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Quantifying GHG Reductions from Land-use Policy Change

An Indirect Relationship

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- Modifying the physical environment (the so-called "5 Ds" or "8 Ds") to influence human behavior in ways that will lead to lower levels of emissions.

- Influenced not only by physical environment but also by:
  - Income
  - Employment
  - Age
  - Number of children
  - Personal preference

Photo from: www.pedbikeimages.org. Photographer Dan Burden.

Additional factors

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- The following are not land-use related but may influence how effective LU policies are at reducing greenhouse gas emissions:
  - Vehicle fuel mix
  - Vehicle and structural efficiency
  - Pavement
  - Congestion management strategies
  - Parking policies
  - Employer-based programs

General Approaches

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- Sketch planning tools, land-use models and analysis tools (often proprietary; often require training; different tools appropriate for different scales)

- Custom Models (beyond the scope of most local planners, require more data than is likely to be immediately available)

General Approaches

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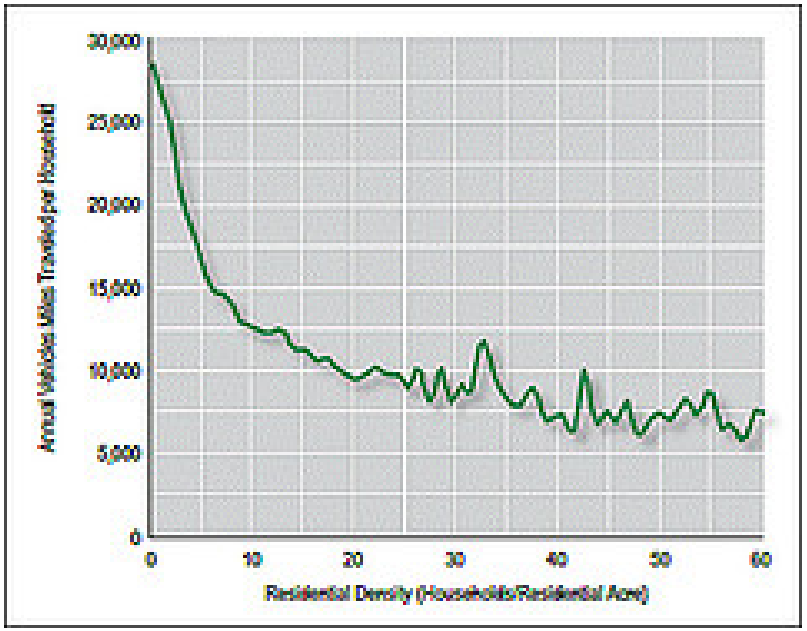
- Simple formulas (apply elasticities based on empirical research, observed correlations and analysis that suggests statistically significant influence)



Source: Center for Neighborhood Technology. Penny Wise Pound Foolish: New Measures of Housing + Transportation Affordability. 2010. http://www.cnt.org/repository/pwpf.pdf

Compilations of Tools

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- Cool California, Climate Calculators for Local Governments: http://coolcalifornia.org/article/climate-calculators
- Greenhouse GO Emissions Planning Tools Compared: http://greenhousego.net/?p=261
- Travel Forecasting Resource, Sketch Planning Tools: http://www.tfresource.org/Topics/Model_Application/Climate_Change_and_Green_House_Gas/Sketch_Planning_Tools_-_Climate_Change.aspx
- Greenhouse Gas Analysis Tools, developed by Fehr & Peers for the Department of Commerce State of Washington http://www.fehrandpeers.net/CoolConnections/wp-content/uploads/2009/12/ctedbooklet112309rev31.pdf

Sampling of tools available

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- Greenhouse GO (app for iPad) http://greenhousego.net/?page_id=19
- CCAP Transportation Emission Guidebook Emissions Calculator (Center for Clean Air Policy) http://www.ccap.org/safe/guidebook/guide_complete.html
- ICLEI's CAPPA tool http://www.icleiusa.org/tools/cappa
- Fehr & Peers - VMT Spreadsheet with Smart Growth Adjustments http://www.coolconnections.org/solutions/4ds/

Using elasticities

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- Many qualitative reviews and meta-analyses have been completed. (Ewing & Cervero 2010)

- Meta-analyses of studies that control for self-selection indicate there is a statistically significant impact of built environment on VMT (Cao 2008)

Xinyu (Jason) Cao, Patricia L. Mokhtarian & Susan L. Handy (2009): Examining the Impacts of Residential Self-Selection on Travel Behaviour: A Focus on Empirical Findings, Transport Reviews: A Transnational Transdisciplinary Journal, 29:3, 359-395. http://dx.doi.org/10.1080/01441640802539195

Reid Ewing & Robert Cervero (2010): Travel and the Built Environment, Journal of the American Planning Association, 76:3, 265-294. http://dx.doi.org/10.1080/01944361003766766

Elasticity of the 5 Ds

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- Density, Diversity, Design, Destination Accessibility, and Distance to Transit
- Ewing and Cervero's 2010 meta-analysis of more than 200 studies computed weighted average of elasticities for these variables.
- Results range from 0 to -0.22.
- Important to note that these are not predictive.

Reid Ewing & Robert Cervero (2010): Travel and the Built Environment, Journal of the American Planning Association, 76:3, 265-294.
http://dx.doi.org/10.1080/01944361003766766

Considerations

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- Level of detail needed. How detailed do you need to be.
- Existing data. Can you afford to collect data required?
- Available expertise.
- Local priorities. Does community support Smart Growth principles for reasons beyond reducing greenhouse gas emissions?

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Thank you.

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