Long-term urban growth and its implications on water supply systems in Asia

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H18 RIHN meeting in Hiroshima

Outline

- Population data (UN survey & estimates)
- Population data (Country and city statistics)
- Demographic characteristics of cities
- Population, income and water supply

Urban Population / Area:

- political and administrative boundaries
- population size and density
- population size, density and economic and social indicators

City population:

- function of and where the city administrative boundaries are drawn

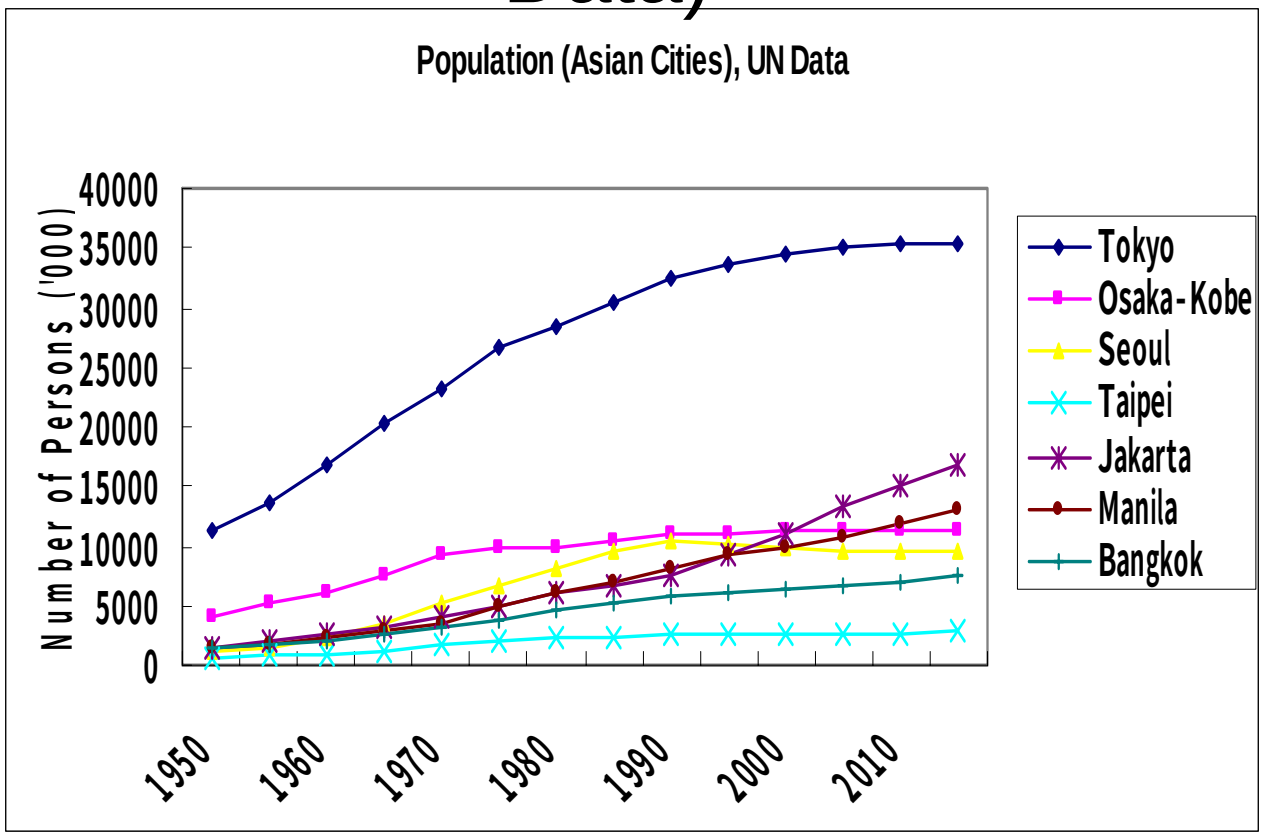
- vary depending on the definition used:
    - city, metropolitan area, region

Urbanization

- growth of the population (natural increase, migration, annexation)

- development of specialized functions / activities

Population estimates (UN Data)



Population estimates (2005)

TOKYO – 35,197,000

OSAKA-KOBE – 11,268,000

SEOUL - 10,256,000

TAIPEI – 2,606,000

JAKARTA –13,215,000

MANILA – 10,677,000

BANGKOK – 6,593,000

Tokyo – Tokyo Metropolitan Area (Tokyo, Chiba, Kanagawa and Saitama)
Osaka - includes Kobe
Seoul – Seoul city
Manila – Metropolitan Manila (Manila City and 16 cities and municipalities)

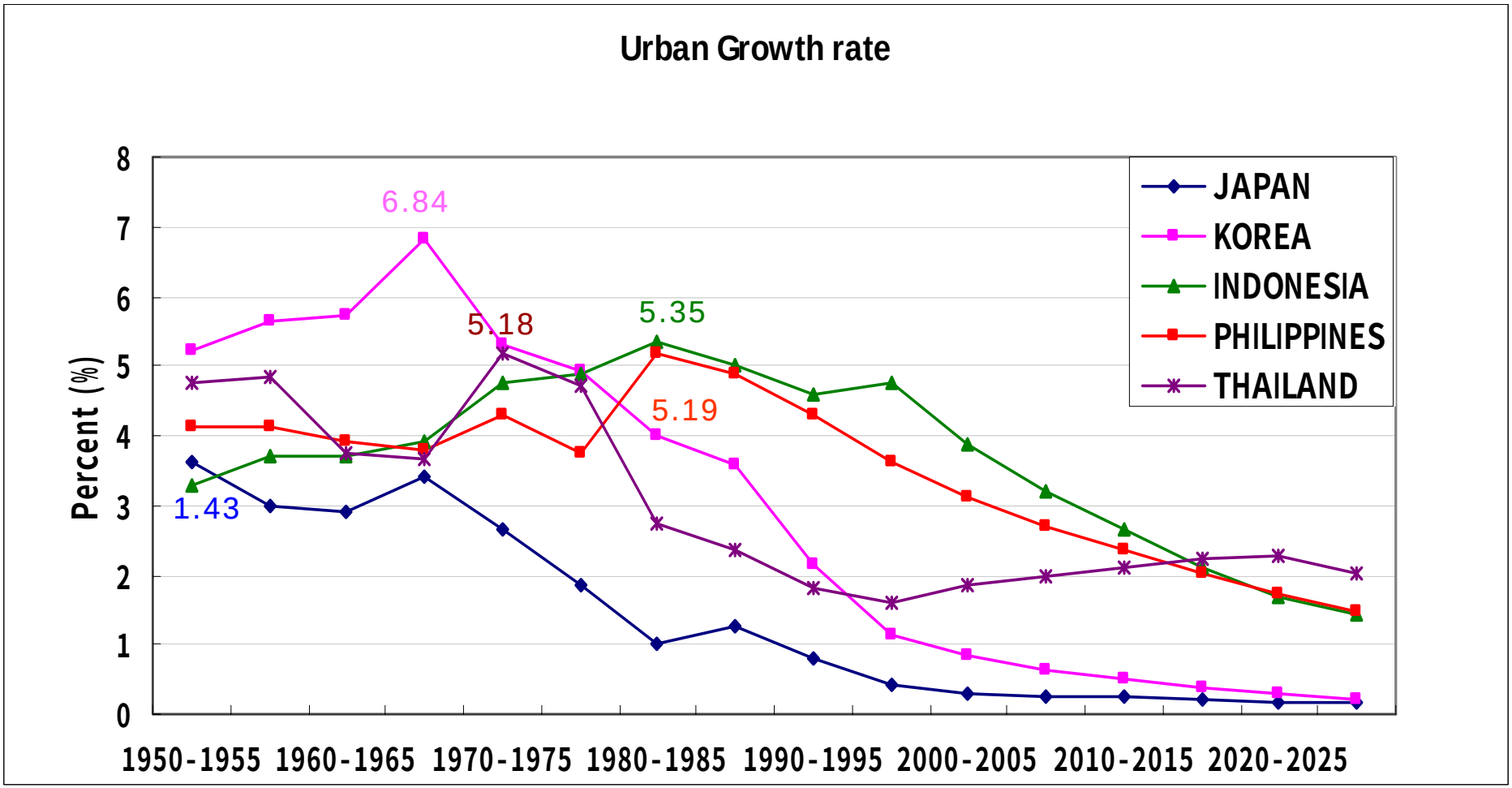
Average Population Growth rates (1950-2005)

	JAPAN	S. KOREA	INDONESIA	THAILAND	PHILIPPINES
Country	0.775	1.69	1.87	2.16	1.89
Urban	1.93	4.12	4.35	3.39	4.10
City[1]	2.07	4.08	4.01	2.87	3.5
City[2]	1.81				

