

Urban Environmental Problems and Citizens' Awareness in Hangzhou City

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This paper aims to analyze the present situation of the urban environmental problems based on citizens' awareness and intentions in Hangzhou City, China, and to examine the level of citizens' recognition of urban environmental problems and measures. As a result, it is made clear that urban environmental problems in Hangzhou City is becoming complicated and diversified. It is also found out that there exists a citizens' group that is deeply aware of the problems.

Key Words : Citizens' Awareness and Intentions, Urban Environmental Problems, Urban Environmental Measures, Hangzhou

1. Introduction

With the rapid progress of urbanization and modernization accompanied by the economic development in China, urban environmental problems caused by living, traffic and other urban activities besides industrial activities have become more serious. However, there are few researches dealing with the relationship between the environmental pollution and measures from the viewpoint of the changing feature of urban activities at present times. The lacking of objective information on general urban environmental quality or degree of pollution is the main reason.

In order to recognize these problems and measures and the relationship between the two above correctly, it is necessary to investigate the citizens' awareness of them, because daily's feeling about urban environment of citizens is objective.

In this paper, Hangzhou City is taken up for analysis. The city has been developing economically like other coastal cities in China since the introduction of Open Door Policy in

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late 1978. It also has many historic remains and beautiful scenes including West Lake. For analysis of the present environmental problems of the City, urban quality data at Hangzhou City's Environmental Statistical Yearbook are used first, and then the answers for a 1997 questionnaire about citizens' awareness of the urban environmental problems are used. Furthermore, through analyzing citizens' intention level of urban environmental measures, it is clear that urban environmental problems in Hangzhou City is becoming complicated and diversified and there exists a citizens' group that is deeply aware of the problems.

2. A general situation of Hangzhou City

2.1 Urban development and environmental measures

Hangzhou City is located in the south of the Yangtze River Delta of southeastern China. The total land area of Hangzhou region is 16,596 square kilometers with a population of about 5.8 million. It is composed of five districts and seven counties.

Some data about urban activities are listed to explain the development since mid 1980s (Figure 1). Figure 1 shows that during the past 10 years, accompanied by the per capita GDP's growth, car-holding percentage, road area per person and citizens' income rose too. Comparing between 1995 and 1985, GDP and citizen's income increased by more than 6 times, car holding percentage increased by 2.3 times, and road area per person increased by 1.4 times. In late 1980s, GDP, car holding percentage and road area per person has increased very fast. With the acceleration of urban development, the city area expanded a lot (the city area in 1995 is 50% larger than that in 1990).

At the same time, the municipal government of Hangzhou City has enforced a lot of environmental protection projects since mid of 1980s, such as "low interest loan for

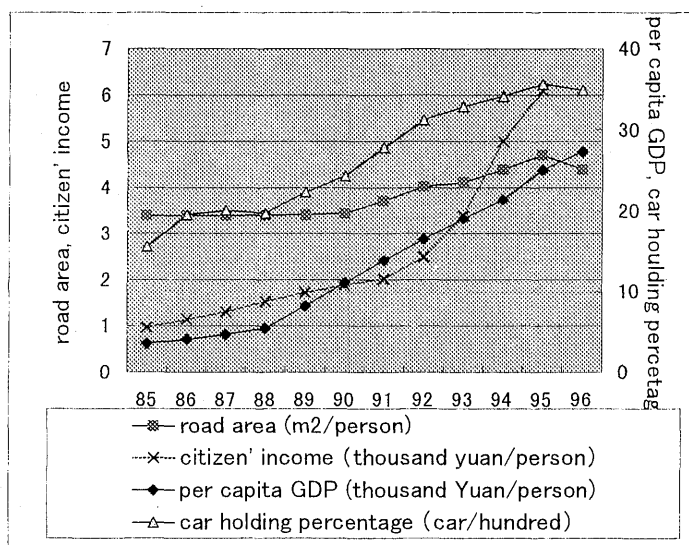


Figure 1 Urban development situation of Hangzhou City

environment protection", "environmental dispute coordination commission", "Hangzhou environment newspaper", "West Lake environment general improvement project (invested 11.6 million Yuan)", "Zhongdong River general improvement project (invested 2.2 billion Yuan)", "Shibao wastewater treatment facility (40 thousand Ton/day)", "city gas project (300 thousand M³/day)", "Tianzhiling refuse landfill dump (capacity: 6,000 thousand M³)", and so on. For this reason, Hangzhou city has being considered as one of the best environmental city among 32 main cities of China since 1988 (Hangzhou City always ranks at top class in "Urban Environment General Valuation of China" since 1988).

2.2 Situation of environmental quality

While many environmental projects have been implemented in Hangzhou City, the city environmental quality is still being serious due to intense economic development.

