

A COMPARATIVE STUDY ON ENVIRONMENTAL PROBLEMS BETWEEN CITIES IN DIFFERENT STAGES OF URBANIZATION

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1. Introduction

Environmental problems due to city development may appear in different ways depending upon the region's stage of economic development and urbanization. This is because the stages of development result in differences in the generation mechanism of environmental problems.

This paper aims at comparing the configurations of environmental problems in Nagoya and Bangkok, including their causes and countermeasures and their results.

2. Stage of Urbanization and Economic Development

2.1 City Background

The city of Nagoya covers an area of 327.9 km² with a population of 2.15 million. During the 1960's the major city's product was the product from chemical and heavy industry. However the product has changed to major on wholesale and retail trade since the 1970's.

Bangkok Metropolis is located on both sides of the Chao Phraya River and covers an area of 1567.8 km², with a population of 5.83 million. The Bangkok's major products are product from small scale industry and service.

2.2 The Stage of Urbanization

In order to determine the stage of urbanization of the cities, Klaassen's concept of the stage of urbanization is adopted. However, due to the wide difference in population distribution in Bangkok and lack of worker data from vicinity area, the core area of Bangkok is defined as all the metropolitan area excluding the area with population density lower than 1,000 person/km², and the ring area is defined as the remaining area in transportation planning area.

Figure 1 shows the percentage change of population in core and ring area for each five year period since 1955. It shows that Nagoya passed 'urbanization stage' (growth rate of core higher than ring) to 'suburbanization stage' (growth rate of ring higher than core) during the 1960-65 period and now is in the stage of absolute decentralization.

Bangkok also passed the 'urbanization stage' during 1980-85 and is in the mid of the 'suburbanization stage'. By considering the period at which the stage changed, it may conclude that the time lag of urbanization between Nagoya and Bangkok is around 20 years.

2.3 Economic Development

The difference in economic development between cities is compared by using the index value of the current value of per capita GRP. The base point (index=100) is defined as the starting point of the rapid growth period. Figure 2 shows the change of per capita GRP index, both for Nagoya (.....) and Bangkok (----). The shape of per capita GRP of Bangkok fits well with Nagoya's shape when time period is shifted for 21 years (—). Then it may be said that the economic development of Bangkok also follows Nagoya for around 20 years.

FIGURE 1 PERCENT CHANGE OF POPULATION IN NAGOYA AND BANGKOK (5 YEARS PERIOD)

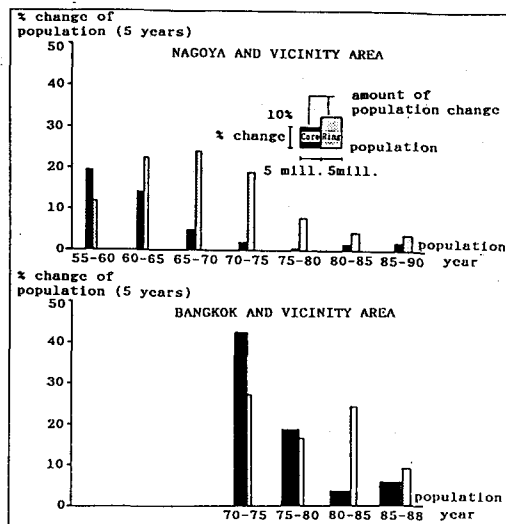
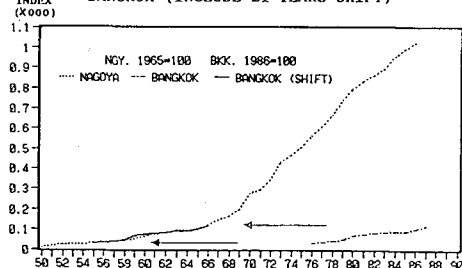


FIGURE 2 CHANGE OF PER CAP. PRODUCT INDEX IN NAGOYA BANGKOK (INCLUDE 21 YEARS SHIFT)



3. Configuration of Environmental Problems and Their Causes

After the Second World War, Nagoya started to rebuild the infrastructure and develop the city's economy. Like other cities, due to the excessive withdrawal of groundwater, Nagoya faced the land subsidence problem since 1950. The air and water quality also began to deteriorate since the starting of chemical and heavy industry and they became to be the major problems since the beginning of the 1960's. However, the quality of the environment is improved yearly since 1975.