City[1]: Tokyo, Seoul, Jakarta, Bangkok, M. Manila

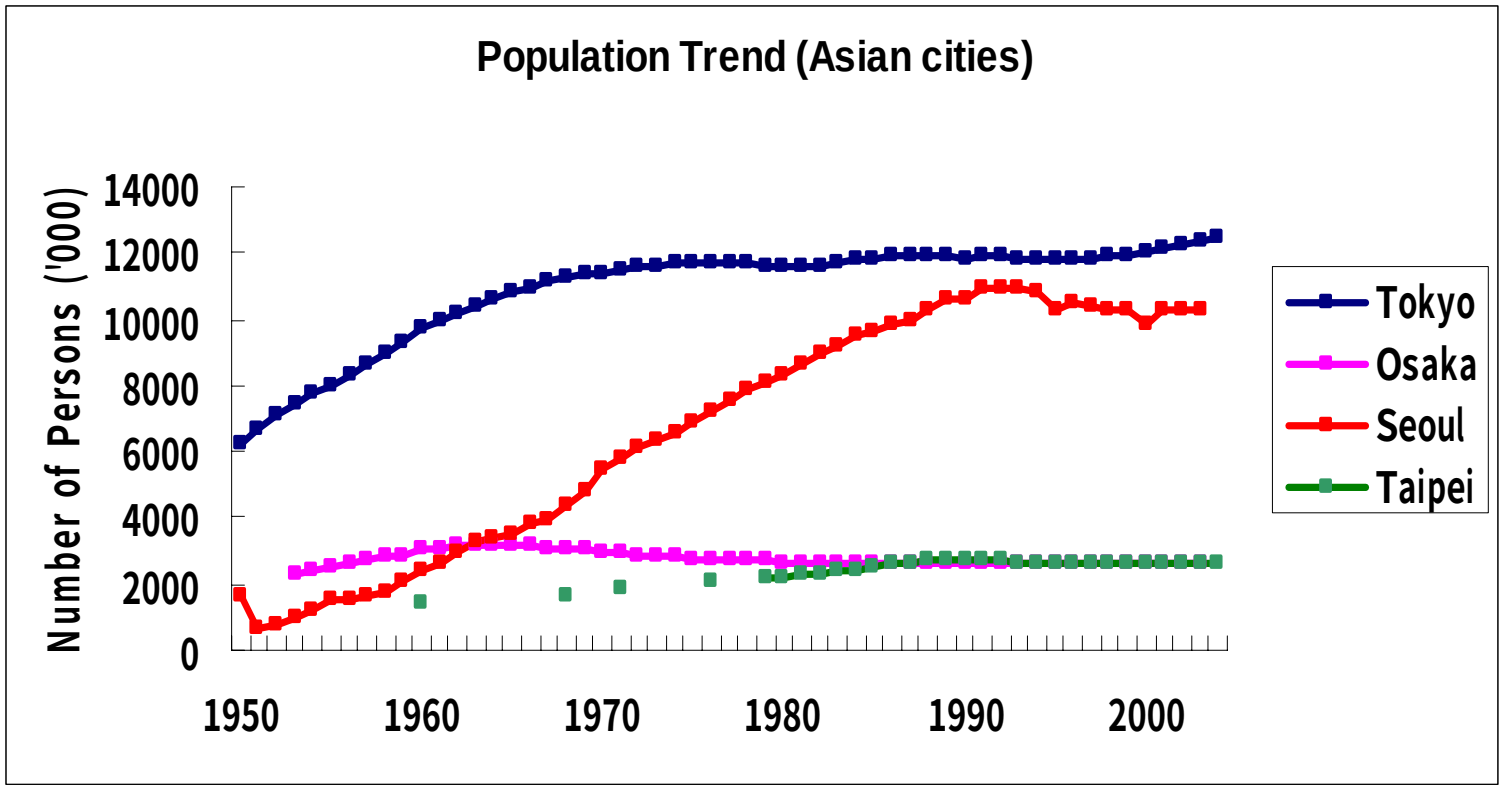
City[2]: Osaka

Urban Growth rate



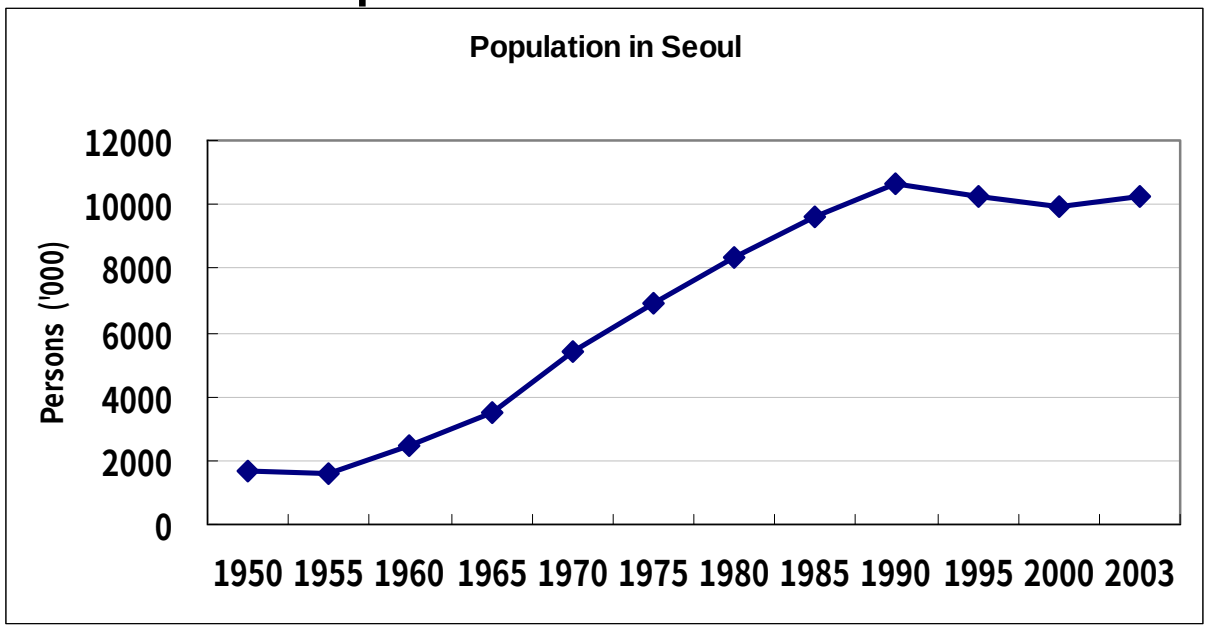
Demographic characteristics of cities

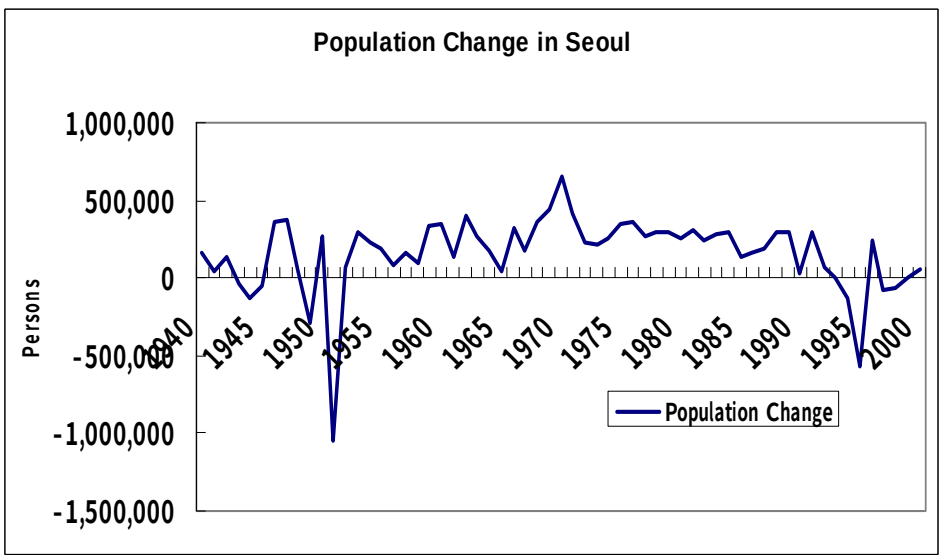
Population Trend

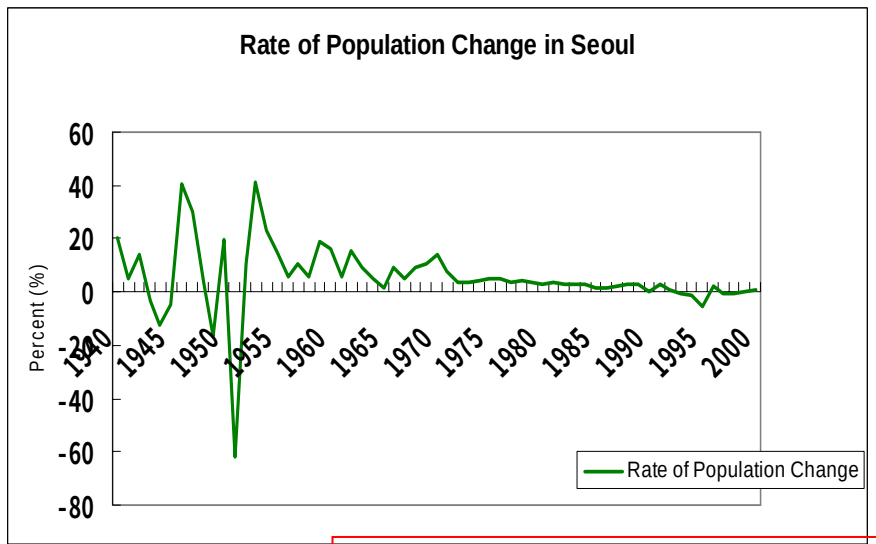


Tokyo: 12,369, 000
Osaka: 2,626,635
Seoul: 10,277,000
Taipei: 2,627,138

Population in Seoul







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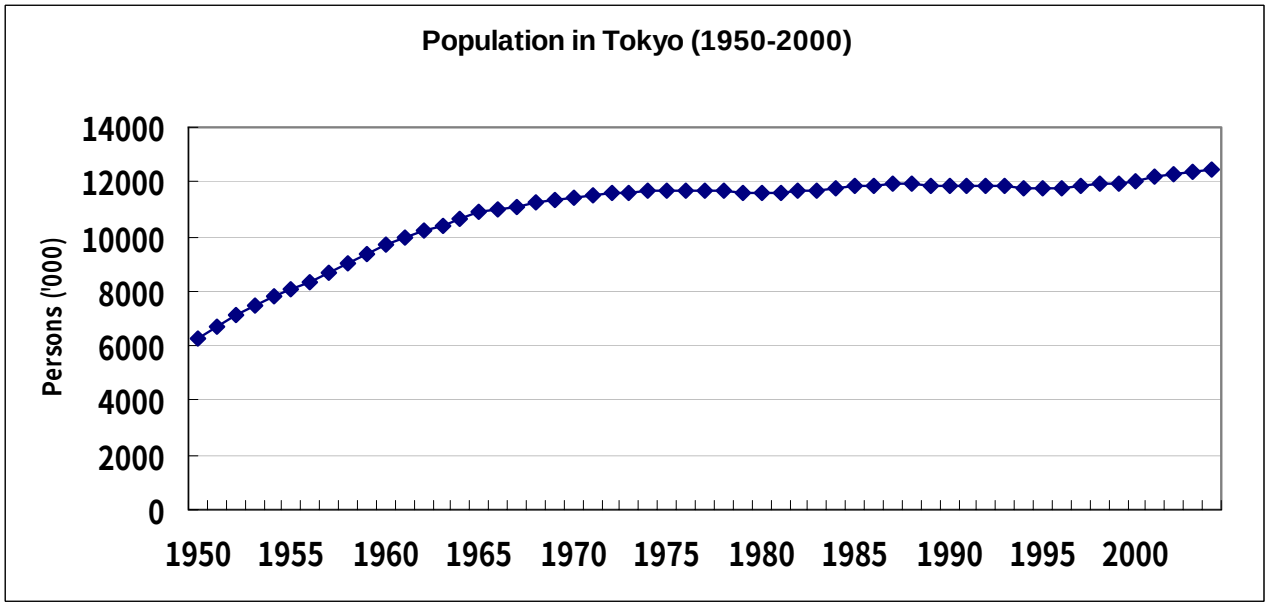
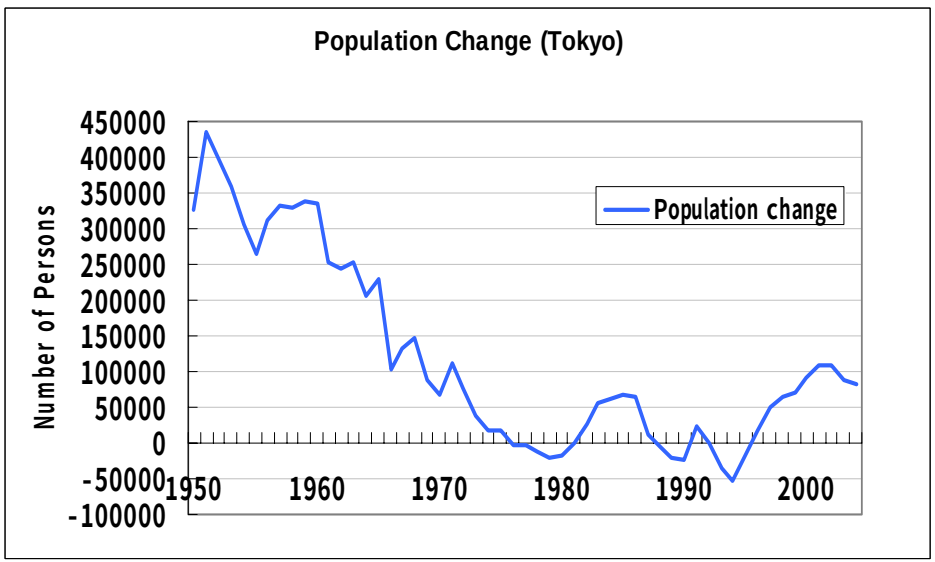
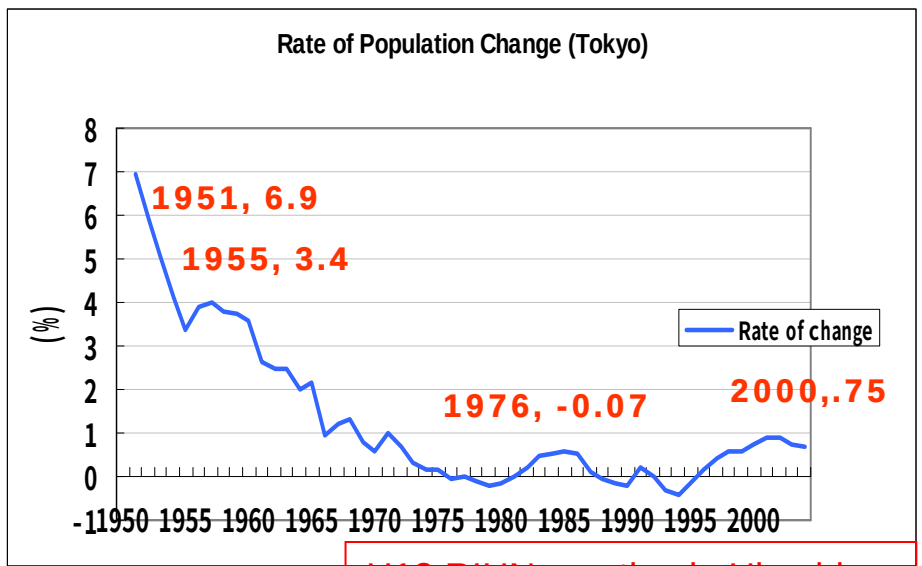
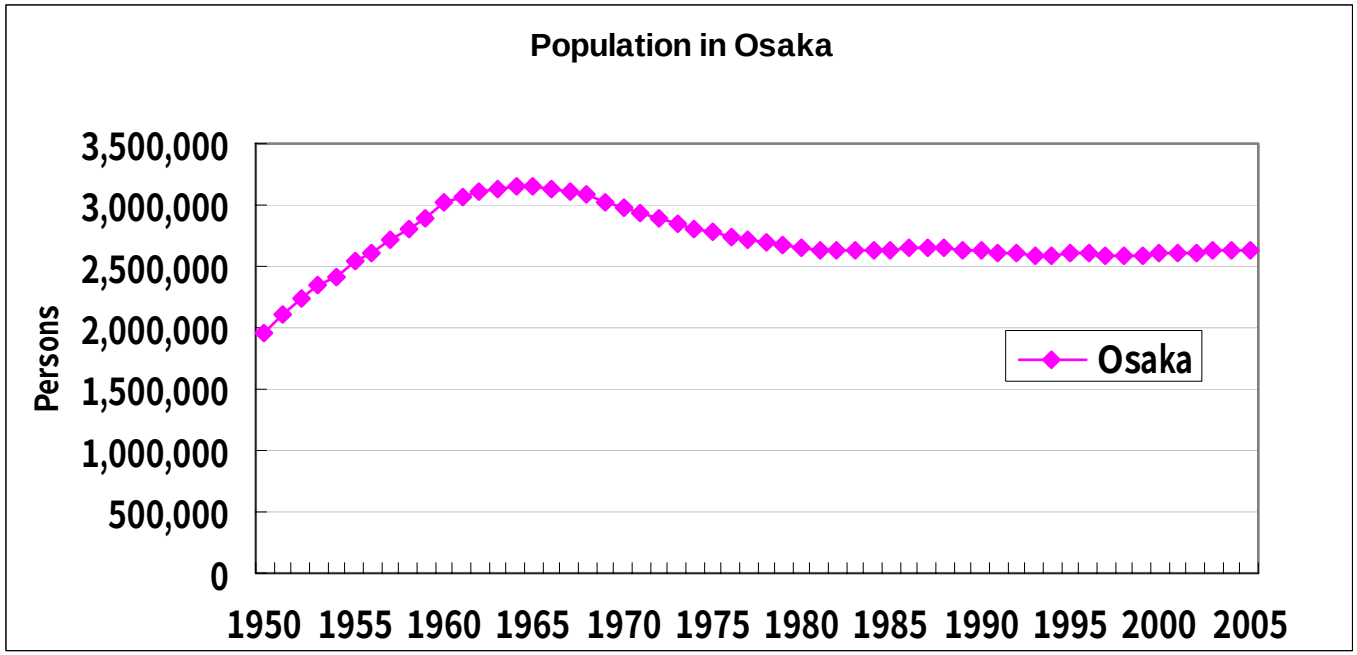
Population in Tokyo

