

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS



5.1 Preamble

This chapter concludes the study carried out for 2 phases; Phase 1: application pollution prevention technique to transportation sector to reduce air pollution emission, Phase 2: integration of transport and vehicle model for simulation of air pollutant emission. However, there are some study limitations, the recommendations to overcome such limitations are stated for future studies.

5.2 Study results

Study results are concluded as follows.

1) Pollution prevention technique derived from USEP and multi-criteria analysis with AHP and Fuzzy program could be applied through the step by step on process mapping, root cause analysis/priority problem, generating of alternative selection, and selecting the best solution for air pollution prevention.

- Process mapping was made through the input-process-output on the basis of travel from origin to destination using different types of vehicle.
- Interviewing of 40 peoples whose career involved in transportation and environment. The responses from this focus group indicated as 4 Ms, man, material, method and machine consisting of 20 items causing air pollution from transportation sector were the input to questionnaire to the next 20 experts.

- Interviewing the focus group of 20 experts whose career are relevant to transport and environment. Basing on 4 Ms approach and multi-criteria analysis with AHP and Fuzzy program, such causing air pollution items from the first focus group of 40 samples were assessed. Poor public transportation was ranked as the first causing problem as score of 0.512.
- Interviewing again with the same focus group of 20 experts, the alternative solutions for Poor public transportation were evaluated on the basis of impact on environment, implement, economic and people & public by AHP and fuzzy program. Four alternative solutions for poor public transport were ranked as respective sequence; implementing NGV bus and rerouting (0.551), increasing mass rapid transit network (0.452), increasing NGV bus rapid transit network (0.374) and improving fare structure of public transport (0.309).

2) Integrated transport and vehicle model (eBUAM and IVE) was used to simulate for selecting the alternative solution. With scenario simulation for implementing NGV bus and rerouting which scenario give the lower air pollution. NO_2 , CO and PM_{10}

3) Source reduction is the process that is frequently used in environmental issues while implementing the principle in the transport sector has not been attempted before. This study has used the principle in creating an integrated model to forecast the reduction in emissions in forecasted years for Bangkok. The study showed that the integrated model forecasted results that predict reduction in emissions should

suggested by solutions i.e. implementing NGV and rerouting buses of the existing services for efficiency be fostered.

Conclusively, the above mentioned reasons would bolster the hypothesis on application of pollution prevention and the integrated transport and vehicle model for air pollution prevention of transport sector. It suggests that it is tested positively to reduce the passenger car kilometer (PCU-km) which represented as a mobile source and reduce pollution by implementing NGV bus for using clean alternative fuel (Compress Natural Gas: CNG), and achieve dramatically Improvement of air emissions generated from transportation sector.

5.3 Recommendations of the study

The study found that the vehicular emissions can be reduced by promoting public transport. Coupled with this if there are studies that prove that a modal shift could be initiated if new transit friendly infrastructure is introduced, such studies would increase the viability of having sustainable modes of travel.

The study also recommends the local government to promote and implement NGV buses and also reroute the existing bus service for increased efficiency. Further the study also states that sole implementation of the above mentioned strategy would yield less benefits rather than compared to a comprehensive implementation of an integrated transport system.

5.4 Limitations of the study

Even though, this study topic states that "Air pollution prevention applications from transport sector by the integration of transport and vehicle emission mode; in urban area; case study Bangkok", on the whole of this study is not cover all every activities in transportation nor in environmental. Nevertheless, the study still holds valid for the purpose of decision marking in macro level. It also needs to be noted that the study was aimed at finding the major root cause for the raise in air pollutants in the transport sector in Bangkok city.

Further, the study used in-depth interviews to the experts for gathering the perception of each expert in the field of transportation and environmental. The experts are also active members in the government related agencies. One can debate on the selection of the experts; hence this can be cited as a limitation of the study. The study justifies selecting the experts because they hold high profile job in the respective organizations and are also instrumental in influencing the country's policies. This study visualizes that knowing the perception of these experts is very crucial for any study that will address the cause of air emissions in transportation and also the solution ways of reducing that air emissions.

It also needs to be noted that it is very difficult to find out the technical aspects of each vehicle such as the exactly millage of travel, the age of vehicle, the engine model, the fact of Inspection and Maintenance schedule, etc,. Some of the above mentioned limitation of the study is an opportunity for the future research.

5.5 Further study

The study provides opportunity for further research in identifying another root-cause in transport sector, which when studied could increase the efficiency of the sector as a whole and lead it towards a sustainable path.

Some of the future studies could focus on topics such as congestion reduction, and fuel switching to more sustainable sources.

And Further study, should be up date and develop all parameters both in transport model and environmental model to be the most present data such as driving cycle, vehicle technology, etc, because all these data are important for output of the analysis to be the most realistic.

In fact, the input parameters have to up to date nearly every year if possible and have enough time and budget because assessing the driving cycle in laboratory test are very costly and time consuming.

Moreover, it should be more clarify in every each activity in the mapping processes such as the energy consuming for the input processes and the emission from each activities.

5.6 Conclusion

This study discusses the cause of air emissions at the main activity of transportation sector. The results of the study are introduced the practical idea to reduce and control levels of air emissions from transportation sector in Thailand. The driving force of this research is to use source reduction for reduce air emissions from transportation sector in Thailand. Finally, the paper proposes possible solutions such as 4 high potential solutions viz., promoting use of NGV bus and rerouting existing services as the most effective countermeasure to minimizing air emissions, and potentially least expensive, when compared with other solutions for prevent pollutants from transportation sector in Thailand.

Moreover, this study supported the tool for analysing air pollution from transportation sector by combining pollution prevention, transport, vehicle emissions and Geographic Information System (GIS) techniques that used to deal with air pollution prevention in urban city.

Finally, the suggestion of further study should be conducted focussing on the suitable solutions that creates less pollution and more environmentally friendly. However, a study on implementing NGV bus service and rerouting the existing bus service might not be successful if it is not integrated with other strategic solutions such as alternative fuel, transportation planning and vehicle standard & technology. Furthermore, the concrete support from government is most crucial.