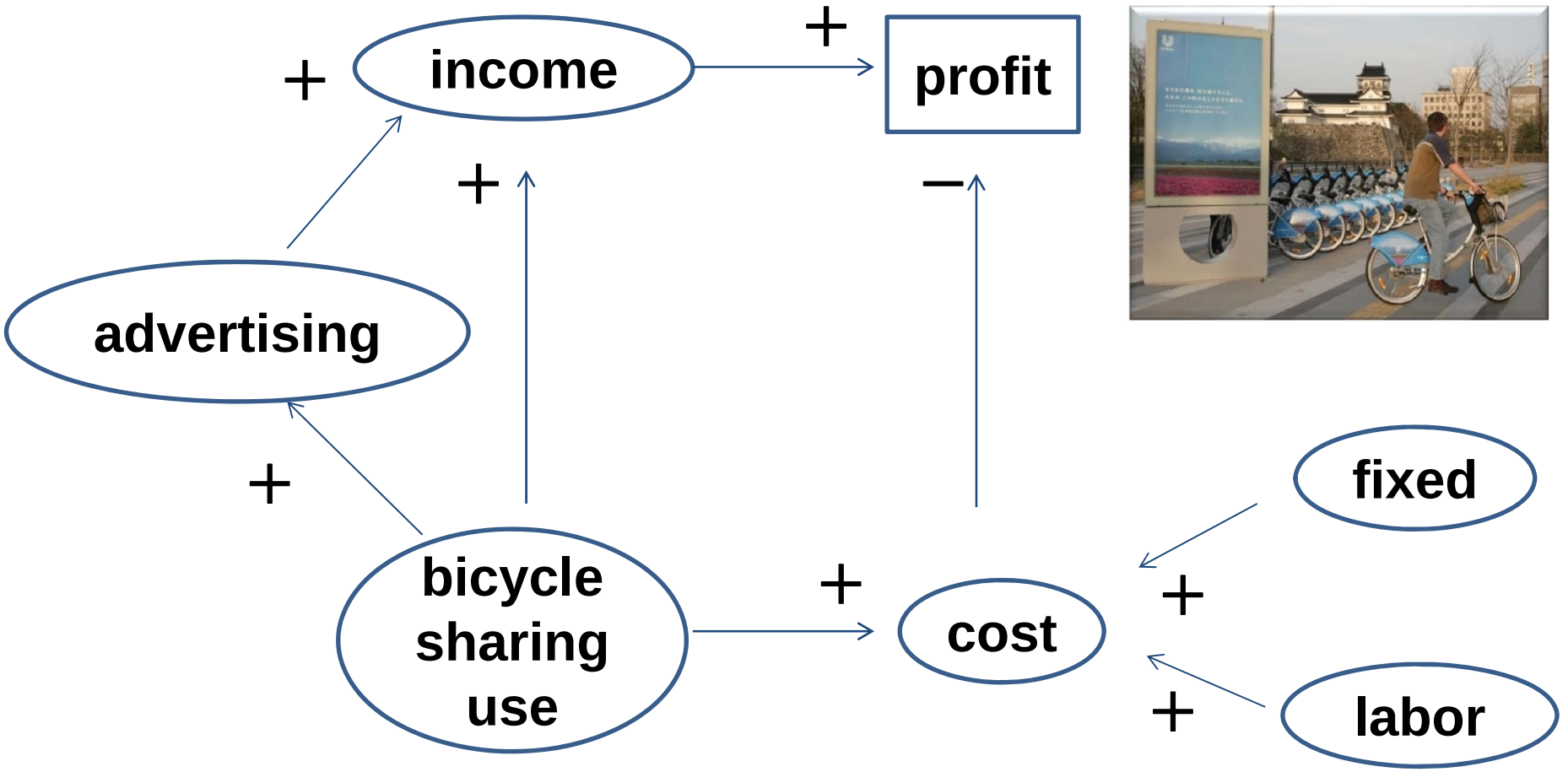
4. Conclusion

Public Bicycle Programs Business Models



4. Conclusion

Public Bicycle Program Business Model （Integration with Advertising）



4. Conclusion

Public Bicycle Program

Business Model
（Integration with Bicycle Parking）

Bicycle Parking Lots

private use

income

labor

cost

park

profit

fixed

?

Public Bicycle Program

income

profit

Cost Reduction

?

fixed

bicycle sharing use

cost

labor

Non-profit

Promotion of Environmentally Friendly Action

Re-education of Traffic Rules

Reduction of Illegally Parked Bicycles

Revitalization of Local Area

Cycle Tour

Bicycle Parking Lots

private use + park

income + profit + labor + fixed + cost

Public Bicycle Program

electric assisted bicycle sharing

4. Conclusion

Statistical analysis, and interview field work

1. Advertising business model is globally well-known, but it is not applicable to all cities, especially in Japan.
2. Integrated strategies: important in terms of finance, sharing new tech., education & local community's activity, especially in Japan
3. Cooperation between Local authorities, companies and NPOs: necessary for integrated strategies

References

1. S. Shaheen, S. Guzman, and H. Zhang, "BIKESHARING IN EUROPE, THE AMERICAS, AND ASIA: PAST, PRESENT, AND FUTURE," 2010 Transportation Research Record, (2010)
2. Paul DeMaio, "Bike-sharing: Its History, Models of Provision, and Future," Velo-city 2009 Conference, (2009)
3. Each Home Page of Bike-sharing programs

Save Energy, and Use Your Energy !!

THANK YOU FOR YOUR ATTENTION

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Please email to me for your Q's or detail info.

