

RESEARCH PROGRESS/ *NOTA PENYELIDIKAN*Urban Traffic Changes and CO<sub>2</sub> Generation In Small Cities:  
The Case Study of Seremban And Nilai

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## INTRODUCTION

Urbanization is part of the development process, which is experienced by all cities in the world. The Expansion of urban areas is in response to increasing number of population and economic activities being established. Rapid urbanization also promotes increasing traffic volume into and through the city. Transportation systems play an important role in the urbanization process, and become a part of important drivers to ensure the sustainability of city. However traffic flow in and through city leads to negative impact on the environment and human health. The transportation sector has been estimated to account for 33 percent of the carbon emissions in the United States (US-EPA, 2007; Southworth et. al., 2008). The United Nations estimated that over 600 million people in urban areas worldwide were exposed to dangerous levels of traffic-generated air pollutants (Cacciola et al., 2002). The risk of these pollutants to human health and environment has been reported; Armstrong et. al. (2004) found that several polycyclic aromatic hydrocarbons (PAH) are causing concern since the hydrocarbon has relatively high carcinogenic potency. PAH is a mixture of chemical species arising from a variety of combustion processes, with road traffic in urban areas being a major source. Carbon dioxide (CO<sub>2</sub>) has negative effect on the earth atmosphere. Increasing CO<sub>2</sub> in the atmosphere has a significant link to increasing of global temperature. CO<sub>2</sub> is the most important anthropogenic green house gaseous (GHG). Its annual emissions grew by about 80% between 1970 and 2004 (IPCC, 2007). Along with other gases released by human activities, it has created greenhouse effect on the atmosphere contributes to global warming. The effect of CO<sub>2</sub> on earth surface and atmospheric temperature was calculated by Swedish chemist Svante Arrhenius (1859 – 1927) (Berger, 2008). It is important to understand the implication of pollution generated by the transportation sector. This will help to determine action plan to minimize the impacts of pollution generated. The development of city is dynamic and will continue in the future hence the transportation sector will serve as one of the important drivers for the development process. Therefore it is important that the transportation sector is managed in a sustainable manner to reduce the impacts on the environment and human health.

## Urbanization in Seremban and Nilai City

Malaysia as in other developing countries is experiencing rapid urbanization process mainly after World War Two and urban growth accelerated after Independence from Britain in 1957. Many small towns in Malaysia have been upgraded to city status since then, especially the capital of each state. However there are also other small towns that have been identified for industrial development, experience rapid development. In this study, two towns were analysed, Seremban and Nilai in the state of Negeri Sembilan. Seremban is the capital town of the state of Negeri Sembilan while Nilai is a small town identified as new township for manufacturing industry (Figure 1). With the expansion of these two towns in the past two decades, its traffic volume also has shown increasing trends.

The key drivers of the increasing traffic volume in these two towns are the rapid development of its economic activities and increasing population. Manufacturing industry, wholesaling and retailing are the key economic activities driving the development process for both townships. With such development, demographic change is evidence shown an increase from 1980 to 2000, from 202,790 to 397,185 people with an annual growth rate increasing from 2.38% to 5.84% within this period (Statistic Department Malaysia, 2000). Its location also promotes its development; both townships are located close to Kuala Lumpur international airport and the main harbour, the Port Klang and West Port. The vibrancy of Seremban and Nilai city increase the movement of vehicles and people in these two towns.

## Trends of Urban Traffic

Rapid development experienced by Seremban and Nilai propels increasing traffic flows into and out of the towns to support its social and economic activities. Available data were combined to illustrate traffic flows for both towns. The trends of the traffic flows are shown as a total vehicular of traffics. The analyses show that the total vehicles move into and out of Seremban and Nilai are increasing. The vehicle number increased from 95,977 vehicles in 1991 to 268,103 in 2006 (Figure 2). Estimation of CO<sub>2</sub> emission generated by the vehicles was conducted for the period of 1991 to 2006. The estimation results show that the CO<sub>2</sub> generated increased from 1,742 metric ton in 1992 to 4,219 metric ton in 2006 (Figure 3).

