Air Quality

Chapter 6

CHAPTER SIX
AIR QUALITY

1. With the extent of development forecast for the Refined Preferred Options, the protection of air quality is a fundamental concern. The deterioration in air quality, especially in the urban area, has been the focus of much public attention and is a key issue arising from the TDS Review. The main contributors to the decline in air quality under the Refined Preferred Options for both Scenarios A and B were identified as industrial and vehicle traffic emissions as a consequence of the scale of developments proposed within the Territory and in the PRD.

2. To enable the extent of these issues to be quantified, a suite of box models was developed to represent the ten major Air Control Zones in the Territory, as illustrated in Figure 6.1. The fundamental aim of the air quality assessments was to identify whether each of the Air Control Zones could accommodate the level of emissions forecast as a result of the transport and industrial proposals without compromising the Air Quality Objectives. On the basis of these assessments, development constraints or controls with respect to air quality were identified. All input data and assumptions were agreed with EPD before modelling commenced. The dimensions of each of the ten Air Control Zones and the necessary equations for the derivation of the concentrations of pollutants were provided by EPD, for use in this Study.

Respirable Suspended Particulates (RSP) and Sulphur Dioxide (SO_2)

3. In the earlier rounds of evaluations, two parameters were selected for assessment. The reason is that for industrial activities the major source is the combustion of sulphur containing fuel (leading to the emission of SO_2). For vehicles, the main concerns are NO_2 and RSP. However, it is well established by local air quality studies that NO_2 is a reasonable indicator of traffic-related air quality problems. This is particularly so when the distance travelled by goods vehicles, which are the major emitters, increases significantly and the forthcoming control measures on these sources such as EURO I and EURO II will reduce more RSP than NO_2. Hence SO_2 and NO_2 have been chosen as the parameters to reflect the air quality impacts of these two activities.

4. Emission rates from industrial developments and transport corridors and other input data together with the summary tables of the results of the modelling scenarios are provided in Table 6.1. In the assessment of the initial Preferred Options it was conservatively assumed that all industrial land would generate emissions. As the trend of relocating manufacturing processes to the PRC and retaining mainly assembly and packaging activities in Hong Kong continues, it may be said that the results reflect a very robust, if not a worst case, development scenario.

5. In order that emissions from restaurants and hotels are also taken into account the SO_2 emission factor has been increased by 25%.

6. It has however been recognised that the results obtained from modelling the very conservative situation described above could be misconstrued and thus two more scenarios were developed and modelled. The second scenario, representing a "medium" scenario, was based on the assumption that some of the I(A) industrial lands would not generate emissions. A more "realistic" scenario has also been developed, which takes account of the current and anticipated situation in terms of emission generation rates (part of the I(A) land assumed not to generate emissions as the manufacturing element has been relocated to China). The results of modelling these three options are illustrated in Figures 6.2 (a,b,c).

Table 6.1 SUMMARY OF CONTRIBUTION OF SO_2 (ug/m^3) FROM INDUSTRIAL AND TRAFFIC STRATEGIES

Air Control Zone	2001 (A)	2001 (B)	2006(A)	2006(B)	2011(A)	2011(B)
1. Harbour						
Industry	19.3	19.6	19.8	21.4	21.9	23.9
Traffic	2.1	2.1	2.5	2.6	2.8	3.0
Total	21.4	21.7	22.3	24.0	24.7	26.9
2. Tseung Kwan O						
Industry	5.5	5.5	6.0	7.2	6.8	8.6
Traffic	0.5	0.5	0.5	0.6	0.6	0.6
Total	6.0	6.0	6.5	7.8	7.4	9.2
3. Lantau						
Industry	7.8	8.4	9.0	9.2	9.7	12.7
Traffic	0.5	0.5	0.8	0.9	1.6	2.1
Total	8.33	8.9	9.8	10.1	11.3	14.8
4. Fanling/Sha Tau Kok						
Industry	2.4	2.4	2.4	3.0	2.6	4.1
Traffic	0.2	0.3	0.3	0.4	0.3	0.5
Total	2.6	2.7	2.7	3.4	2.9	4.6
5. Port Shelter						
Industry	3.3	3.4	3.4	3.4	3.4	3.7
Traffic	0.04	0.04	0.05	0.05	0.05	0.05
Total	3.3	3.4	3.4	3.4	3.4	3.7
6. South Hong Kong Island	2.7	2.7	2.7	2.8	2.9	2.9
Industry	0.2	0.2	0.3	0.3	0.4	0.5
Traffic	2.9	2.9	3.0	3.1	3.3	9.4
Total						
7. Tolo						
Industry	7.3	7.4	7.6	7.9	8.0	8.7
Traffic	0.6	0.6	0.7	0.8	0.7	0.7
Total	7.9	8.0	8.3	8.7	8.7	9.4
8. Tsuen Wan/ Kwai Chung	14.8	15.1	15.1	15.6	16.6	16.8
Industry	1.5	1.6	1.8	2.1	1.9	2.1
Traffic	16.3	16.7	16.9	17.7	18.5	18.9
Total						
9. Tuen Mun						
Industry	26.7	26.8	27.2	27.8	28.1	29.1
Traffic	1.6	1.8	2.4	3.0	2.9	4.1
Total	28.3	28.6	29.6	30.8	31.0	33.2
10. Yuen Long						
Industry	3.2	3.2	3.9	5.6	4.8	7.5
Traffic	0.7	0.8	0.8	0.9	0.8	1.1
Total	3.9	4.0	4.7	6.5	5.6	8.6

The data were calculated to three decimal places, however for simplicity the data presented above were rounded to 1 decimal place.

Nitrogen Dioxide (NO_2)

7. Traffic forecasts from the PlanD transport model have been used as input to the air quality model in the evaluation of the air quality impact of the Prototype Preferred Options. The results indicate there would need to be significant reduction in NO_2 emissions if the transport strategies were to be acceptable especially in the Harbour, Tuen Mun and to a lesser extent in the Tsuen Wan/Kwai Chung Air Control Zones. Three scenarios have been tested based on the following pollution control strategies:

   (a) Euro I/0.2% S diesel (1995) and Euro II/0.05%S diesel (1997);
   (b) Higher penalties for smoky vehicles and the introduction of a strengthened and maintenance programm in 1996; and
   (c) The introduction of a 'Diesel to Petrol' programme in 1996.

8. A summary of the results are shown in Table 6.2. Graphical illustrations of the effects of the three pollution control strategies are illustrated in Figure 6.3 (a,b,c). The cumulative effect of the transport and industrial strategies are illustrated in Figure 6.4 (a, b and c).

Total Suspended Particulates (TSP)

9. Dusts have been identified as a major contribution to air pollution in Hong Kong, and further study will be required to determine the extent of this issue. Airborne dusts are measured at all of EPD's routine monitoring stations over 24 hour period, which indicate temporal changes in concentrations. Analyses of these results have shown that in 1994 the Air Quality Objective (AQO) for Total Suspended Particulates (TSP) (annually averaged) was exceeded at 6 out of 7 roof top stations. At street level, the concentration of dusts is often higher than on the roof tops, giving rise to concern over the effect on the general health of the population. Sources of dust are numerous, including combustion (especially from diesel engines), soil, construction activities including reclamation and building works, combustion of fossil fuels and the sea.

10. Although there is little scope for influencing some of the problems relating to the build up of dust, such as the climatic factors, there are various measures which can be developed to minimise the problem at source. These include legislative controls being formulated by EPD to control dusts generated by construction works and restricting open burning, and the development of measures to reduce particulates operated by road-based vehicles. Due to the complex nature of the dust sources, limitation of data and the modelling methodology, it has not been possible within this study to forecast quantitatively future RSP or TSP concentrations. However some preliminary assessments have been carried out using monitoring data and by analysing the historical trends.

Criteria Adopted

11. Analyses of monitored hourly air quality data show that Hong Kong's Air Quality Objectives may be under threat when the predicted annual concentrations of SO_2 and NO_2 reach the level of about $40\mu g/m^3$. Thus, a preliminary indication of potential air quality problems is set at $40\mu g/m^3$ for both SO_2 and NO_2 for use in this Study, hereafter referred to as the 'trigger level'. The model input relates to NO_x emission rates, and thus the output generated be converted to NO_2 in order that comparison can be made with Hong Kong's Air Quality Objectives.

12. As previously noted, the formulation of the box model does not allow for vertically disparate emission sources to be simulated together. Since ground level emissions have a more direct impact on the affected area, the box model has been set up to assess only the impact of low

level emissions. Emissions from major utilities have thus been excluded from this simulation. It must be stressed that the impact of utility stacks and the possible effects of increasing electricity generation would need to be assessed by comprehensive numerical modelling at a later stage.

Table 6.2 SUMMARY OF CONTRIBUTION OF NO_2 (ug/m^3) FROM INDUSTRIAL AND TRAFFIC STRATEGIES

Air Control Zone	2001 (A)	2001 (B)	2006(A)	2006(B)	2011(A)	2011(B)
1. Harbour						
Industry	3.4	3.5	3.5	3.8	3.9	4.2
Traffic	34.7	34.9	33.9	35.7	36.1	38.7
Total	38.1	38.4	37.4	39.5	40.0	42.9
2. Tseung Kwan O						
Industry	1.0	1.0	1.1	1.3	1.2	1.5
Traffic	7.5	7.7	7.4	8.0	7.9	8.4
Total	8.8	8.7	8.5	9.3	9.1	9.9
3. Lantau						
Industry	1.4	1.5	1.6	1.6	1.7	2.2
Traffic	8.2	8.6	11.0	12.6	20.1	25.4
Total	9.6	10.1	12.6	14.2	21.8	27.6
4. Fanling/Sha Tau Kok						
Industry	0.4	0.4	0.4	0.5	0.5	0.7
Traffic	3.9	4.4	3.9	4.6	4.2	5.9
Total	4.3	4.8	4.3	5.1	4.7	6.6
5. Port Shelter						
Industry	0.6	0.6	0.6	0.6	0.6	0.6
Traffic	0.7	0.7	0.6	0.7	0.7	0.7
Total	1.3	1.3	1.2	1.3	1.3	1.3
6. South Hong Kong Island						
Industry	0.5	0.5	0.5	0.5	0.5	0.5
Traffic	4.1	4.3	4.0	4.4	4.2	4.3
Total	4.6	4.8	4.5	4.9	4.7	4.8
7. Tolo						
Industry	1.3	1.3	1.3	1.4	1.4	1.5
Traffic	10.3	10.8	9.9	10.7	10.0	10.0
Total	11.6	12.1	11.2	12.1	11.4	11.5
8. Tsuen Wan/ Kwai Chung						
Industry	2.6	2.7	2.7	2.8	2.9	3.0
Traffic	24.5	25.2	24.0	27.0	24.6	25.9
Total	27.1	27.9	26.7	29.8	27.5	28.9
9. Tuen Mun						
Industry	4.7	4.8	4.8	4.9	4.9	5.1
Traffic	26.8	28.9	32.1	39.5	37.3	50.0
Total	31.5	33.7	36.9	44.4	42.2	55.1
10. Yuen Long						
Industry	0.6	0.6	0.7	1.0	0.8	1.3
Traffic	10.9	11.8	10.1	11.1	10.4	13.6
Total	11.5	12.4	10.8	12.1	11.2	14.9

The data were calculated to three decimal places, however for simplicity the data presented above were rounded to 1 decimal place.

Discussion of Results

Industrial Emissions

13. From the results given in Table 6.1 and illustrated on Figure 6.2 it may be observed that the problem areas in terms of industrial emissions are Harbour, Tuen Mun and, to a lesser extent, the Tsuen Wan/Kwai Chung Air Control Zones. Furthermore, the results indicate that the situation regarding the industrial strategy is not so bleak if the 'realistic' emission scenario is adopted. As noted above, the 'realistic' scenario is driven by market forces. Although this trend could be reversed, there is evidence from existing development trend to suggest that such a scenario will materialise. Thus, the 'realistic' scenario has been the focus of the assessment given herein. Between Scenario A and Scenario B, some minor variations are evident in the forecast SO_2 concentrations especially in the Harbour Air Control Zone. It should be noted that the SO_2 contribution from the traffic forecasts is very small (<2%) compared to the industrial emissions.

