Symposium “Towards Low-Carbon Society in Asia”

February 22, 2011

Panelist

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1. Necessity for Low-Carbon Transport Systems in Asia

It is likely that growth in global CO_2 emissions will be caused mostly by Asian developing countries for coming decades. The growth from the transport sector is specially expected to be larger than the growth from the other sectors and, thus, it is an important issue to design measures to calm the growth and implement them. The amounts of CO_2 emissions from the transport sector depend on levels of motorization. A new transport system is required to decouple growth in CO_2 emissions from economic growth in order to realize “sustainable transport” in Asian developing countries.

On the other hand, existing transport policies in Asian developing countries have hardly taken such a new transport system into account. Many of them have been engaged with a palliative approach by constructing roads to reduce traffic congestion caused by growing motorization. This approach would rather induce more car traffic in the long term and consequently more CO_2 emissions. Developed countries have experienced this error, which is being repeated by developing countries. Accordingly, it is important to specifically propose desirable transport and urban systems with a backcasting approach so as to realize Asian low-carbon society in 2050. Particularly, measures to achieve it in a leap-frog manner need to be identified, considering development timing, technology advancement and potential local transport systems.

2. Early Railway Development and Urban Compaction

The level of motorization is significantly affected by availability of alternative transport modes to cars in a city. In Japan, cities with early railway development tend to have lower car ownership. However, many of Asian cities have prioritized road development over railway development for tackling growing motorization. This growth in motorization causes more urban sprawl, which accelerates further motorization leading to car-dependent cities. As the experience in Japan suggests, early railway development potentially calms urban sprawl and motorization growth in Asian cities. Our analysis has estimated motorization growth and consequent CO_2 emissions with time-series data at a city level, considering the influences from the levels of railway development and road development. This estimation showed that early railway development is more effective in Beijing, Shanghai, Deli and Bangkok (Fig 1).

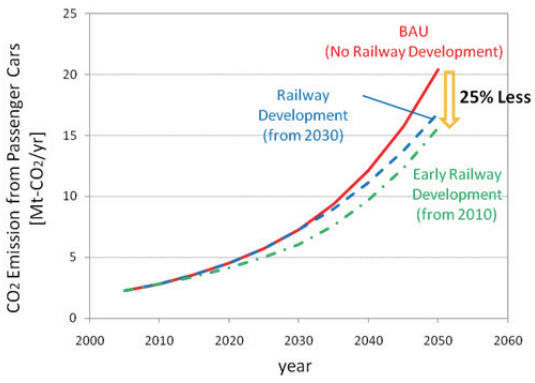

Fig 1. Estimated CO_2 Emissions by Development Timing of Railway in Shanghai

According to the result, early railway development starting from 2010 can reduce CO_2 emissions from passenger cars by 25% than a BAU case without new railway development. The reduction is higher in the early development than in railway development starting from 2030, despite the same level of railway supply in 2050.

As the control of urban sprawl calms motorization growth in the long term, urban compaction to concentrate urban activities can contribute to developing a low-carbon transport system. Urban structure of Asian cities has been changed a lot by their raid economic growth, which causes serious environmental impacts. Earlier development of sustainable urban structure is more effective for Asian cities because the change in urban structure lasts long and development cost rises due to their economic growth. Among various types of urban compaction, the most effective combination between urban structure and a transport system needs to be identified (Fig 2). Our analysis has designed scenarios of different urban structure to test their impacts on an effective low-carbon transport system.

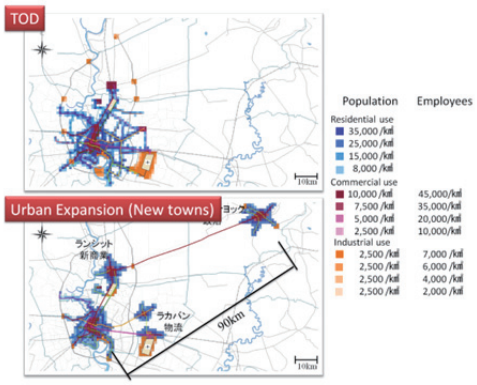

Fig 2. Scenarios of Urban Structure in Bangkok

3. Advancements in Technology and Transport Systems

A low-carbon transport system is expected to introduce more advanced technology and transport systems in the future. Our analysis has estimated CO_2 emissions from passenger cars in 2050, using the emission per unit based on prospective HV/EV technology advancements. The estimation showed that it is possible to reduce the emission by 40% from a BAU case in Japan and by 75% at maximum in China.

Bus Rapid Transit (BRT) can play a role of a new option for public transport in a low-carbon system. The level of CO_2 emissions from BRT depends mainly on construction and maintenance of vehicles and facilities, passenger demand and vehicles running performance. By applying Life Cycle Assessment (LCA) and travel demand estimation, our analysis found that, in Bangkok, most of the emission from BRT is derived from vehicles running performance and the emission from public transport can be reduced by replacing 50% of existing bus services with BRT.

4. Low-Carbon Management in Air Transport

Changes in plane size can contribute to reducing CO_2 emissions from air transport. According to our calculation of CO_2 emissions by airline based on flight patterns in 2008, the total emission from all the international airlines in Japan, China and Korea amounts to approximate 4.35 million ton. Considering changes in demand of air passengers in 2020, future changes in the emission have been estimated with the Grey prediction model. The result showed increases in the demand by 167% and in the emission by 113% from 2008 to 2020. The estimated emission is reduced by 0.04 million ton by changing plane size from a big plane to a middle-sized one and by 0.18 million to by changing to a small one.

5. Asian Low-Carbon Transport Management

Effective low-carbon transport systems can be achieved not only by developing new vehicles, facilities and infrastructure, but also by changing individuals' travel behavior. Our analysis has estimated less CO_2 emissions by 75% by travelling with paratransit and public transport in combination than by travelling only by car. In order to encourage the combined mode, it is necessary to capture usage patterns of motor cycles, motor-cycled taxies, three-wheeled taxies and other intermediate public transport modes particular to each Asian city. In designing a new transport system in Asian cities, differences of their usage patterns by socio-economic status and changes in travel patterns from income growth need to be considered.