Behavior-Based Transportation Greenhouse Gas Mitigation Under the Clean Development Mechanism

Transport-Efficient Development in Nanchang, China

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This paper proposes a methodology, consistent with the Kyoto Protocol's clean development mechanism (CDM), to quantify the greenhouse gas (GHG) emission reduction benefits of transport-efficient development (TED). TED aims to reduce transportation GHGs by changing urban development patterns. The Nanchang Transit-Oriented Development project in China is used to demonstrate the methodology and the possibilities for bringing such projects into the carbon market. The case illustrates the challenges of using the CDM to reduce transportation GHG emissions via TED. The proposed analytical approach, utilizing a control group, encounters difficulties with geographical control, the reliability of the statistical techniques, and challenges to calculating emissions "leakage." These methodological difficulties also affect financial viability because of high monitoring costs and high project risks. Ultimately, the CDM executive board rejected the proposed methodology, suggesting limited possibilities for utilizing today's carbon market to alter developing countries' urban transportation GHG growth trajectories.

Transportation currently accounts for one-quarter of the world's energy-related carbon dioxide (CO_2) emissions and is expected to be the most rapidly growing source of these emissions over the next 30 years. The developing world will account for the largest share of this growth, increasing by a forecast 3.5% to 5.3% per year, compared with 1.2% to 1.4% in Organisation for Economic Co-operation and Development (OECD) countries. Given these forecasts, the developing world will shift from accounting for 35% of world transportation greenhouse gas (GHG) emissions in 2000 to 52% to 63% by 2030 (*1*).

Modifying these emission growth trajectories will likely require a suite of technology, policy, and pricing approaches focusing on both passenger and freight transportation at the urban and interurban levels. In the short to medium term, technological fixes alone will most likely not provide the hoped-for "silver bullet." Heywood et al. provide a sense of the challenges; their assessment of plausible vehicle technological improvements in the U.S. private passenger vehicle market leads them to the conclusion that technology and demand management options—that is, behaviorally based interventions—together will be required (*2*).

In this context, passenger transport cannot be ignored. Personal mobility consumes roughly two-thirds of transportation energy today, a share expected to remain fairly stable over the next 50 years (*3*). Nor can the developing world's metropolitan areas be ignored, where population will double by 2030, representing 95% of net global population growth (*4*). Changing passenger travel behavior in the developing world's urban areas may be crucial to reducing transport GHG emissions.

Perhaps no developing country better represents the challenges and opportunities for reducing urban transportation GHG emissions than China. The country is undergoing a major transition of rapid and intense urbanization, coupled with sustained economic growth and changes in consumer behavior (with respect to residential space, for example) and industrial and economic activity. China already has more than 100 cities with 1 million or more persons, yet just 40% of its total population currently lives in urban areas. This share will increase to 60% by 2030 (*4*). At the same time, motorization continues apace. Already the world's fourth-largest automobile producer and third-largest consumer, China has recorded increases in car sales of 70% per year this decade.

These forces—combined with economic reforms and fiscal decentralization—are dramatically transforming China's urban landscape. Although necessary as cities modernize and business and residential space demands increase, these transformations raise a key question: How can we capitalize on the dynamism of urban China to create more energy-efficient, less carbon-intensive cities in the long run? Integrated policies that target changes in travel behavior along with technological improvements will help (*5*). But to what degree can alternative urban development patterns induce lower carbon travel behavior in urban China? And can the current carbon market, specifically, the Kyoto Protocol's clean development mechanism (CDM), play a meaningful role in generating such changes? To help answer these questions, a methodology is outlined for quantifying the transportation GHG reduction benefits of an urban land development project, illustrated with a project in Nanchang, China.

POTENTIAL ROLE OF THE BUILT ENVIRONMENT

Interest in modifying urban development patterns to influence transportation behavior, energy consumption, and emissions has a long history. Urban simulation models of "hypothetical cities"

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