

## 5. DEVELOPMENT OF SCREENING CRITERIA FOR PROVIDING RETROACTIVE NOISE MITIGATION

The constraint mapping technique has been employed to select a manageable number of roads for detailed engineering studies. In essence, this comprises establishing a set of screening criteria which are applied systematically to screen all existing roads.

Given that there are tens of thousands of roads over the territory, it is prudent to apply screening criteria without compromising the study result. The following 3-level screening procedure aims to provide a pragmatic system to select these roads for further investigation :

### Level 1 - Policy Consideration

Selection Criterion: That the road must be "noisy".

For the purpose of this study, roads are defined as "noisy" if any one of the following conditions is met :

- (a) Peak-hour  $L_{10}$ (1-hour) at a nominal facade from the edge of the carriage exceeds the HKPSG noise criteria, i.e. 70 dB(A) for domestic premises, 65 dB(A) for places of public worship and 55 dB(A) for medical establishments; or
- (b) Noise complaints have been received by EPD and the measured noise level due to road traffic at the facade of the complainant exceeded  $L_{10}$ (1-hour) 70 dB(A);
- (c) Measured noise levels reported in a school survey report supplied by the EPD and normalized at residential facade exceeded  $L_{10}$ (1-hour) 70 dB(A).

The above criteria follow directly from an analogy of the HKPSG criteria.

### Level 2 - Macroscopic Consideration

Selection Criterion: That the road is amenable to retroactive treatment without adverse effects on safety, structural integrity and public/business activities.

A Consultation Paper has been sent to all concerned Government departments in November 1994 to consult their views and concerns on the implementation of retroactive noise mitigation of existing roads and comments have been received. Responses to comments from these departments are included in Appendix J.

For example, the Fire Services Department (FSD) have expressed grave concerns about the likely adverse effects of barriers or enclosures on rescue and fire fighting operation. FSD comment that operations will be severely impaired if noise screening structures are erected at positions such that: (1) external rescue and fire fighting operation by means of ladders is rendered impossible; (2) vehicular access to areas on both sides of a road is blocked; or (3) emergency crossing to the opposite lane of a road is blocked.

HyD, on the other hand, have requested that the foundation of a noise screening structure should be kept clear from the road infrastructure (i.e. the foundation slab should be wholly outside the footway, or if there is no footway, at least 1m from the carriageway slab). This space requirement may not be met for roads running through urban areas because of the often limited roadside space. HyD dismiss as impractical any proposals to fix barriers or enclosures on existing highway structures, unless separate or independent structures could be provided. HyD also point out that improper location of noise screening structures could cause severe public and business disturbance (e.g. disruptions to kerbside parking, loading/unloading,

vehicular access to buildings and commercial activities).

The above comments have formed the basis for the development of this Level 2 criterion and can be summarized as :

- (a) Blockage or obstruction to fire fighting or emergency access.
- (b) Insufficient space for installation.
- (c) Significant impact on public/business activities.
- (d) Significant impact on existing road structures, i.e. existing flyovers, central dividers, etc.

Level 2 has therefore aimed to select those "noisy" roads which may have provisions along some sections to avoid creating these adverse impacts. These selected roads have been subject to a more detailed investigation on site at Level 3 based on other concerns of these departments.

### Level 3 - Local Consideration

Selection Criterion: That the section or subsection is amendable to retroactive treatment in a practical and effective manner.

Level 3 has aimed to focus on one or more sections or subsection of a "noisy road" with a view to identifying one or more for treatment and thereafter to identify the form, practicability and effectiveness of the treatment.

In order to select the sections or subsections for noise treatment, it has been necessary to evaluate the effectiveness of providing the treatment. As agreed with the EPD, due to resources constraint, higher priority has been allotted to those road segments where 50% or more of the exposed population may be practically protected or where the exposed population is sufficiently clustered together for a mass protection.

For a given barrier or enclosure configuration, the following factors may degrade the performance of the noise treatment and hence whether 50% or more of the exposed population may be practically protected :

- (a) Presence of multiple vehicular/pedestrian access in the close vicinity.
- (b) Presence of sightline problem which dictates that the barriers or partial enclosures must be setback further from the edge of the road.

For example, in well-developed areas like the urban districts, the presence of multiple road junctions, bus lay-bys, pedestrian crossings, MTRC entrances and private driveways, etc. over a short length of road section tends to degrade the acoustic performance of any noise screening structure and very often may render the structure ineffective to protect the target NSRs. This is because openings are needed in the structure to maintain the flow of pedestrian and traffic.

In general, barriers and partial enclosures may be placed at 3m from the road edge of the straight section of a road without impairment of the sightline. However, for a curved section with a speed limit of 70 km/h, it is a requirement of the Transport Department that the barriers/partial enclosures must be so located to give a clear visibility of 125m ahead. Similarly, a 70m visibility line must be maintained for a curve with a speed limit of 50 km/h. As a result, additional setback would be required to maintain the required visibility.

Another practical consideration is to determine whether the exposed population is sufficiently clustered together. A desk-top survey of the village settlements along rural roads shows there are a large number of isolated, low-rise settlements which are potentially amendable to retroactive road traffic noise mitigation measures. However, given the limited resources

available, it is unlikely that all can be equitably protected. Apparently, it is more effective to protect clustered settlements such as villages with a noise barrier than isolated houses with a number of shorter barriers. A "linear density", which is defined as the total number of dwellings protected per unit length along the road, has been employed to screen these rural roads. Mitigation works which result in more dwellings to be protected per unit length have higher linear densities.

Typically, the length of clustered rural developments ranges from approximately 70 to 200 m, with the total number of dwellings varying between 30 and 90 units. The linear densities of the developments have been calculated to be in the range of 0.24 and 0.6 dwelling/m. Based on the shortest length (i.e. 70 m) and the lowest linear density (i.e. 0.24), the linear density of 17 dwellings per 70m has been adopted as a screening criterion. Rural developments with a linear density lower than the criterion will not be recommended for Phase 2 study because of the ineffectiveness of the noise mitigation.

Figure 15 shows a flow chart summarizing the screening procedures of noisy roads with potential for retroactive noise mitigation.