Summary of the February 2010 Forum
Center for BioEnergy Sustainability (CEBS)
Shrinking the Carbon Footprints of Metropolitan America

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Historically, there is a close correlation between carbon emissions and gross domestic product (GDP) with very few exceptions, like France. In comparison with other countries, the United States could do better in per capita carbon footprint. The aspirational goals of the American Clean Energy and Security Act will be a challenge to accomplish while maintaining the U.S. standard of living.

The 2005 data for carbon footprints of the 100 largest metropolitan areas were studied. In the United States, most greenhouse gases come from energy production for industrial (28%), transportation (33%), and building (39%) usage. This study focused on carbon from transportation and homes. Transportation refers to highway usage (cars, light trucks, and freight trucks). Homes refers only to emissions from fuels burned in the metropolitan area, not to remote power plants producing power for the metropolitan area. Included are space heating, water heating, lighting, and cooling.

The study found that large metropolitan areas offer a greater energy and carbon efficiency than does the nation as a whole. Large metropolitan areas are responsible for 76% of GDP, 65% of population, 56% of carbon emissions, and 12% of land area. The carbon footprint of the 100 largest metropolitan areas is 14% smaller than the U.S. average (not including industrial or commercial energy usage). Variation in carbon usage ranges from Honolulu at 1.356 tons of carbon per capita to Lexington, Ky., at 3.455. Most high-emitting metropolitan areas are east of the Mississippi River.

In the transportation sector, a National Academy of Sciences report found that more compact and more mixed-use development reduces vehicle-miles-traveled (VMT) energy consumption and greenhouse-gas emissions. Analysis of a range of residential density increases (often coupled with higher employment concentrations, significant public transit improvements, mixed land uses and other supportive demand measures) might suggest CO_2 emissions reductions in the range 1% to 7.7% by 2030, and 1.3% to 11 % by 2050. The current study found that metropolitan areas with large transport footprints tend to be those with high levels of freight transport. For truck travel, tons of CO_2 per million dollars in GMP falls off rapidly with the jobs per acre of developable land (employment density). The more money per capita, the more CO_2 emitted in transportation. [Only direct (tailpipe) emissions were considered; lifecycle analyses would also incorporate upstream (creation) and downstream (demolition and scrapping) emissions.]

The fuel mix and electricity prices are also important determinants of emissions. The more coal used for electrical generation, the more greenhouse gases are emitted. Pricing and climate affect fuel consumption. Electricity prices are the strongest predictors of residential carbon footprints.

The four primary factors influencing city-to-city differences in carbon footprint are per capita income, population density and compactness, modes of transport, and electricity supply.

In conclusion, the metropolitan area's role needs to be better characterized, international trends underscore the pace of urbanization, and better data are needed. Density is an index for a range of causes. It also spills over into the housing and industrial sectors from the transportation sector. In addition, rural areas emit a lot of carbon on behalf of the surrounding metropolitan areas.

Presentation Slides