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## LEGISLATION AND PLANNING ON THE NOISE ENVIRONMENT OF HONG KONG

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**ABSTRACT**

Hong Kong is a metropolitan city with more than 6.8 million population sharing some 1000 sq.km of hilly terrain. During the rapid development of Hong Kong in the 60's and 70's, environmental issues have not been taken seriously leading to many problems including noise disturbing the community. Since the mid 80's, with more focused attention on planning of land uses and new infrastructure of new towns, as well as the introduction of a comprehensive piece of legislation on the control of environmental noise in 1988, there are indications that deterioration of the acoustical environment has at least been stalled. This paper gives a comparison of background noise levels monitored in the late 90's to those obtained 10 years ago.

**1 - INTRODUCTION**

Two noise surveys were conducted in 1984 [1] and 1985 [2] to evaluate the degree of industrial noise exposure at residential/industrial interfaces and the typical background noise levels for various types of areas in Hong Kong. They also aimed at providing essential information for the preparation of the Noise Control Ordinance [3], which was enacted in 1988 and was the first comprehensive piece of legislation in Hong Kong to control various kinds of environmental noise.

Another territory-wide survey covering over 700 locations was conducted between 1997 and 1999 with a view to updating the general information on acoustic environment of Hong Kong. The measurement results are compared with that obtained in 1984 and 1985 with respect to the general background noise and industrial noise exposure. Also, it gives a brief overview on the background noise levels between rural, new development and urban areas.

**2 - MEASUREMENT METHODOLOGY**

Appropriate survey approach should be used to account for the large spatial and temporal variations of background noise levels in urban areas [4]. For the surveys conducted in 1985 and 97/99, the Environmental Protection Department have broadly classified the whole territory into 4 different types of areas, namely i) rural area; ii) low density residential; iii) urban area; and iv) areas other than the above. The background noise levels of the territory is grouped into 3 ratings, namely Area Sensitivity Rating "A", "B" and "C", as shown in Table 1, depending on the influence of traffic noise or industrial activities. Three outdoor measurements (at 1 m from the facade), each of 30 min. duration, were taken at different times of the day (i.e. day, evening and night periods) at each measurement location.

Type of Area	Degree to which it is affected by noise from major roads or industrial premises		
	Not Affected	Indirectly Affected	Directly Affected
(i) Rural area	A	B	B
(ii) Low density residential area	A	B	C
(iii) Urban area	B	C	C
(iv) Area other than those above	B	B	C

**Table 1:** Area sensitivity rating for various types of areas.

### 3 - WAYS TO REDUCE THE NOISE EXPOSURE

The general acoustic environment of Hong Kong is dominated by noise from road traffic and from commercial and industrial premises, while noise from construction activities and other neighbourhood activities is rather transient in nature.

For noise from commercial and industrial premises, it is controlled under the Noise Control Ordinance and enforced by the Environmental Protection Department by means of abatement notices. Owner or occupier of the premises will be required to abate the noise if the authority is satisfied that the objective criteria stipulated in the Ordinance is exceeded.

With regard to traffic noise, proactive participation in the planning and policy making process is the most effective means to minimize the traffic noise problem. The Environment Chapter of the Hong Kong Planning Standards and Guidelines (HKPSG) [5] was first published in 1985 and extensively revised in 1990. It was the commitment of the government to require all major projects to go through environmental impact process for assessing potential adverse impact and identifying the practicable remedial measures. The Environmental Impact Assessment Ordinance [6] enacted in 1998 gave the administrative procedures the legal power and further strengthened the assessment process during the planning stage.

### 4 - RESULTS OF THE NOISE SURVEY

For the survey conducted in 1997 to 1999, a total of 765 measurement points were selected with equal no. of samples randomly located in every type of areas within the whole territory. The average background noise levels in Hong Kong (in  $L_{eq30min}$ ) range from 59-69 dB(A) for daytime period, 58-66 dB(A) for evening and 49-64 dB(A) for night-time. The results have also been grouped into 3 different Area Sensitivity Rating for comparison with that obtained in 1985 as shown in Table 2 and Figures 1 and 2. The standard deviations for the measurement data are in the range of 5-7 dB(A) and 5-8 dB(A) for 1985 and 97/99 respectively.