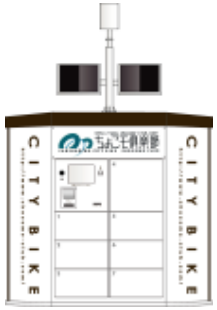
NPO Town Mobile Network Kitakyushu

Associated with Kitakyushu City

Kitakyushu Community Cycle

CITY BIKE

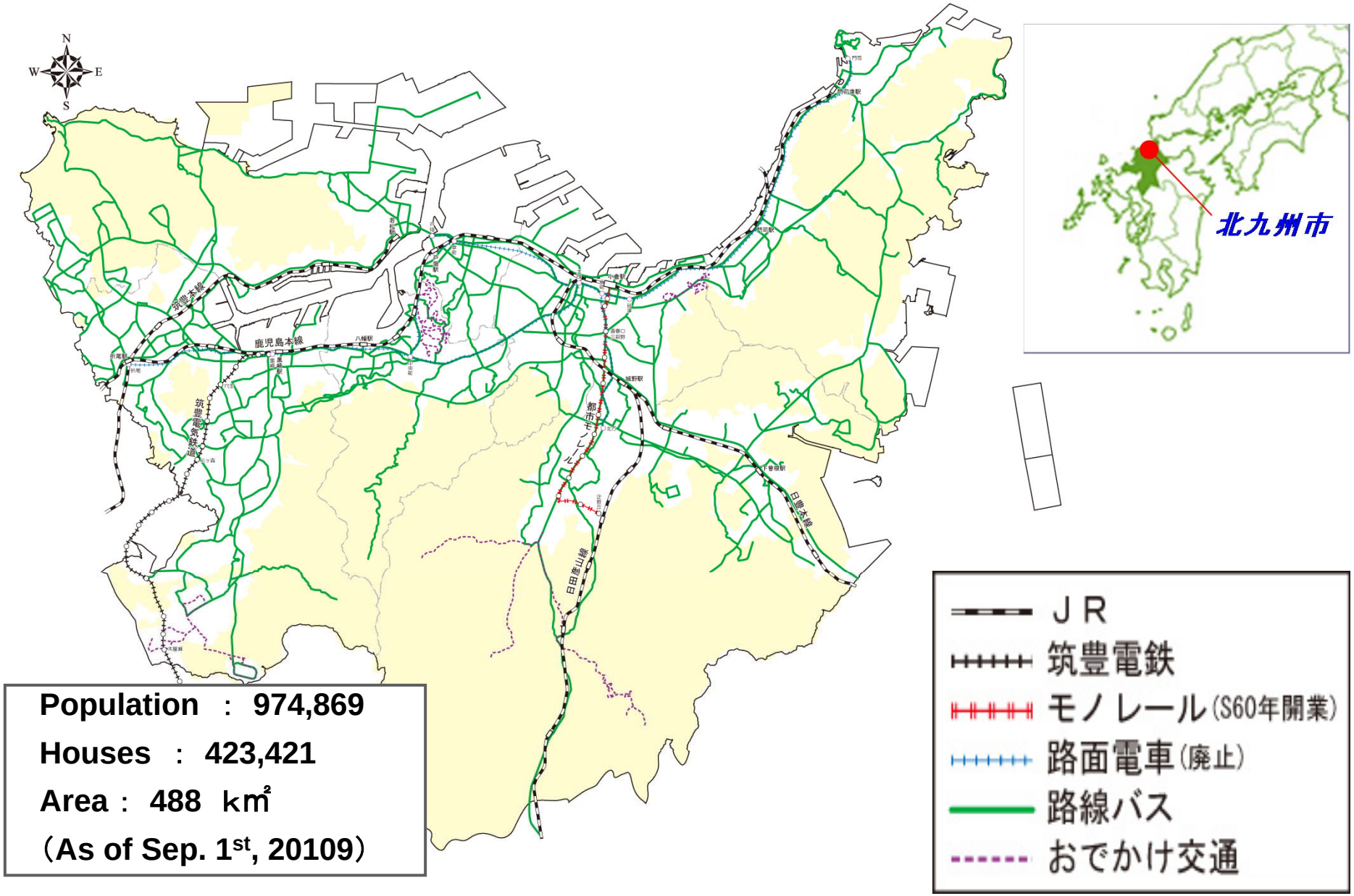
CITY BIKE Cycle Port



System

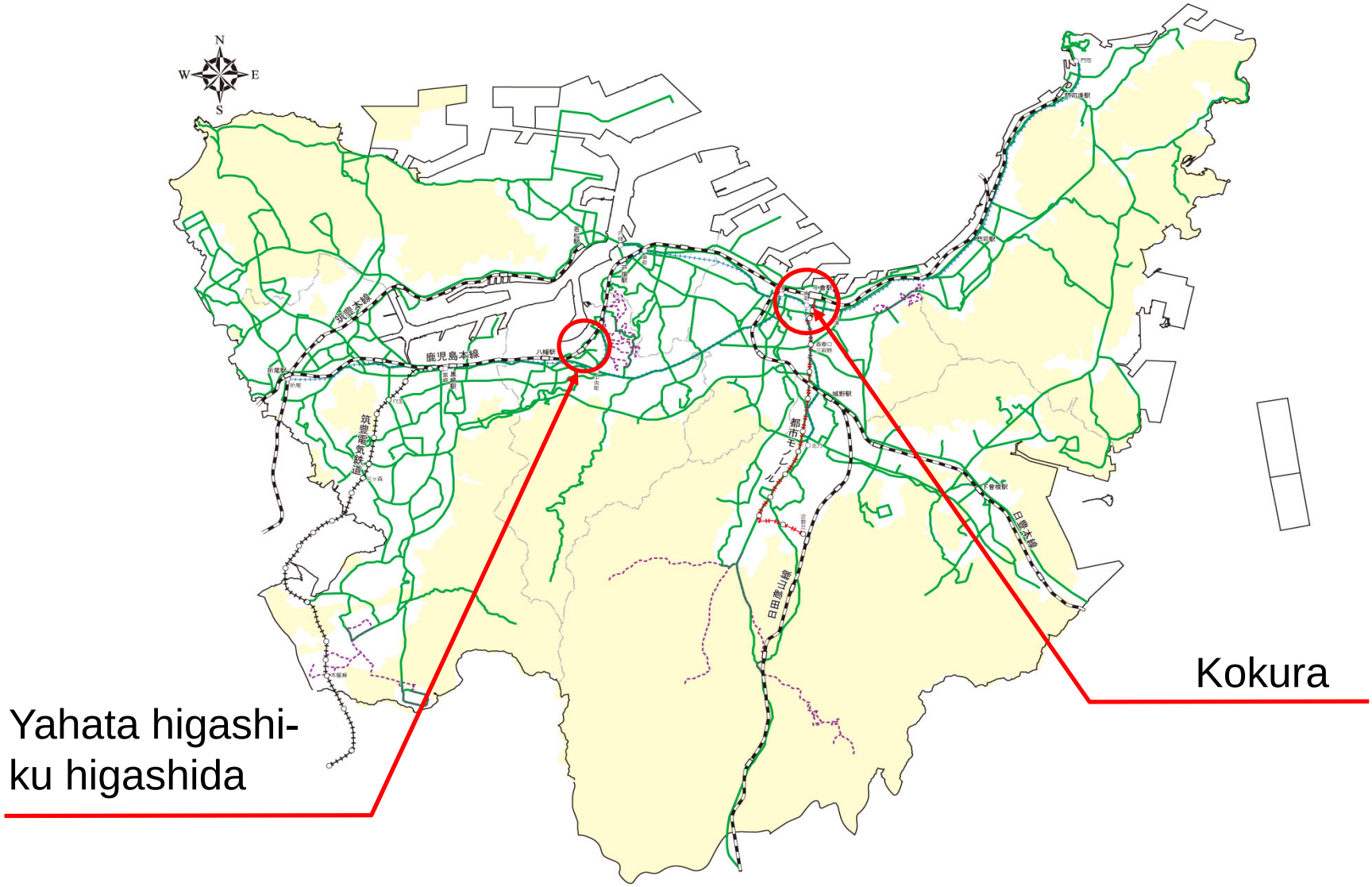
Electric Assistant Bicyle

Kitakyushu City



Population ： 974,869
Houses ： 423,421
Area： 488 ㎢
（As of Sep. 1st, 20109）

Map


N
W
E
S
鹿児島本線
筑豊本線
日田彦山線
日豊本線
Yahata higashi-ku higashida
Kokura

City Bike Management System

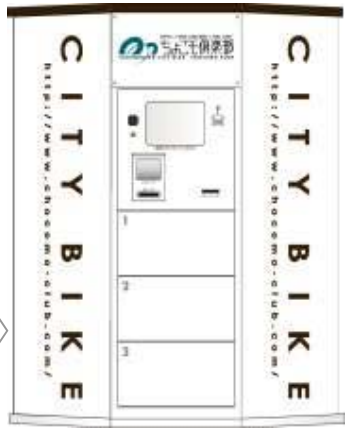
Bike-sharing with Electric Assistant Bicycles

