Noise and Vibration Regulation policy in Japan

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ABSTRACT

For noise regulations in Japan, environmental quality standards as noise-related administrative targets are provided under the Basic Environment Law and various measures are put in place under the Noise Regulation Law which was legislated as a law for the implementation of the Basic Environment Law. Environmental quality standards for general ambient noise are established by certain land-use types and time divisions, while separate environmental quality standards are specifically set for aircraft and Shinkansen Superexpress Railway noise. The Noise Regulation Law controls noise from factories and business that have specified facilities and sit in designated areas as well as noise from specified types of construction operations, with proper demarcation of regulation roles among national and local governments. In recent years, new types of noise problems that are not well controlled by the Noise Regulation Law or the application of environmental quality standards, including complaints against noise from facilities not regulated under the Noise Regulation Law and against low-frequency noise, calling for responses to these problems. The Vibration Regulation Law controls the ambient level of vibration caused by specified types of factories and construction work. The Ministry of the Environment compiles an annual summary of vibration-related complaints and the status of the enforcement of the Law every fiscal year based on reports submitted by local governments. These days, the number of complaints over vibration related to construction work has reached around 60% of the total number of complaints to be addressed. Since vibration from construction work is always short-lasting and intense, monitoring and evaluation methods for such vibration levels remains an issue that needs to be addressed.

1. INTRODUCTION

In Japan, industrialization raced ahead exponentially from the mid-1950s following the postwar years of recovery to the early 1970s, improved the Japanese people's standard of living significantly. On the other hand, however, pollution began to threaten the health and living environment of Japanese people. Responding to such developments, municipalities that experienced serious industrial pollution spearheaded the introduction of ordinances for countermeasures, pushed the national government to promulgate and put into force in 1967 the Basic Law for Environmental Pollution Control, which set forth the basic principles to deal with industrial pollution problems and made clear the policy measures the government should take.

Since noise emerged as a major social problem, just as like air pollution and water contamination, across Japan, the national government proceeded with the preparation of noise regulations in parallel with the enactment of the Basic Law for Environmental Pollution Control, and promulgated the Noise Regulation Law in 1968

and the Vibration Regulation Law in 1976 as a law for the implementation of the Basic Law to achieve environmental quality standards for noise and vibration established under the Basic Law.

As results of above, a variety of measures have been implemented to date for noise and vibration regulations in Japan under the legal framework centering on the Basic Law for Environmental Pollution Control, the Basic Environment Law enacted in 1993 to replace it and the Noise Regulation Law, an individual regulatory law under these two basic laws.

Regulatory measures have been revised in series, in response to subsequent changes in the environment affecting Japanese society and lifestyles, along with noise prevention and noise measurement technologies. Resources in English are in http://www.env.go.jp/en/air/.

2. REGULATORY LAWS RELATED TO NOISE AND VIBRATION

As mentioned above, for noise regulations in Japan, the Noise Regulation Law and the Vibration Regulation Law are in force as an individual law for the implementation of the Basic Environment Law (Figure 1). The Noise Regulation Law and The Vibration Regulation Law provide for regulations of noise from specified factories and business, specified construction work and road traffic, and it also stipulates that local governments can adopt, by ordinance, their own regulatory measures and standards for other types of noise in accordance with the particular local physical and social conditions. In addition, a number of individual laws, though not regulatory laws, are in force concerning measures to cope with road traffic noise and noise from civilian airports and non-civilian airports, etc. for attaining environmental quality standards.