	ASR "A"			ASR "B"			ASR "C"		
	Day	Eve-ning	Night	Day	Eve-ning	Night	Day	Eve-ning	Night
<i>Average <math>L_{eq}</math> in 85</i>	59.9	57.4	53.3	65.7	62.5	58.5	73.6	70.3	66.9
<i>Average <math>L_{eq}</math> in 97/99</i>	59.1	57.5	49.1	64.0	62.4	57.3	69.3	66.3	64.4

**Table 2:** Comparison of background noise levels (in  $L_{eq}$ ) between 1985 and 97/99.

The above results indicate that the current background noise levels are similar to that in 1985 for rural, low-density development and new development areas (i.e. mainly of ASR "A" and "B") for all the time periods. The lower background noise levels for ASR "A" during night-time is probably due to more measurement points taken at remote areas where effect from city hum and distant traffic becomes negligible.

For busy urban areas with ASR C, there are reductions of background noise levels by about 2-4 dB(A) for all the time periods as compared with that in 1985. The reductions are probably due to: i) a better planning for the new urban area to minimize traffic noise and interface with industrial activities; ii) the switch from noisy industrial processes (e.g. manufacturing and textile) to relatively quiet processes; and iii), due to redevelopment, the old industrial sites have been converted to other uses.

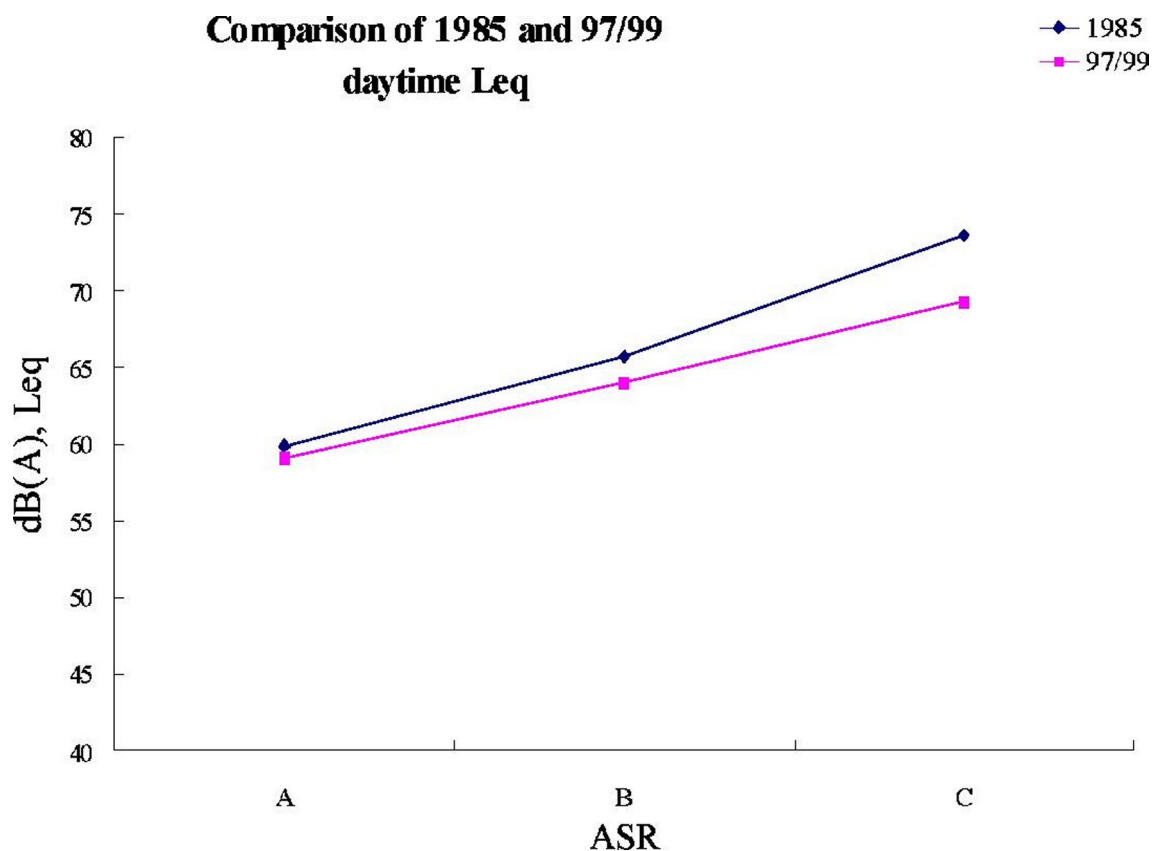


Figure 1.