Auto Management System

Management Machine

Operation

Insert a card



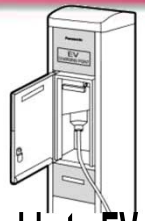
Manual

1. Select “Menu” on a touch panel
2. Insert a card
3. Take a key and a battery
4. Unlock a bicycle

Let’s see if it’s available…

Merits of CITY BIKE

- Environmental-friendly
- 24 hour Auto Management
- Easy Operation
- Reduce illegally parking bicycles
- Reduce car parking lots

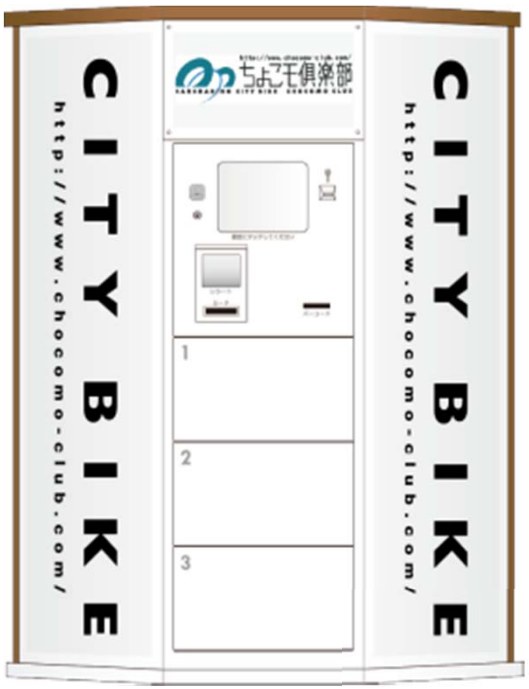


Applicable to EV charging

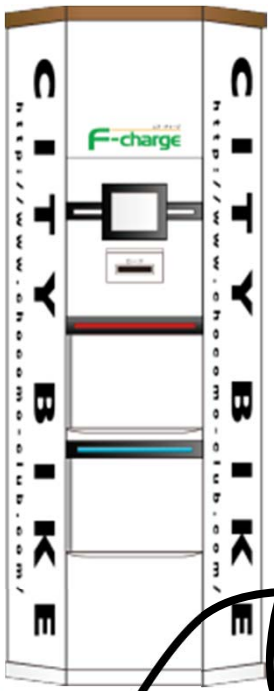
Same operation to return

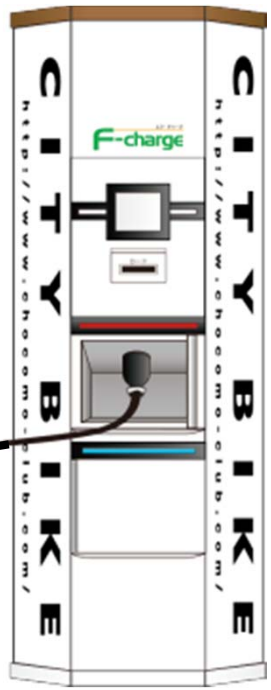
Future vision of Mobility Center

●Mobility Center



Front





Side

Shopping E V Cart

i ミーブ

City Bike

日産リーフ

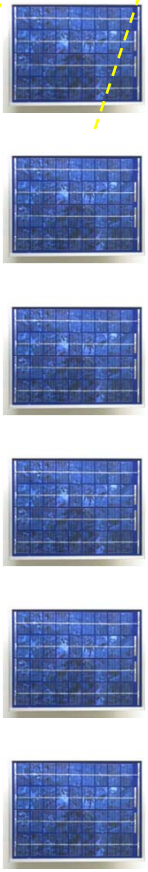
E V Community Vehicle

Disaster emergency power supply

CITY BIKE

Solar Power Display Panel

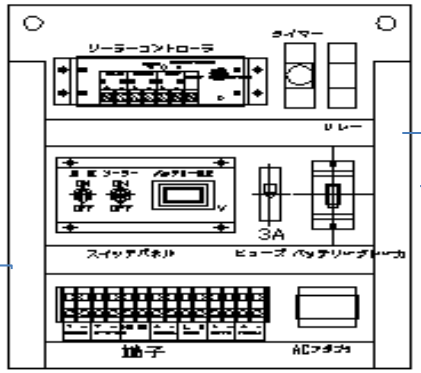
Electric Assistant Bicycle

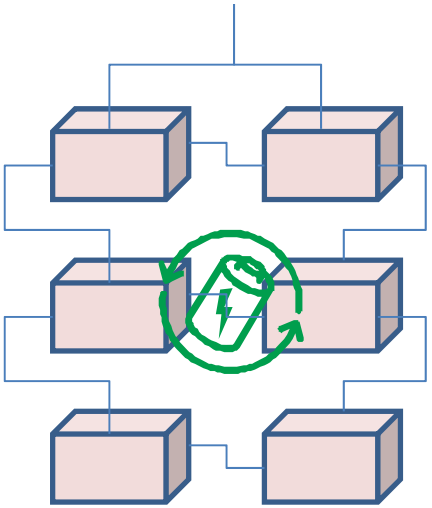


Solar panels
ADVANTEC
20-year guarantee
W1,424 H894 D35

Power source 100V

F-solar Controler





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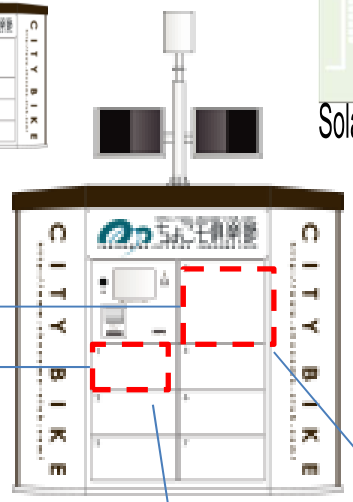
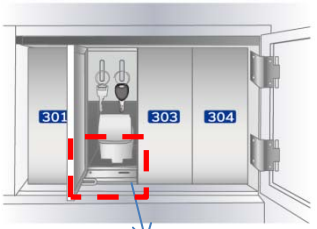
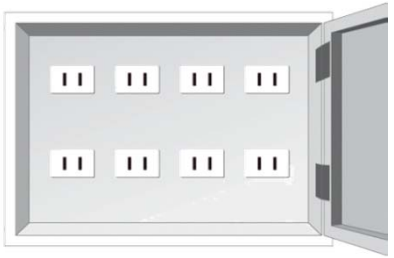