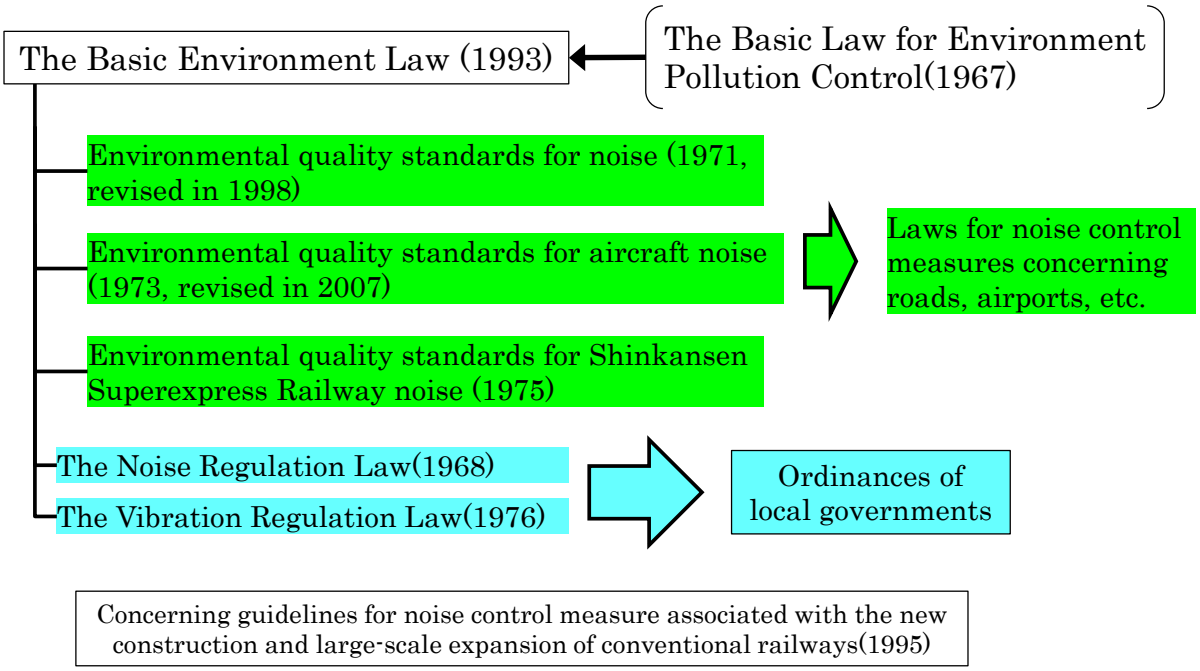

Figure 1: Laws related to noise and vibration

3. ENVIRONMENTAL QUALITY STANDARDS FOR NOISE

Environmental quality standards prescribed by the Basic Environment Law are “standards --- levels to achieve or maintain for the protection of human health and the conservation of the living environment” and are designed to as administrative targets.

At present, environmental quality standards are set for ambient noise, aircraft noise and Shinkansen Superexpress Railway noise, as shown in Figure 1.Environmental quality standards for ambient noise are established as national standards in accordance with categories of areas set in consideration of land utilization and division of time. The actual designation of categories of area, or zoning, is to be made by each prefecture, in principle. Specific standards use L_{Aeq} as an assessment indicator, and separate standards are applicable to the two types of “general areas” and “road-facing areas,” with different categories of area prescribed for both types (Table 1). Areas are divided into the two types of “general areas” and “road-facing areas” in consideration of the fact that the road traffic in Japan has increased markedly, that the road networks have yet to be fully developed despite the extremely high publicness of roads and that the residents in road-facing areas often benefit greatly from the roads.
In addition to the environmental standards, some guidelines are set for small scaled airport and large scale construction or reconstruction of conventional rail roads. Status of ambient noise is monitored by local governments. In FY2012, 85.1% of a total of 3,107 monitoring points in general areas conformed to environmental quality standards for noise.

Table 1: Environmental quality standards for noise in general areas (revised in 1999).

Type of area	Standard value	
	Day-time (6AM-10PM)	Night-time (10PM-6AM)
AA	50dB or less	40dB or less
A&B	55dB or less	45dB or less
C	60dB or less	50dB or less

- Day is definited as between 6 a.m and 10 p.m. and night as between 10 p.m. and 6 a.m. the following day.
- Area category AA shall be applied to areas where quietness is specially required, such as those where convalescent facilities and welfare institutions are concentrated.
- Area category A shall be applied to areas used exclusively for residences.
- Area category B shall be applied to areas used mainly for residences.
- Area category C shall be applied to areas used for commerce and industry as well as for a significant number of residences.

Table 2: Environmental quality standards for noise in road-facing areas (revised in 1999).

