Potential futures for road-transportation CO$_2$ emissions in the Asia-Pacific

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Presentation Outline

• Background;

• 3 Research questions;

• Current trends in road transportation CO$_2$ emissions in the region;

• Selected driving forces of change;

• Which way for the lower-income economies?

• Conclusion
This paper is one in a series of explorations of the comparative transportation CO$_2$ emission trends;

It focuses on the Asia-Pacific (17 economies) and on road CO$_2$ emissions (from gasoline and diesel consumption);

Data and methodology are explained in Marcotullio, Williams and Marshall, 2005. (note: data from 1960/71 to 2000).
Research questions

• (1) Do patterns of road-transportation CO$_2$ emissions differ from the historical patterns of developed countries and amongst economies within the Asia Pacific region? If so, how?

• (2) What are the differences in driving forces influencing these emission trends?

• (3) Based on the characteristics of the driving forces associated with different patterns amongst countries in the region, what road-transportation CO$_2$ emission trends might we expect in the large, lower-income Asia Pacific economies?
Research question 1: Current trends

• Road transportation CO$_2$ emissions from Asia Pacific economies differ from the historical experience from the now developed world, when compared across similar GDP per capita ranges (PPP);

• Within the Asia Pacific there are observable differences between economies, such that they form three basic patterns (low-Group A; medium-Group B; and high-Group C)

• Patterns for the lower-income economies (Indonesia, the Philippines, and Vietnam) within the region seem to be moving towards Group C. China’s trends are similar to Group B.
Figure 1: Road carbon dioxide emissions per capita by GDP per capita, USA and selected Asian economies

Source: Marcotullio and Williams, forthcoming
Figure 2: Road carbon dioxide emissions per capita by GDP per capita, USA and selected developed economies

Source: Marcotullio 2006
Simplified chart of comparative developed economy trends with shaded area between the Netherlands and Australian curves.
Group A – low emitters

Figure 3a
Group B – medium emitters

Figure 3b
Group C – high emitters

Figure 3c

- Malaysia
- Thailand
Lower-income economies

Figure 3d
Figure 4: Comparison of road CO2 emissions by GDP; Group C, Group B and Low-Income Asia Pacific countries

GDP per capita (1990 G-K$)

Road carbon dioxide emissions (kg per capita)
Research question 2: Patterns in driving forces of change

• A number of direct and indirect forces impact the consumption and use of motor vehicles. We chose to examine: socio-demographic (pop growth rate and structure, national density and urbanization level); economic (income level and growth rate, automobile and land consumption); institutions and policies (land and transport planning, consumption restrictions, fuel taxes, etc); technology innovation and adoption (engines and fuels); infrastructure (transit and road development);

• Some driving forces are similar across economies and others differ between groups;
General findings: similarities

All economies have experienced rapid population increases, population aging, urbanization (although they are at different stages);

Group A currently has the slowest population and urbanization and economic growth. Populations are aging quickly and they have the lowest percentage of young people;

Group C currently has the highest population, urbanization and economic growth. Populations are also aging rapidly, but they are the highest share of young people.
Differences exist in timing of these changes, densities, institutions and policies and infrastructure; Group A’s rapid socio-demographic changes occurred first, followed by Group B, then Group C; Group A includes the highest densities; Group A have demonstrated attempts to develop integrated land use and transportation policies, which is evident in their urban structures. They also implemented vehicle restriction, fuel taxes and other policies that seemingly reduced automobile consumption. Less evident in the other groups.
Group A’s emphasized infrastructure, including both road and transit (rail, subway, light rail). Group B also emphasized transit, but to a lesser extent. Group C have prioritized road infrastructure development. Members of Group A, and all those of Group B and C have not kept up with road infrastructure demand creating an “infrastructure bottleneck.”
Figure 7: Road carbon dioxide emissions per capita by surfaced road length

Source: Marcotullio and Williams 2006
Research question 3: Future for low-income economies

• Given the distinctions between the drivers of the different groups, the lower-income economy road transportation CO$_2$ emissions driving forces are most similar to those of Group C (although there are some important differences).
Conclusion 1

• Given the selected sample of Asia Pacific economies, three different road-transportation paths emerge. One pathway, represents a low emission model for others to follow;

• Following this pathway will not be easy for the lower income economies, as there are both structural and policy differences between them and Group A. Lower-income economy trends driving forces are most similar to those of Group C;
Conclusion 2

• The path of the lower-income group, which given the size their populations will determine the fate of the region, however, is NOT “path dependent” in any direction and there are many positive signs that they can reduce their emissions;

• Much will depend upon whether they can promote transit, restrictive automobile consumption and usage, implement land use and integrated transportation planning, and are successful at adopting new engine and fuel technologies, among other changes.
The End

Thank you for your attention

Please email comments and questions to:
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