In Bangkok, the quality of the environment began to deteriorate since the second half of the 1970's, except land subsidence which started around 1960. Unlike Nagoya, Bangkok economy is based on small scale industry and service then, the environmental problems due to industry are not serious. However, Bangkok faced the environmental problems due to lack of infrastructure such as road network, water supply, waste water treatment system, etc. Air and noise pollution are mainly from transport, both land and water transport (in 1986 the number of car in Bangkok less than Nagoya around 10% but the road area less than 2.5 times). On the other hand, water pollution are mainly from residential.

Figure 3 shows the cycles of urbanization stages and environmental problems. It can be seen that the Bangkok's cycle is faster than Nagoya around two times since the population, both in core and ring area, change very fast. In Nagoya, due to rapid economic development in 1950's, air and water pollution problems appeared at the end of the 'urbanization stage'. On the other hand, in Bangkok, the problems appeared during the 'urbanization stage' since the rate of population growth is very high (as shown in Figure 1 and Figure 3) and infrastructure supply could not follow the rapid growth. However, both in Nagoya and Bangkok, land subsidence problems occurred during the 'urbanization stage'.

Figure 4 shows the air quality in Nagoya and Bangkok. At the end of the 1960's the major air pollutant in Nagoya was SO_2 which mainly came from industrial activities. On the other hand, CO and SPM are the major pollutants in Bangkok especially in the roadside area.

4. Environmental Countermeasures and Their Results

In order to improve the quality of environment, in both Nagoya and Bangkok, various countermeasures were introduced. Some of major measures and their results are shown in Table 1.

5. Conclusion

The environmental problems in Nagoya and Bangkok are difference. In Nagoya the problems were mainly from economic development and these problems had been solved in the short period. For Bangkok, due to the rapidly urbanization, the problems occurred during 'urbanization stage', which earlier than Nagoya and continue to present since the infrastructure supply is still inadequate.

FIGURE 3 THE CYCLES OF URBANIZATION STAGES AND ENVIRONMENTAL PROBLEMS

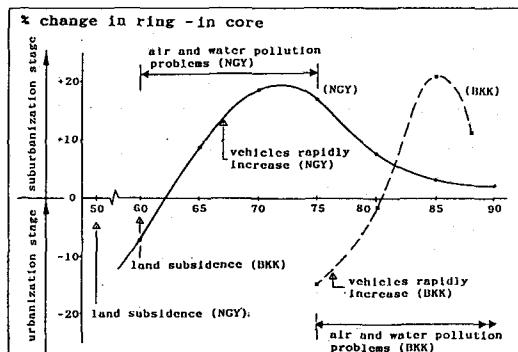


FIGURE 4 CHANGE OF AIR QUALITY IN NAGOYA AND BANGKOK

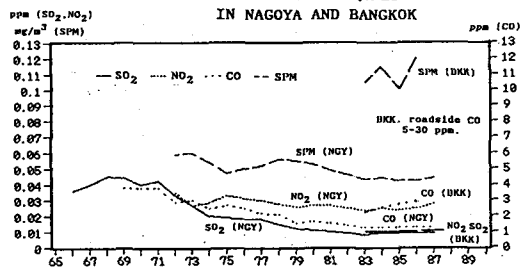


TABLE 1 MAJOR COUNTERMEASURES AND THEIR RESULTS

Problem	Countermeasure	Year	Result
NAGOYA			
Air and Water Pollution	- Introduce 'Rule for Pollution Control Agreement'	1971	the environmental quality improved since 1975
	- shift of industrial structure	1970-	
	- established various standards		
	- increase budget and personnel		
Land Subsidence	- restrict withdrawal of groundwater for whole area	1974	subsidence not appear since 1979
	- increase water supply		
BANGKOK			
Air and Water Pollution	- established various standards	1980-	still in the serious condition
	- reduced lead in oil	1984	
	- enforcement and promotion of environmental education	1980	
Land Subsidence	- same as Nagoya	1983	subsidence continue but lower rate