City Bike Management System

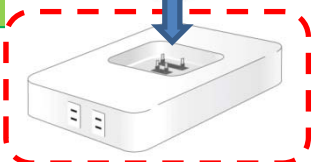


Auto Charging System



Emergency power socket

LED light



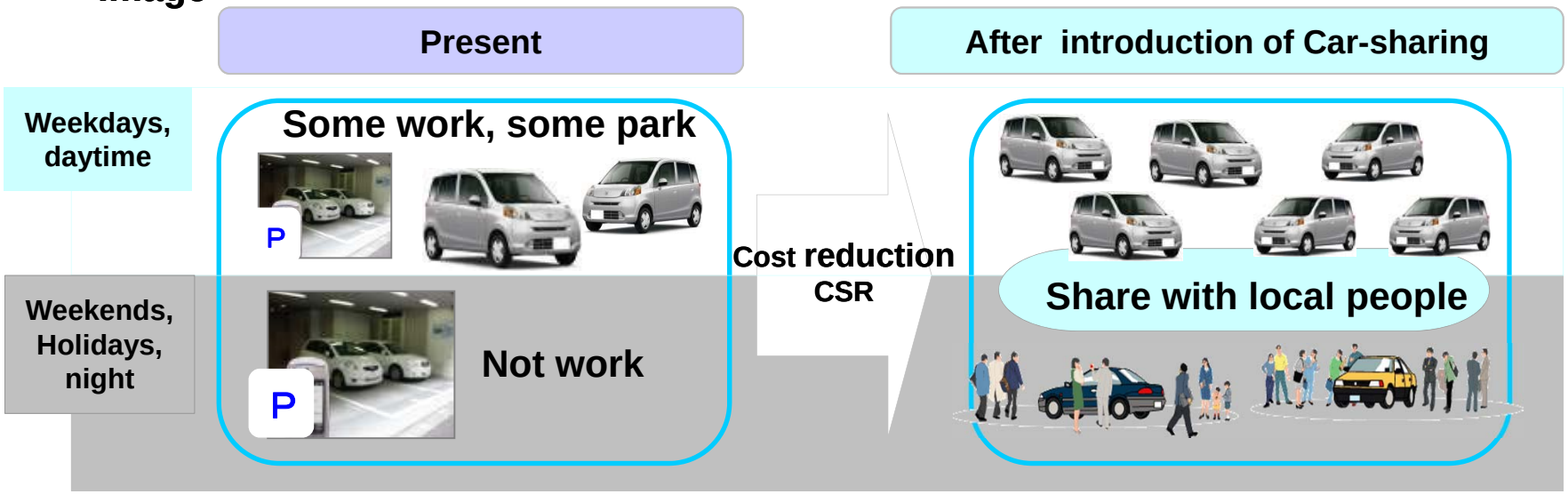
Bicycle Battery Charging System

Emergency Mobile Power Source

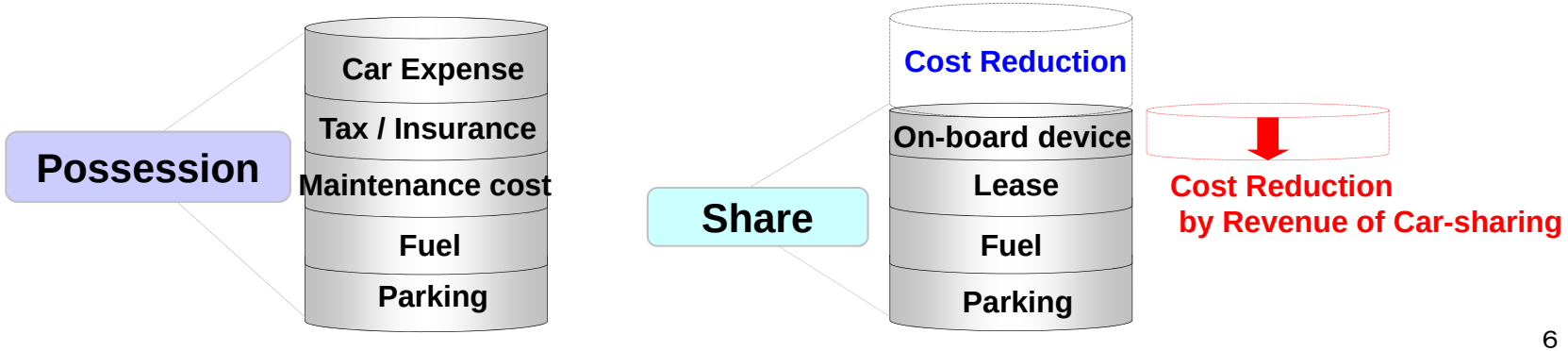
Car-sharing for city official vehicles or commercial cars

- Effective utilization of city official vehicles and commercial cars by car-sharing.
- Sharing these cars especially, weekends and holidays, with local people
- Purchasing hybrid cars or EVs by an amount of cost reduction.

Image



Cost reduction



Usage fee and incentive points (eco point)

●Fee

☆☆☆☆ Usage Fee ☆☆☆☆

Car-sharing /Bike-sharing

Entrance fee \3,150 (only for car-sharing) **Basic fee** \525 / month				
Usage fee	**Car**	\315 / per 30 min.	**Bicycle**	\105 / per hour
		Distance fee Free for less than 50 km		Max \525 / per day
		From 51 km Additional fee \10 / km		\5,250 / per month
		Time + Distance fee = Total		
Terms of Payment		**Credit card**		