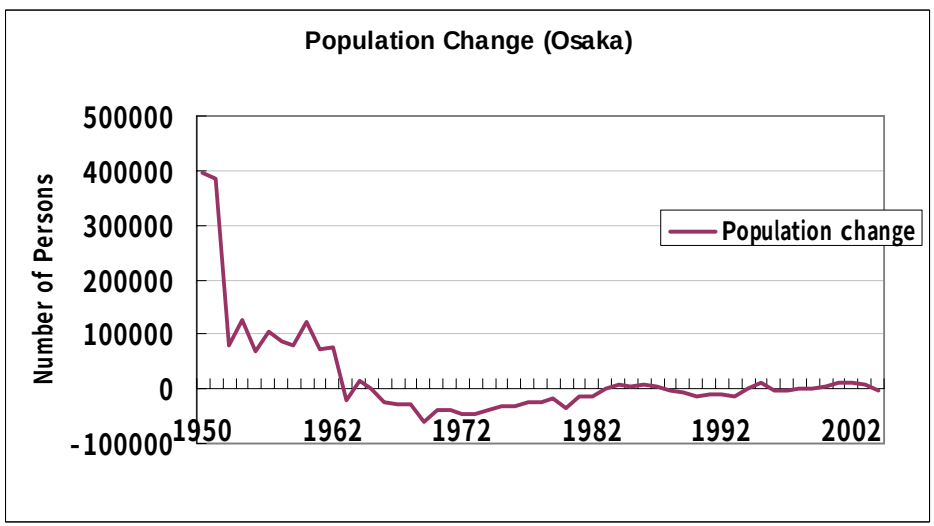


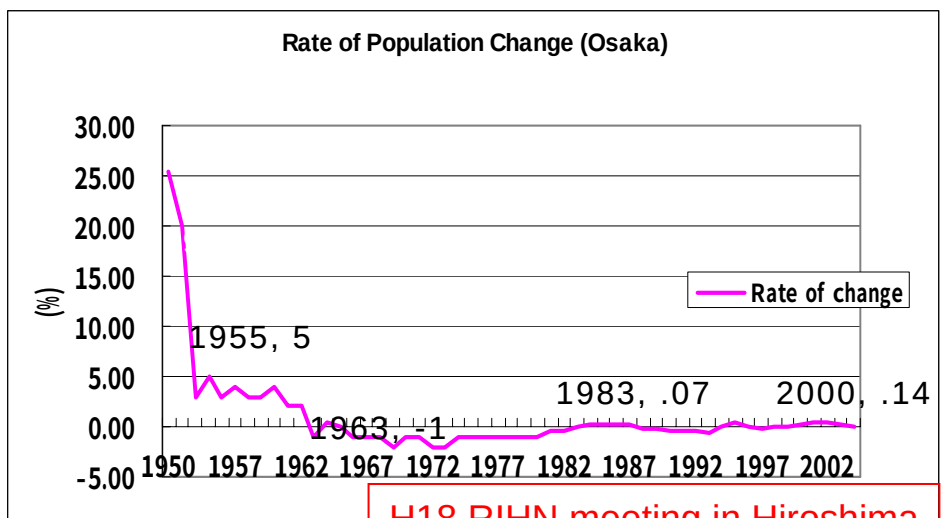




Population in Osaka







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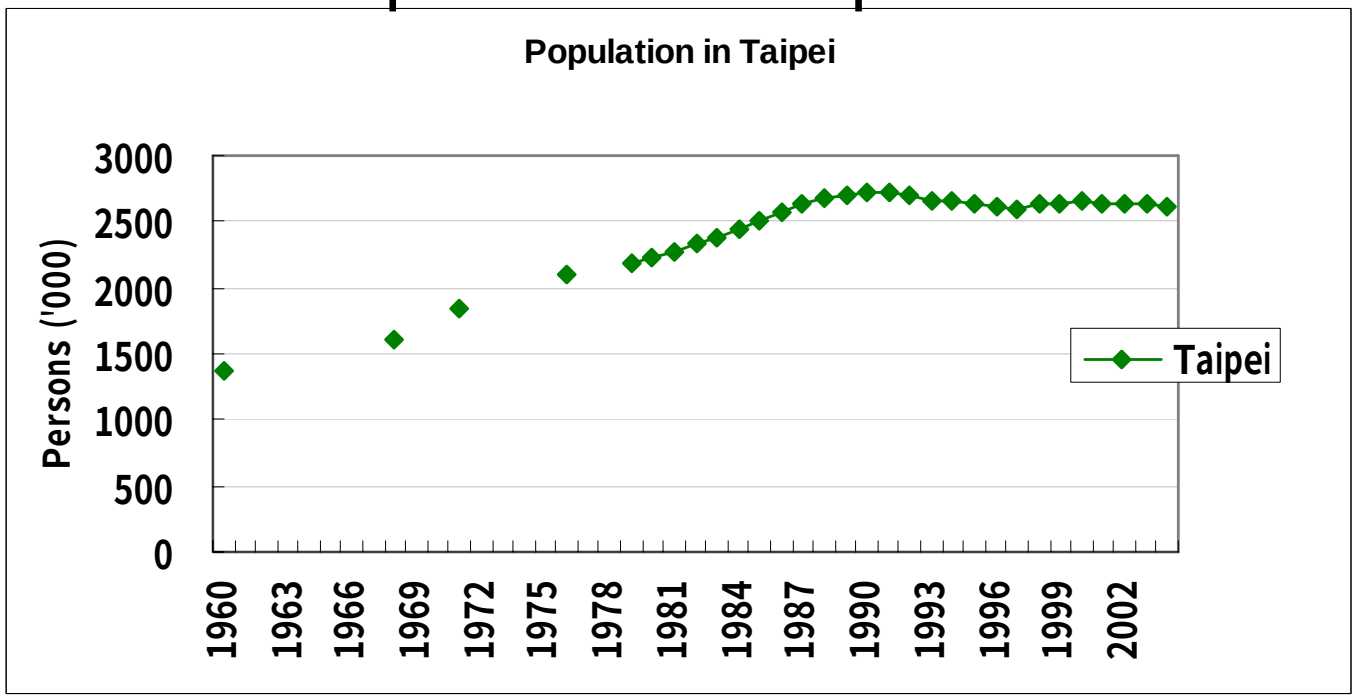
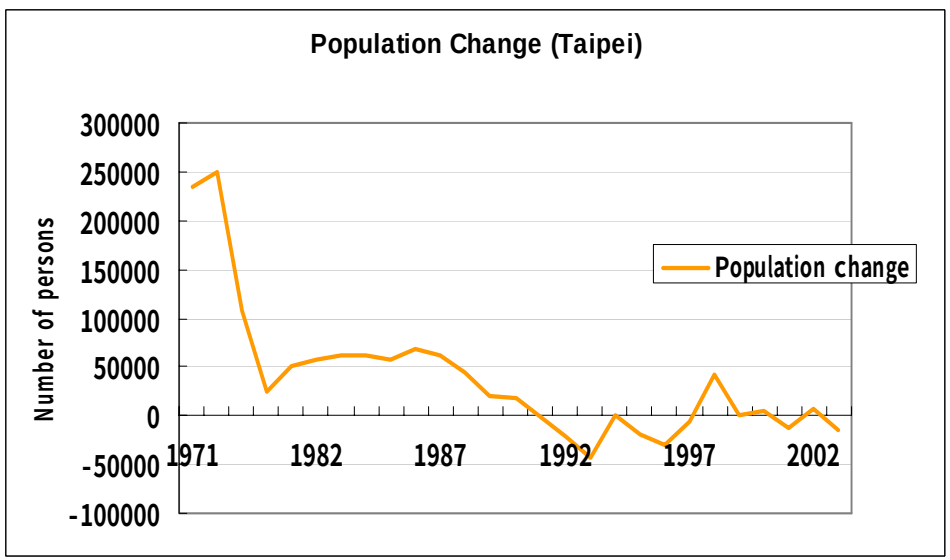
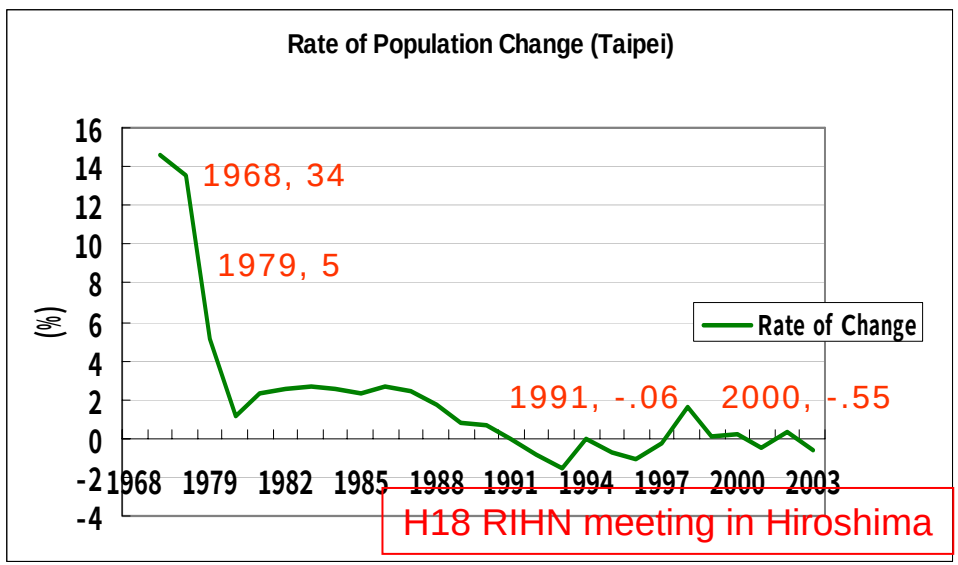
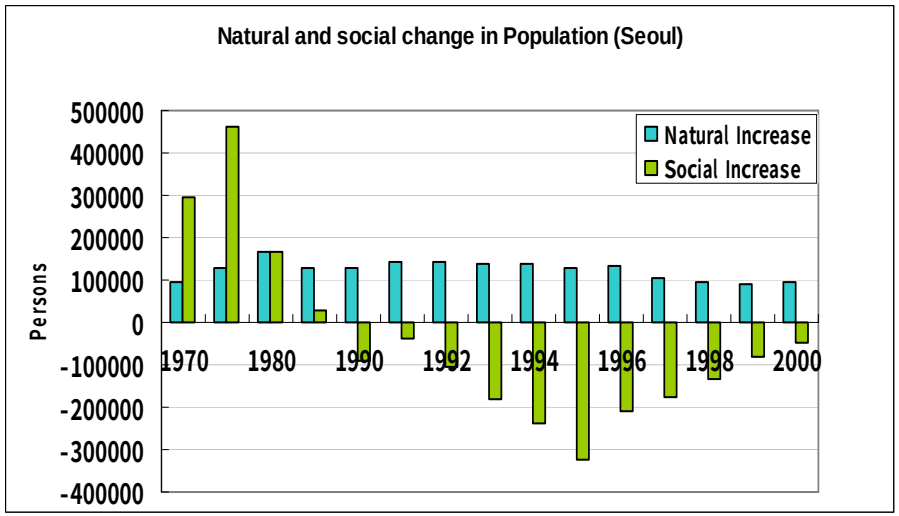
Population in Taipei