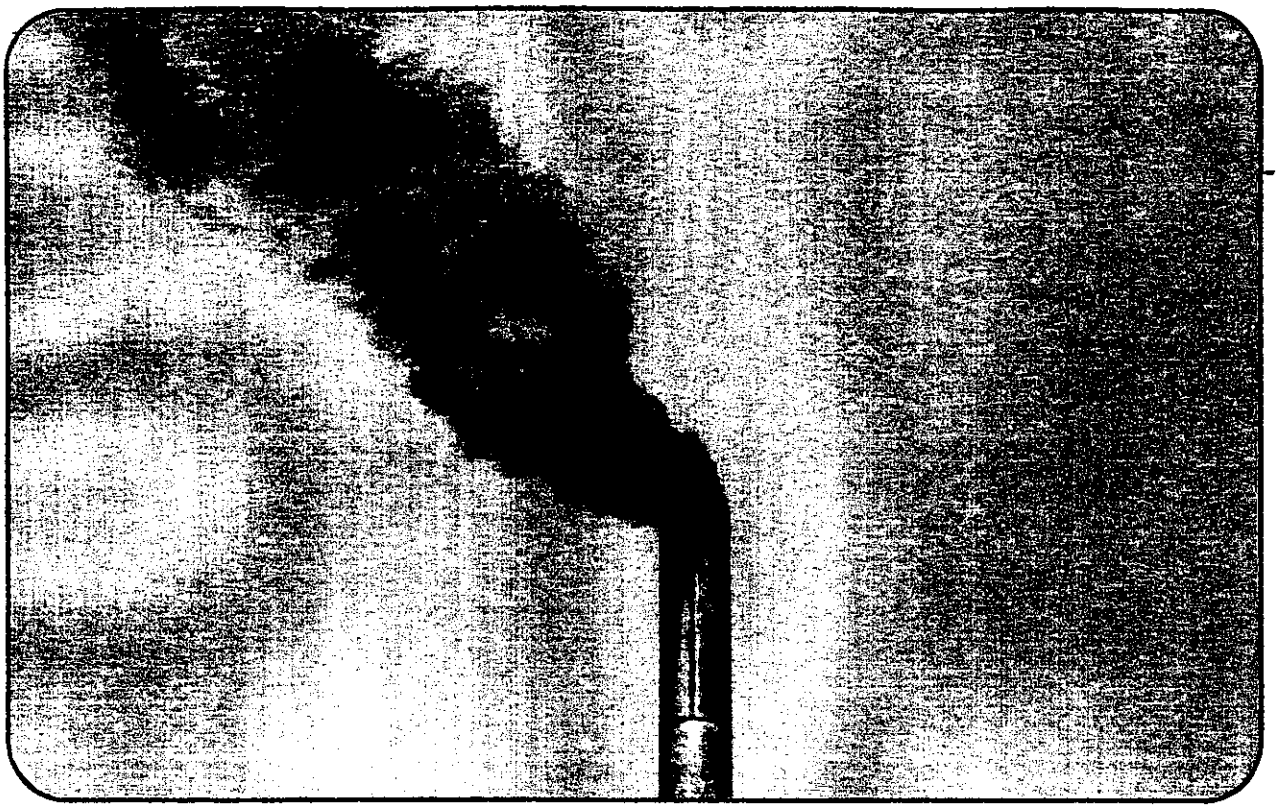
14. It is apparent from the results obtained that the trigger level for the AQO's will not be exceeded for the industrial scenarios in isolation, nor will the contribution of SO_2 from vehicular sources be significant enough to elevate the forecasts to trigger levels even in Tuen Mun. It may be surmised that the iterative approach to the redistribution of industrial floor space throughout the TDS Review process has achieved its goal in developing an industrial strategy which could be sustained even by the year 2011. This supposition does not preclude the need to further refine the industrial strategy and in future studies with the express intent of further decreasing industrial emissions to improve air quality.

Traffic Emissions

15. In terms of the transport strategies, the greatest contributor to air pollution is the goods vehicle category, as shown in Table 6.1. This category represents the most significant contribution of NO_2 in each of the ten Air Control Zones. In Fanling and Yuen Long, the relative contribution is greater than 70% even at the year 2001. Although the predicted concentrations are not great, the relative contribution to air pollution in these areas may give rise to concern. This implies that the assimilative capacities of the airsheds in the rural NT will be constrained, and that measures may be required to ensure that the health of the existing and new residential population being located therein is not compromised in pursuit of development.

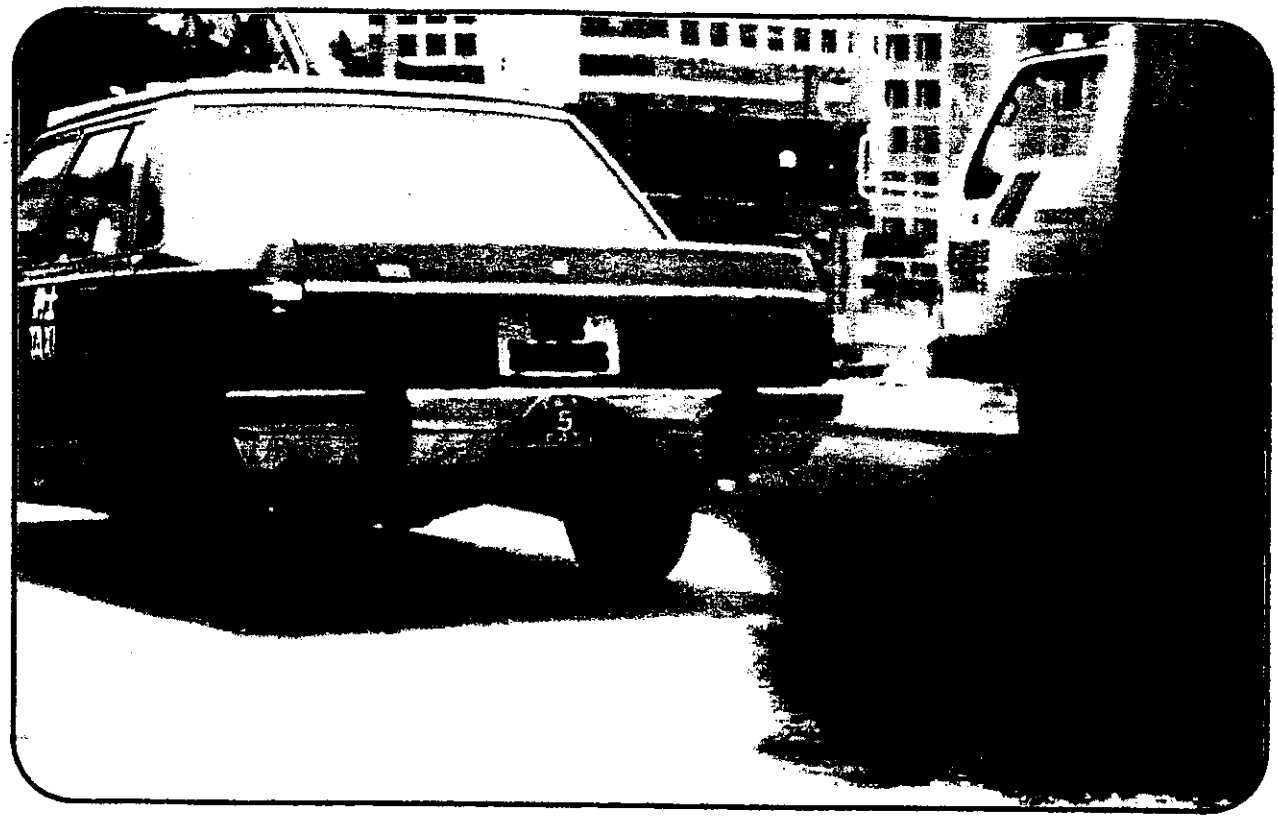
16. Reference to Figure 6.3 (a,b,c) indicates that the trigger levels are likely to be exceeded in the Harbour Air Control Zone by 2011 under Scenario B in the and Tuen Mun Air Control Zone by 2006 under Scenario B as a result of vehicular emissions. Although the trigger levels have not been approached in these ACZ's under Scenario A, there is still a cause for concern by the year 2011 when the forecast NO_2 approaches the trigger level. Figures 6.3 (b and c) indicate the reduction in emissions which could be achieved with more stringent pollution control measures in place.

17. It is pertinent to note that in the Harbour ACZ the forecast NO_2 concentrations will diminish by 2006 under Scenario A and then increase at 2011 as a result of the traffic forecasts. The decline in air quality forecast in the Harbour between 2001 and 2011 (both A and B) is expected to be gradual. In Tuen Mun the model forecasts increases in NO_2 of about 70% between 2001 and 2011 under Scenario B which is in part a reflection of the increase in the number of vehicles expected to enter the territory from the PRD. If all of the pollution control measures were to be implemented (i.e. EUROI and EUROII, higher penalties for smoky vehicles and conversion of diesel to petrol engines), the overall NO_2 emissions could be reduced by between 5 to 10% by the year 2011. Even assuming this reduction, it is

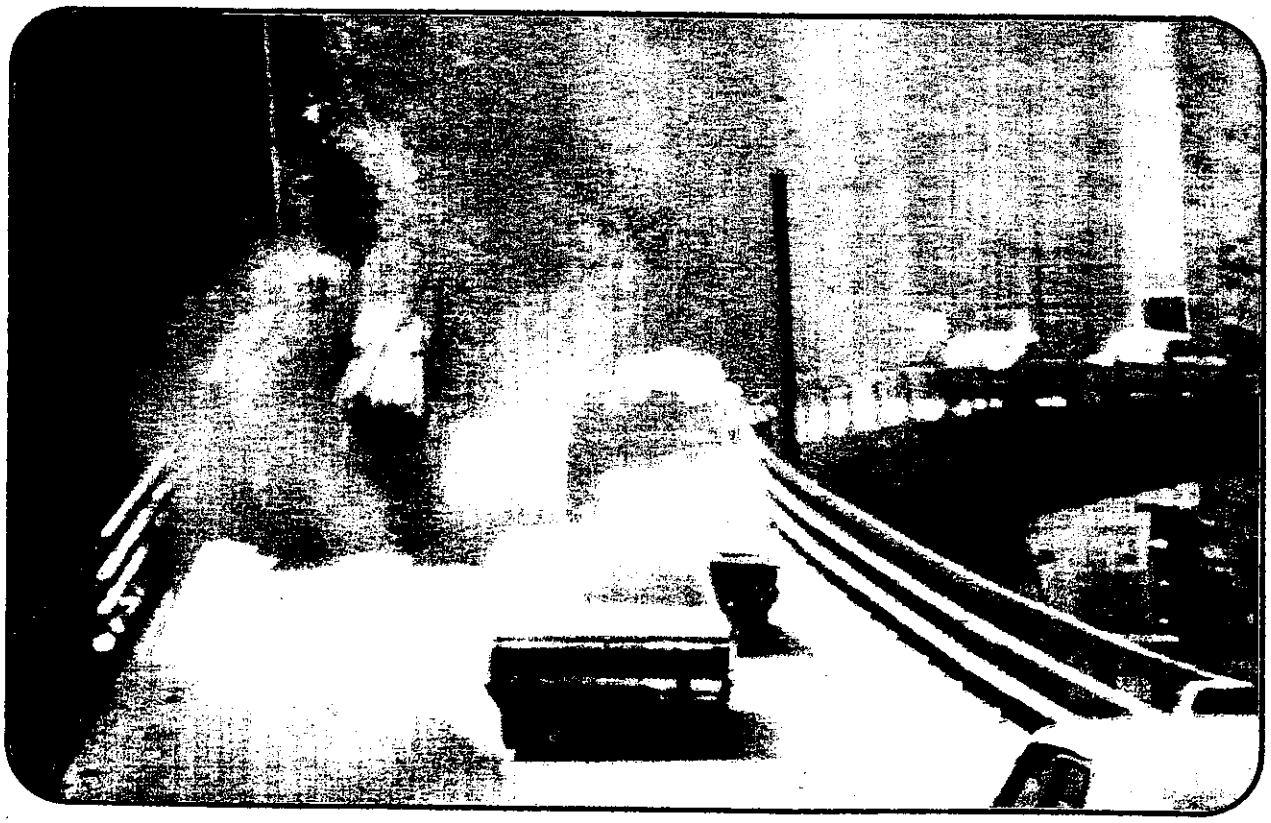


Dark smoke emissions from a chimney polluting the air

Industrial emission close to residential area



Dark smoke emission from vehicles



The greatest contributor to air pollution from the transport strategies are the goods vehicles

(Credit : ERL(Asia) Ltd.)

however anticipated that in the Tuen Mun ACZ under Scenario B, the AQOs would still be exceeded.

