Post assessment on environmental management policy about urban sound qualified zones construction — A case study on the effectiveness of environmental noise control technology and policy

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ABSTRACT
In a country, a top-level-designed environmental policy usually has most significant effects on the solutions of environmental problems. However, because a policy usually largely involves governments, contents, technologies and costs, corresponding operation is complicated and difficult. In China, so-called post assessment method (PAM) has been widely applied in huge governmental projects and plans, as shown in much technology reports and research literatures, but it is rare to be used in the assessment of the policies in environmental noise control area. In this paper, the authors introduce an important environmental management policy of urban sound qualified zones construction (USQZC), which was top-level designed and operated by corresponding governmental departments (in China), and discuss its effectiveness and analyze several issues by applying PAM, including some viewpoints of the environmental policies from the perspective of new environmental protection law and new normal economy in China. The Practice of USQZC can cover the whole development and implementation process of an environmental noise control policy, which provides a good case for the assessment and post-assessment of the policy.

Keywords: Planning for Noise Control, Zoning, Land Use and Urban Planning: 52.9; National Government, State, Local Legislation and Regulations:82, 83; Noise Programs: 08.

1. INTRODUCTION
For urban environmental noise management, internationally there’re the methods of reaching noise standard limits assessment and noise engineering control directly towards the buildings. China is still a developing country, requiring another method such that the areas in a city are divided into several types of sound environmental functional zones according to the population density, land resources and economic conditions, and therefore the assessment of reaching noise standard limits and noise control are on different noise functional zones. An environment management policy entitled urban sound qualified zones (USQZC) construction, which was top-level designed and issued in the early 1980’s and 1990’s by environmental protection agency (1) in China, has played a critical role in promoting China urban environmental noise management in the past time. The policy is still implemented in a few cities, but is no longer used in quite a lot of cities. In this paper, through researching the literatures, combining the visiting of the government management departments and technical experts, and applying “post evaluation principle or science ” (2-5), the effects and issues of the policy during the promotion and actual use for a period of long time are discussed, including the comparison between the expectations and the actual use results, in order to provide some self-examination for the continuous progress of the urban environmental noise management policy.

The principals of post evaluation method (PAM) in literatures are widely applied in a project or a planning (6,7). The assessment of environmental policies in China was rarely done in the past, and was even much more rarely done using the PAM. A top-level-designed environmental policy usually has

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most significant effects on the settlement of environmental problems. However, because of the unavoidable involvements of many governmental departments, contents, technologies and costs, its corresponding operation is complicated and difficult. The practice of the USQZC, which covers the whole life process of the development and implementation of a policy, can offer a valuable case study for the assessment and post assessment of China’s environmental policies.

2. RESEARCH METHODOLOGY

This paper follows the idea of raising, analyzing and solving a problem, which starts from the policy practice of USQZC, collects the introduction and effects of this environmental policy and management system in literatures, as well as the analysis of insufficiency, and gives suggestions to overcome the existing problem. The main research methods include literature collections, comparative analysis, expert interviews etc. Since the literatures and experts’ opinions were mainly based on the experience under the background conditions at that time, this paper also crossly collected some discussions on the new version of China environmental law and the environmental policy in the perspective of new-normal-era when the economics are developing in a normal speed rate comparing to a high one in the past, with the purpose of anticipating a deeper rethink. From the perspective of the research on the environmental policies, the decision-making process is a complex matrix closely related to social factors. The cases analysis method can be a most effective way for explaining the environmental problems under complicated backgrounds. Through exhibiting the cases and self-examination, using more cases is not only going beyond the role of a single case, but also occurring the effects of amplification and even resonance which are anticipated.

3. POST POLICY ASSESSMENT ON USQZC

3.1 The management specification and related content introduction

3.1.1 Top-level design, procedure and related technologies

In order to effectively reduce urban environmental noise pollution, during 1994 to 2000, under the top-level design by national environmental protection administration, all major cities and important small and medium-sized cities in China launched the work of USQZC. The management technical specifications, relative issues statements, detailed implementation rules about quantitative assessment indicators and the administrative regulations about reporting and registration of pollutant discharge had been successively issued (see Table 1 (8)). The local environmental protection and the relevant departments also made some regulations in succession according to local conditions, such as the local acceptance methods, monitoring implementation detailed rules, monitoring sites identification of urban environmental quality assessment, regulations for acceptance and monitoring technologies of construction projects and environmental protection facilities (see Figure 1 (9-13)). These documents and practices have achieved significant results for promoting the concepts and management of urban environmental noise in China.