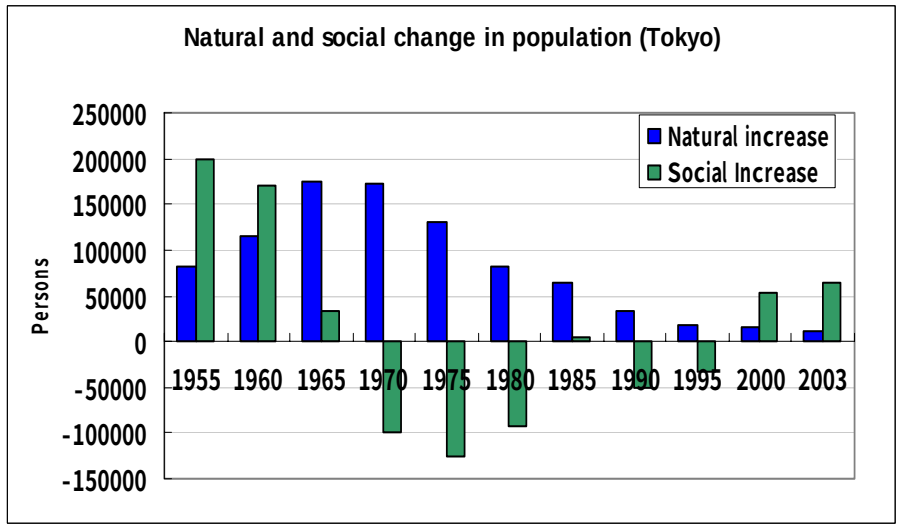


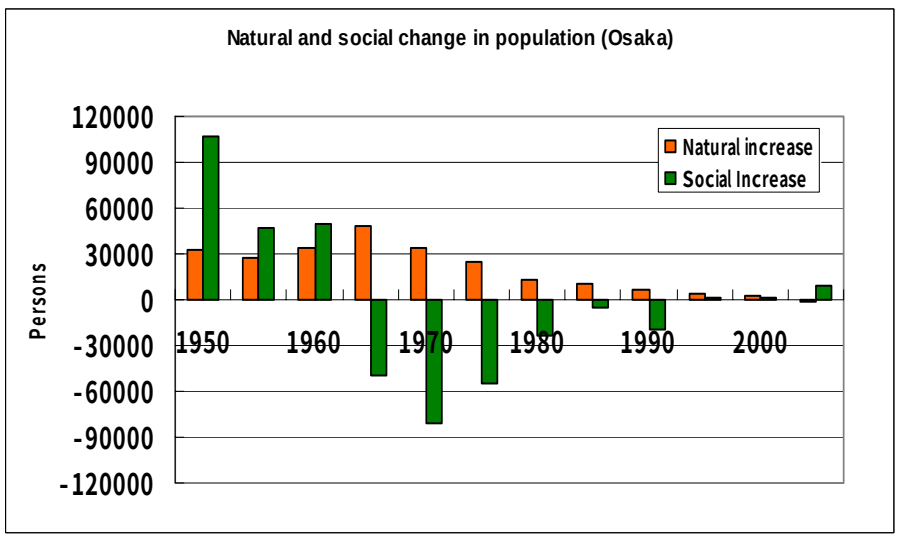


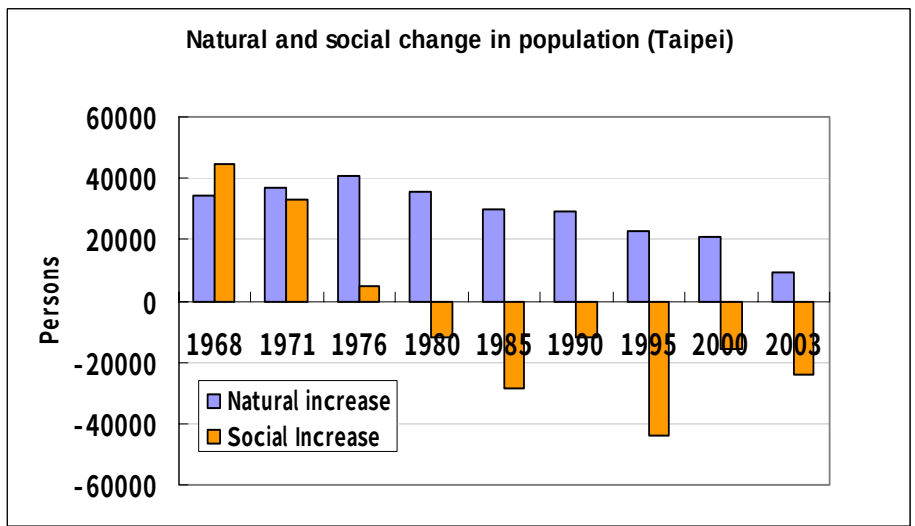


Natural and social change in population









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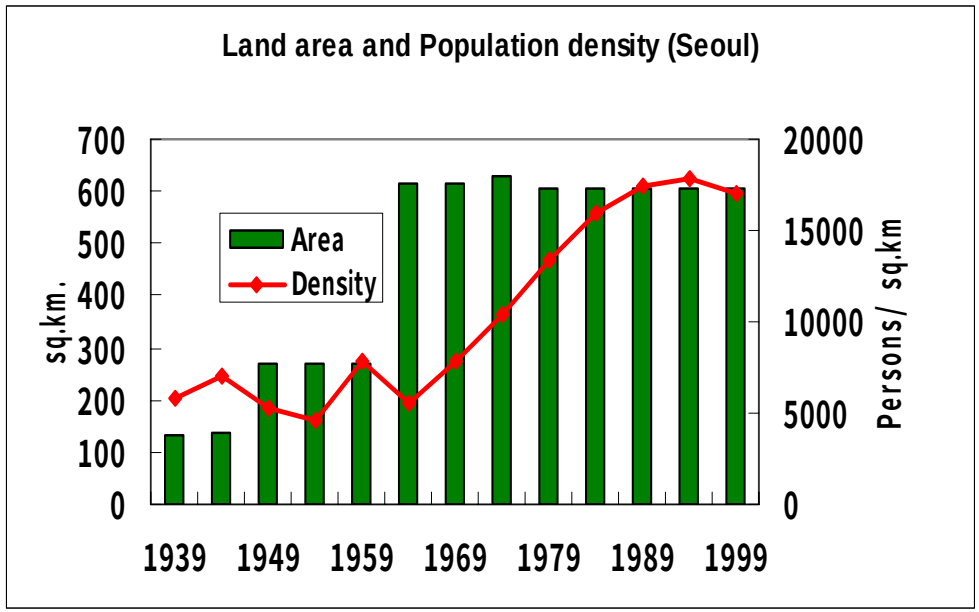
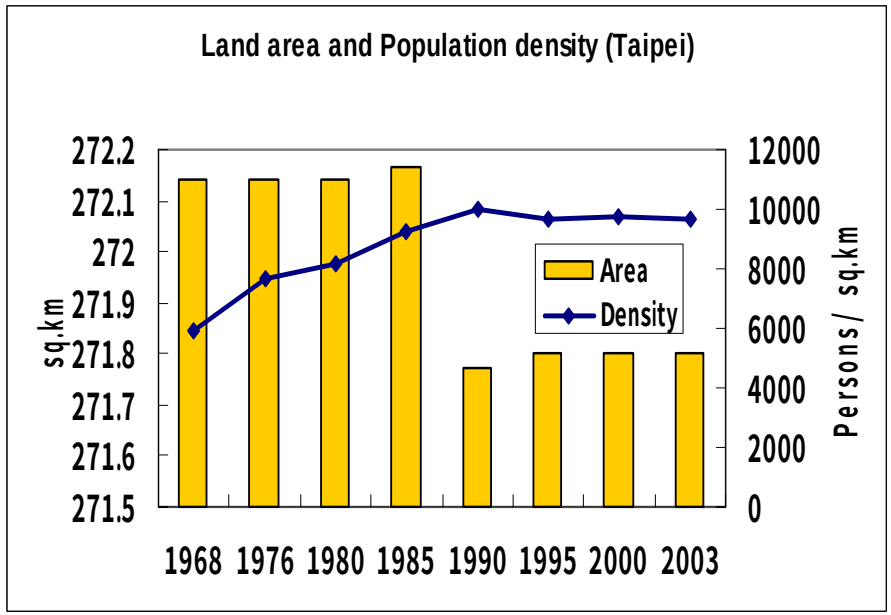
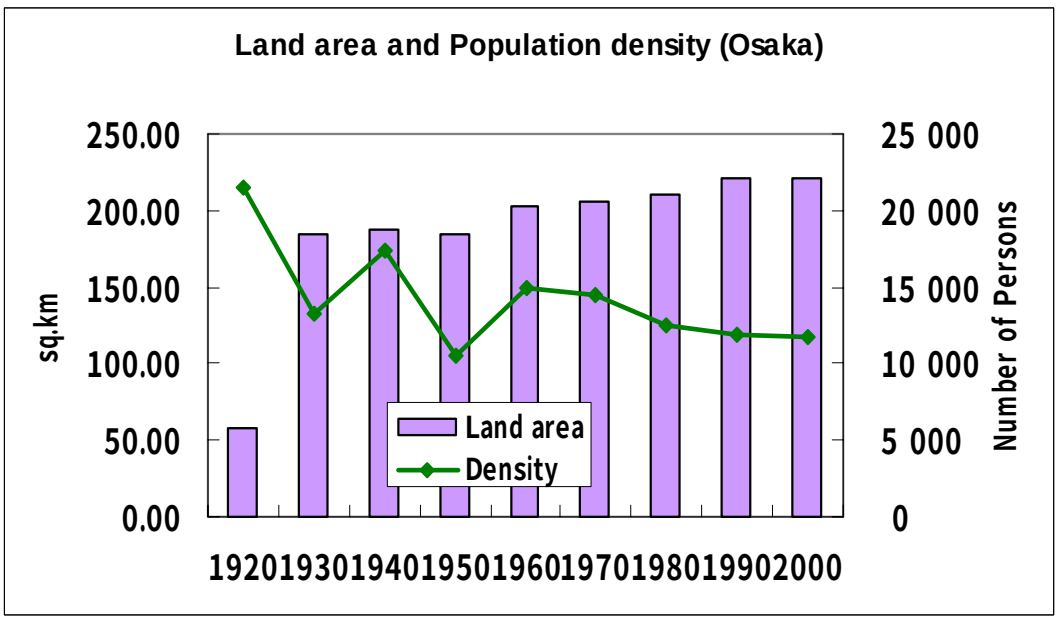
Land area and population density