18. As noted above, the respirable suspended particulates cannot be modelled within the linked box model framework, and it was thus agreed that the interpolation of the routine monitoring data (provided by EPD) and the traffic forecasts could be used to give an indication of any areas of particular concern. Assuming that goods vehicles are the major source of vehicular RSP's, it may be assumed, for the purposes of this assessment, that at least 50% of the RSP generated throughout the territory is due to this category of vehicles.

19. With the increase in goods vehicles forecast to be 24% for Scenario A and 30% for Scenario B from 2001 to 2011, it may be conservatively surmised that the increase in RSP due to vehicular traffic could be in the order of 12% for Scenario A, and 15% for Scenario B. This percentage increase would most likely be higher in areas such as Fanling (about 18% for Scenario A and about 23% for Scenario B) where the relative pollution contribution from goods vehicles is higher.

20. Considering the results of the monitoring data collected by EPD, as illustrated in Figure 6.4, it is evident that at present only the station at Sha Tin marginally complies with the AQOs while all other annual statistics demonstrate non-compliance. Increases in RSP due to the enlarged vehicle fleet (includes goods vehicles, taxis and buses) and longer kilometres travelled through the Air Control Zones could cause a further deterioration in the air quality, particularly in the Harbour ACZ.

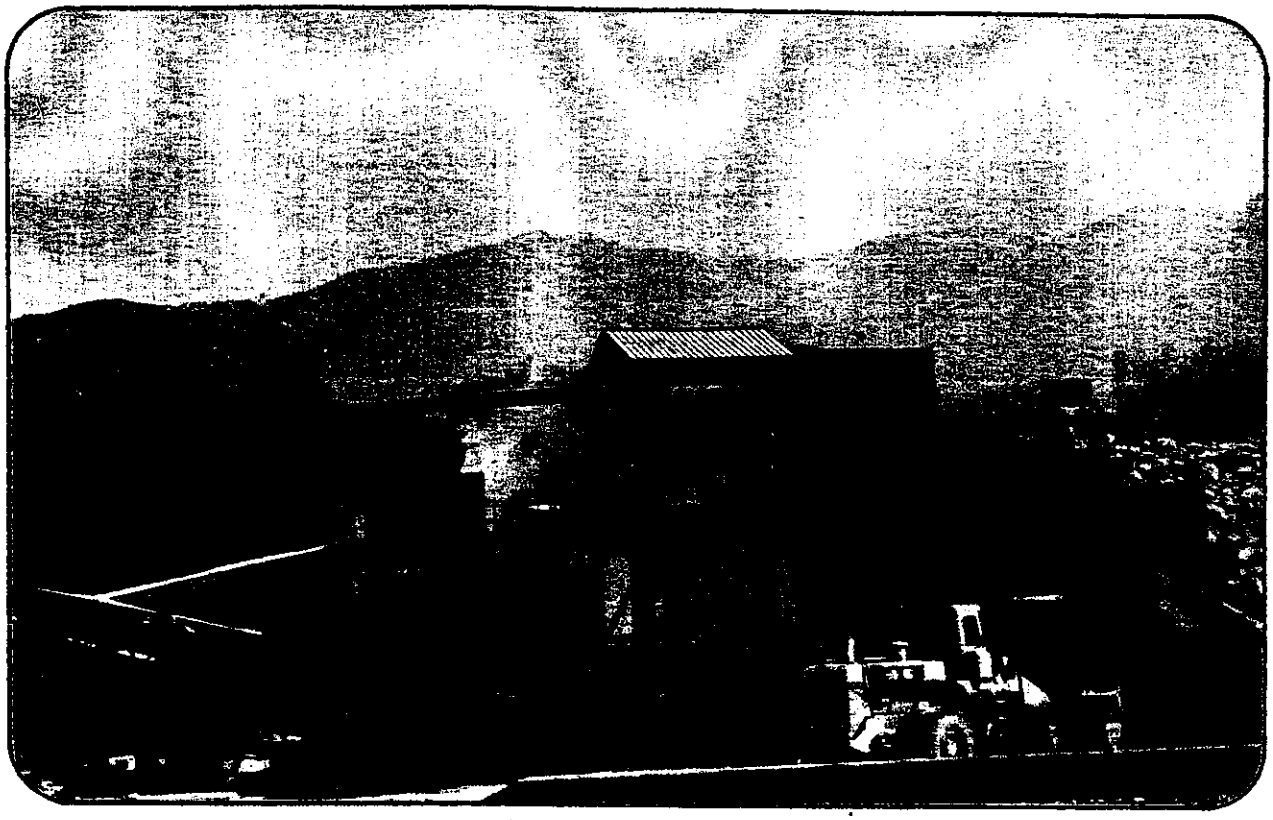
Dusts

21. The primary concern associated with dust generation relates to health; and, as the problem of dusts has been identified as a territory wide issue, there is clearly a need to study this issue in detail and define effective measures to minimise man-made problems of dusts. It has been estimated that between 893 ha and 1488 ha (for Scenario A and B respectively) of additional land will be required for the implementation of the development proposals with an additional 919 ha required for the port facilities by 2011. Such large scale development plans require a considerable amount of land formation and construction works to be undertaken which are likely to result in increased levels of dusts in the atmosphere. The annual TSP values recorded at the EPD routine monitoring stations are illustrated in Figure 6.5 which indicate non compliance with the AQO's at all stations. Increases in land requirements on the scale forecast (even if these are not on reclamation) will result in further increases in the TSP levels recorded.

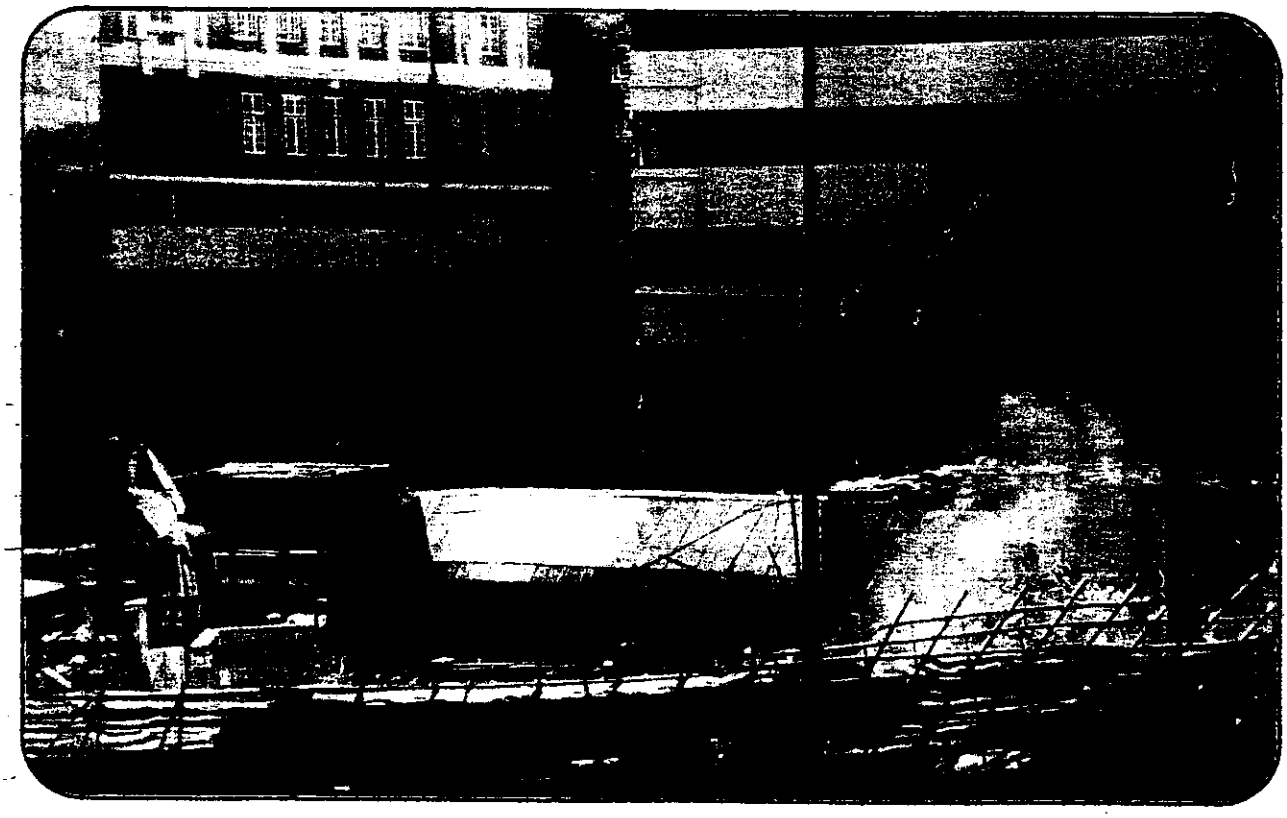
22. It will therefore be imperative that all reasonable measures are adopted by contractors to ensure that fugitive dust emissions on development sites are minimised as far as practical. Although it may be considered that dusts generated by construction works are temporary sources of pollution, the amount of construction and associated works which is forecast for the territorial development is likely to render this elevation in dusts levels a semi-permanent state unless action is taken. Mitigation measures have been practised in the Territory over the past few years on the major construction sites, although more stringent enforcement is likely to be required in future.

Cumulative Impacts

23. To examine the cumulative impacts of the transport and industrial strategies, the relative contribution of SO_2 and NO_2 from these two sources are presented in Tables 6.1 and 6.2 respectively. From the results presented it is apparent that in cumulative terms the trigger



Dusts generated by industrial activities



Construction sites are common
but temporary sources of pollution

levels for the SO_2 AQO will be not be exceeded even at 2011 on the basis of the assumptions that the industrial strategy and vehicular control strategies of EURO I and EURO II will be in place.

24. Even though SO_2 AQO trigger levels are not exceeded it should be noted that the increase in forecast levels of SO_2 is approximately 24% (between 2001 and 2011) for Scenario B in the Harbour, with a commensurate forecast increase of 15% for Scenario A over the same period. In Tuen Mun ACZ the comparative estimated increases in SO_2, for Scenarios A and B are 9% and 16% respectively between 2001 and 2011.

25. Of greater concern in terms of air quality, are the predictions for NO_2 which is primarily derived from vehicular sources as noted in Table 6.2. In terms of the cumulative impacts of the developments, it is apparent that in the Harbour ACZ, NO_2 trigger levels will be approached even in the medium term (2006) under both Scenarios A and B. In the longer term, the concentration of NO_2 generated by vehicular traffic (which is an order of magnitude greater than from industrial developments) will require action to be taken to reduce the air quality impacts.

26. In Tuen Mun ACZ the contribution of vehicular sources of NO_2 are also an order of magnitude greater than from industrial sources. The forecast increases in NO_2 will cause the trigger level to be exceed in the medium term for Scenario B and in the longer term under Scenario A. The increases forecast for Scenario B in 2011 are almost 40% in excess of the trigger level which is a key issue to be resolved in further detailed studies.