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<td>May 13, 1994</td>
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<td>The notification and attachments on issuing the explanations of several questions about executing &lt;Urban environmental noise standard&gt; and &lt;The management Specification of USQZC&gt;</td>
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<td>No. 10 National environmental protection administration, &lt;The regulations and application form for declaring and registering the No.10 National environmental protection administration</td>
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Figure 1 – The main content and process flow for the USQZC
The technical requirements and contents include: when the urban environment of a single closed functional area meets all the conditions in the specifications, it can be clarified as an environment noise qualified zone. The zones are divided according to the standard of environmental noise of urban area (GB3096), and the management is strengthened, making the noise levels and control measures of the environmental sound achieving the standard requirements. For each noise qualified zone, it is required to make noise monitoring, investigation and assessment for regional environment, fixed noise source borders, building construction, social life and transportation. The monitoring methods obey the relevant technical specifications or standards. Finally, the superior environmental department organizes the acceptance testing, including information acceptance and on-site sample test.

Zhihong Xing (11) summarized the development of the USQZC across China, which was unbalance and the construction methods, name used, and emphasis were different, which can be mainly divided into three models: popularized type, large-scale prevention treatment type, and stationary sources noise control type. The popularized type is more common, represented by Dalian, Beijing, Hengyang cities etc. in which comprehensive treatment method is adopt in the regional area within a few square kilometers to reduce environmental noise pollution. The large-scale prevention treatment type is represented by Xi’an city with the new USQZC. The stationary sources noise control type is represented by Shanghai city which focuses on controlling fixed source noise in residential districts, and completes a group each year which is strengthened to make the conflicts caused by fixed source noise between the factories and general public essentially controlled. These three models have their own emphasis.

On the basis of the theory of acceptance sampling and the practical experiences of acceptance monitoring for the USQZC, Zhen Zouxue, Jianping Feng, et al. (14) discussed the reasonable method of acceptance testing, which can not only save both time and labours, but also assure the reliability of the acceptance results, under which the site check planning can be optimized. Using mathematical statistics methods, Xiangdang Chen, Guanghua Chen et al. (15) analyzed and researched the grid monitoring data of USQZC, and proposed an optimal method used to determine the measuring point number of grid monitoring for the small regional environmental noise. In particular, it used the data of the USQZC to statistically analyze and study the error of environmental noise grid sampling in small area (typically less than 10 km²) to determine the optimal number of measuring points of noise monitoring.

Based on the work experiences of the USQZC in county-level cities, Wenli Lv, Jiyoung Wang (16) and Weibin Shi, Ruiyue Xing, et al. (17) summarized current characteristics of small districts (county-level cities), discussed the requirements, guidelines and methods of monitoring and assessment for them, and pointed out the issues that should be noticed.

Jinquan Chen (18) discussed the USQZC with the losses-investment benefit principle/analysis method and its application, and indicated that not all the environmental noise functional areas in a city really require the construction of qualified zones. Therefore, it is necessary to choose and construct site zones reasonably after investigation and analysis. The basic conditions and standards of the USQZC were proposed.

3.1.2 The ongoing cities experience -Shanghai as a case

Due to the large population with high density in Shanghai, the development and the construction and operation of the infrastructure can easily encounter the conflict problem with environmental noise. However, through serious, careful, long-term, and more effective management, significant experience of managing the environmental noise in domestic cities has been obtained. Shanghai has been committed to USQZC since 1994 (19), which was taken as one of the practical projects of municipal government and listed as one of city assessment indexes in China. In 2009 (20, 21), by following the notification on building quiet residential areas from the requirement of national environmental protection administration, the municipal environmental protection agency first launched the activity of building quiet residential area in Shanghai, and named 9 quiet residential areas in the first batch after acceptance checks, meanwhile carried out the pilot projects in the whole city. At the same time, the successfully built residential areas were required to continuously solidify the current achievements, implement each environmental noise management system, and pay attention to the long-term and dynamic management in order to create quieter, more comfortable and more beautiful environment. Some problem were also discovered in the pilot process of building quiet residential areas. The management specification of USQZC in Shanghai city was made and issued in April 2013 (19-28), which further promoted the construction and daily management of USQZC, and provided an acceptance check basis for the USQZC establishment and re-inspection.

