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Environmental Action Plans for Modern Chinese Communities: Taking Tingzhou Community as a Sample

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Abstract. In many developing countries, economic development cause environmental damages. Environmental problems result in health problems, which become a conflict to social progress. Current environmental problems become increasingly serious in China. Although the government has already taken actions on laws and policies on a macro-level, the implementation in different provinces and regions can hardly be evaluated, not to mention in smaller units such as communities. In this article, the author will take Tingzhou Community as a sample to discuss the main environmental problems in this community and then design plans for improvement.

1. Introduction

Tingzhou community is a typical representative of those middle class communities in Hangzhou, which is an important city in China. The pollution issues Tingzhou community faces represent the problems of most communities of its kind in China. The issues Tingzhou community faces right now mainly focus on four parts: 1. Air pollution emitted by construction sites nearby, road vehicles as well as from the external big environment seriously pose a threat to residents' health, especially to the respiratory system; 2. Water pollution cause by improper discharge of domestic waste water into nearby rivers, which results in a large burden on ecological restoration; 3. Solid waste pollution because of the inappropriate disposal of garbage; 4. Noise pollution caused by road vehicles, construction as well as shopping malls. In this article, the author will analyze the current situations, the reasons and provide some simple solutions in the mentioned areas above.

2. Research Background

Nowadays in China, typically all the urban residential communities are constructed by estate builders. However, community elementary services are not provided by estate, but by specialized property companies. Environmental assessment report in construction will not be handed over between both sides. A worse thing is that although there is an environmental impact assessment report prior to the construction, there is no corresponding post-processing after the actual delivery. During the transition process, varieties of problems occur which include environmental problems. More specifically, expect for the Ministry of Environmental Protection and the subordinate official EPA, few companies could help in dealing with those emergencies. Unitary communities need to deal with environmental emergencies independently with limited supports. So usually the situation is no precaution or solution other than waiting for the officials to solve the problems after they occurred. In order to deal with this situation, appropriate measures need to be designed.

This project is designed specially according to the real situation of Tingzhou community which is quite typical with a high occupancy rate and a population structure of both adults and children. Nearby,



there is a comprehensive range of living facilities including supermarkets, shopping mall, schools, as well as a subway station which is still under construction. The first step is to confirm the scope of the research regions. After contacting with the property company and the owners' committee as well as checking influential factors and open environmental data, the project confirmed the scope of the community as north to Linping Mountain, south to 320 State Road, east to Yuhang High School, and west to Wanbao Commercial Center. The second step is to select the environmental health problems caused by the main classification of air, water, solids and noise pollution. After investigating several families as well as searching the analysis report on the open data platform, a sample of health problems actually existed in the community was confirmed. In order to create a specific contingency plan, an analysis of the details will be made. By the way, the implementation of these measures is based on the fact that every community has a property management company and a owners' committee which are the main bodies of community management.

3. Analysis of pollution and suggested solutions

3.1. Air pollution

3.1.1. Current situation. Air pollution, attracts high attention among people in Hangzhou recently. In a 1-year air quality study around the Tingzhou Community area, there were 38 days of O₃ exceedance and 62 days of PM_{2.5} exceedance referring to the National Ambient Air Quality Standards in China. The data used for the analysis of the main components of air pollution in Hangzhou showed that the annual mean concentrations of PM_{2.5} decreased from east to northeast while the community located in east of the city is undergoing severe pollution.

The main PM source in Hangzhou is related to soil dust, vehicle exhaust, fly ash from burning coal and building cement dusts. In order to find out the main sources of the air pollution in the community, research focused on five factors:

(a) The construction of Hangzhou Metro Line 9 which is being carried out near the block. The main air pollutant in construction is dust from excavator operation.

(b) The ground road, which is one of the main lines, is busier than usual because of traffic congestion caused by the Metro construction. Automobile exhaust becomes another factor to the air pollution in the community.

(c) The simultaneous construction of some supporting facilities causes construction wastes, which are located too close to the residential area. Some of the residential buildings are less than 50 meters from where the wastes placed. Residents who are living on floors from 1 to 11 could feel obvious chemical irritation when they open the windows.

(d) Around the community there are a lot of restaurants without proper emission management. A large amount of untreated contaminated air from the kitchen is discharged.

(e) On the eastern side of the community, there is a thermal power plant. Whether the emission meets the national environmental friendly standard or not is remaining unknown.

The harm of air pollution is obvious. It is showed that air pollution in Hangzhou area is directly related to acute myocardial infarction. The mean number of AMI admissions per day in hospital respectively was 8.2 during G20, 13.3 before G20, and 15.1 after G20. The higher concentration of PM_{2.5} is, the more negative impact is on cell viability and ROS levels to human bronchial cells BEAS-2B, which unavoidably leads to the decrease of lung function. The mortality rate from cardiopulmonary diseases then increases as the particular matter may enter the blood circulation easily through gas exchange in lungs. Except for the direct harm to the human body, finer fractions of PM also have a great negative effect on atmospheric visibility, which may lead to traffic accidents and threaten social security.