27. Although in the Tsuen Wan/Kwai Chung ACZ the NO_2 AQO trigger levels are not exceeded it is pertinent to note that this area currently suffers from poor air quality. It will be important to review the situation with regard to air quality in this area through monitoring and auditing, and to take necessary action to minimise the impacts of future development proposals in this ACZ. It is also pertinent to note that there is a small improvement forecast between 2006 and 2011 under Scenario B as a reflection of the redistribution of the traffic flows in this area.

28. The levels of NO_2 to be assimilated in the Lantau Island ACZ are forecast to double between 2006 and 2011 under Scenario B as a result of the number of goods vehicles travelling through the airshed. While the numerical values can cause concern, the characteristics of the area included in the model may have over-estimated the pollution potential. It is recommended that a monitoring station is located in the Tung Chung new town to monitor the response of the airshed to the increasing level of development.

29. On the basis of the results obtained, it is apparent that the key concerns relate to the levels of NO_2 forecast to be generated in the Harbour and Tuen Mun ACZs in the medium term for both Scenarios. The relative increases in NO_2 in these areas, between 2001 and 2011, suggest that the impacts of the medium term transport strategies will need to be further refined in future studies, especially at a district level. The forecasts are based on current suppositions and any subsequent changes to the input data (such as traffic volumes) will need to be re-examined. Furthermore it is recommended that the forecasts are frequently reviewed and necessary action taken in the context of monitoring data collected over the next few years.

Kilometres of New Road

30. There is no difference between the two options in the length of new roads required until 2011 when Scenario B is assumed to require 160km of road compared to 130km for Scenario A. Differences however exist in the NWNT and are discussed further in the assessment of the

transport strategies.

Interface of New Road with sensitive receivers

31. There are no significant differences between Scenario A and B, except in terms of the scale of development proposals.

Kilometres of Road Passing through Airshed

32. The major increases in road building requirements will result in the potential increase in vehicle emissions in Harbour , Tsuen Wan and Kwai Chung (medium and long term)(2006>), Tuen Mun and Yuen Long.

Projected Number of Vehicles on Roads

33. This performance measure was included as an indicator of the differences in vehicle mix in the traffic flows. Estimated numbers of vehicles and vehicle mix percentages were provided as output from the transport model. Both scenarios are identical in terms of the number of private cars estimated on the roads. The number of private cars significantly increases by 20% over a decade (2001 to 2011) which together with the other developments could constitute a constraint on the dispersion of pollution particularly in constrained airsheds unless strategic measures are adopted.

Vehicle Speeds

34. It has been assumed that the slower the average vehicle speed during the peak hour, the greater the potential impact on air quality, in terms of carbon monoxide generated, at that particular time (as well as congestion and queuing). This relationship is illustrated in Figure 6.6 (extracted from a case study in the UK) which also illustrates the converse relationship for NO_x. By 2011 the average vehicle speeds will have decreased by more than 20% under Scenario B compared to 2001 which combined with an increase in the vehicle fleet could result in a deterioration in air quality (CO in addition to the anticipated increases in NO_x and RSP) in, for example, the Tuen Mun airshed.

Proximity of Industry (including Special Industry) to Residential Areas

35. Interfaces between residential and industrial sources were measured from the 1:100,000 plans, the size of population which could be affected was identified for each option, and included in the overall assessment. This performance measure should be adopted with caution as the industrial developments being considered may not necessarily have an adverse impact on ambient air quality.

Proximity of Proposed Industrial Developments to Existing Pollution Blackspots

36. Using the information provided in the Baseline Studies prepared for Phase I of this Study, existing blackspots were identified as indicated in Figure 6.7. New industries proposed within a radius of 1km from the blackspots, were included in this assessment. Proposed industrial development in an area where the Air Quality Objectives are presently exceeded was assumed to have a greater cumulative impact on existing air quality than in areas where the AQOs are achieved.

Industrial / residential interface

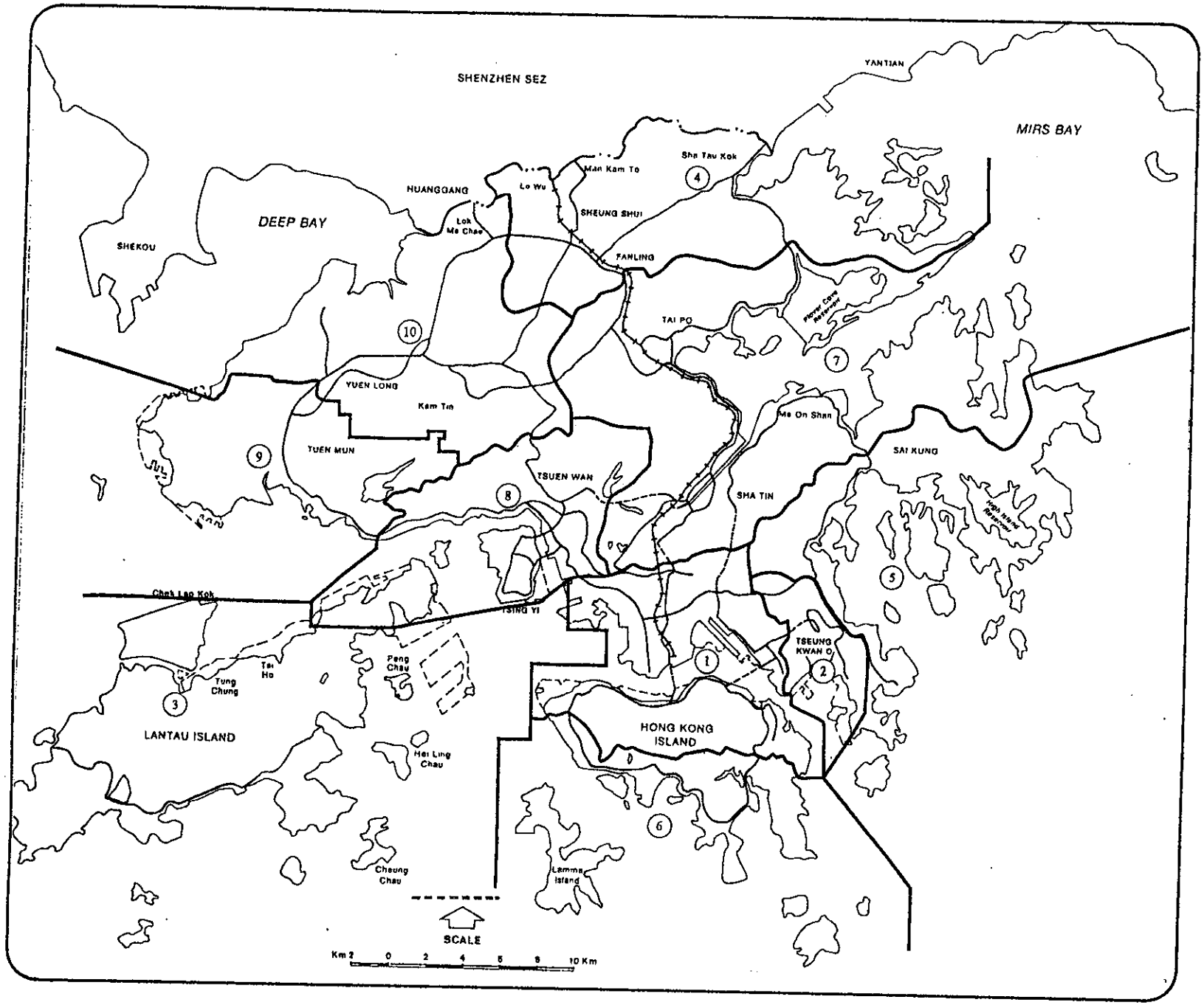
Tsing Yi oil depot next to residential area

Impact on Existing Air Quality

37. This performance measure relates directly to the air quality modelling study. Implications of individual components such as traffic and industrial developments and with respect to residential development are discussed in Chapters Twelve, Thirteen and Fifteen respectively.

Industries Within Confined Airsheds

38. Descriptions of topographical constraints on the airsheds in relation to prevailing air quality were adopted from the Baseline Studies Report. It is apparent that the number of exceedances of the AQO's in the Metro area and the industrial developments located therein could cause concern in terms of future air quality. However, in view of the promotion of 'clean' industries and the changing nature of the industrial sector especially in the Metro area industrial emission is not such a major issue as vehicle emission in confined airsheds.