3.2 Effectiveness analysis (10-12)

Building USQZC was based on the actual situation of China at that time, by concentrating the limited labor power, materials and financial resources; according to the zone area division of urban regional environmental noise standard in China cities, the environmental noise of a region was jointly managed and made by comprehensive treatment step by step, in order to reach the regional environmental noise standards. Years of practice has fully proved that the USQZC is a concrete measure of strengthening environmental management. It makes the environmental noise pollution
prevention and control work from qualitatively to quantitatively, and from single point source control to regional comprehensive treatment. USQZC has become an effective way of improving the urban sound environment and controlling environmental noise pollution with Chinese characteristics and made the work of noise pollution control up to a new level.

3.3 Researches on existing problems and solutions (9-13, 29)

Noise monitoring data is the basis and core for the whole USQZC construction, whether the monitoring process is professional or not directly affects the accuracy of monitoring results, as well as the quality of USQZC and the work of pollution control. Firstly, the monitoring operators and instruments must obey the specifications of USQZC, in which the operators should own a monitoring qualification with certificates. Secondly, monitoring procedures must be in accordance with national relevant monitoring technical specifications, which always expose many problems during site inspections, according to the acceptance experiences in every city. Because the area of USQZC could impact the score of local governments’ quantitative evaluation on comprehensive environmental improvement, they often tried to expand the area of USQZC which led to false monitoring data. In order to make the monitoring results truly reflecting the current state of noise and ensure the monitoring quality for USQZC, it is required that local monitoring departments should be separated from USQZC department and strictly obey the technical specifications for noise monitoring, as well as strengthen routine monitoring and periodic retest.

How to properly evaluate USQZC is also an important part of the work. According to the requirements of USQZC, the candidate noise qualified zones should firstly be the residential areas with higher density, which are the area classifications of type 1 and type 2 in sound environmental quality standard GB3096 of China. However, some cities firstly chose the industrial zones with lower population density which could be convenient for construction and easily reach the standard in order to increase the area of USQZC, which is contrary to the original intention of USQZC and also difficult to monitor and evaluate properly. In order to expand qualified zone areas, some cities ignored status survey work and blindly constructed USQZCs in any urban area (especially in the classifications of type 3 and type 4 area of GB3096). But once the work was started, it was found that the work area do not meet the requirements of qualified zone construction due to the terrible noise pollution there. As a result the work had to be stopped in a hurry, which wasted a lot of labors, materials, and financial resources.

In addition, there were also a lot of problems in the acceptance process for the USQZC. For instance, the sample number of fixed noise sources was too small, some archives were incomplete, and the data collections and statistics are inaccurate, etc., which should be paid much more attentions.

A large amount of monitoring data show that traffic noise is the main noise source of city, and also one of the main noise sources impacting noise qualified zones. Only largely reducing traffic noise can make people feel the sound quality improved obviously. Because there were few clear requirements on traffic noise in some cities, they have paid less attention to the monitoring assessment of the traffic noise for the USQZC. Some traffic mainlines passing through the qualified zones even did not have any monitoring data, such as inland rivers shipping noise, and railway noise etc., which made it impossible to analyze the variation of traffic noise in the qualified zones before and after construction.

With the furtherance of urban planning, the neighborhood factories which had early distributed in various sound environment functional areas were gradually moved into the fully centralize industrial areas out of city. Therefore the industrial noise is no longer a major source. However, because of the rapid growth of private cars and overspreading of urban, the urban traffic noise, construction noise and social activity noise keep being the main sources of urban noise. Particularly during the college entrance examination every year, the green guarding for the examination, no honking, and construction noise control keep being significant roles in the urban noise management.

Construction noise is difficult to be stopped completely at night due to the limitation of the engineering techniques. Traffic noise becomes a new challenge of urban noise control, because the continuous growth of vehicles makes the length of new surface roads and viaducts increased so as to solve the traffic congestions, which keeps, expands and even worsens the impacts on the people along the roads.