Figure 2 shows some air environmental situation represented by data of SO_2 , NO_x , TSP and the level of noise from 1986 to 1995. Among them, NO_x and the level of noise have not been reduced within the city area since 1986, and SO_2 had a tendency to reduce only a few. However TSP increased drastically since 1990. For this tendency, there are two main reasons that could be considered. One is that the polluting pace caused by the increase of urban activities is only equivalent to the effect of supplementary environmental projects. Another is that some environmental measures haven't yet take a detectable effect to some increasing pollution matter such as TSP which is mostly caused by the dramatic increase of car or construction.

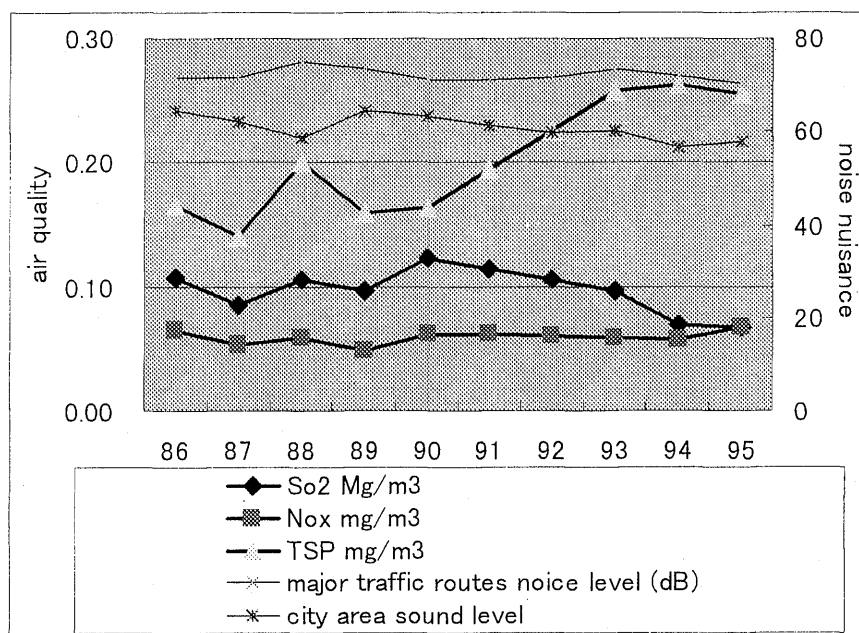


Figure 2 Urban air quality situation of Hangzhou

Beside air quality, the amount of industry sewerage and household sewerage was 210 million-ton and 60 million-ton respectively in the city area in 1990. As for industrial sewerage 66.32% was disposed and in which only 44.38% satisfied the national standard. Most part of household sewage was discharged into rivers directly or after going through simple sewerage disposal facilities. This makes rivers inside the city dirtier than those outside the city. There are three main rivers passing through Hangzhou urban area, Qiantang River, Yunhe River and Zhongdong River. Table 1 shows density of BOD of them. It shows the water quality in Yunhe River and Zhongdong River nearer to urban center is worse than Qiantang River out of the city, although the Zhongdong River general improvement project and Yunhe River dam project were implemented during 1983 to 1985.

In addition to the above-mentioned problems, solid waste is also becoming one of new environmental problems. Most solid wastes are shipped to refuse dump for landfill only and the collecting and transport system is not enough too. Recently because household waste increases rapidly, citizens' complaints concerning solid waste problem are increasing intensely.

Table 1 Density of BOD of rivers in Hangzhou

	1986	1987	1988	1989	1990	Location
Qiantang River	1.46	1.45	1.47	1.28	1.47	Outside
West Lake	5.47	6.15	5.91	5.62	5.33	
Zhongdong River	27.69	21.00	22.26	13.22	13.75	Inside
Yunhe River	38.21	21.3	14.75	15.22	14.12	

3. Citizens' awareness of urban environmental problems

Here the free answers of the questionnaire about citizens' awareness of urban environment carried out from Dec. of 1996 to Mar. of 1997 were used for analysis. The number of free answer respondents is 228 of one thousand effective questionnaires in total.

Firstly, examine the meaning of answer contents, put keywords in order, and then make use of KJ Method to form relationships among all keywords. The present urban environmental situation from citizens' view is shown at figure 3, based on the relationships between pollution source and pollution phenomenon. Car, industry plant and constructing are recognized as main pollution sources. Citizens' living manners, lacking of planning are also pointed out. It is suggested that pollution phenomenon is becoming more prominent in the field of traffic environment, housing environment, air environment, river pollution and street environment.