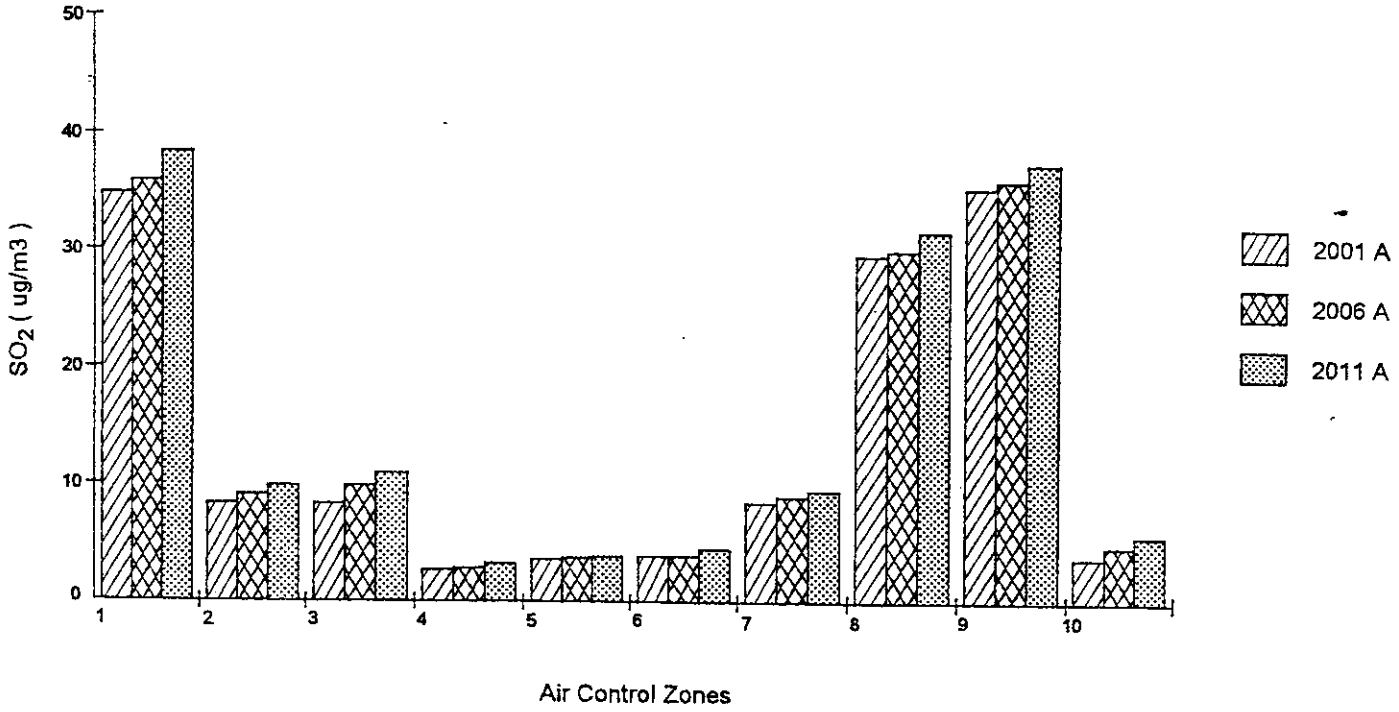
LEGEND

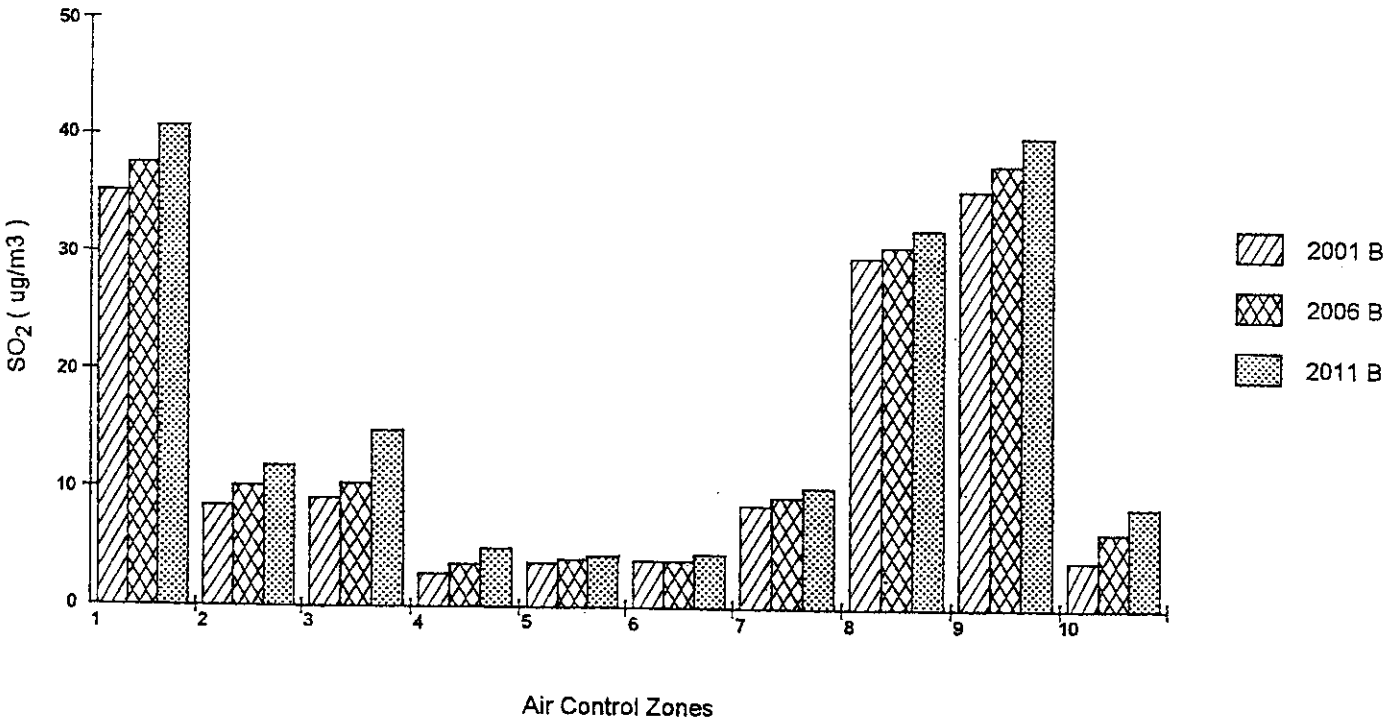
Name of Air Control Zone

1. Harbour
2. Junk Bay
3. Lantau
4. Fanling - Sha Tau Kok
5. Port Shelter
6. South Hong Kong Island - Lamma
7. Tolo
8. Tsuen Wan - Kwai Chung
9. Tuen Mun
10. Yuen Long

TERRITORIAL DEVELOPMENT STRATEGY REVIEW ENVIRONMENTAL PROFILES
AIR CONTROL ZONES

6.1

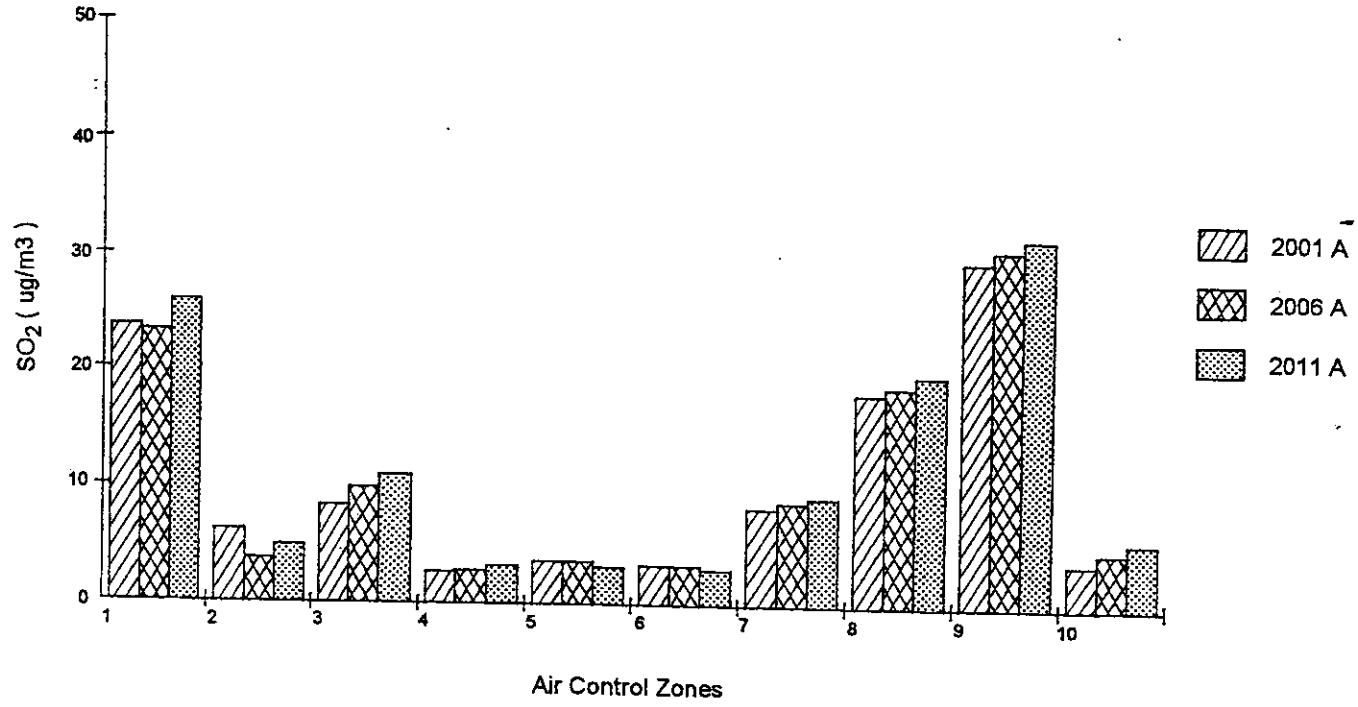


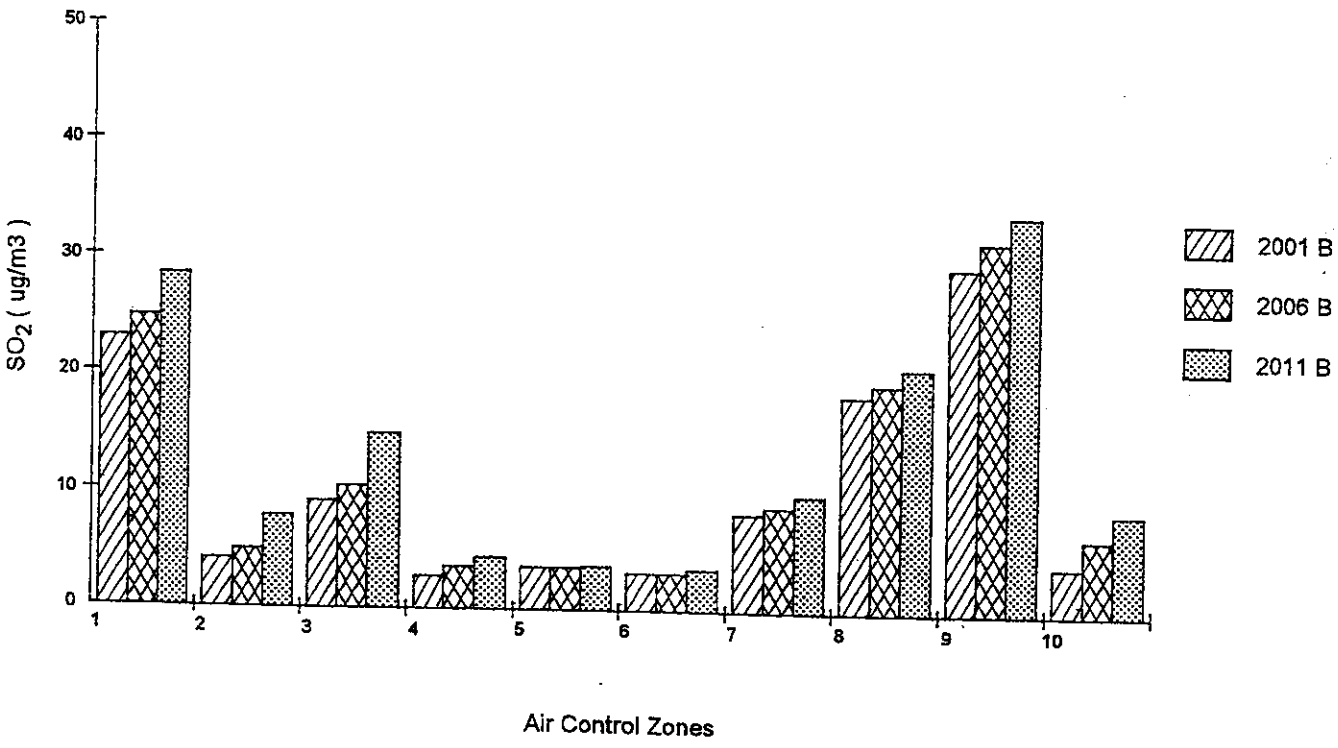


Legend : Air Control Zones

1 : Harbour
2 : Tseung Kwan O
3 : Lantau
4 : Fanling / Sha Tau Kok
5 : Port Shelter
6 : South Hong Kong Island / Lamma
7 : Tolo
8 : Tsuen Wan / Kwai Chung
9 : Tuen Mun
10 : Yuen Long