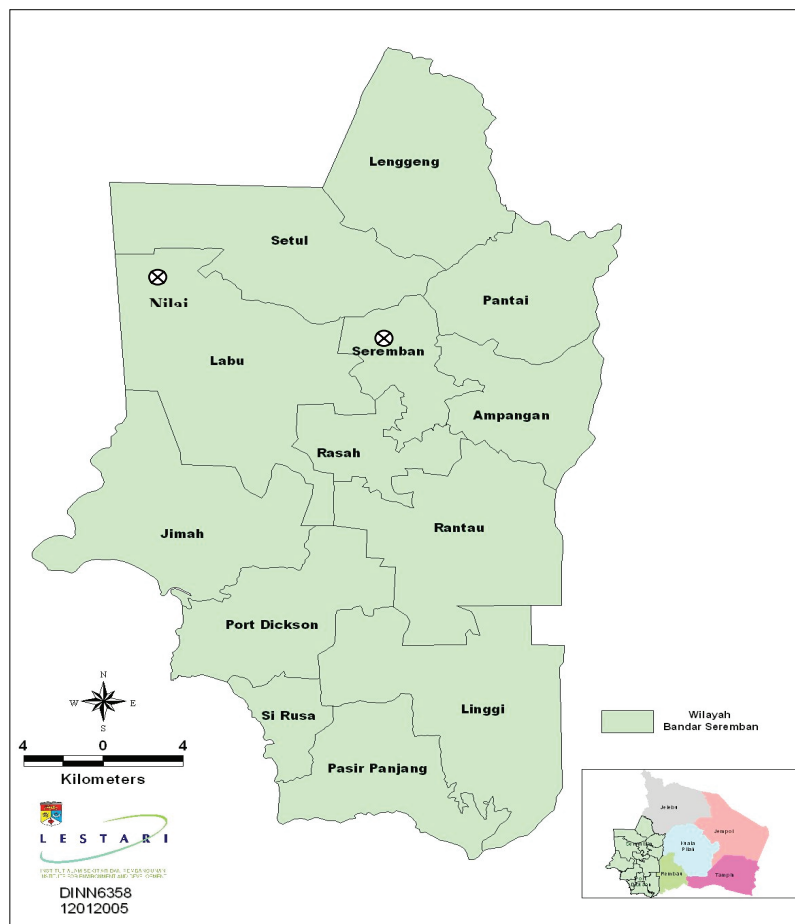


Figure 1: Seremban Region, of Negeri Sembilan.