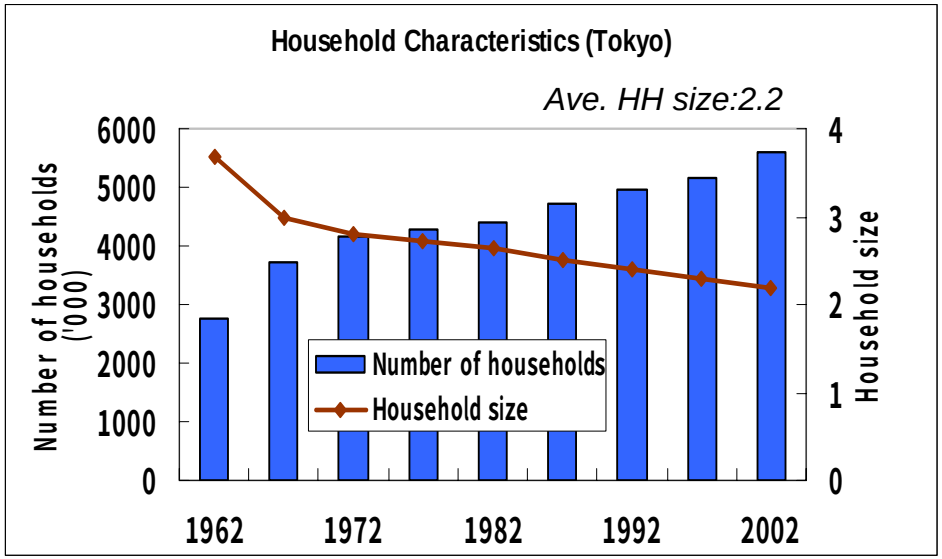


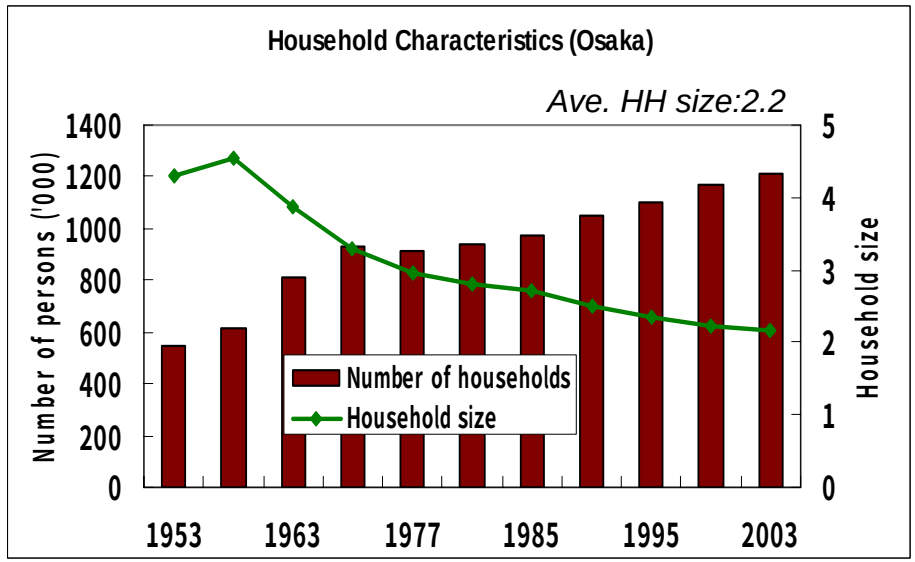
Seoul (2000) -17131 persons/ sq/km

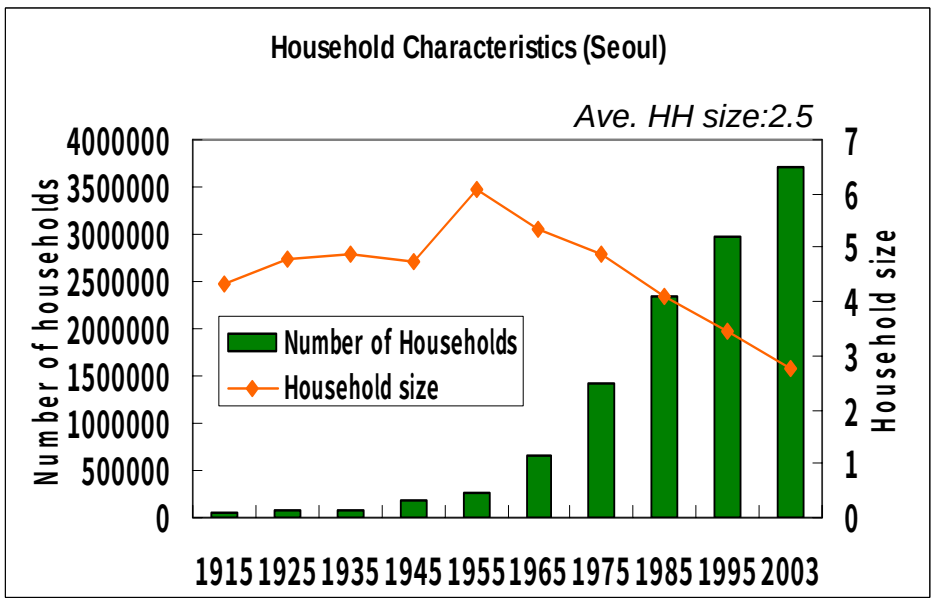
Osaka (2004) – 11,825 persons/ Sq/km

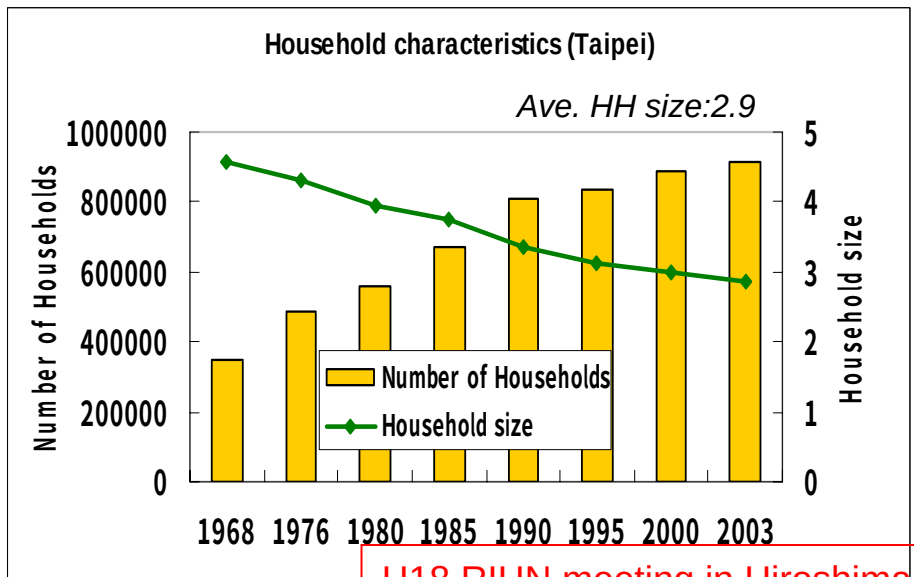
Taipei (2003) – 9666 persons/ Sq/km

Household Characteristics

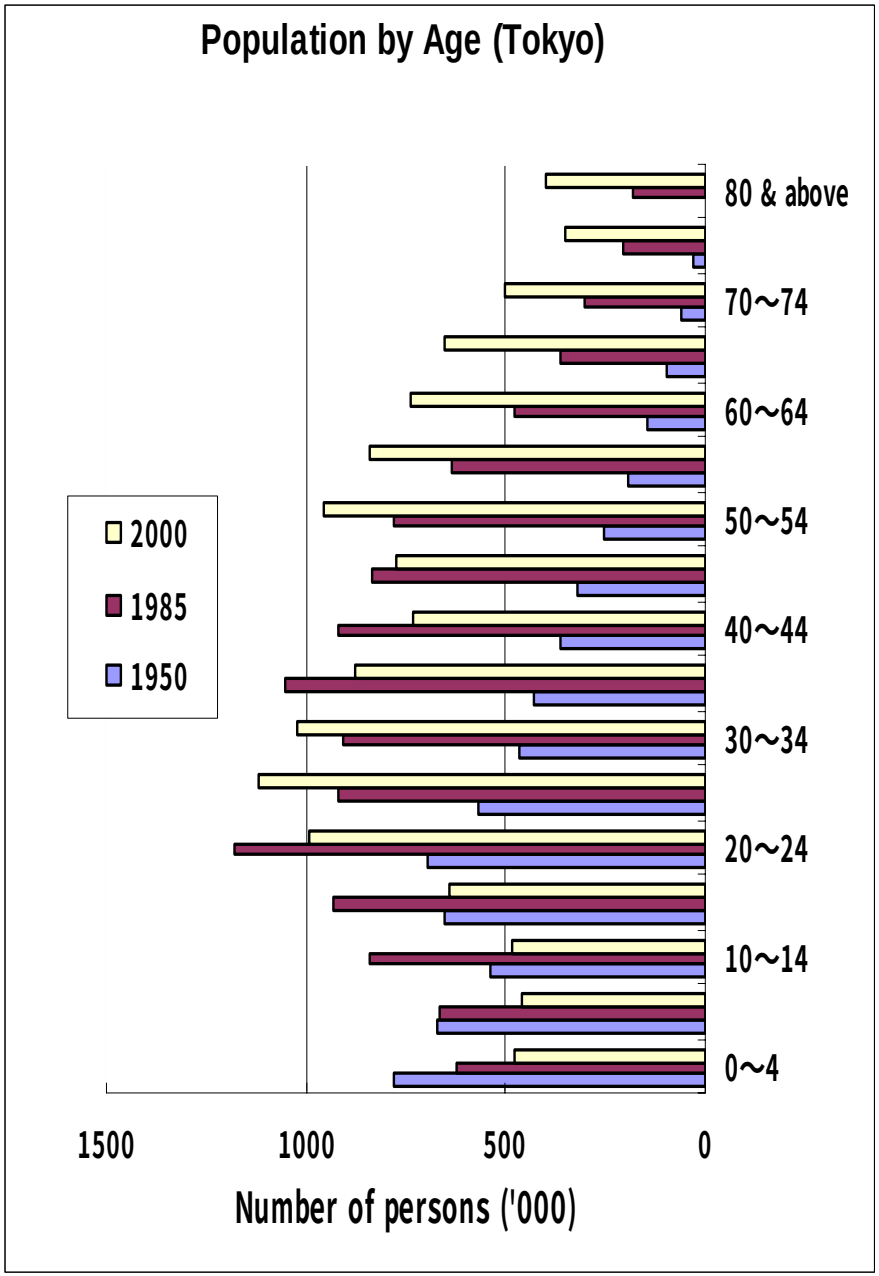


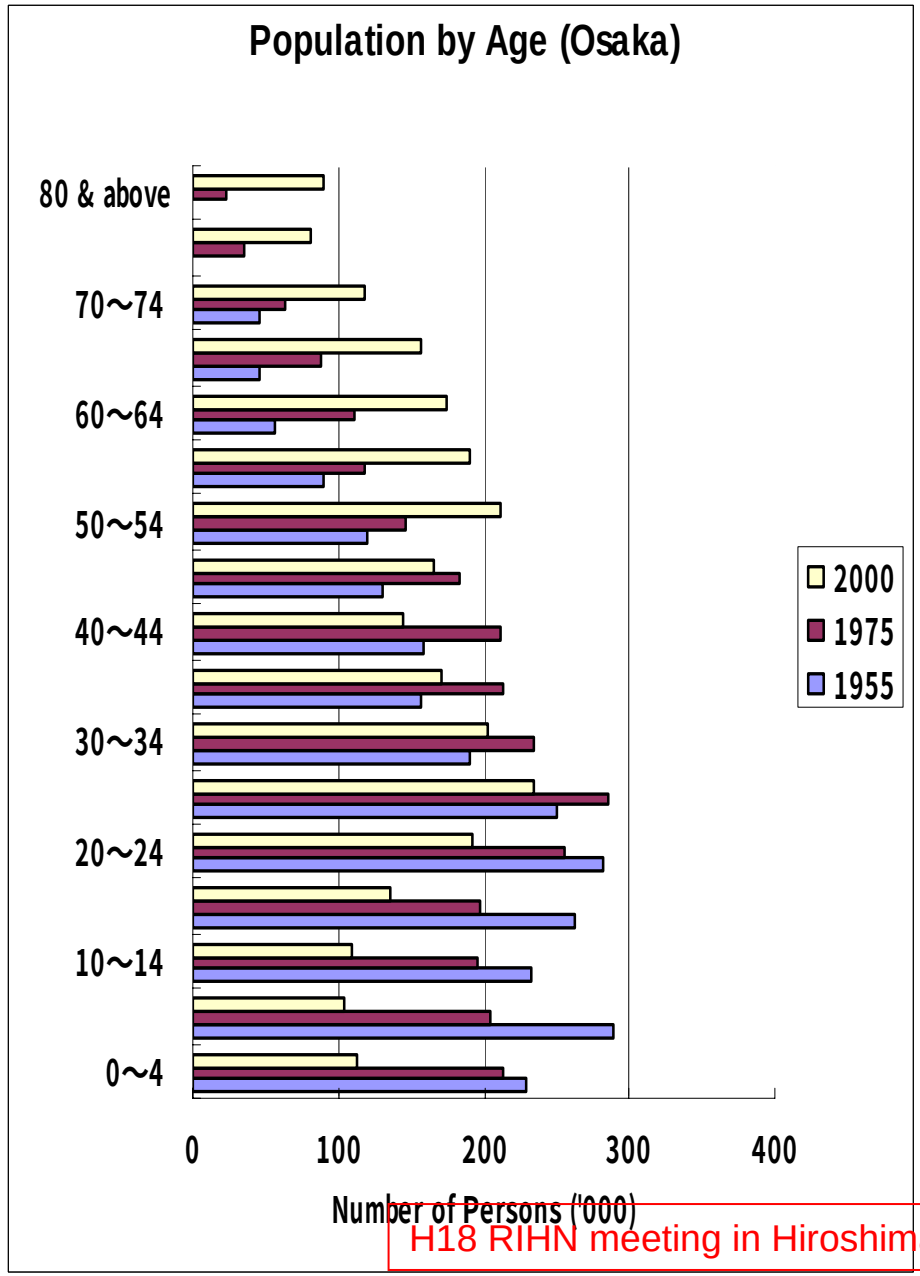




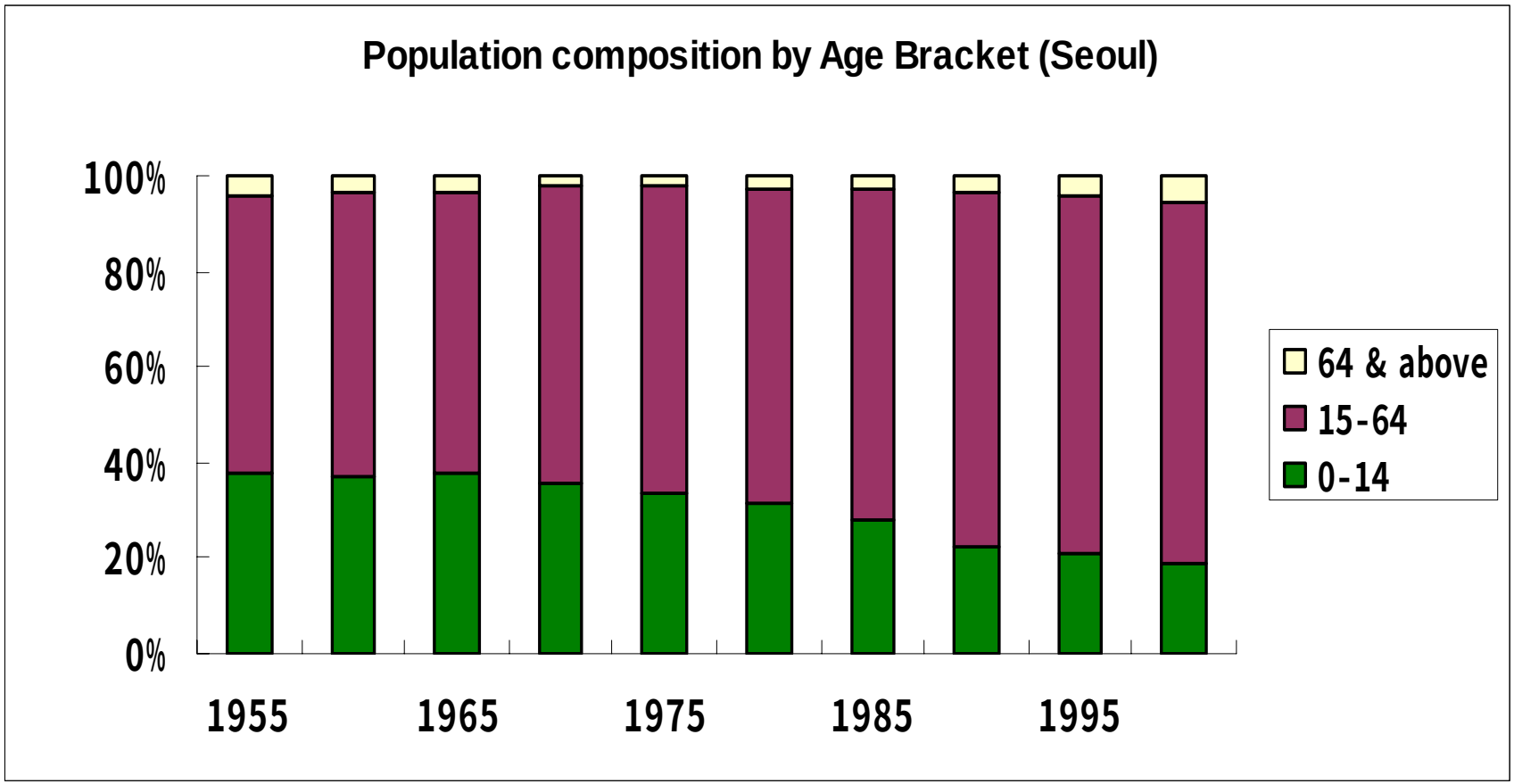


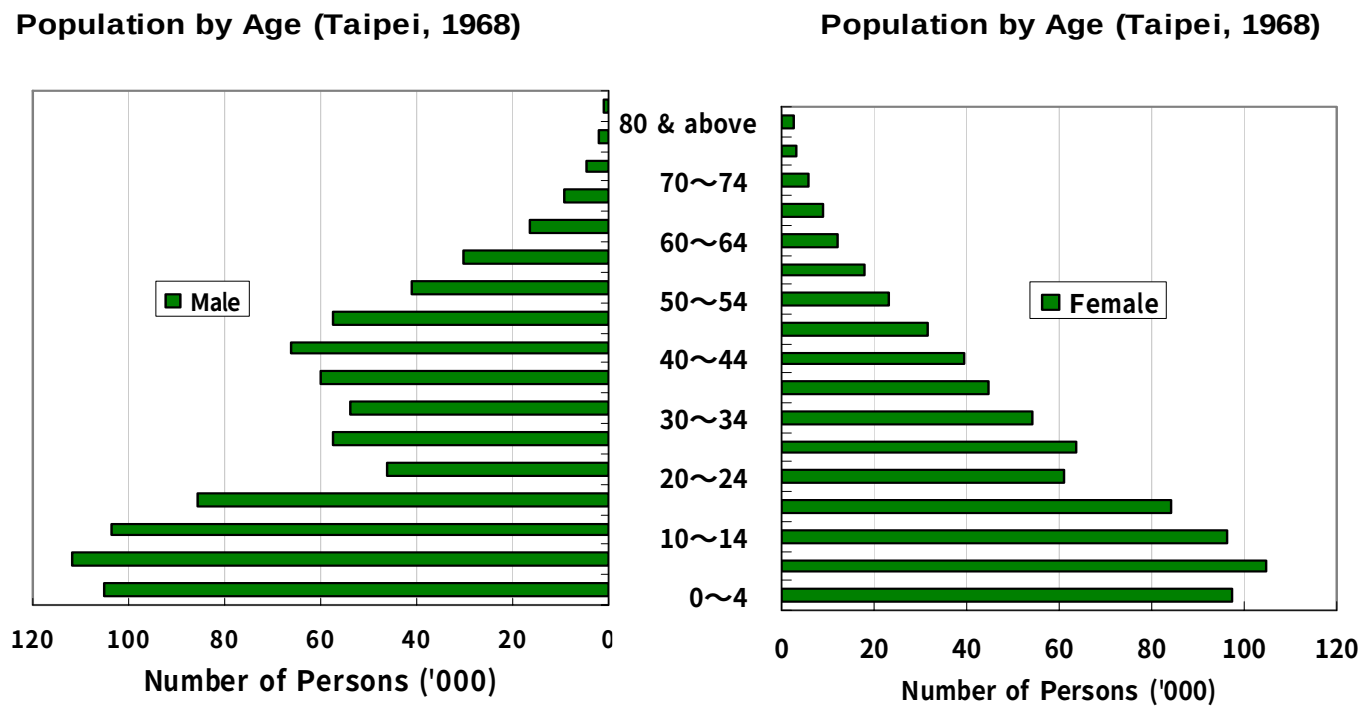
Population by Age

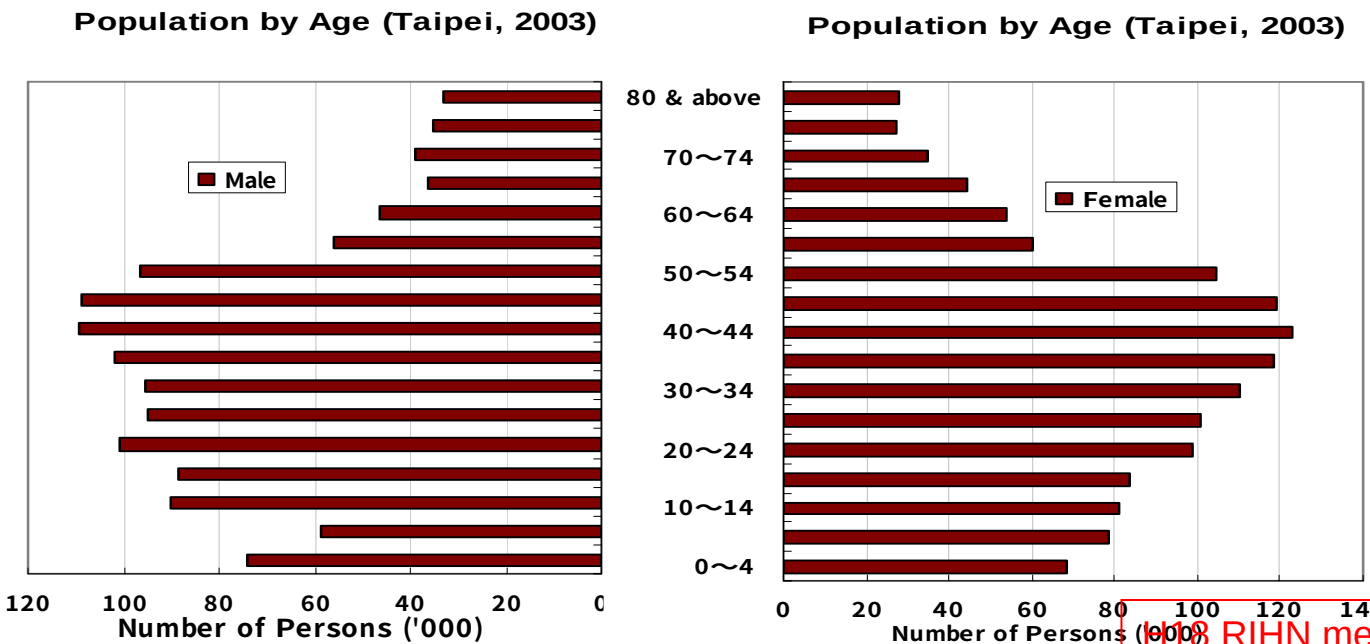




Population by Age




Population by Age (Taipei, 1968)
Male
120
100
80
60
40
20
0
Number of Persons ('000)
80 & above
70～74
60～64
50～54
40～44
30～34
20～24
10～14
0～4