Figure 6.2a Summary of SO_2 for Worst Case Industrial Scenario

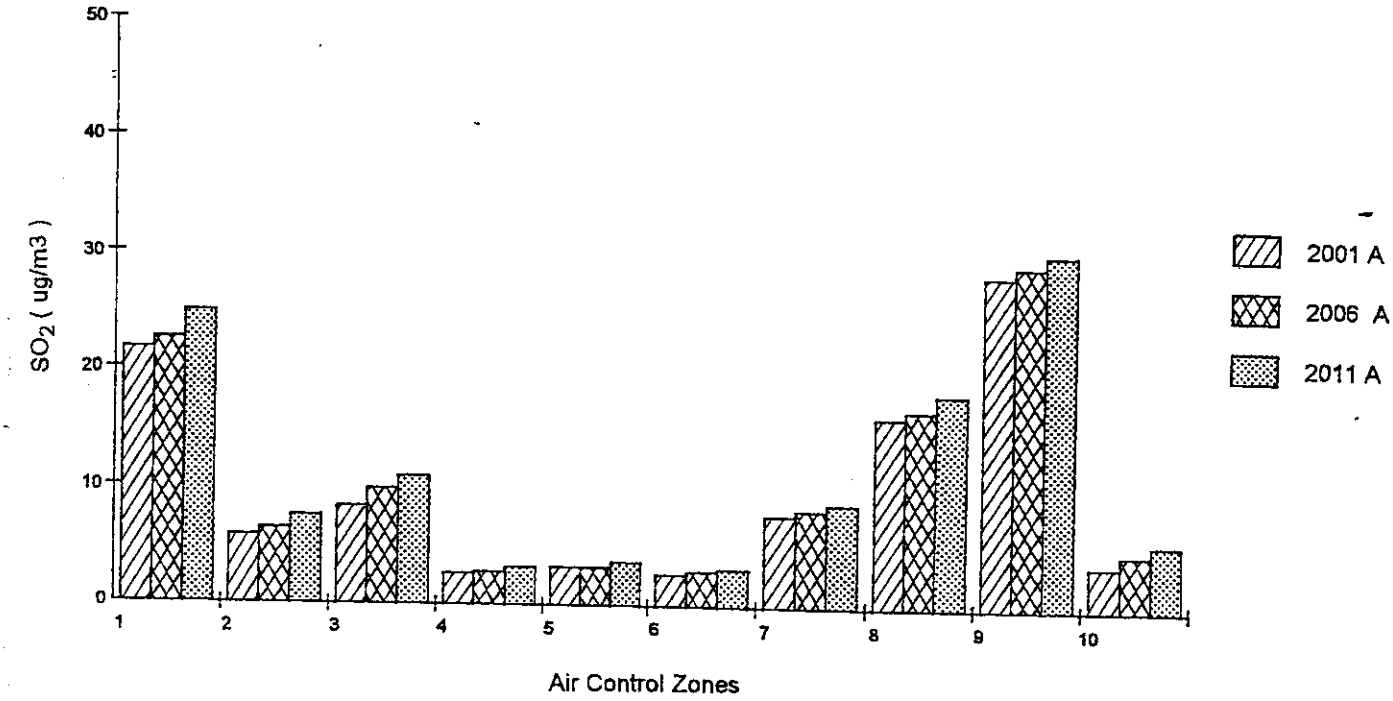


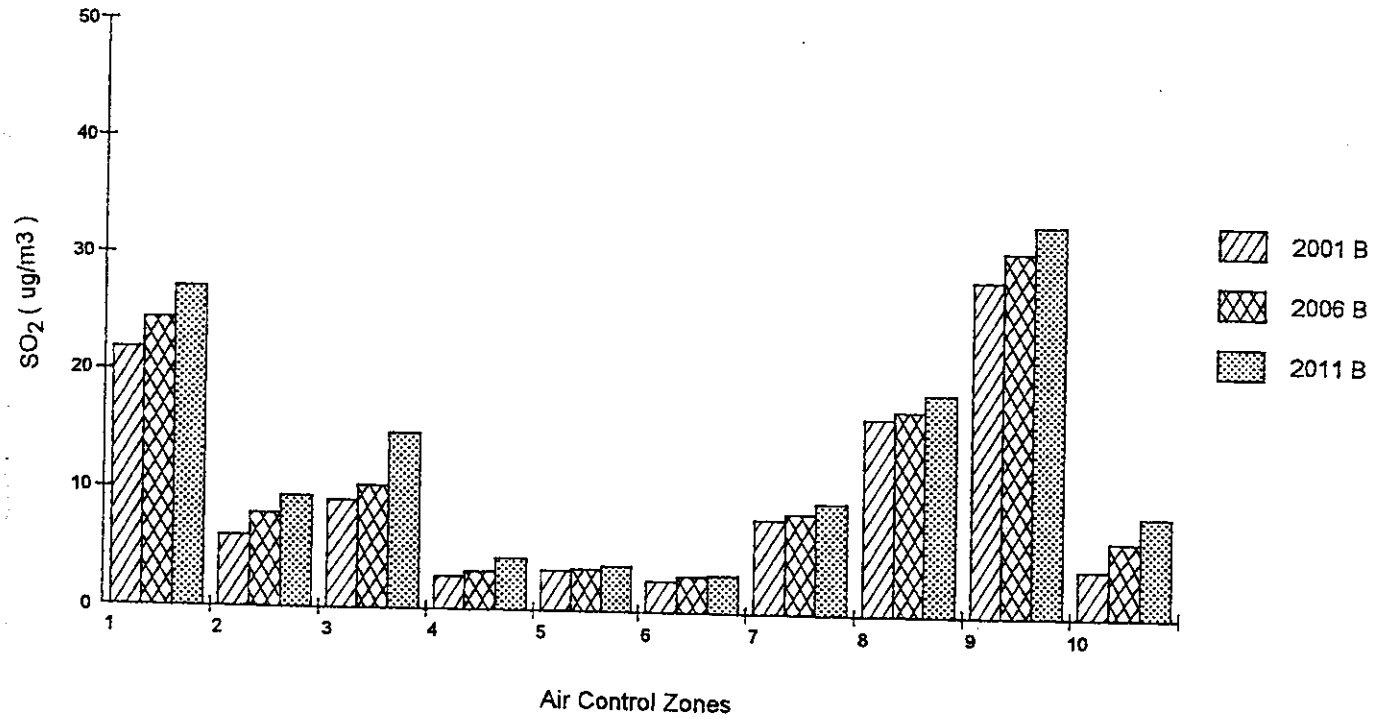


Legend : Air Control Zones

1 : Harbour
2 : Tseung Kwan O
3 : Lantau
4 : Fanling / Sha Tau Kok
5 : Port Shelter
6 : South Hong Kong Island / Lamma
7 : Tolo
8 : Tsuen Wan / Kwai Chung
9 : Tuen Mun
10 : Yuen Long

Figure 6.2b Summary of SO_2 for Medium Case Industrial Scenario

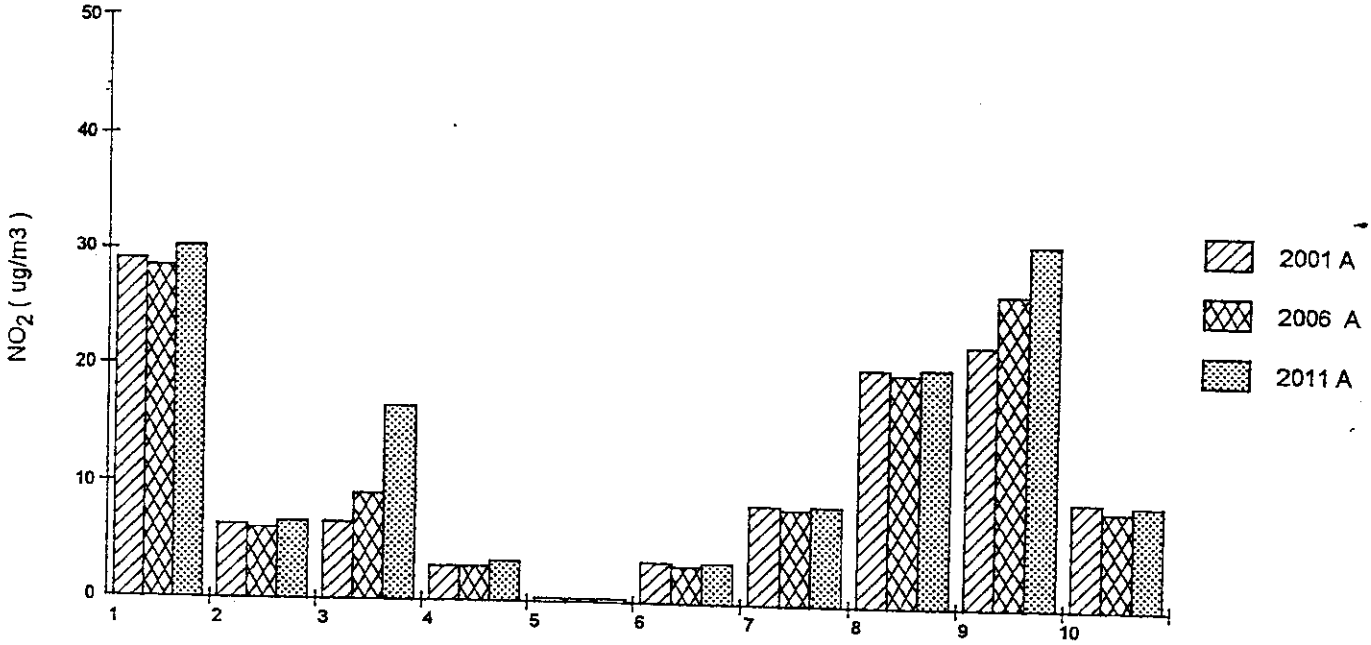




Legend : Air Control Zones

1 : Harbour
2 : Tseung Kwan O
3 : Lantau
4 : Fanling / Sha Tau Kok
5 : Port Shelter
6 : South Hong Kong Island / Lamma
7 : Tolo
8 : Tsuen Wan / Kwai Chung
9 : Tuen Mun
10 : Yuen Long

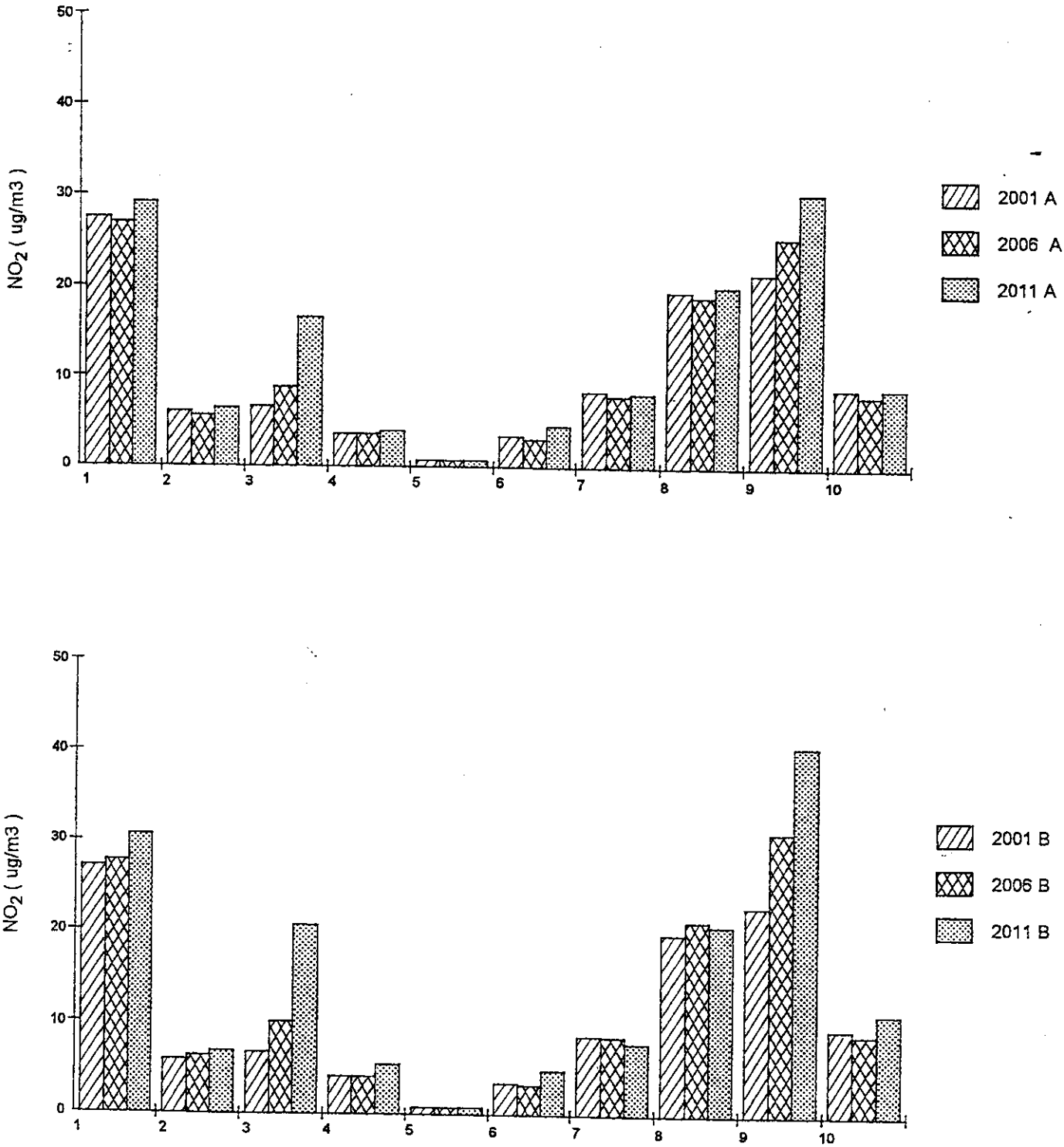
Figure 6.2c Summary of SO_2 for Realistic Case Industrial Scenario