☆ **City Bike 1 day use: \ 500**

☆☆Member's Card☆☆

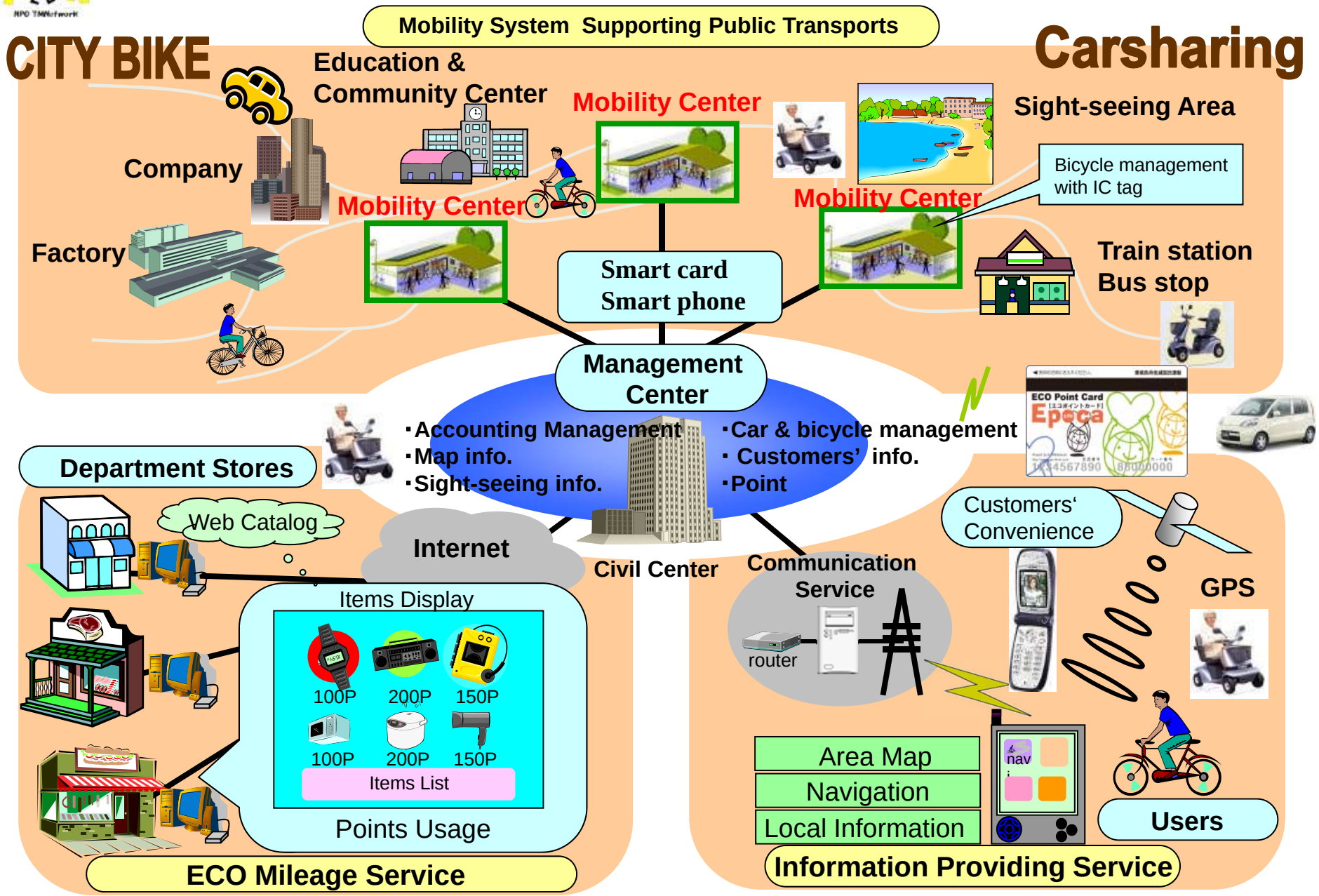
Eco point card
Member's card

Credit cards

●Incentive

1. return 10% of usage fee to Eco points
2. change 500 Eco points to Local Money for shopping

Future Vision



Securing Users / Activating Local Community

Navigation Service for Tentative Users


集中リンク


Panasonic
パナソニック

3. Cases in Japan

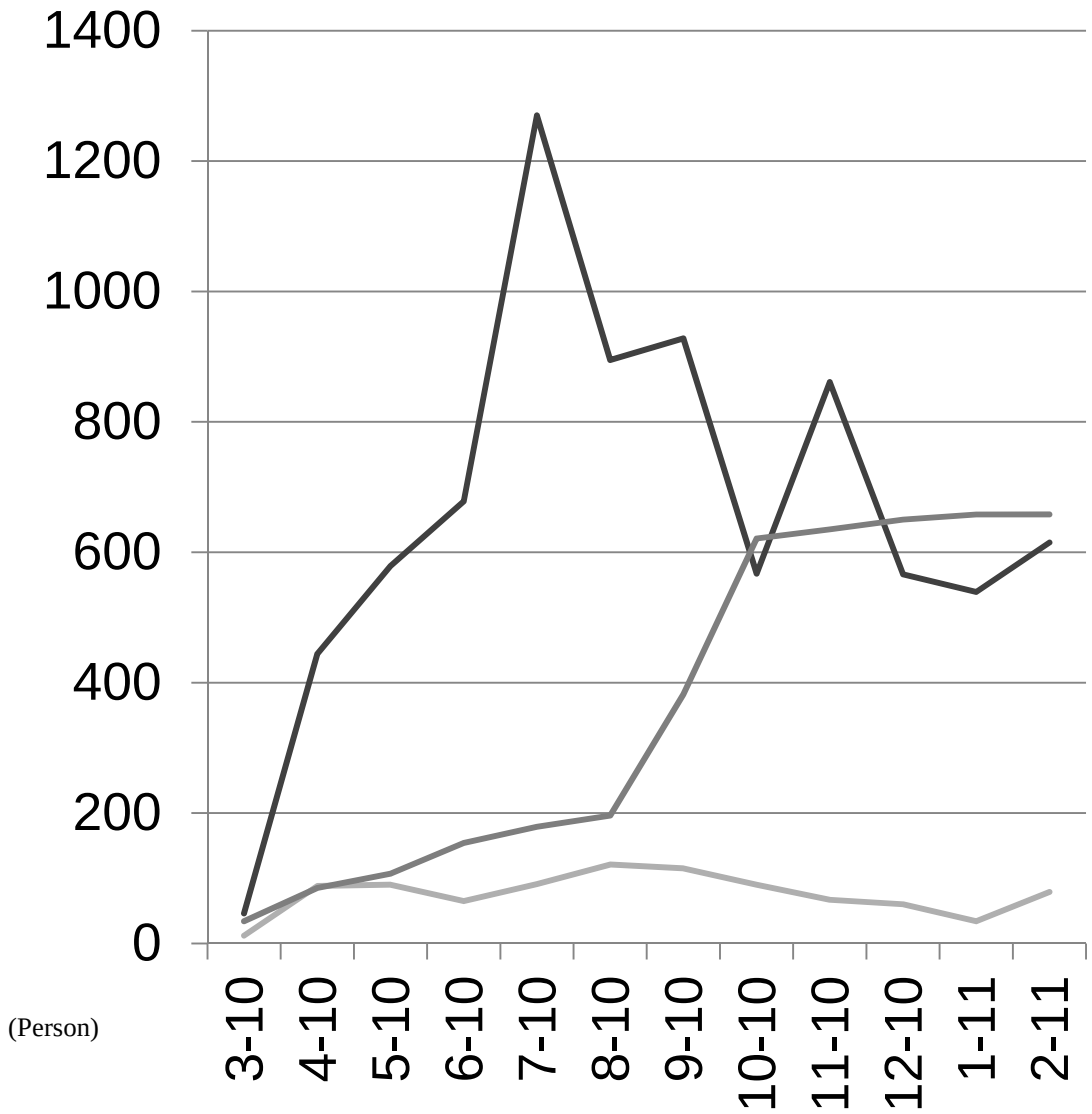
Cost

Cost	Details	JPY	US Dollars as of April 2011
Initial Cost	Electric Bicycles (116 bicycles)	11,618,880	138,602
	Bicycles Management Systems	60,012,540	715,890
	Solar Power Systems	43,514,470	519,084
	Maintenance Systems	1,439,800	17,175
	Total	116,585,690	1,390,751
Maintenance Cost (Monthly)	Online Maintenance	100,000	1,193
	Communication Expenses	70,000	835
	Electricity Charges	40,000	477
	Labor Costs	277,500	3,310
	Incidental Expenses	15,000	179
	Total	502,500	5,994

