An Economic and Life Cycle Analysis of Regional Land Use and Transportation Plans

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Travel and emissions models are commonly applied to evaluate the change in passenger and commercial travel and associated greenhouse gas (GHG) emissions from land use and transportation plans. Analyses conducted by the Sacramento Area Council of Governments predict a decline in such travel and emissions from their land use and transportation plan (the "Preferred Blueprint" or PRB scenario) relative to a "Business-As-Usual" scenario (BAU). However, the life cycle GHG effects due to changes in production and consumption associated with transportation and land use plans are rarely, if ever, conducted.

An earlier study conducted by the authors, applied a spatial economic model (Sacramento PECAS) to the PRB plan and found that lower labor, transport, and rental costs increased producer and consumer surplus and production and consumption relative to the BAU. Life cycle GHG emissions from these upstream economic activities may increase while those associated with the manufacture of construction materials for housing may decline due to a shift to smaller multi-family homes. To explore the net impact of these opposing GHG impacts, economic production and consumption data from the PRB and BAU scenarios, as simulated with the Sacramento PECAS model, are used in and input-output life cycle assessment model to estimate change in life cycle GHG emissions.

This study also builds on the findings from two previous studies, which suggest potential economic incentives for jurisdictional non-compliance with Sustainable Communities Strategies (SCSs) under Senate Bill 375 (also known as the "anti-sprawl" bill). SB 375 does not require local governments to adopt general plans that are consistent with the land use plans included in SCSs, and thus such incentives could jeopardize implementation of SCSs and achievement of GHG goals. In this study, a set of scenarios is simulated with the Sacramento PECAS model, in which multiple jurisdictions partially pursue the BAU at differing rates.

Study Methods

The 2035 build forms for the PRB and BAU were input into the Sacramento spatial economic model (PECAS) along with inputs from the Sacramento activity-based travel model (SACSIM). The outputs include forecasts of consumption and production activity within a comprehensive

set of economic sectors. The Economic Input-Output Life cycle Assessment Model (EIOLCA) was integrated with the outputs from the Sacramento PECAS PRB and BAU simulations.

Findings

The life cycle analysis showed that total CO_2e (carbon dioxide equivalent) would increase by 1,037,864 metric tons from upstream economic activities derived from consumption in the PRB scenario relative to the BAU over 25 years. However, a commensurate shift in construction from larger luxury to smaller single- and multi-family homes causes a reduction in upstream emissions that is estimated at a larger 2,165,959 metric tons.

The analysis of incentives and disincentives for SB 375 implementation indicate that when non-conformity increases the supply of larger luxury single family homes in non-complying jurisdictions, the average household experiences increased economic benefits, while, losses are incurred elsewhere. These benefits are large enough to offset the losses in complying jurisdictions. However, when non-conformity increases in both luxury and standard single family housing, then economic benefits decline for the average households in all jurisdictions. At this point, the more heavily weighted gains of the higher income households are not great enough to offset the losses of lower income classes.

Policy Recommendations

If the consumer preference for larger homes returns to levels observed prior to 2007, developers and jurisdictions may face significant economic incentives to increase the supply of luxury single family homes over and above that recommended in the regional land use and transportation plan. If this is at the expense of multi-family housing units, then low income households may face significant economic losses. If, however, the early evidence that consumer preferences are shifting in favor of smaller homes coupled with high quality local and regional accessibility, then the land use and transportation plans envisioned under SB 375 are more likely to match market demand and be implemented. More research is needed to understand the market preferences for housing in regional land use and transportation plans. Implementation of SB 375 should be carefully monitored as well as the regional supply of multi-family housing. Decision makers may find the results of monitoring very useful as they contemplate the need for future revisions to SB 375 over time.

About the Authors

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For more details about the study, download the full report at ***transweb.sjsu.edu/project/1008.html***

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