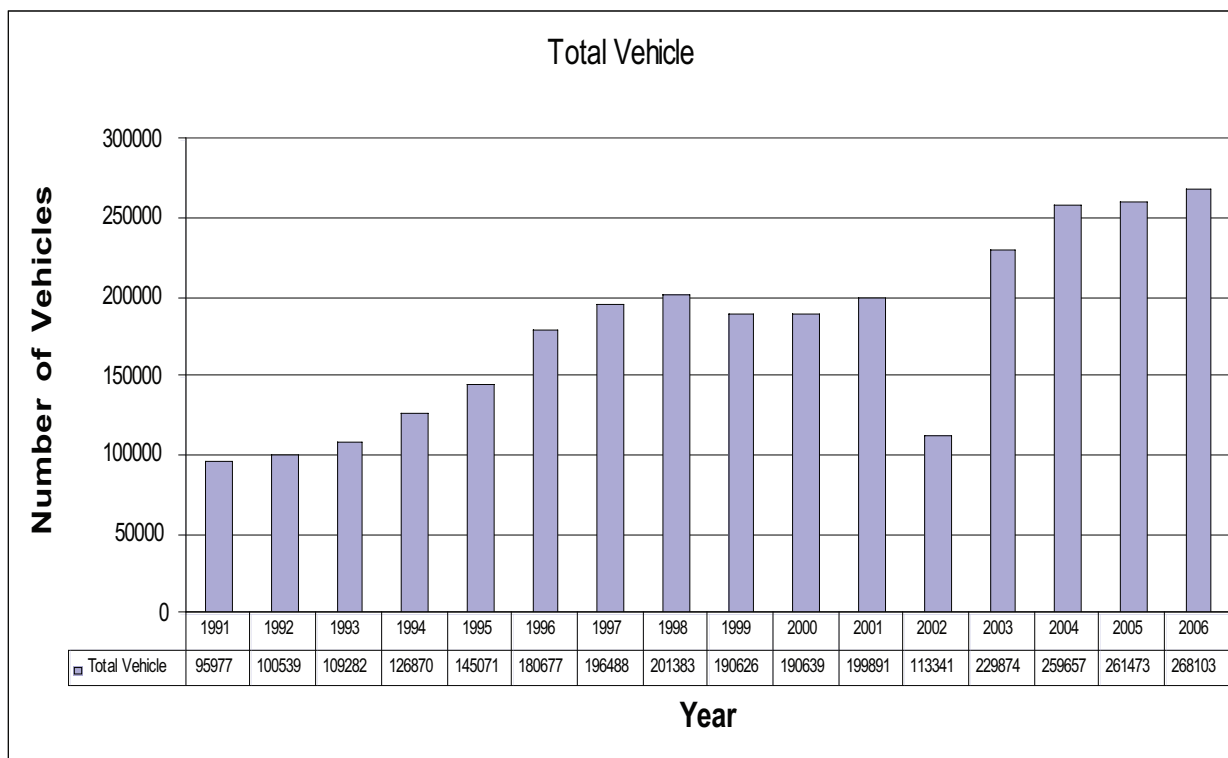


Figure 2: Total vehicle for Seremban and Nilai

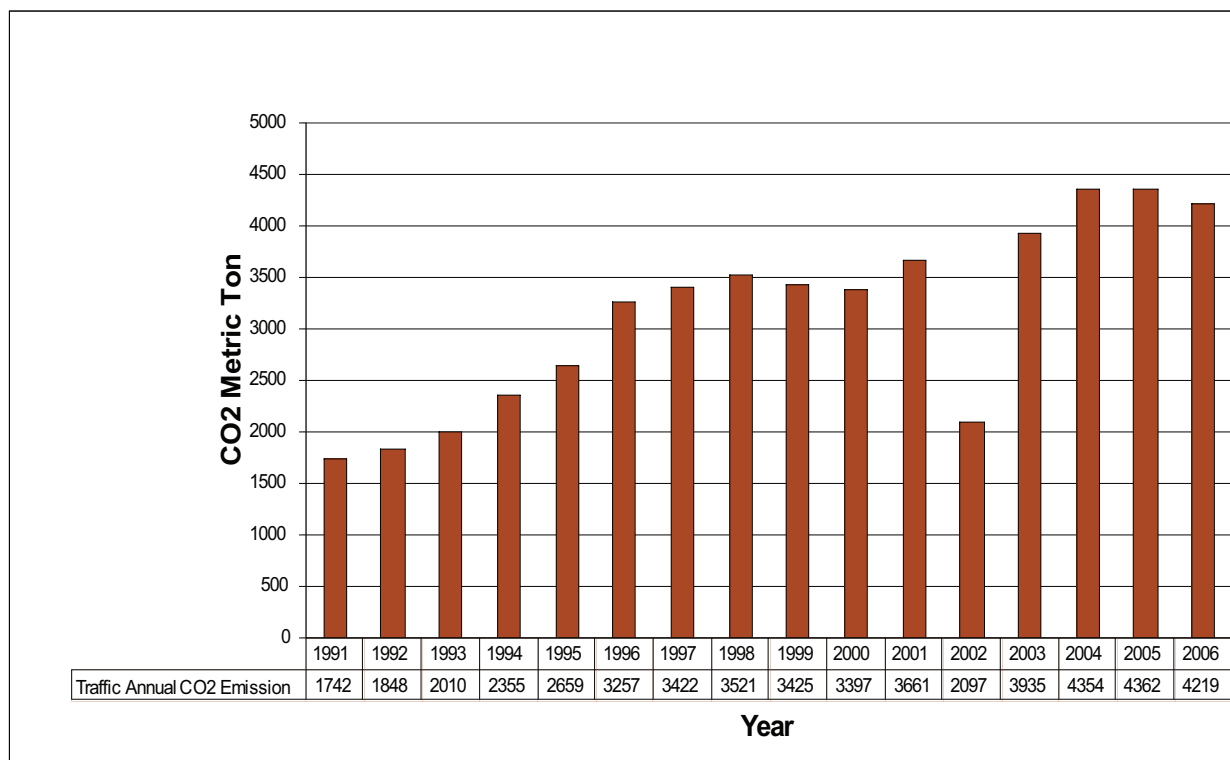


Figure 3: Estimated CO2 emission by vehicles in Seremban and Nilai

### MANAGING URBAN TRAFFIC AND AIR QUALITY IN SEREMBAN AND NILAI CITY

Managing traffic and mobile source of air pollution becomes an important activity for developing cities. It is important to have a regulated mechanism in managing traffic and mobile sources of air pollution. Malaysia is one of the countries in Asia that has started to address the emission of air pollutants from mobile sources. The regulation to tackle these issues has been enacted in 1977. The Motor Vehicle (Control of Smoke and Gas Emissions) Rules part of the Road Traffic Ordinance of 1958, and this enables the control of excessive black smoke emitted from diesel vehicles (Heng 2002). The development of legislative mechanism then includes the need to regulate both petrol and diesel vehicles. The Environmental Quality (Control of Emission from Diesel Engines) Regulation of 1st September 1996 and the Environmental Quality (Control of Emission from Petrol Engines) Regulation of 1st November 1996 were introduced to manage vehicles emission. In supporting the enforcement of these regulations, Malaysia has adopted Euro 1 emissions standards for new light-duty vehicles in 1997 and has adopted Euro 2 standards for gasoline vehicles in 2000. The authorities introduced Euro 2 standards for diesel vehicles and Euro 3 standards for gasoline vehicles in the 1st quarter of 2007. The Malaysian Government also planned of adopting Euro 4 standards by 2009 (JAMA 2006).

There is a need to manage traffic flow and to reduce traffic congestion especially during peak hours. The emission of air pollutants increases during traffic congestion and high number of vehicles on the road (Han and Naehar, 2006). There are actions that could be implemented to reduce total vehicles on the road. Increasing number and use of public transport will help to reduce the number of individual vehicles on the road. The initiatives have been identified. The Ninth Malaysia Plan (2006–2010) includes urban transportation strategies focusing on the development of an integrated, efficient, and reliable public transport system to encourage a modal shift from using private vehicles to public transport, particularly in the Klang Valley (EPU 2006). However this strategy will not include Seremban and Nilai towns. The current situation of public transportation used in both townships does not show any critical problems as both towns have a good public transportation system. Its road network and the number of public buses and taxis are found adequate for the local community. Both towns are also connected to Kuala Lumpur with train commuter system, hence providing alternative mode for local and workers.