Area category	Standard value	
	Day-time (6AM-10PM)	Night-time (10PM-6AM)
Area A facing roads with two or more lanes	60dB or lower	55dB or lower
Area B facing roads with two or more lanes, and area C facing a road with one or more lanes	65dB or lower	60dB or lower

Spaces in close proximity to roads for arterial traffic

Standard value	Header
Day-time (6AM-10PM)	Night-time (10PM-6AM)
70dB or lower	65dB or lower

Separate environmental quality standards are set for aircraft and Shinkansen Superexpress Railway noise according to their respective characteristics.

Environmental quality standards for aircraft noise were established in 1973, revised in 2007. Given the advancement of noise measurement technology as well as international trends, environmental quality standards for aircraft noise is set to be changed to the assessment by Lden based on the equivalent sound level (Day-Evening-Night A-Weighted Average Sound Level) in April 2013. The new standard value is set by subtracting 13 from the old standard value pursuant to the result of considerations for a conversion to make the levels of the new and old standard values almost identical.

Table 3: Environmental quality standards for aircraft noise(revised in 2007).

Category of area	Standard value
I	L_{den} 57dB or less
II	L_{den} 62dB or less

- Area category I refer to areas used exclusively for residential purpose and Area category II refers to other areas where the normal living conditions shall be preserved.

Environmental quality standards for Shinkansen Superexpress Railway noise are set with $L_{A,s,max}$ (the power mean value of the upper half of 20 continuous maximum values) as an assessment indicator.

Table 4: Environmental quality standards for Shinkansen Superexpress Railway noise.

Category of area	Standard value
I	70dB or less
II	75dB or less

- Area category I refer to areas used exclusively for residential purpose and Area category II refers to other areas where the normal living conditions shall be preserved.

While there are no environmental quality standards set for conventional railway noise in view of the circumstances where urban areas have developed together with expansion of railway networks, the government established the guideline value for noise control measures in 1995, with Leq as an indicator, applicable to the new construction and large-scale renewal of conventional railways. More specifically, Leq of 60 for daytime and Leq of 55 for nighttime are set as the targets of such measures for the new construction of conventional railways, while the large-scale renewal of conventional railways calls for improving noise levels from the pre-renewal levels.

4. THE NOISE REGULATON LAW

The Noise Regulation Law is designed to preserve living environments and contribute to the protection of people's health by imposing regulations on noise generated by the operations of factories and business as well as construction work, and also by setting maximum permissible levels of motor vehicle noise at source. The law provides for the prefectural governor(or mayer) to designate areas where it is deemed necessary to preserve the living environment of residents, and to regulate noise produced by specified factories, business and construction work and also to apply maximum permissible levels of motor vehicle noise in such "designated areas." As of the end of FY2012, a total of 1,307 municipalities (cities, wards, towns and villages), or 75% of all the municipalities in Japan, have such designated areas for noise regulations.Regulations of noise generated by factories and business cover only the factories and business that install "specified types of noise generating

facilities" defined by the national government, and located in the designated areas. Parties operating specified facilities are required to report to the relevant mayor of municipality, and comply with the regulatory standards for noise levels at the lot boundary.Regulations of noise generated by construction work are applicable to those who undertake construction projects which involve "specified construction work" in designated areas. Regulations require them to comply with the standards for noise levels at the lot boundary and also provide for work hours, including no construction work on Sundays and public holidays.Regulatory limits on noise levels at the lot boundary are set by the prefectural governor(or mayer) in accordance with the particular local physical and social conditions within a window of regulatory standards set forth by the national government. The standard value of the national government is set for each area category for the three time zones of night, morning/evening and daytime within a range of 5 to 10 dB.When noise generated by factories, business establishments or construction work at the lot boundary exceeds the regulatory standards and is deemed detrimental to the environment of the surrounding areas, the mayor of municipality can issue recommendation or order for improvement.Regulations of motor vehicle noise set maximum permissible levels of noise produced by motor vehicles under specific conditions, and if motor vehicle noise in specified areas exceeds the maximum permissible limits set under the ordinance of the Ministry of the Environment and is deemed significantly detrimental to the living environment in surrounding areas, the Minister of the Environment can ask prefectural public safety commissions and road administrators to improve road traffic regulations and road structures. In addition to the above, the Noise Regulation Law states that the stipulations of the law do not prevent local governments from establishing necessary regulations by ordinance for noise emitted by factories other than specified factories or construction work other than specified construction operations within designated areas in accordance with the particular local physical and social conditions, since noise, unlike air pollution or water contamination, is a problem with strong regional characteristics. Furthermore, under the Noise Regulation Law, while the national government does not set regulations on noise emitted during the nighttime operation of bars and restaurants and noise caused by voice and music through loudspeakers, local governments, who are in the position of having the best knowledge of conditions prevailing in their areas, can to introduce own regulations or to take necessary regulatory measures. Thus, prefectural governments and cities, towns and villages establish their respective ordinances for necessary regulations.