Source: Materials from Town Mobility Network

Category	Non-profit organization (NPO)
Name	Town Mobile Network Kitakyushu (K-TMN)
Chairman	Ueki, Kazuhiro
Main office location	Kitakyushu city, Fukuoka prefecture
The application date	6-Dec-02
The certification date	27-Mar-03
The establishment registration date	31-Mar-03
The settlement of accounts	31-Mar
Purpose of the article of association	This NPO regards bicycles as reasonable public transport means of cities and do various projects to promote bicycle use. The NPO regards bicycles as reasonable public transport means of cities and do various projects to promote bicycle use: . The purpose of the NPO is to contribute to promotion of community development, health, medical treatment, or welfare, conservation of the environment, and education for children through these projects
The specific non-profit activities	Promotion of community development
	Conservation of the environment
	Promotion of health, medical treatment, or welfare
	Education for children
	Administration of organizations that engage in the above activities or provision of liaison, advice, or assistance in connection with the above activities

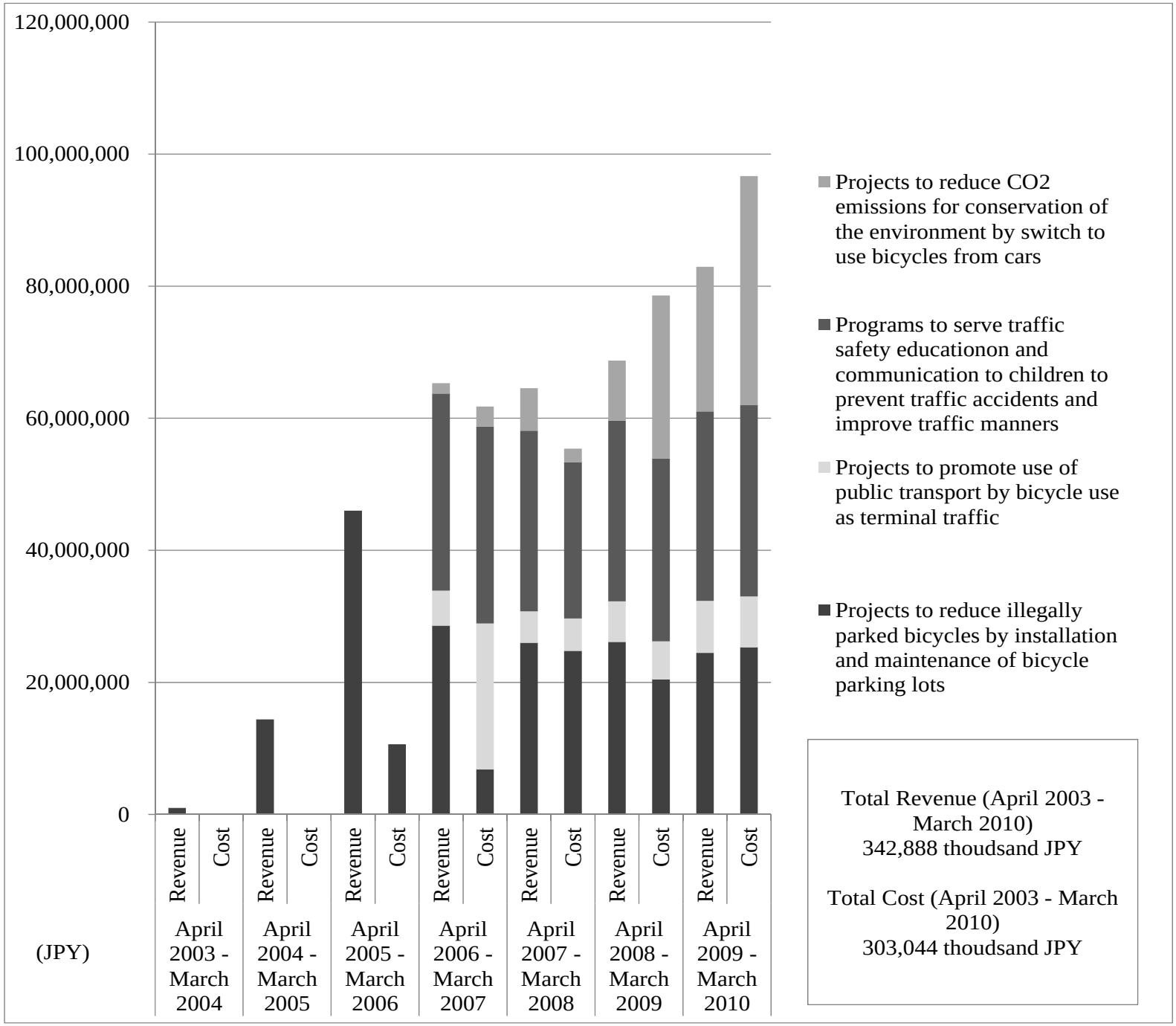
to develop and activate a central city area reasonably with the short distance trip by bicycle use promotion
to promote use of public transport by bicycle use as terminal traffic
to reduce illegally parked bicycles by installation and maintenance of bicycle parking lots
to monitor and patrol people not to park bicycles illegally and remove illegally parked bicycles for city beautification
reduction of disposal and illegal dumping of private bicycles by public use of bicycles
to propose and promote to solve problems of illegally parked bicycles early
to serve traffic safety education and communication to children to prevent traffic accidents and improve traffic manners
to reduce CO2 emissions for conservation of the environment by switch to use bicycles from cars
to ease traffic congestions and improve car parking manner by installation and maintenance of car parking lots
to support aging and handicapped people to go out and live to increase public welfare
to build the Town Mobility systems using rental electric four-wheeled carts
promotion of community development by information services about the community and sightseeing using mobile phones and IT systems



Total (339 days)

