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THE NOISE PROBLEM IN HIGH DENSITY LIVING IN SINGAPORE

DR RAYMOND BW HENG

UNIVERSITY OF SINGAPORE

Introduction

Singapore is a country of 600 sq km with a population of 2½ million people. As a result land is scarce and most people live in high rise apartments and more than half of the total population in vast high rise complexes built and administered by the public housing board. The increasing awareness of all forms of environmental pollution in the Republic has caused the public to focus attention on the growing problem of noise pollution, and more especially so in the public housing estates.

This paper reports on a month-long general study of noise in the high rise public housing estates in Singapore. The purpose of the study was to look into the present grievances among Singapore's high rise apartment dwellers and to educate the residents on simple noise control measures and help the housing authorities in the planning of new estates. The eight estates covered in the survey were Estate A (Toa Payoh), Estate B (Queenstown), Estate C (Telok Blangah), Estate D (Holland), Estate E (Bedok), Estate F (MacPherson), Estate G (City Area) and Estate H (Jurong).

Method Used In The Survey

The method adopted in the survey is a combination of subjective personal interviews as well as the pure objective measurements using sound instruments. The basic procedure was that the residents were asked a number of questions from a preprinted form regarding particulars of the occupants, the degree of noise in their homes, the type of noise encountered and the most noisy period of the day. Residents were carefully selected so that they were representative of the population of the flat dwellers being studied, and asked to answer exactly the same questions, so that the replies of different categories of respondent could be examined in order to bring out differences in opinion.

Sound pressure levels were measured in situ using a small hand held sound level meter. This provided a quick and accurate spot reading within the constraints of time and the large scale of the survey. A continuous tape recording was also made at Estate D in order to determine the hourly L_{90}, L_{50} and L_{10} levels at that location.

Results

(A) Sound Pressure Level

Of the eight estates investigated, Estate C has the highest average SPL of 67.6 dBA and also shows a wide variation in the SPL readings. This is because some of the flats are situated very close to bus-stops, giving rise to exceptionally high SPL readings due to noise from buses decelerating and accelerating. Estates F and G give the second and third highest readings, of 66.5 dBA and 65.8 dBA respectively. This is because Estate F is near the airport and also has a large bus terminus nearby and Estate G being in the City Area has a large volume of traffic. Estate E is the quietest with an average SPL of 60.9 dBA.

This is because it is a new estate and the occupancy rate is still low at present.

It was also found that the average SPL measured decreases as the size of the dwelling increased. This is because there is more space per person with the higher number of room per flat. Also the occupants were from a higher paid income group and parental control over children here is expected to be greater.

(B) Variation Over A 24 Hour Period

Because of the fluctuating nature of noise over any period of time, a statistical treatment of the sound pressure levels must be adopted. 24 hour recordings of noise at various locations in housing estate D were made. On playback in the laboratory, the levels exceeded 10%, 50% and 90% of the time (L_{10}, L_{50} and L_{90} respectively) were obtained using a statistical distribution analyser in conjunction with a graphic level recorder. The L_{10} shows the peak noise levels (momentary noisy periods) and L_{90} the background noise levels (always present) and the variation of these two over the typical 24 hour period is shown in Figure 1.

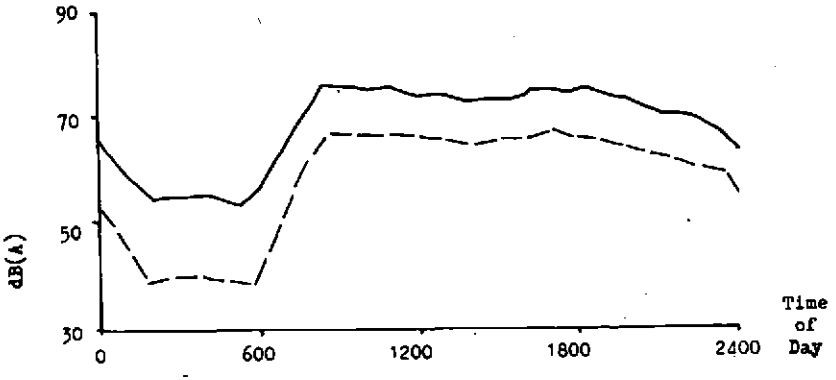

Figure 1. Sound Pressure Level at a typical residence over a 24 hour period

(C) Number of Occupants

The number of occupants per unit for each type of unit, was found to be fairly constant. However, the size of the 1-room unit is much smaller than of the 5-room unit. This implies that there is much crowding in the smaller units. It was found that the SPL measured increases as the occupational density increases.

(D) Type of Noise

The proportion of the types of noise in each estate is shown in Figure 2. Generally speaking, the main sources of noise are from traffic and children playing. Together, they comprise three-quarters of all sources of noise.