3.4 Some methods of solving problems in the new normal economy time (developing at a normal speed) in China

(1) The Shanghai model and experience (19-28). As one of the methods, the effective model of USQZC from Shanghai City is recommended to solidify and enhance the management level, regulate and clear the requirements for USQZC. USQZC is built in urban built-up area. For the built range, a township is the fundamental unit, and the people's governments of townships and neighborhood offices are the main operating bodies, which are constructed according to the detailed requirements in relevant specifications. The district (county) environmental protection agency should cooperate with all levels of governments in the construction work, strengthen professional training and guidance, and organize trial review for USQZC, after which the report is sent to municipal environmental protection administration to have acceptance.
check and a confirmed document is issued by municipal environmental protection administration. After the completion of USQZC, it is necessary to develop the maintenance plans for the USQZC, solidify construction achievements and improve the long-term management, and do re-inspection once for every three years by the municipal environmental protection administration.

(2) From multiple control to strict control- Application of environmental regulation under the policy of simplifying administrative procedures and delegating powers to lower levels (30).

(3) Modernizing management system and improving the environmental quality including acoustic environment (31). It is a long term challenge to improve environmental quality. For the strengthening of top-level design, experienced from USQZC, it can achieve maximal environmental benefits with minimal administrative costs and capital investment. The national sound environmental management departments and professionals (can be concurrently in charge of) should be established to continuously coordinate and top design area noise pollution prevention and control work, make the regulations essentially, and effectively integrate the management system currently distributed in various departments to ensure seamless convergence and effective operation.

(4) Comprehensive use of legal, economic, technical and necessary administrative measures to solve environmental problems (32).

(5) New environmental law in China highlights and strengthens the government responsibility in the field of environmental protection (33).

3.5 Discussions

(1) For urban environmental pollution in China, a voice is said that “This can’t be avoided and has to be experienced in economy development”, another voice is said that “This is due to management vacancy, weakness of management intensity, and even unrestrained management”, and the third voice is said that “This requires a process to realize everything, but the shorter the better”. Through the discussions, self-thinking, and undeceiving in this paper, the authors believe that if environmental management is proactive, can be seen everywhere, is paid more attention by the whole society, and is implemented indeed, in general it will play a decisive role in the urban environmental pollution prevention and environmental quality improvement. Comparing with the successful experiences of drunken driving control on road traffic management in China, urban noise control will become easier.

(2) The new USQZC, comparing with the design-time one, should have more new features, such as the old neighborhood factories rarely being seen in the downtown, since most of them have been planned and moved to the centralized industrial areas. The traffic noise has become the main noise source with the improvement of people's living standards, the rapid growth of private cars, the extension of expressway and the emergence of high-speed railway, which is also a kind of source that is difficult to obtain noise reduction effect. It is suggested that the management of the airport noise could refer to and apply the concept of USQZC, because of the noise features of large impact and wide range. In China, the EPA has been revising the environmental or quality standard of airport noise, and some airports have begun to apply foreign experiences. By testing, predicting, drawing noise impact contour lines, relocating, installing sound insulation doors and windows, and planning to control the impact of aircraft noise on the neighboring town lands, which can realize sustainable development.

(3) Urban environmental noise monitoring is a very professional work. Because general environmental noise cannot propagate with a far distance, it can easily be interrupted by outside activities. The rapid development of the technologies including digital technology, real time online monitoring and signal processing motivates the application on the USQZC so as to improve the reliability, reduce work intensity, and avoid all kinds of human interference.

4. CONCLUSIONS

In China, after a period of time for practicing, the USQZC has been proved that in despite of the heavy workload and difficulties, in general the executed cities can still be in strict accordance with the relevant documents and requirements of national environmental protection department, to complete the planning, current status investigation of qualified zones, all kinds of noise data monitoring and analyzing, the noise pollution sources controlling, acceptance check of qualified zones and site sample check of noise source, etc.. During the construction procedures of USQZC, it is not easy to avoid various problems and go some detours, but according to the Shanghai’s experience, it is possible to continuously summarize and restructure the existing issues and strengthen the management of qualified zones and noise pollution source control, and further improve the city sound environmental quality, including the requirement of encouraging creating national ecological environmental protection model city.

Limited to the knowledge and time, the discussions in this paper revolve around the viewpoints from the references, and the inevitable defects will be corrected in future.
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