Population by Age (Taipei, 1968)
Female
0
20
40
60
80
100
120
Number of Persons ('000)


Population by Age (Taipei, 2003)
Male
120
100
80
60
40
20
0
Number of Persons ('000)
80 & above
70～74
60～64
50～54
40～44
30～34
20～24
10～14
0～4
Population by Age (Taipei, 2003)
Female
0
20
40
60
80
100
120
140
Number of Persons ('000)

Summary 1

Population increase in:

SEOUL – due to natural increase
- (negative rate of social increase)

TOKYO – due to social increase
- (decreasing rate of natural increase)

OSAKA – due to social increase
- (negative rate of natural increase)

Population decrease in:

TAIPEI – decreasing rate of natural increase
- negative rate of social increase

Increasing number of households and decreasing household size.
Household dynamics may influence per capita consumption of water Resources.

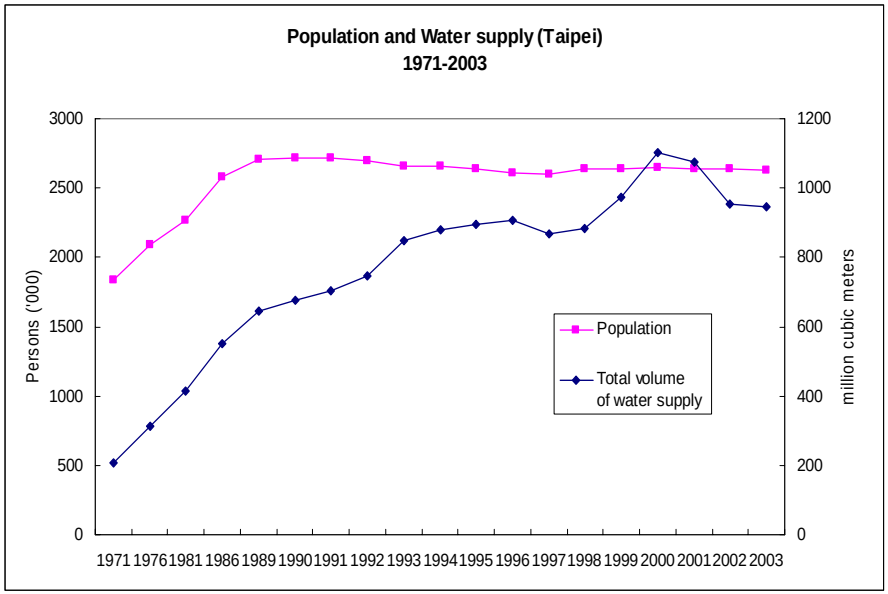
Summary 1 (Cont.)

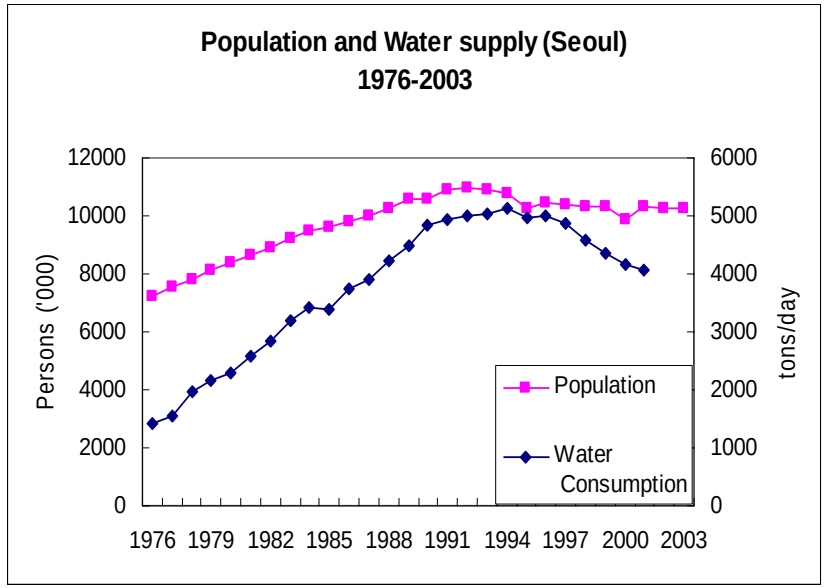
Population trend according to age bracket (1995-2000)

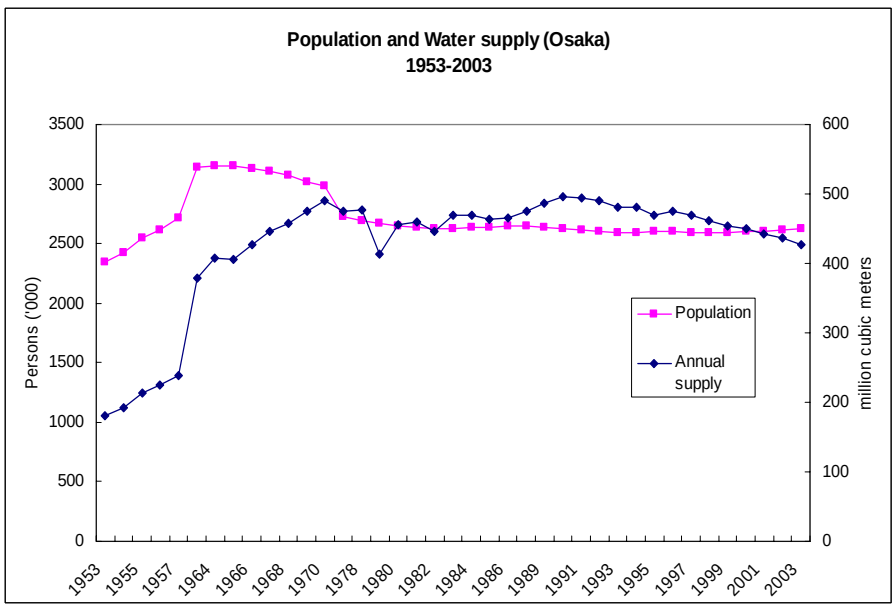
Age bracket	Seoul	Taipei	Osaka	Tokyo
0-14	Decreasing	Decreasing	Decreasing	Decreasing
15-24	Increasing	Decreasing	Decreasing	Decreasing
25-34	Increasing	Decreasing	Decreasing	Increasing
35-49	Increasing	Increasing	Decreasing	Decreasing
50-64	Increasing	Increasing	Increasing	Increasing
64-80			Increasing	Increasing

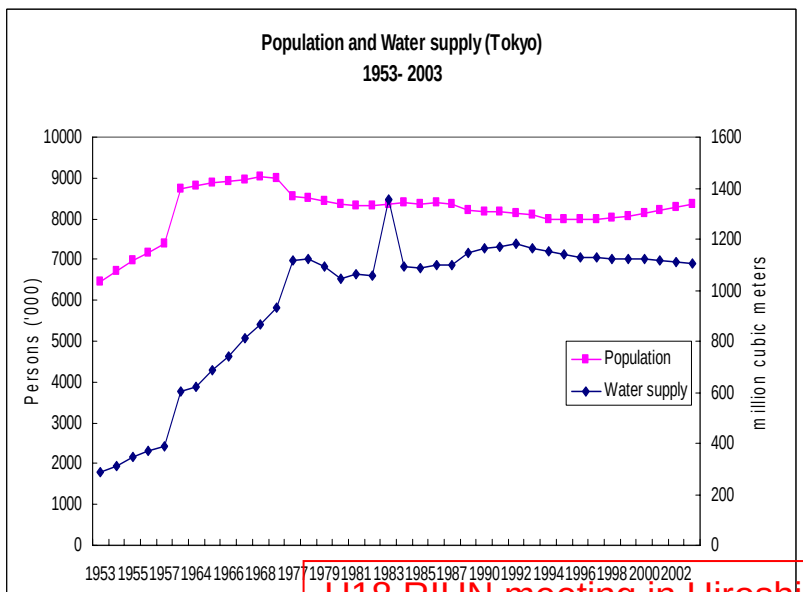
Population, water supply and consumption

