

8. DEVELOPMENT OF PRIORITY RANKING SYSTEM

8.1 Ranking based on Population Exposure

8.1.1 In order to optimise the utilisation of resources available and to implement the recommended mitigation schemes for the studied flyovers in a manageable and efficient manner, it is necessary that the works should be prioritised. One possible ranking system is to prioritise the works in terms of the population exposure which may be defined as:

- (a) Population Exposure = \sum (dB Exceedance of 70 dB(A)) x No. of Dwellings, or
- (b) Population Exposure = Total no. of dwellings where noise level exceed 70 dB(A)

Higher priority is given to the mitigation scheme which aims to protect more dwellings affected by traffic noise according to definition (b) or to protect more dwellings adversely affected by traffic noise according to definition (a). The method described in (a) would provide a more rational result, as the top prioritised mitigation schemes would tend to protect more population and sites to achieve a higher reduction.

8.2 Ranking based on Cost-effectiveness

8.2.1 Alternatively, the recommended mitigation schemes for the identified road sections may be ranked in terms of cost-effectiveness of the schemes. Higher priority is given to the scheme with lower cost of construction per dwelling protected. In this assessment, the cost of construction should include the following:

- direct cost of construction (i.e. capital cost);
- indirect cost of construction for diversion of any affected utilities and services, road signs and other street level furniture which is assumed to be a percentage of the capital cost;
- cost for land resumption; and
- recurrent costs which include annual maintenance cost and annual staff cost as obtained from HyD/Str.

The total number of dwellings protected by each scheme should include those where there would be at least a one dB(A) reduction of noise level as a result of implementing the scheme.

8.3 Recommended Ranking System

8.3.1 The first ranking system, i.e. based on population exposure, prioritises the mitigation schemes according to the severity and extent of the noise problem. Both noise levels and the number of dwellings being exposed to the noise are

duly considered in such prioritisation. From the prospective of the District Boards and the public at large, this system is a more logical choice. From a technical prospective, it is also a right choice.

8.3.2 On the other hand, the second ranking system prioritises the mitigation scheme according to the cost of construction per dwelling protected. For a given funding arrangement, the above system has an obvious advantage because more dwellings would be protected and benefited by the mitigation schemes. However, this system ignores the severity of the problem and therefore may not address the concerns of those who are adversely affected by the traffic noise. It may also give a wrong impression to the public that government is only concerned about the money in implementing the schemes.

8.3.3 The ultimate objective of the retroactive noise mitigation measures is to reduce the adverse effects of noise impacts due to traffic on existing flyovers. In due consideration of the pros and cons of the two systems, it is recommended that the first ranking system should be adopted.

8.4 Priority Ranking of the Recommended Mitigation Measures

8.4.1 Based on the above evaluation of ranking systems, the recommended mitigation measures at the studied flyovers have been prioritised and summarized in terms of recommended noise mitigation measures and costs. Table 8-1 presents the summary of these mitigation measures, Table 8-2 presents the cost summary of these measures and Table 8-3 shows priority ranking based on population exposure (ie. Z (dB exceedance of 70 dB(A) x no. of dwelling), has been proposed for implementation. Taking into account the percentage of protected dwellings in the ranking criteria, the priority for the recommended schemes would remain the same. A comparison of the two approaches is shown in Table 8-4 for reference.

8.4.2 The capital cost estimation for the implementation of these recommended measures as shown in Table 8-2 have been based on the figures worked out in Section 4.9 & 5.9. The recurrent consequence in terms of financial and staffing implication have also estimated in Section 4.9 & 5.9 based on the latest information such as annual unit maintenance and annual unit staff cost for noise barriers/enclosures obtained from HyD/Str. They are summarized as follows:

Flyover Location	Annual Maintenance Cost (HK\$ M/year)	Annual Staff Cost (HK\$ M/year)
Ap Lei Chau Bridge	0.15	0.05
Tsing Tsuen Bridge		
• Tsuen Wan Approach	1.57	0.47
• Tsing Yi Approach	0.54	0.16

Note: Recurrent Costs are given at Dec 97 Price Level

Table 8-1 Mitigation Summary Table

Location	Protected NSRs	No. of exposed dwelling	No. of dwelling protected	No. of dwelling benefited	Recommended noise mitigation measures	% of Protection
Ap Lei Chau Bridge	Toho Court Rousseau Heights Sun Ming Building Nam Tack Mansion Ning Fung Mansion	77	34	74	Bent top Vertical Barrier (95m)	44
Tsing Tsuen Bridge - Tsuen Wan Approach	Rivera Gardens: Hoi Nga Mansion Hoi Kwu Mansion Hoi Sing Mansion Hoi Fung Mansion Hoi Wai Mansion Hoi Yat Mansion Hoi Kwai Mansion Hoi Yin Mansion Hoi Yue Mansion	1545	714	960	Partial Enclosure Type I (125m) + Type II (160m)	46
Tsing Tsuen Bridge - Tsing Yi Approach	Cheung On Estate: On Mei House On Pak House On Chiu House	1061	122	657	Partial Enclosure Type II (150m)	12

Table 8-2 Cost Summary Table

Location	Direct Construction Cost	Indirect Construction Cost	Total Construction Cost	Total Cost per dwelling protected	Total Cost per dwelling benefited
Ap Lei Chau Bridge	HK\$13.4M	HK\$2.7M	HK\$16.1M	HK\$0.48M	HK\$0.22M
Tsing Tsuen Bridge - Tsuen Wan Approach	HK\$103.7M	HK\$20.7M	HK\$124.4M	HK\$0.18M	HK\$0.13M
Tsing Tsuen Bridge - Tsing Yi Approach	HK\$71.7M	HK\$14.3M	HK\$86M	HK\$0.71M	HK\$0.13M

- Note 1: Total Construction Costs are given at Dec 98 Price Level and include the followings:
(a) direct construction cost (capital cost); and
(b) indirect construction cost includes cost for utilities, street furniture and traffic diversion (assuming 20% of the capital cost for medium diversion).
- Note 2: No resumption on private land is considered necessary for the implementation of the recommended measures at each flyover location.
- Note 3: Land resumption on "semi-government land" for erection of the recommended measures fronting Cheung On Estate at the Tsing Yi approach section of Tsing Tsuen Bridge is necessary.

Table 8-3 Priority of Mitigation

Priority Ranking	Location	Total No. of dwelling exposed	Sum of Exposure Levels (Priority Criterion)	Recommended noise mitigation measures	Total Cost
1	Tsing Tsuen Bridge - Tsuen Wan Approach	1545	5754	Partial Enclosure Type I (125m) + Type II (160m)	HK\$124.4M
2	Tsing Tsuen Bridge - Tsing Yi Approach	1061	3030	Partial Enclosure Type II (150m)	HK\$86M
3	Ap Lei Chau Bridge	77	349.5	Bent top Vertical Barrier (95m)	HK\$16.1M

Note: Exposure Level = Mean Exceedance x No. of Dwellings

Table 8-4 Sensitivity Analysis of Priority of Mitigation

Location	Priority based on Exposure Level			Priority with account of % protection		
	No. of dwelling exposed	Sum of Exposure Levels	Priority Ranking	% of Protection	(% of Protection) x (Sum of Exposure Level)	Priority Ranking
Tsing Tsuen Bridge - Tsuen Wan Approach	1545	5754	1	46	2647	1
Tsing Tsuen Bridge - Tsing Yi Approach	1061	3030	2	12	364	2
Ap Lei Chau Bridge	77	349.5	3	44	134	3