Legend : Air Control Zones

1 : Harbour
2 : Tseung Kwan O
3 : Lantau
4 : Fanling / Sha Tau Kok
5 : Port Shelter
6 : South Hong Kong Island / Lamma
7 : Tolo
8 : Tsuen Wan / Kwai Chung
9 : Tuen Mun
10 : Yuen Long

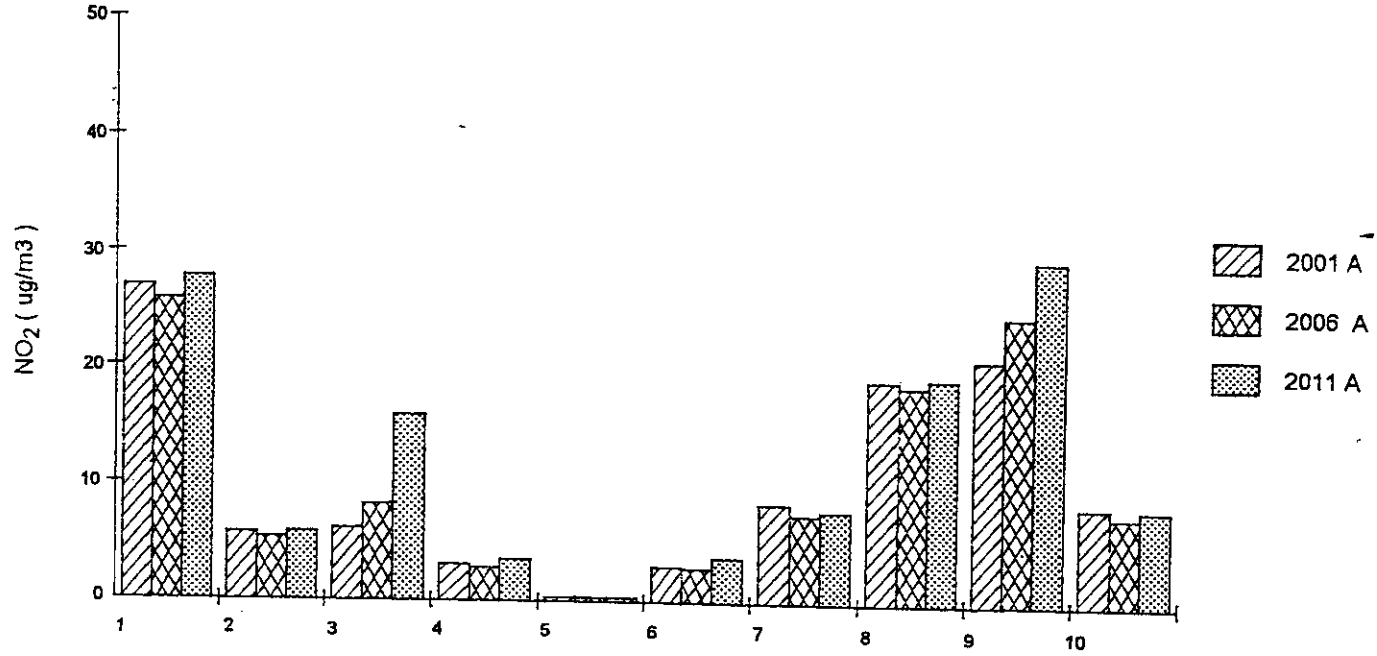
Figure 6.3a Summary of NO_2 for Traffic (with EURO I and EURO II)

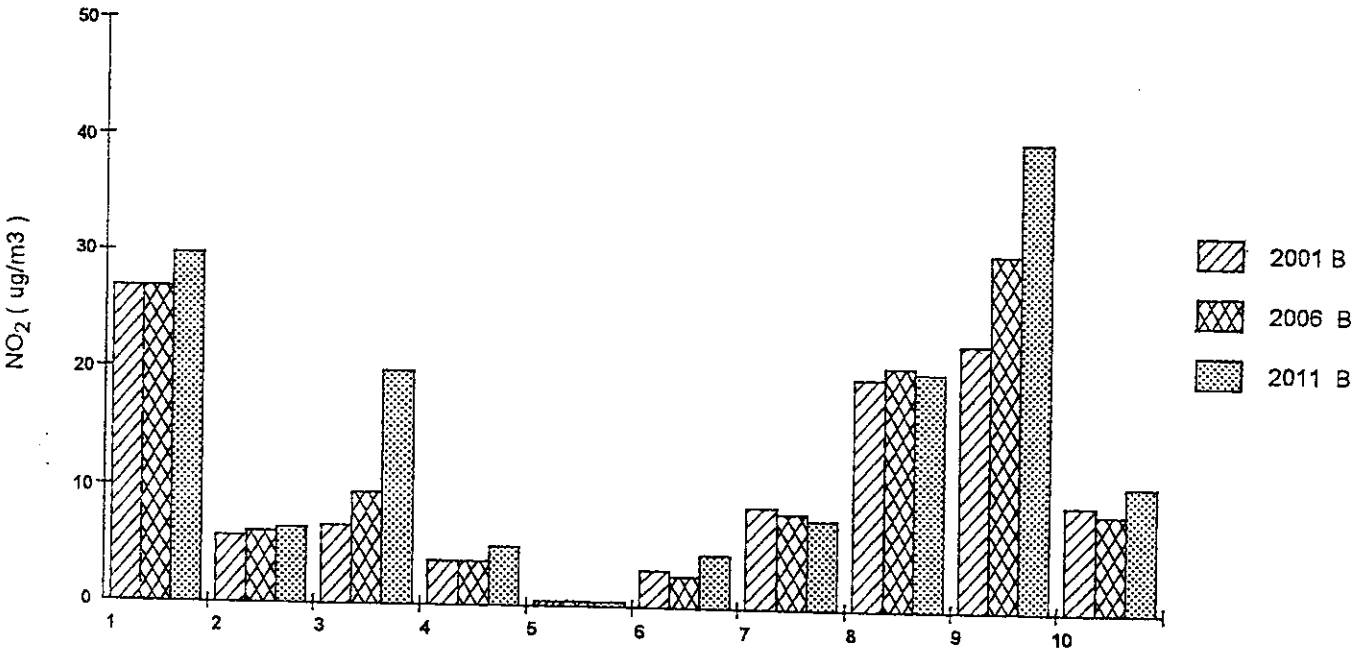


Legend : Air Control Zones

1 : Harbour
2 : Tseung Kwan O
3 : Lantau
4 : Fanling / Sha Tau Kok
5 : Port Shelter
6 : South Hong Kong Island / Lamma
7 : Tolo
8 : Tsuen Wan / Kwai Chung
9 : Tuen Mun
10 : Yuen Long

Figure 6.3b Summary of NO_2 for Traffic (with EURO I and EURO II with higher penalties for smoky vehicles)

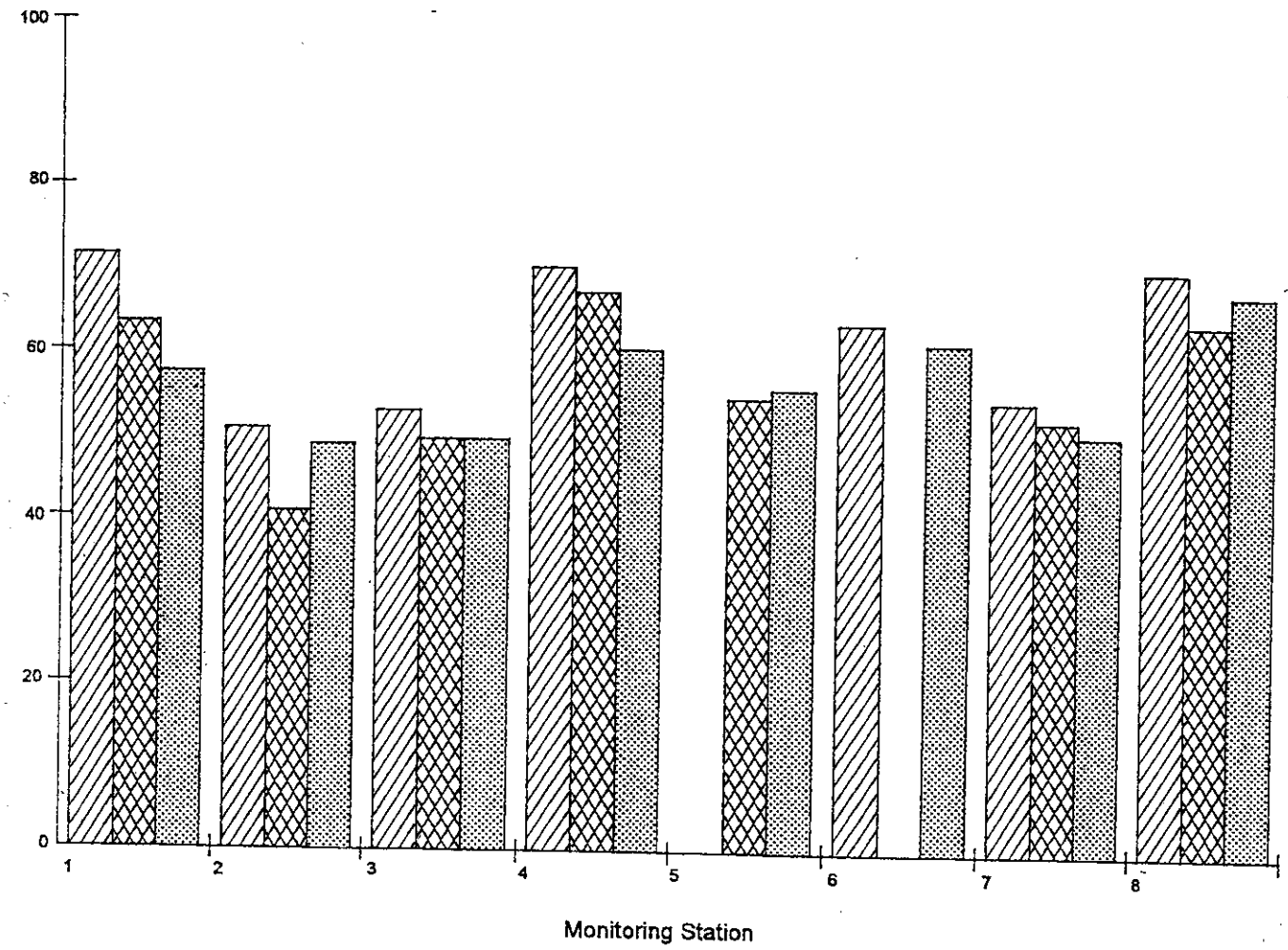




Legend : Air Control Zones

1 : Harbour
2 : Tseung Kwan O
3 : Lantau
4 : Fanling / Sha Tau Kok
5 : Port Shelter
6 : South Hong Kong Island / Lamma
7 : Tolo
8 : Tsuen Wan / Kwai Chung
9 : Tuen Mun
10 : Yuen Long

Figure 6.3c Summary of NO_2 for Traffic (with EURO I and EURO II with higher penalties for smoky vehicles and conversion of diesel to petrol engines)