# of use
Member: 7988
Temporary: 912
Total: 8900
Average daily users: 26

# of members
Total: 658

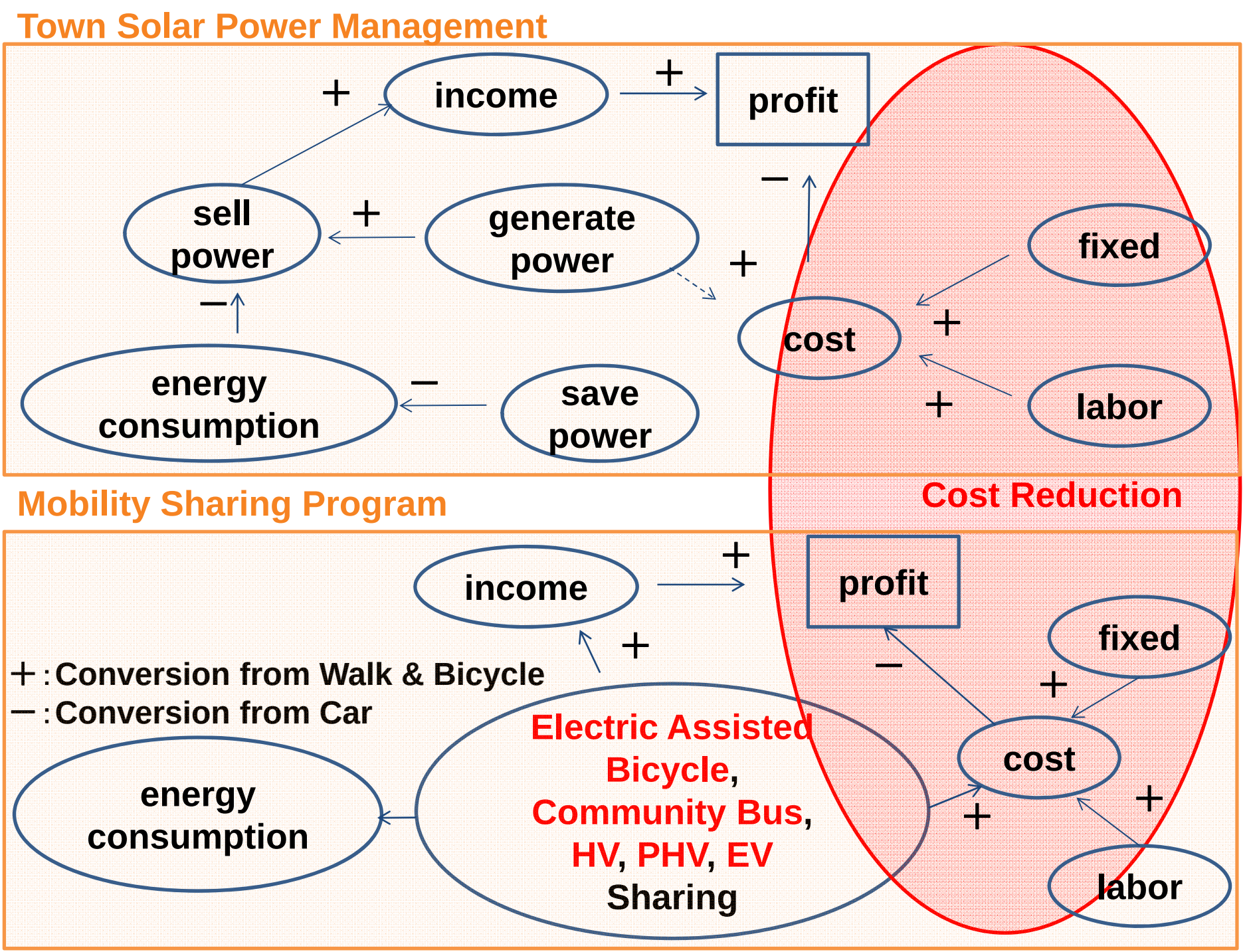

120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
0
(JPY)
Revenue
Cost
April 2003 - March 2004
April 2004 - March 2005
April 2005 - March 2006
April 2006 - March 2007
April 2007 - March 2008
April 2008 - March 2009
April 2009 - March 2010
Projects to reduce CO2 emissions for conservation of the environment by switch to use bicycles from cars
Programs to serve traffic safety educationon and communication to children to prevent traffic accidents and improve traffic manners
Projects to promote use of public transport by bicycle use as terminal traffic
Projects to reduce illegally parked bicycles by installation and maintenance of bicycle parking lots
Total Revenue (April 2003 - March 2010)
342,888 thoudsand JPY
Total Cost (April 2003 - March 2010)
303,044 thoudsand JPY

Question items about participation incentives		Component			
		Ⅰ	Ⅱ	Ⅲ	Ⅳ
Q1	To save transportation expenses	○			
Q2	To ride a bicycle more frequently	○	○	●	●
Q3	To ride an electric assist bicycle	○		●	
Q4	To join a car-sharing project as well	○			
Q5	To reduce car use for environmental reasons	○			●
Q6	To reduce car use for health reasons	○			⬤
Q7	To feel local nature and landscape by bicycle-ride	○	○	●	
Q8	There is no alternative transportation		○	◯	
Q9	More convenient than other transportations			○	●
Q10	Car-parking is not convenient			○	⬤
Q11	Bicycle-parking is not convenient		○		
Q12	Riding a bicyle is safe and easy		○		
Q13	To go around shopping streets on a bicycle	○	○	●	
Q14	To support and sympathize with the NPO	○	●		
Q15	To join an eco point project as well	○			
Q16	To acccess information about environmental issues	○			
Q17	Recommended by friends			○	○
Q18	To join local activities	○	●		
Q19	To support and join projects administered by the local government	○	●		
Q20	To exchange various information with local people	○			○
Q21	To reduce car use for energy consevation reasons	○	●		
Q22	To join a renewable energy related project (e.g. solar parking lots)	○	●		
Q23	City Bike are "cool"	○			
Q24	To refresh		○		
Q25	To start to do something new	○	○	●	○
Q26	Because of a long-standing relationship with the NPO			○	○
Q27	Unconscious participation		○		○
Eigenvalue		8.28	2.53	2	1.49
Proportion (%)		30.7	9.4	7.4	5.5
Cumulative (%)		30.7	40.1	47.5	53
◯: more than 0.34, ○: more than 0.17, ●: less than -0.17, ⬤: less than -0.34					

	Male		Female		Total (Person)
	General Interest	Active Incorporator	General Interest	Active Incorporator	
10's	0	0	0	0	0
20's	0	6	0	6	12
30's	1	9	3	8	21
40's	7	19	1	6	33
50's	12	12	3	1	28
60's	4	2	0	0	6
70's	0	0	0	0	0
more than 80's	0	0	0	0	0
Total (Person)	24	48	7	21	100
Total (%)	24%	48%	7%	21%	100%

Public Bicycle Program

Business Model
（Integration with Town Solar Power and Mobility Sharing Management）


Town Solar Power Management
income
profit
sell power
generate power
fixed
cost
labor
energy consumption
save power
Cost Reduction
Mobility Sharing Program
income
profit
fixed
cost
labor
＋：Conversion from Walk & Bicycle
－：Conversion from Car
energy consumption
Electric Assisted Bicycle, Community Bus, HV, PHV, EV Sharing

Non-profit

- Promotion of Environmentally Friendly Action
- Re-education of Traffic Rules
- Reduction of Illegally Parked Bicycles
- Revitalization of Local Area
- Cycle Tour