## 5 - INDUSTRIAL NOISE EXPOSURE

A total of 44 sites of residential-to-industrial interface were identified in 1984 to provide a general picture on the extent of industrial noise impact. The noise measurement survey in 97/99 contained 66 sites of residential-to-industrial interface, majority of which are of relatively better buffered. The comparison of 1984 and 97/99 results is listed in Table 3.

The results show a general reduction of industrial noise of above 3 – 4 dB(A) for day and evening periods. However, there was about 3 dB(A) increase at nighttime. The reduction of industrial noise at day and evening period, as explained in previous section, is mainly due to the combination of legislative enforcement, proactive planning effort, urban redevelopment and relocation of factories to other area. The higher nighttime noise levels are probably due to the increase in traffic generated from nearby residential and commercial activities as a result of redevelopment in this area.

	Day	Evening	Night
<i>Average <math>L_{eq}</math> in 1984</i>	73.4	69.0	63.1
<i>Average <math>L_{eq}</math> in 97/99</i>	69.0	66.0	65.2

Table 3: Comparison of industrial noise levels between 1984 and 97/99 in urban area.

## 6 - ACOUSTIC ENVIRONMENT OF URBAN, RURAL AND NEW DEVELOPED AREA

The comparison of noise environment of urban, rural and new developed areas were listed in below Table 4 and Figure 3:

	Day and Evening	Night
<i>Urban Area, Average <math>L_{eq}</math> in 97/99</i>	67.1	62.9
<i>New Development Area, Average <math>L_{eq}</math> in 97/99</i>	61.8	55.0
<i>Rural Area, Average <math>L_{eq}</math> in 97/99</i>	57.1	46.2

Table 4: Background noise levels for different types of areas.

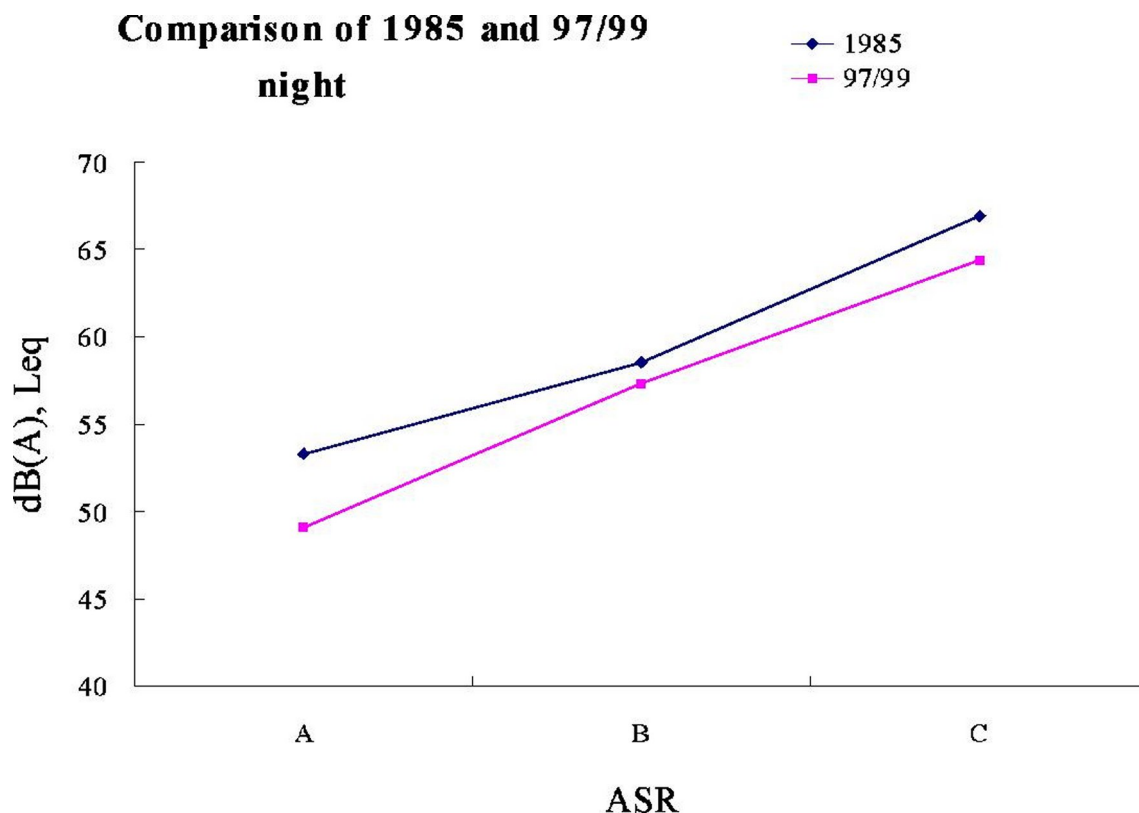


Figure 2.