3.1.2. Suggested solution. Since the construction project which mainly affects the air quality of the community can not be stopped or completed within one year, the relative solution is mainly focused

on the self-protection methods among the residents. By studying on 8 plants commonly used in Hangzhou, camphora and japonica stand out referring the retention capacities of the leaf when facing particulate matters. Therefore, the two kinds of plants could be a preference when selecting plants for greening the community. Community property management company should provide masks for residents in each building on days with heavy haze and fog. Indoor air purifiers are highly recommended to be used in each house. Besides, the community property management company should make a deal with the nearby restaurants to ensure a proper emission management. This is also the case with the thermal power plant to make sure exhaust gas recovery units be installed to ensure that emissions meet the national environmental standard.

3.2. Water pollution

3.2.1. *Current situation.* The water quality in river nearby the community is getting worse and worse in the new century. The philosophy of “Five water co governance” as the main direction of water treatment has been put forward. The analysis of ammonia nitrogen, total phosphorus, permanganate index and dissolved oxygen in the water is made according to 《The Environmental Quality Standard for Ground Water》 (GB3838-2002) and the implement of 《Environmental Quality Standard for Surface Water》 (GHZB1-1999).

Table 1. Water quality index

Number	TAN (mg/l)	CODMn (mg/l)	TP (mg/l)	DO (mg/l)	Flow (m ³ /s)
1	5.03	5.52	2.44	0.48	0.25
2	4.23	7.60	2.36	0.43	0.25
3	2.48	6.15	5.01	0.62	0.25
4	2.34	4.44	2.95	0.23	0.25
5	3.92	5.28	2.96	0.27	0.25
6	0.61	6.88	4.36	0.77	0.25
7	1.28	5.44	4.12	0.46	0.25
8	1.84	4.8	3.89	0.23	0.25
9	2.88	5.83	6.45	0.85	0.25
10	2.6	4.12	3.79	0.34	0.25
11	2.84	3.99	4.32	0.28	0.25
12	5.45	4.56	3.85	0.30	0.25

The water pollution of this river is severe. Dissolved oxygen content fluctuates greatly and the ammonia nitrogen index continues to exceed the standard seriously. The total phosphorus index has exceeded the standard for several months referring ammonia nitrogen as the main pollution index. Overall, although there is no floating garbage, there are two untreated domestic sewage outlets along the river. Improving existing water quality will be a long-term goal as there is no permit to get daily average discharge of domestic sewage and component. The polluted water may affect the drinking water system in the community, and may cause direct food poisoning among the elders and children who have comparatively fragile digestive system. The water pollution also seriously affects the nearby ecosystem. When the water is roasted in the hot summer, it releases stench smell as well as harmful substances to the air, which cause an air pollution with harms to human bodies.

3.2.2. Suggested solution. As the river pollution is also related to both the upstream and downstream, which is a complicated and comprehensive system, the solutions are also focused on the self-protection methods. Water filters are highly recommended to be used in every house. Also the domestic waste water should be emitted after proper treatment to avoid the secondary pollution to the river. Trees should also be planted in order to reduce the air pollution caused by stench smells and etc. Except for these self-protection methods, the community property management company should try to find out the pollution factors in both the upstream and downstream, and make plans together to deal with the pollution.

3.3. Noise

3.3.1. Current Situation. The community is very close to major roadways. The heavy traffic unavoidably caused noise pollution. Besides, when the supermarkets make promotion events using the loudspeaker, a noise of over 90 decibels can be easily measured at a distance of 500 meters using a portable decibel tester.

Noise caused both mental and physical harm to human body. It is regarded as a common source of pressure in modern days. In a related project applied in Swedish women showed that exposure to high levels of noise during pregnancy resulted in a slightly reduced fetal growth. Another research made in Sao Paulo, Brazil showed that almost half of the maternal feel extremely uncomfortable and anxious under noise. What's more, a project in Korea proposed that when daytime noise increases by 1 A-weighted decibel (dB(A)), cerebrovascular disease increases by 0.66%, hypertension increases by 0.17%, and heart disease increases by 0.38%. Back into the community case, as the major groups of the residents are elders and children, they are more vulnerable to noise pollution. My research showed that among the 96 research samples, 82 reported a sudden awake when the outside have a strong noise, and 43 of the 82 reported to feel difficult to fall asleep again after waking up.

3.3.2. Suggested solutions. According to a research about plants reducing noise indicated that living in a neighborhood deprived of trees (< 5.84%) enhanced the negative effects of noise, whereas living in neighborhoods with higher tree cover density could reduce the negative effects of noise. Therefore it will be helpful to plant more trees and grasses in the community to decrease noise pollution. Besides the community property management company should establish a regulation of night maximum decibel limit for residents, as well as drivers and construction companies to follow. If the elders or children demand more quiet environment, sound insulation glasses are recommended to be equipped in the bedrooms. Sleeping aids such as walnuts, hot milk are also suggested to be used for those who have sleeping problems.

4. Conclusion

Although the ecosystem of Tingzhou Community is still relatively fragile at present, after simple suggestions for different environmental problems are given as above, a lot of actions have been taken as so far. A non-mandatory public contract about traffic restriction when the AQI index becomes greater than 150, is made by the property management company and the owners' committee, and has been notified to all the community families to follow. An artificial water quality monitoring station is set up to provide free domestic water which purified by household device when water quality doesn't reach the standard. Also, the waste treatment system of dry and wet separation was established by classifying kitchen waste and other wastes. Although there's still a long way to go, the situation has greatly improved.

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