Secondly, sum up keywords to 20, classify them into four items, that is "pollution source" "pollution content" "pollution area" and "environmental measure" (table 2), and then look at share of keyword by each item. As figure 4 shows, "car" and "constructing" are pointed out by more than 50% and 9% respectively as pollution sources, which are directly reflected by rapid economic development. In pollution content, exhaust gas and noise are pointed out by 42% and 34% respectively, which are also caused by economic development. Based on these results, it can

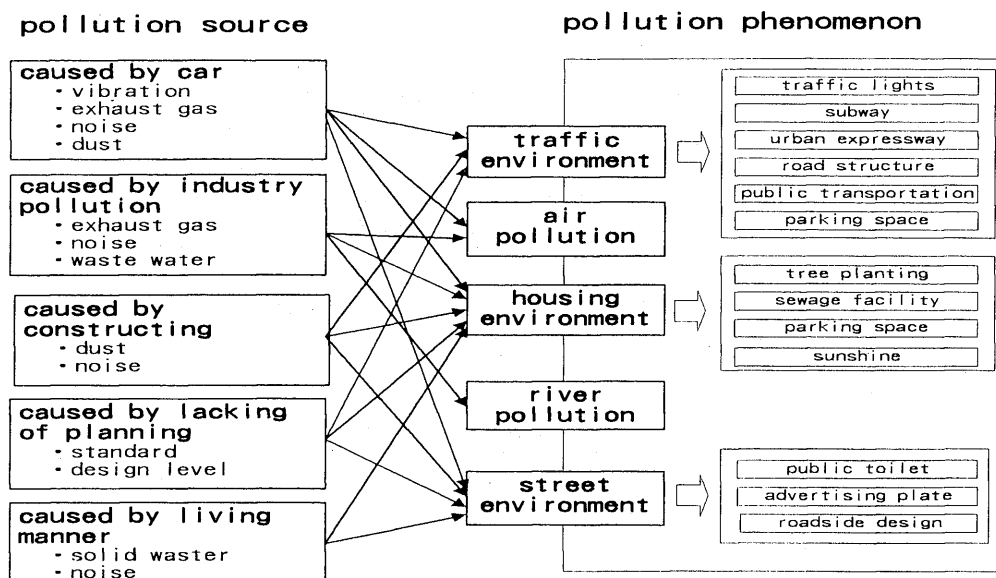


Figure 3 The present urban environmental situation in Hangzhou from citizens' view

Table 2 Keywords' classification

Items	Keywords
Pollution source	Car, Industry plant, Constructing
Pollution content	Exhaust gas, noise, solid waster, vibration, dust
Pollution area	Housing environment, river, street environment, traffic environment, protection against disasters, nature environment
Environmental measures	Tree planting/infrastructure implementation, planing, law system, culture/history, education/awareness, citizens participation

be said the pollution type is sifting from traditional industry pollution to urban pollution.

As for pollution area, because of the higher share of housing, river, street, and traffic environment, it can be said that citizens are concerning the daily's living environment definitely. In addition, due to the higher share of keyword on amenity such as street environment, it is suggested that city's historic character is considered as an important factor in citizens' awareness. In short, there seem to be no doubt that countermeasures to improve the urban living condition are not sufficient yet in citizens' awareness.

In the item of environmental measures, the keyword of "tree planting/infrastructure", "planing", "law system", and "education/awareness" are in higher rate, which are strongly close to governmental actions. On the other hand, the keyword of "citizens' participation" shows only 4% (figure 4). Therefore it can be said that citizens generally expect the actions against pollution done by government much more than by citizens themselves. This means that the awareness on necessity of individual action by citizens themselves is still on low level.