Town Solar Power

generate power

save power

sell power

＋

－

－

＋

＋

energy consumption

income

＋

＋

profit

－

labor

＋

cost

＋

＋

fixed

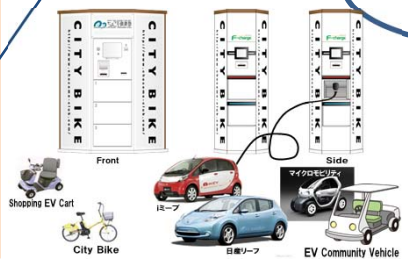
Non-profit

・Networking
・Disaster Emergency Power & Mobility Supply
・Revitalization of Local Area

Mobility Sharing

＋：Conversion from Walk & Bicycle
－：Conversion from Car

Electric Assisted Bicycle, Community Bus, HV, PHV, EV Sharing



Examples all over the world

Velib’

○1451 ports, 20600 bikes in Paris
300 m intervals

Smart Bike

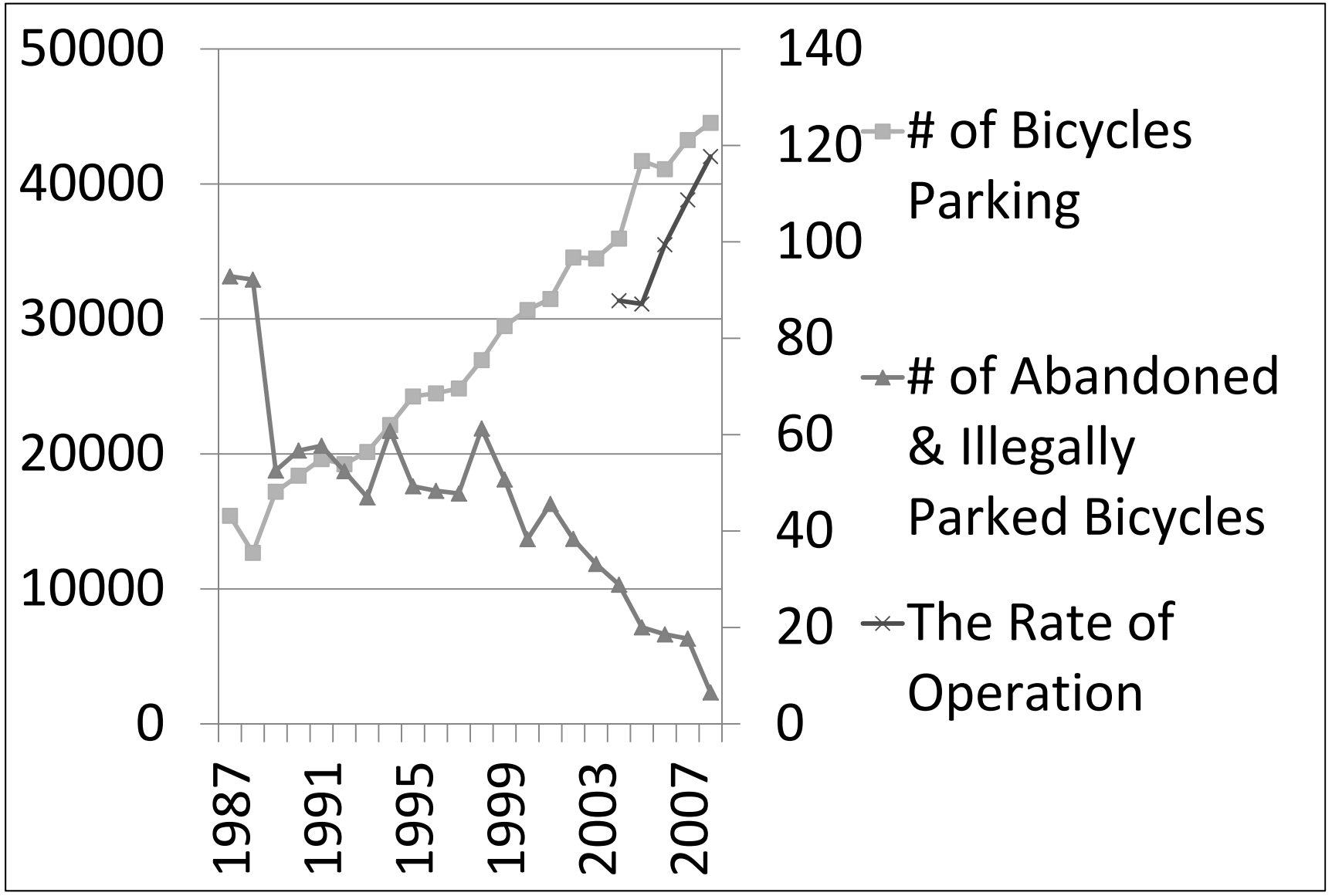
Social Experiment in Tokyo

Oct, 2009
（Oote-machi, Marunouchi, Yurakucho
5 ports）

Cyclocity Toyama

Setagaya Community Cycle

Initial Cost	✓ **Electric Bicycles (108 bicycles)**	**\ 7,000,000**
	✓ Solar Power Systems (Sakurajyosui-minami)	\ 33,000,000
	✓ Solar Power Systems (Sakurashinmachi)	\ 45,000,000
	✓ System programs	\ 3,000,000
	Total	\ 88,000,000
Maintenance Cost (5 years)	✓ Annual Maintenance	\ 300,000
	✓ Solar Panels (20 years)	\ 0
	✓ Rechargeable Batteries (3-5 years)	\ 12,000,000
	✓ Other Parts (5 years)	\ 300,000
	✓ Batteries for Electric Bicycles (3 years)	\ 3,000,000
	Total	\ 15,600,000


50000
40000
30000
20000
10000
0
140
120
100
80
60
40
20
0
1987
1991
1995
1999
2003
2007
# of Bicycles Parking
# of Abandoned & Illegally Parked Bicycles
The Rate of Operation

Name		Sakurajyosui-minami	North Sangenjyaya	Central Sangenjyaya	Seijyou-kita	Kyodo	Sakurashinmachi
Station		Keio Line	Den-en Toshi Line		Odakyu Line	Odakyu Line	Den-en Toshi Line
		Sakurajyosui	Sangenjyaya		Seijyou Gakuen	Kyodo	Sakurashinmachi
Start		Mar. 1994	May 1996	Mar. 1998	Jan. 2002	Mar. 2007	Mar. 2009
Provider		Setagaya city					
Possession		City	City	National road	City	Odakyu Electric Railway	Private
Management		Setagaya-ku Silver Jinzai Center					
# of bicycles		407	128	260	195	180	250
Fee	Monthly	\ 2,000（\ 500 deposit payable with a IC card issued）					
	Daily	\ 200（\ 500 deposit payable with a IC card issued）					
# of Users 2008	Monthly	5,976	974	3,232	2,736	1,615	
	Daily	9,746	1,873	7,032	1,945	11,451	
Rate of Operation 2007		121.9	44.2	101.7	135	133.2	