Seremban and Nilai towns administrators should also think of future public transport action plan. Since the populations of both towns are expected to increase, strategic planning is needed. Reducing traffic congestion requires planning of traffic flow

to encompass the need for space and time suitable for increasing vehicles number. Efficiency of public transport need to be enhanced and should be environmental friendly. Use of vehicles that is able to reduce air pollutants should be encouraged in supporting the use of fuel efficiency technology. These vehicles include those using NGV, hydrogen fuel, bio-diesel and electric power. The planning of the urban areas also should consider the ecosystem approach. There are plants that have the capability to absorb many types of air pollutants, mainly the CO and CO<sub>2</sub> effectively.

## CONCLUSION

This findings of this show that there is a significant relationship between urban traffic and air pollution for both Seremban and Nilai townships. However the pollution condition trends show no critical incidents where air pollution becomes important issues for them. This is due to unavailability of other analyses such as comfort level and health. Moreover, no study has been conducted to understand what the level of acceptance for traffic volume is and its emission to the city air space. Therefore management for better traffic needs to determine the flow and carrying capacity of city for its traffic volume is badly needed.

The estimation of CO<sub>2</sub> emission findings could not be concluded here yet until a comparative analysis with other cities with similar characteristics is done in Malaysia. CO<sub>2</sub> emission study needs to be done for cities in Malaysia and other cities in tropical countries. Comparative studies are important to determine the kind of action needed to manage traffic volumes in cities in a sustainable manner. There are also need to conduct study on other vehicles pollutants such as VOCs, PAHs, Hence this study would like to suggest further study on other cities in Malaysia to understand better the impacts of urban traffic to air quality, environment and human health.

## Acknowledgement

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