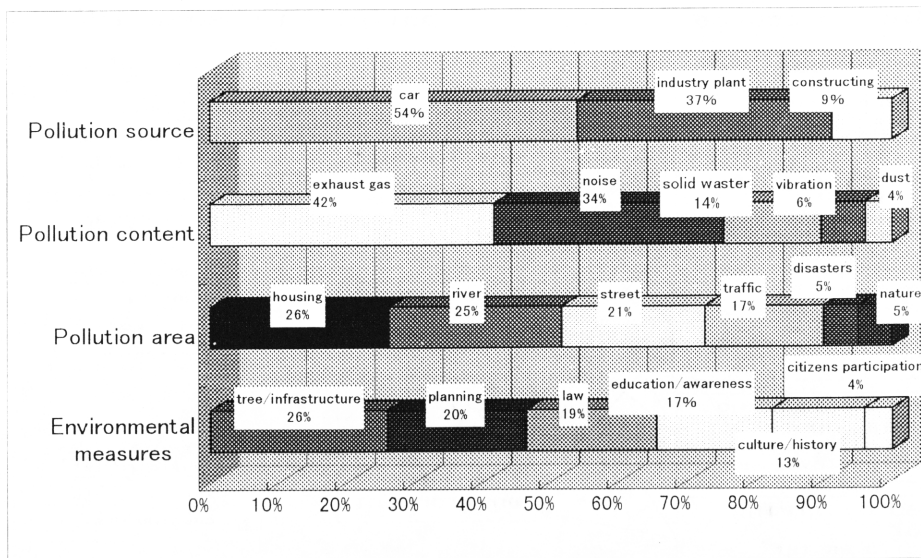


Figure 4 Share of keyword in each item

4. Citizens' intention level of urban environmental measures

Under the situation of urban environmental problems which is now becoming complicated and diversified in Hangzhou, how are citizens aware of the relationships among 4 items and what is the citizens' intention level for the tackling of environment problems? Here, in order to analyze these points, Cluster Analysis is applied for the free answer data. As a result, citizens are classified into 4 groups from the viewpoint of their awareness on environmental issues (figure 5).

The rate of each item pointed out by respondents of each group is shown at table 3. Some features of each group are concluded as follows. Group 1 has a largest share and accounts for 47% of all 228 respondents. Because the item "environmental measures" has a quite higher rate (96%) in this group than other three, Group 1 can be considered as a measure-oriented group. In Group 2, the rate of pollution content and pollution area is 84% and 72% respectively, which are higher than other two items. Pollution phenomenon is regarded as an important issue in this group. In Group 3 the rate of pollution area and environmental measures is 61% and 82% respectively which are higher than others. This is a peculiarity of this group.

Additionally, comparing the rate by item for all groups, the item of environmental measures is the highest among all items in three groups excluding Group 2. It can be said that most of citizens (more than 75%) do pay attention to environmental measures by government. This result is not in favor to establish an environmental protection system that involves direct participation of citizens. If environmental problems have to be solved

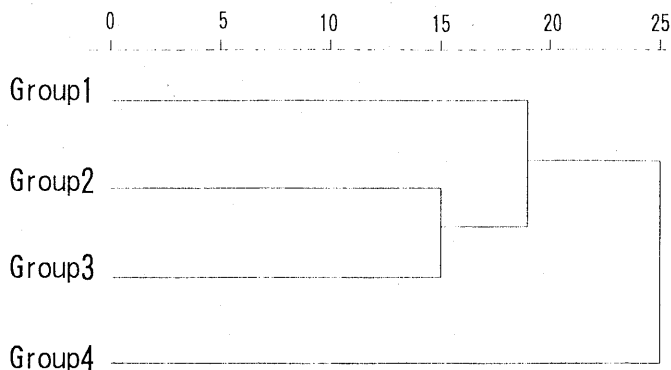


Figure 5 Rescaled distance cluster combine

Table 3 mentioned item rate in each group

	Number. of respondents	Pollution source	Pollution content	Pollution area	Environmental measures
Group 1	107	4%	10%	32%	96%
Group 2	57	58%	84%	72%	58%
Group 3	38	18%	16%	61%	82%
Group 4	26	85%	100%	81%	100%
Total	228				" " is higher rate

completely, the citizen's intention level of urban environmental measures should be upgraded. Because daily activities such as living and traffic activities that are much close to citizens' life are becoming a more possible cause of urban environment problems from now on citizens themselves' individual actions against pollution have to be considered as more important.

Here Group 4 should be paid attentions, because the group is deeply aware of urban environmental problems. Although the number of respondents in this Group is only 26, or 11% of all, the rate of each item is higher than that in other groups. It can be said that this group considers urban environmental problems most deeply among all. Encouragement of Group 4 is a key point in establishing an environmental protection system that involves direct participation of citizens.

5. Conclusion

In this paper, the profile of urban development, environmental quality and environmental measures in Hangzhou City was summarized basing on statistic data and some other related materials. The citizens' awareness of urban environmental problems and measures was analyzed by using the answers of questionnaire. The results are concluded as follows:

(1) It was made clear that urban environmental problems is becoming complicated and diversified even in Hangzhou City which is one of the best environmental city in China.

(2) It was proved that citizens generally expect the actions against pollution done by

government much more than by citizens themselves. This means that the awareness on necessity of individual action by citizens themselves is still on low level.

(3) It should be paid attention that there exists Group 4 that is deeply aware of urban environmental problems, although the number of respondents in Group 4 is only 26, or 11% of all respondents.

As a conclusion, though this study was carried out for Hangzhou City, it can be said that the complication and diversification of urban pollution problems accompanied by the progress of economy is a general phenomenon all over cities of China. Though citizens' awareness of urban environmental problems and measures varies from one to one, the awareness on individual action by citizens themselves is still on low level. However it was proved that there exists a high intention level group that recognizes urban environmental problems. In order to deal with environmental problems completely, and to establish an environmental protection system that involves direct participation of citizens smoothly, the encouragement of Group 4 is a key point.

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