Rural area would have lower background noise levels as commercial activities and the traffic is much less in this type of area. The acoustic environment at new developed areas is much quieter (about 5-7 dB(A) lower) than that at old urban areas. Through better planning for new development areas, major trunk roads are located in the periphery of noise sensitive areas, instead of passing through these developments. In addition, appropriate mitigation measures to reduce traffic noise, e.g. better road alignment and installation of roadside barriers, have been adequately addressed during the early stage of planning.

## 7 - CONCLUSION

In general, ambient noise levels increase with the extent of urbanization and the intensity of human social and commercial activities. It is not an easy task to achieve a desirable acoustic environment in Hong Kong while satisfying the growing, and sometimes conflicting, social, economic and different development demands. Better attention on the planning of land use and transportation in an integrated fashion; grasping opportunities in the urban renewal process as well as proactive enforcement of the environmental legislations are vital to secure a pleasant living environment.

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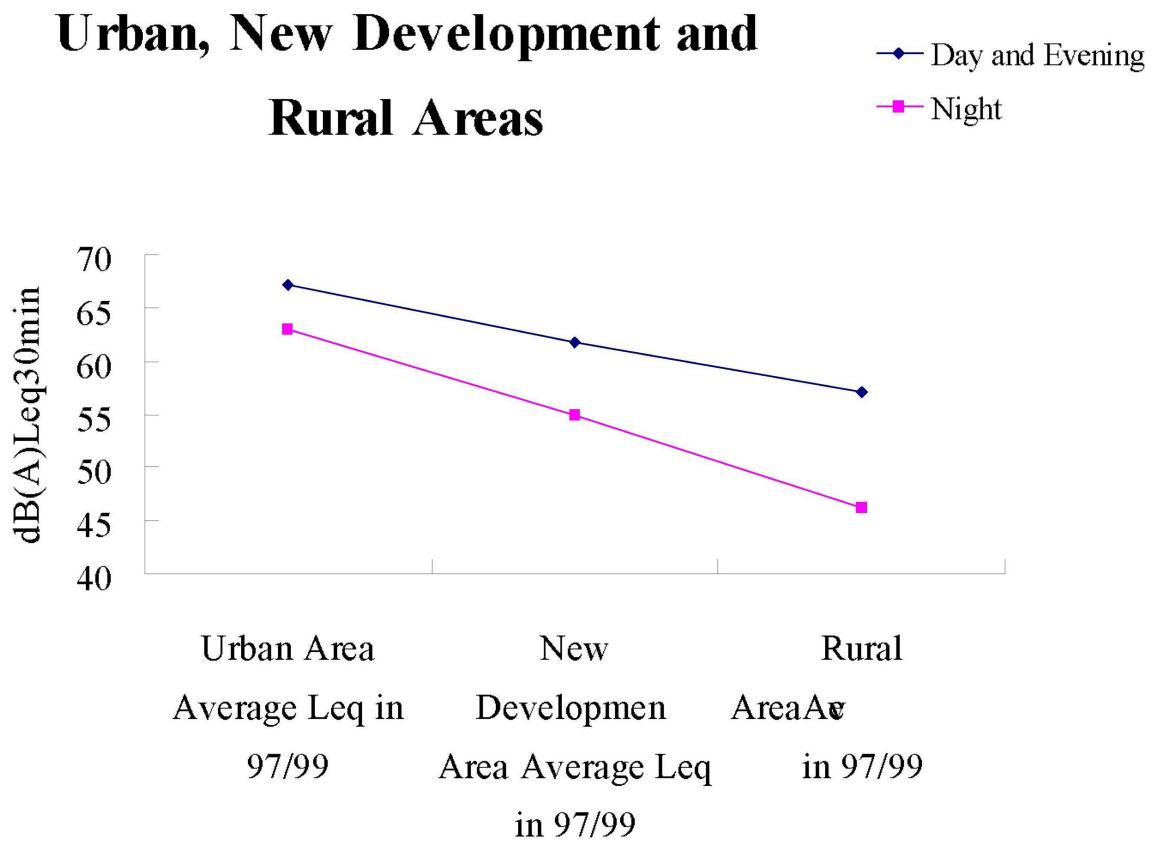


Figure 3.