Population and Water supply









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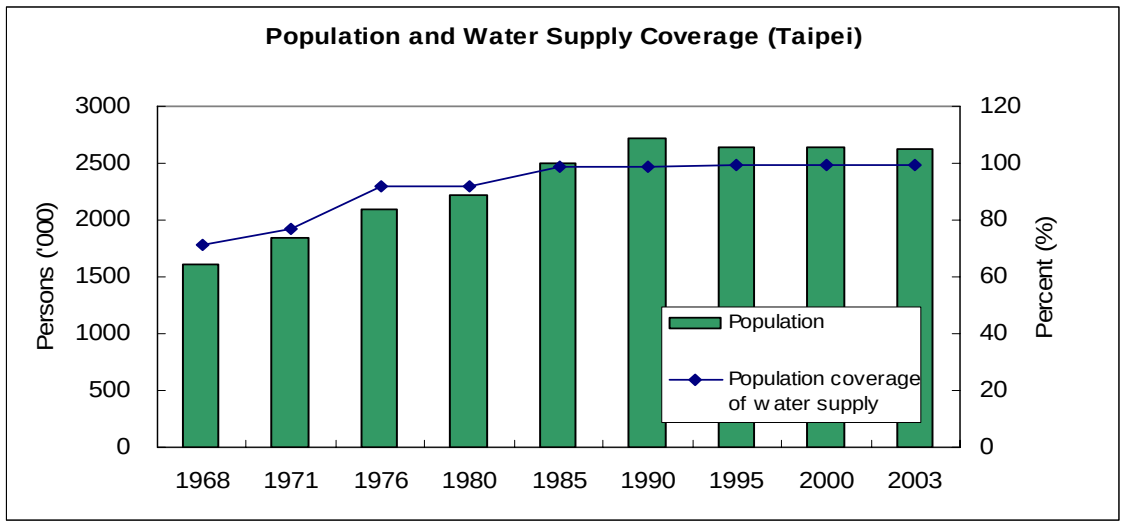
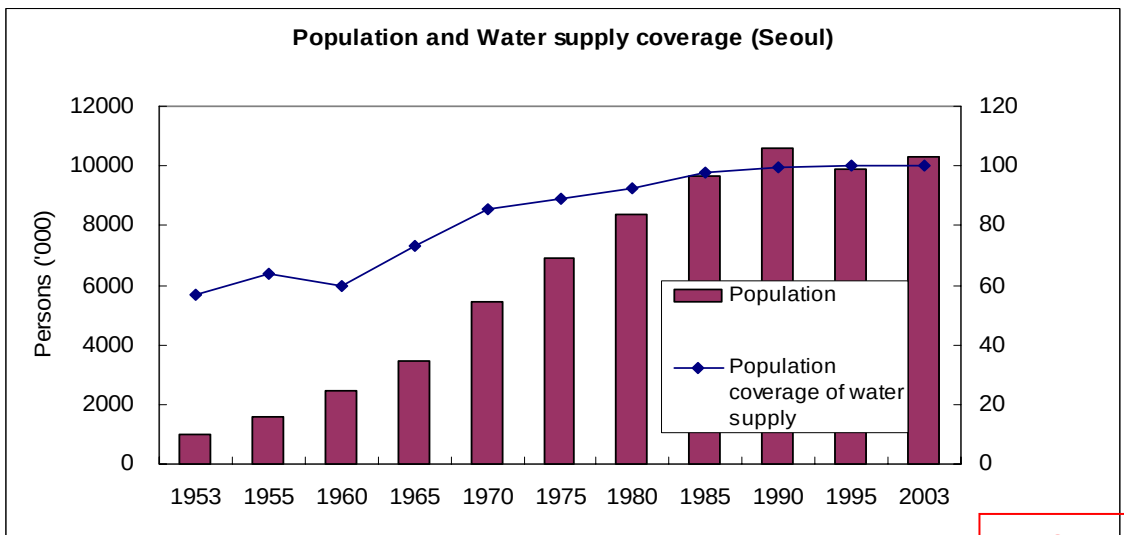
Population and water supply coverage





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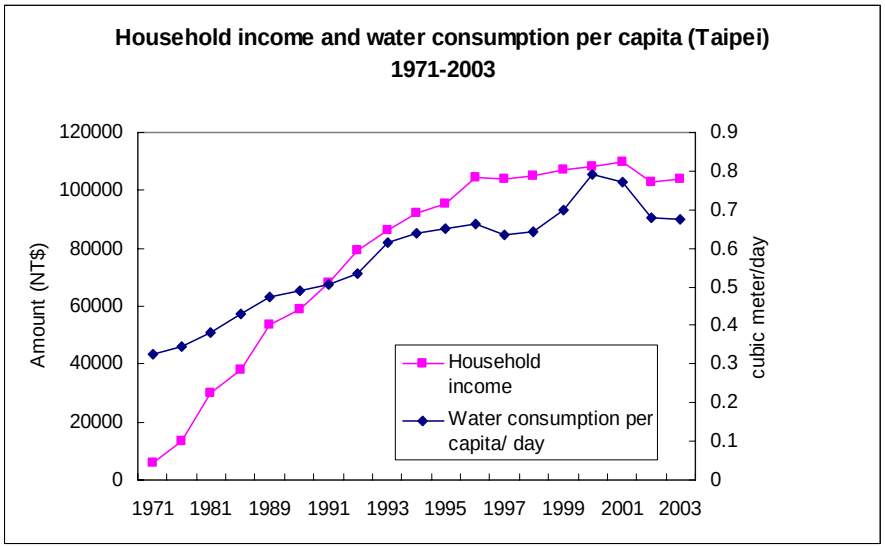
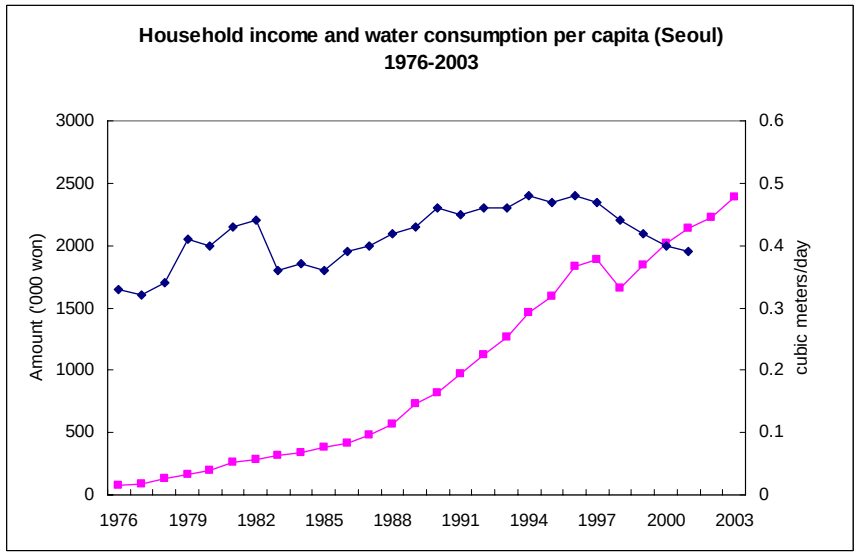
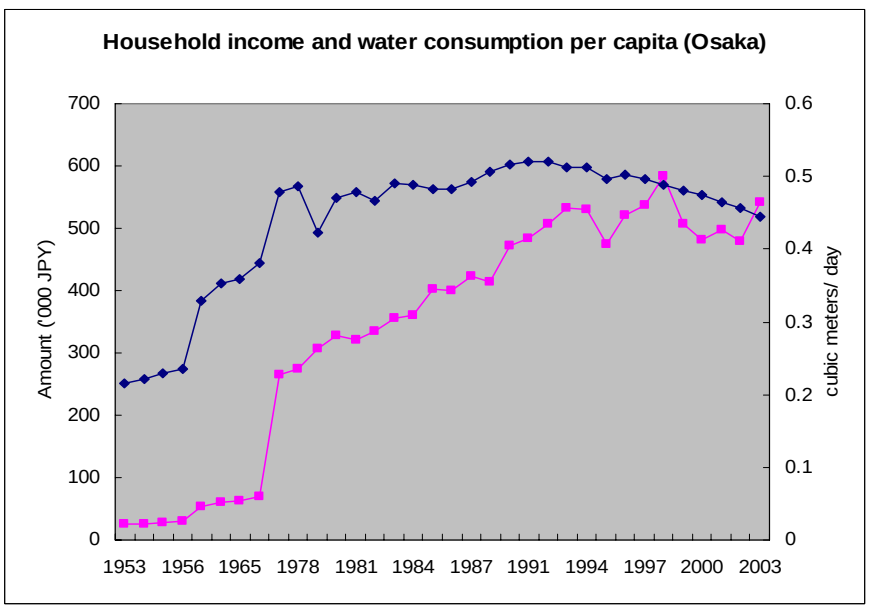
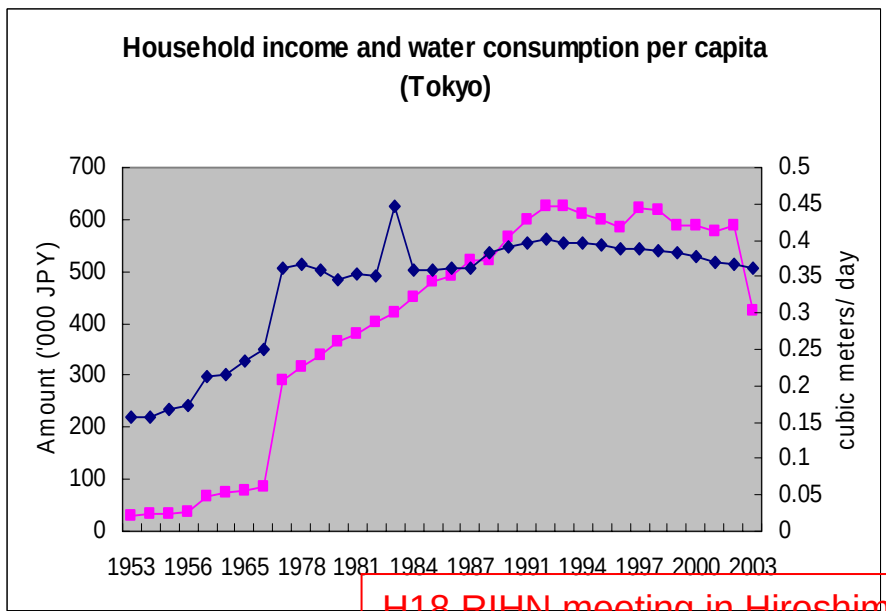
Household income and water consumption









Summary 2

Water supply increases with population growth

- Osaka: 1953-2003 (181 ⇒ 426 million cm^3)
- Tokyo: 1953-2003 (287 ⇒ 1103 million cm^3)
- Taipei: 1968-2003 (414 ⇒ 945 million cm^3)
- Seoul: 1976-2001 (142 ⇒ 405 million cm^3)

Water consumption per capita/day increases with population growth

- Osaka: 1953-2003 (0.22 ⇒ 0.45 cm^3)
- Tokyo: 1953-2003 (0.16 ⇒ 0.36 cm^3)
- Taipei: 1968-2003 (0.28 ⇒ 0.67 cm^3)
- Seoul: 1976-2001 (0.32 ⇒ 0.39 cm^3)

Water consumption per capita increases with household income in Taipei but decreasing in later years in Seoul. Trends in Osaka and Tokyo still need to be reviewed further.

Summary 2 (Cont.)

Differences in water consumption between cities maybe due to:

- Socio-economic conditions (income, etc.)
- Water use patterns
- Technological improvements

Future Plan

- Trend analysis of domestic water supply and consumption and urban growth factors.

- Determination of water use patterns in households and technological improvements which led to the increase/ decrease in water consumption in the past 50 years.

- Analysis of socio-economic factors and policy measures affecting delivery of water supply and changes in water demand.

- Case study cities of Bangkok, Jakarta and Manila in order to provide a good comparison of experiences of cities in different income levels and stages of growth.

Thank you for your kind attention!