5. THE VIBRATION REGULATON LAW

From the 1960s onwards, various forms of industrial pollution started to threaten the health and living environments of citizens in Japan. It was then deemed necessary to work to implement the necessary measures to address vibration, including the establishment of regulatory standards, thus prompting the enactment of the Vibration Regulation Law in 1976. Vibration regulations resulting from this law: 1) specified facilities and construction-related operations that generate significant vibration levels as "special facilities" and "specified construction operations" respectively; 2) specified that these vibration regulations were to be implemented at the prefectural level; and 3) implemented regulatory measures for vibration generated from factories and businesses with special facilities in designated areas and from specified construction operations, as well as for road traffic vibration. "Special facilities" refers to metalworking machines, compressors, and other facilities,

while “specified construction operations” specifies work that makes use of pile drivers and breakers. At the end of fiscal 2009 there were 120,000 special factories in Japan and approximately 32,000 different forms specified construction operations.

Vibration levels are evaluated using the level of weighted acceleration in a vertical direction expressed using the formula below. Regulatory standards are also listed in Tables 5-7.

$L_v = 20 \times \log(a_w / a_0)$

L_v= frequency weighted acceleration level (vibration level)

a_w= weighted acceleration

$a_0 = 10^{-5} [m/s^2]$

Table 5: Regulatory standards for vibration emitted from specified factories.

Type of area	Standard value	
	Day-time	Night-time
I	60-65dB	55-60dB
II	65-70dB	60-65dB

- I areas where maintenance of quiet is particularly needed to preserve a good living environment and where quiet is called for as they are used for residential purposes.
- II areas used for commercial and industrial as well as residential purposes where there is a need to preserve the living environment of local residents and areas mainly serving industrial purposes which are in need of measures to prevent the living environment of local residents from deteriorating.
- Vibration level shall be measured at the boundary line of the specified factory.

Table 6: Standards for vibration emitted from specified construction work.

Type of Restriction	Type of area	
Standard value	I	85dB
	II	
Work prohibited time	I	7 p.m. - 7 a.m.
	II	10 p.m. – 6 p.m.
Maximum working duration	I	10 hours per day
	II	14 hours per day
Maximum consecutive working days	I	6 days
	II	
Work prohibited days	I	Sunday and holidays
	II	

- I areas where maintenance of quiet is particularly needed to preserve the residential environment.
- I areas which require maintenance of quiet since they are used for residential purposes.
- I areas used for commercial and industrial, as well as residential purposes which are in need of measures to prevent vibration pollution since a considerable number of houses are located there.
- The neighborhood has schools, hospitals and the like. 'Area II' stands for areas other than Area I where there is a need to preserve the living environment of inhabitants.
- Vibration level shall be measured at the boundary line of the specified construction work site

Table 7: Request limits for motor vehicle vibration.

Type of area	Day-time	Night-time	Applicable Areas
I	65dB	60dB	Areas where maintenance of quiet is particularly needed to preserve a good living environment and where quiet is called for as they are used for residential purposes
II	70dB	65dB	Areas used for commercial and industrial as well as residential purposes where there is a need to preserve the living environment of local inhabitants and areas mainly serving industrial purposes which are in need of measures to prevent the living environment of local residents from deteriorating

- Vibration level shall be measured at the boundary line of the road.