CHAPTER 5
DISCUSSIONS AND CONCLUSIONS

5.1 DISCUSSIONS

5.1.1 Assessment of the DSS/IPC System

Applying the DSS/IPC methodology to estimation of pollution load for EIA approved projects/facilities in the industrial sectors in Malaysia is of interest for a number of reasons. Firstly, it is possible to provide estimates of the emissions of a number of pollutants that are not currently monitored by the DOE. Some of these pollutants have high degree of toxicity, and estimates of the release of these pollutants especially on a regional basis, may therefore provide the DOE with valuable information. Secondly, comparison between the predicted levels of pollution by DSS/IPC and the actual pollution load recorded, albeit imperfectly, is possible. However, it is clear that many country-specific factors must be adjusted for non-U. S. circumstances, although the relative ranking of the industrial sectors are relatively robust. In order to adjust the indices to reflect current Malaysian industrial practices, existing literature and monitoring data on the regional industrial pollution have to be consulted. Pollutant specific scaling factors are to be developed from the available data and used to adjust the sectoral pollution indices of the DSS/IPC system in order to provide better estimates of pollution loads in Malaysia.

5.1.2 Sources of Bias

The methodology used in this research project contains several possible sources of bias. Firstly, in the event that there is no comprehensive record of the pollution control technologies used, the DSS/IPC modules will tend to move calculations toward overestimates of average sectoral pollutant loads. Furthermore, this study assumed that there would be no change in term of the treatment options after post-EIA. The second bias arises because there may be a number of approved EIA projects being suspended, or with the possibilities of changes in the production capacity which deviated from the proposed output in the EIA reports. With the assumptions of all the EIA approved projects being researched would be

implemented, and the production capacity maintain equal as proposed, the estimated pollution load would become unreliable.

Beyond the unavoidable inaccuracies of estimating pollution loads at the 4-digit ISIC level, a further bias may arise out of the standard procedure used to aggregate the production process to the 4-digit ISIC level. Under this procedure, those facilities that matched more than one ISIC code were assigned the ISIC code with the highest production value. As a result all releases and transfers from such facilities were attributed to a single ISIC code, although in reality some proportion were associated with other activities. This approximation might lead to some overstatement of pollutant loads.

5.1.3 International Applicability of the DSS/IPC System

Cross-country variations in regulatory, economic and technological conditions clearly impose limitations on the international applicability of the pollutant estimates modules by U.S.-based DSS/IPC system. The DSS/IPC pollution intensity figures are developed from a sample of U. S. manufacturing facilities, and so constitute and estimate of U. S. conditions. Even though work is underway to expand the size of the sample, and so improve the accuracy of the U. S. estimates; a number of sources of variation will tend to affect the reliability of the DSS/IPC pollution estimates for the industry of Malaysia particularly.

At the four-digit ISIC level of aggregation describe above, there may be significant variation between Malaysia and the U. S. in the product mix within each sector. Further, even with similar inter-sector product composition, the scaling factors suggested above represent only a crude adjustment of the differences in the production and pollution control technologies applied in the two countries. Future work shall focus on providing a more detailed analysis of the technologies employed in the polluting industrial sectors. In the longer term, given the importance of having reliable data on actual pollution intensities in Malaysia for the development of efficient pollution control policies, the DSS/IPC system can be verified on its accuracy.

However, even if there is considerable international variation in the absolute level of sectoral pollutant load estimation between two countries, the relative ranking of intensities across sectors may be expected to remain constant. Thus, one might reasonably expect the chemical processing sectors to be found near the top of all rankings of water pollution intensity indices, and the iron and steel sector to be found near the bottom.

5.1.4 Recommendations for Future Studies

Clearly there remains a large scope for further development of pollution load estimates using the U. S. based DSS/IPC system as complements to direct measures of environmental parameters at the firm level. Many efforts to appraise environmental conditions and standards in the developing countries rely upon engineering estimates and effluent data obtained from the developed countries. While there is little alternative until detailed empirical work is carried out in the former, this approach has serious limitations. It is hoped that, measuring effluent contribution by inputs will account for many of those differences when estimates based on one country's data are transferred to another. With more extensive empirical work of this kind, it is hoped that more benefits of the DSS/IPC system in environmental assessment can be transferred to countries which lack sufficient institutional capacity for effective environmental assessment and regulation.

Although much more detailed empirical research is needed on the sources of variation in industrial pollution, it is already clear that great differences are attributable to cross-country and cross-regional variations in relative prices, economics and sectoral policies, and strictness of regulation. The second phase of research may, therefore, have to be even more ambitious than the first. The continuation research may use plant-level data from many states to quantify the major sources of interregional variation in industrial pollution. That project should help to identify the policies, which can help to reduce industrial pollution most cost-effectively under different conditions. By quantifying the effects of region-specific policy and economic variables, it should also provide the basis for adjusting DSS/IPC System to conditions in a wide variety of regional economies taking into account the conditions prevalent in the another countries.

On the other hand, the costs and risks of industrial pollution are heightened to the extent that they are concentrated in provinces with high population densities, and in industrial estates. By combining pollution intensity data with the locational estimates of industrial sector growth, it is possible to generate geographic-specific projections of future pollution loads, which include trends in the industrial estates or off-industrial estates, and urban or rural distribution of industrial pollution.

Another area for future study may include work on integrated database of the full range of air, water and land pollution effects due to specific industrial zones with intensive urban-industrial effluents, emissions and wastes. For example, to carry out locational estimates for the main industrial estates throughout the Peninsular Malaysia; e.g., Bayan Lepas in Penang, Tasek in Perak, Klang Valley in Selangor, Air Keroh in Malacca, Pasir Gudang in Johore, Kuantan in Pahang and Kemaman in Trengganu. The range of detailed pollution projected addressed will span the continuum from geographically localized environmental degradation in industrial areas to more accurate transnational pollution estimates. The objective will be to deliver significant environmental assessment of the imposition of a great burden on local ecosystems due to highly concentrated industrialization. Using this empirical basis, the work will emphasize the identification, development and extension of techniques in the areas of environmental management, in order to build up best pollution control practices and applied research studies.

5.2 CONCLUSIONS

A large number of developing countries over the last two decades have introduced industrial environmental emission/discharge standards and at the same time, some form of inventory of industrial pollution emission as well as conducting ambient environmental quality monitoring program. However, it is generally recognised that developing countries lacked quantitative decision support tools in the formulation and implementation of pollution control measures necessary to abate environmental impacts associated with industrial development. Reliable and comprehensive simulation models are needed as basic tools for the quantification of industrial pollutant emission load, the assessment of their impacts on the environment as well as the evaluation of pollution control options. Indeed, as a result of limited resources, a large number of developing countries have little information on industrial emissions of air-borne and water-based pollutants, the costs of pollution abatement, and the environmental and health impacts of these various emissions. This lack of information makes it difficult in the prioritisation of actions, and the implementation of cost-effective intervention.

It does not follow that regulators in developing countries should refrain from acting. This research project shows that it is possible to use the computation modules available in DSS/IPC to estimate industrial pollution emissions for the industrial sector in Malaysia. Some of the results will undeniably provide new information to the environmental regulator. In this research dissertation, presentation of the applications of the DSS/IPC, identification of pollution intensive industries and assessment of the pollution load have been enumerated in the respective chapter.

The purpose of such industrial pollution projection is not to supplement proper monitoring activities of pollution sources. These activities are utterly desirable and necessary. Its purpose is, in absence of such activities, to provide the regulator with information that can be used to prioritise its monitoring efforts and as decision supports in the planning and implementation of pollution control measures.