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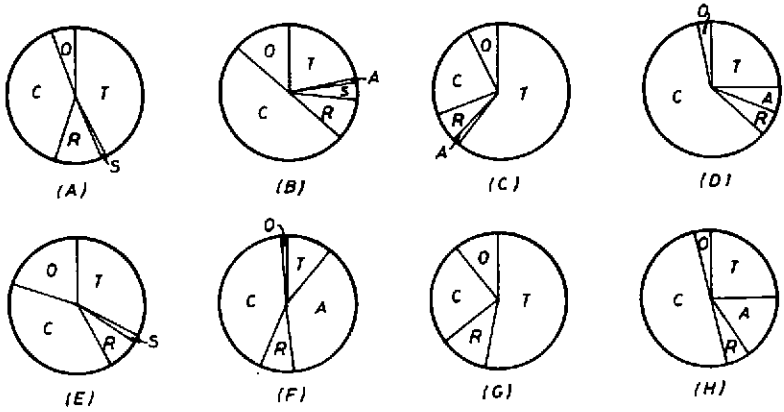


T - traffic noise
A - aircraft noise
R - radio or television
C - children playing
O - others

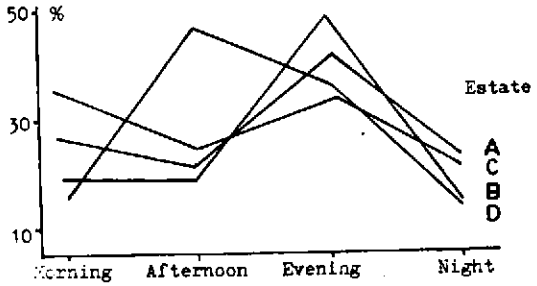
Figure 2. Type of noise in each Estate

The estates with traffic as the main source of noise are C and G. B, D and H have children playing as the main source of noise. F is the only estate with Aircraft comprising a large part of the noise sources. This is because F is close to the present Singapore International Air-port in Paya Lebar.

(E) Residents Opinion of the Most Noisy Period of the Day

The distribution of the Most Noisy Period of each estate is shown in Figure 3. Generally, the noisiest period is in the evening i.e. the period when traffic is heaviest and at the same time, the children are free to play after school. In Estate D however this is not so, and this is also confirmed in the actual noise variation measurements for the 24 hour period described under Section (B).

Figure 3. Residents' opinion of most noisy period of day



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Conclusion

From the results of the above survey, it is concluded that due to various degrees of insufficient planning during the early stages of the housing programme, the public housing estates are now found to be subjected to various degrees of noise affliction. Unless remedies are found immediately, the problem could become too gigantic a task to solve in the near future.

The general planning and layout of some of the estates could be improved to cut down the noise problem. For instance, the living rooms and bedrooms should not face the main roads. These could be replaced by kitchen, utility rooms and bathrooms which are not as sensitive to noise. Also since sound waves hit the surfaces of a building and is reflected from one block to another, block of flats should be built on a staggered pattern. More space in front of each block will reduce the impact of noise. Noisy areas such as playgrounds, markets and public recreational spots should be carefully distributed in the housing estates to reduce annoyance. Long rows of flats should be avoided as this will cause the common corridors to be turned into playgrounds. The number of flats should be limited to at most 10 units per row. Bus stops should be erected away from the flats.

More noise absorbant material could be used. This could be in the form of wood-wool to replace the concrete blocks used at present. Concrete surfaced playgrounds could be replaced by grass or sand covered areas and more trees and hedges should be planted to surround and beautify the playgrounds, community centres, recreational spots etc. These will improve the esthetic appearance of the estates and can serve as natural acoustic absorbers.

It was found that vehicular noise, particularly that of large buses operating near the residences, contributed nearly half of the noise present. More care should be devoted to planning and widening of roads and some form of traffic restriction through the housing estates should be investigated. The location of bus-stops should be critically examined. It is proposed that the large buses should operate only to the outskirts of the estates and be supplemented by smaller shuttle buses running within it. A more radical solution but a quite feasible one is to introduce electrically motivated buses to Singapore. This will also help alleviate smoke and smell problem the residents now face.

The present allotment of flats according to the income of the family leads to cases of large families being put into the smaller flats particularly amongst the lower income groups. Preference should be given to large families to live in bigger flats with some form of government subsidy if they cannot afford them. As there are more rooms and the living area is bigger the noise problem may then be reduced.

It is further recommended that residents should be educated with the concept of civic consciousness and noise control. While a certain amount of noise is unavoidable much can be done if residents will consciously reduce the noise they cause. This can be popularised through programmes in the community centres, TV and radios.

Acknowledgement

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