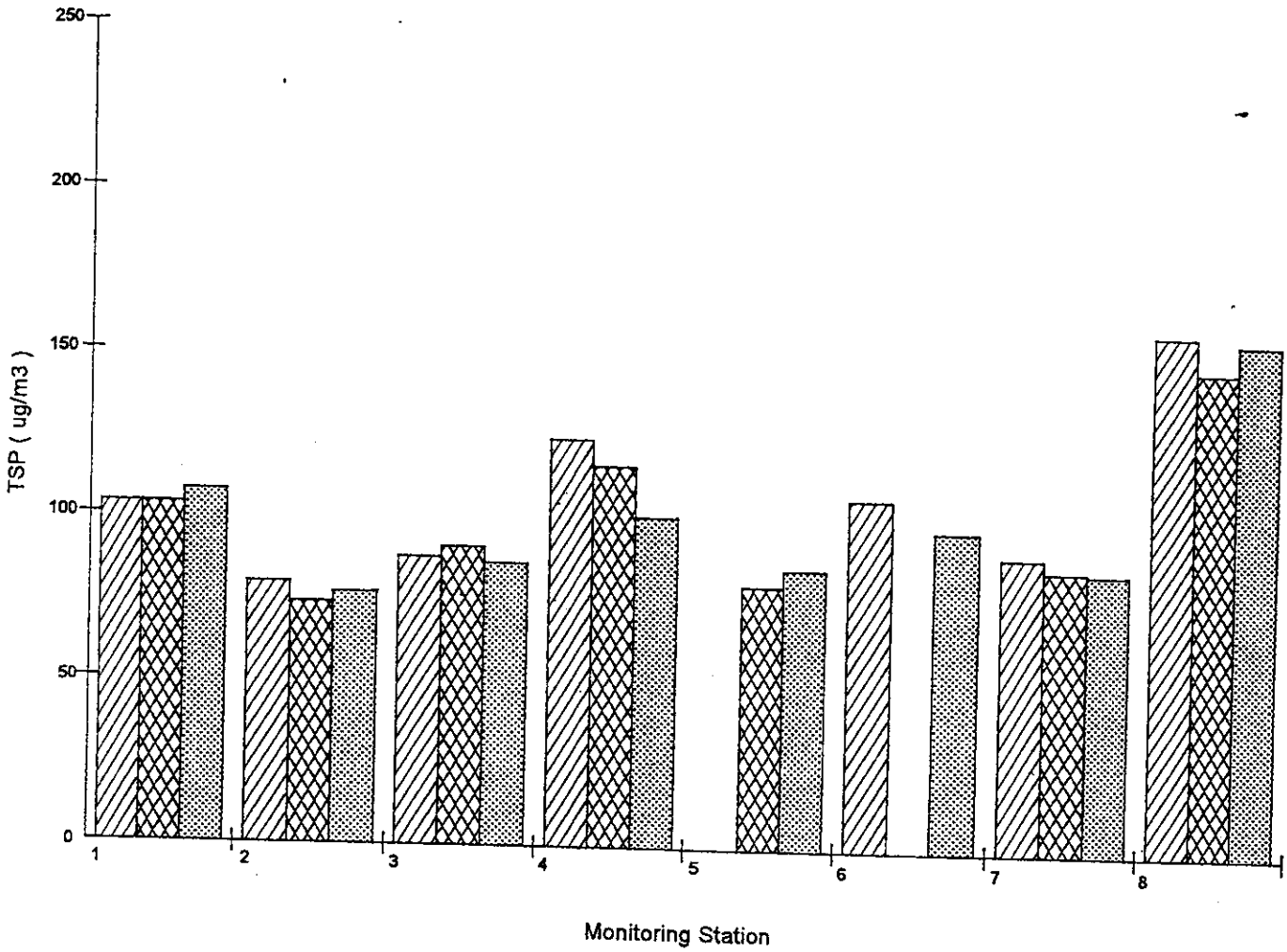


Legend : Monitoring Stations

1 : Kwun Tong
2 : Sha Tin
3 : Tai Po
4 : Sham Shui Po
5 : Central and Western
6 : Tsuen Wan
7 : Kwai Chung
8 : Mong Kok

1992
1993
1994

Figure 6.4 Results of Monitoring RSP at Fixed Stations



Legend : Monitoring Stations

1 : Kwun Tong
2 : Sha Tin
3 : Tai Po
4 : Sham Shui Po
5 : Central and Western
6 : Tsuen Wan
7 : Kwai Chung
8 : Mong Kok

1992
1993
1994

Figure 6.5 Results of Monitoring TSP at Fixed Stations

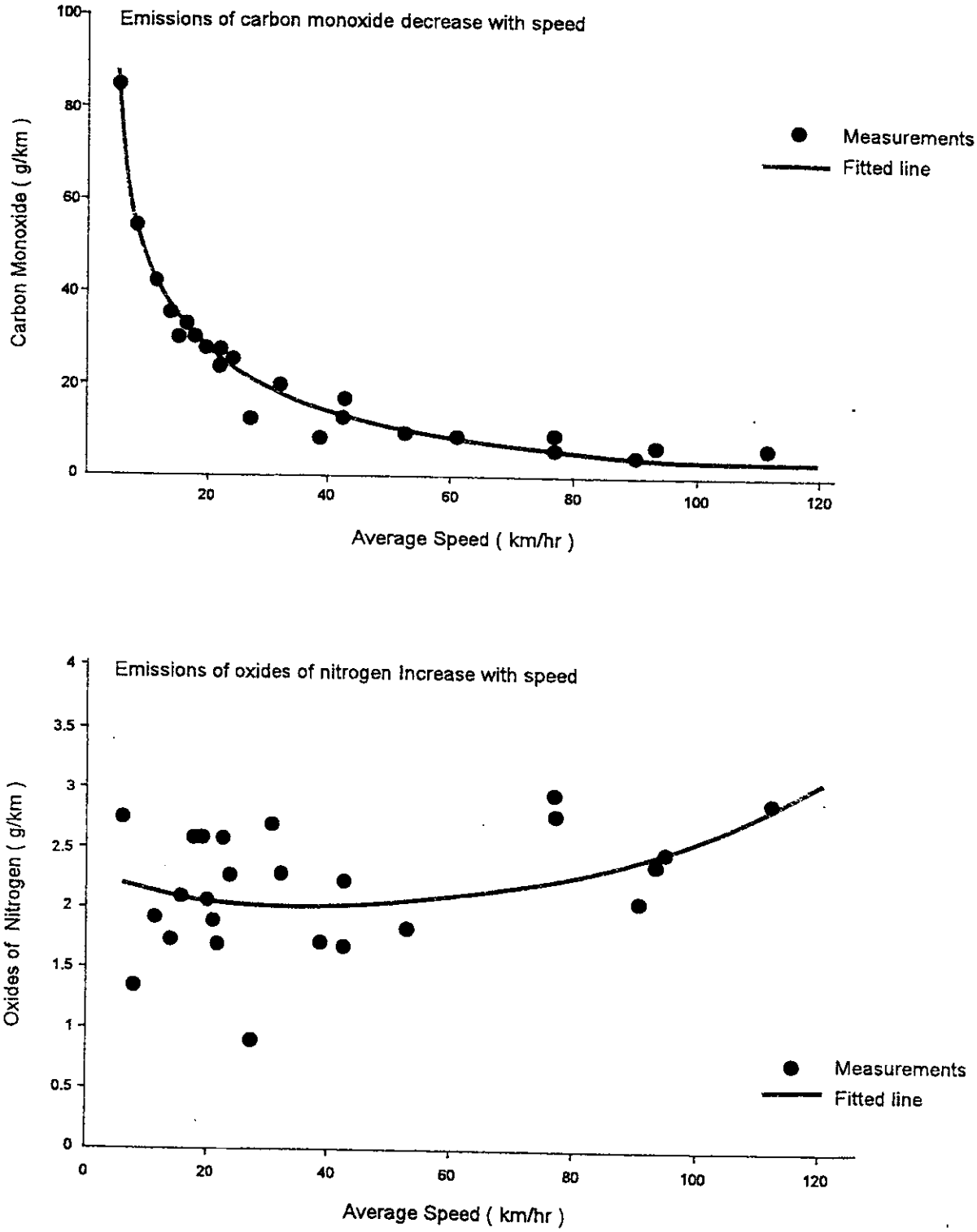
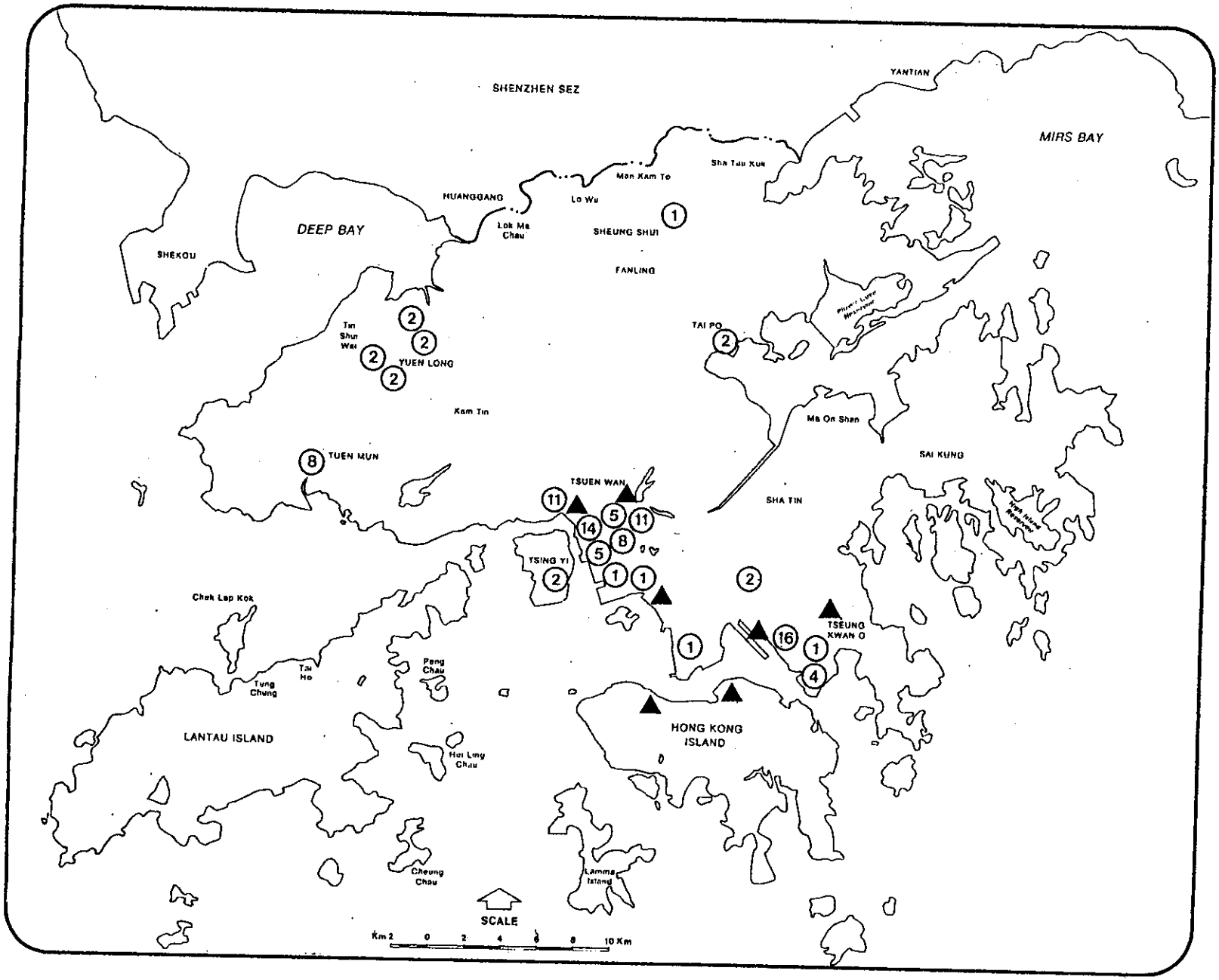


Figure 6.6 Variations in Vehicular Emissions with Speed
(Source New Civil Engineer, June 1995)



LEGEND

▲ Exceeds 1 hour, 24 hour, or 1 year AQOs

(2) Number of potential blackspots (as identified by industrial emissions survey)

TERRITORIAL DEVELOPMENT STRATEGY REVIEW ENVIRONMENTAL PROFILES
IDENTIFICATION OF EXISTING AND POTENTIAL POLLUTION BLACKSPOTS

6.7