

The Effect of Smart Growth Policies on Travel Demand

Developed through the second Strategic Highway Research Program (SHRP2), the Smart Growth Area Planning tool (SmartGAP) provides planners with scenario-forecasting tools that allow them to estimate smart growth strategies impact on peak-hour transportation, as well as its effects on sprawl, energy reduction, active travel, and carbon footprints.

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Overview of SmartGAP

The SmartGAP tool allows a user to test different scenarios for land use, population growth, and transportation strategies, and then evaluate their effects on several significant performance measures. SmartGAP tracks individual households and firms in a region to determine transportation impacts from growth. The tool has several advantages:

- Requires relatively low-resolution inputs,
- Is based on high quality science,
- Can handle complex interactions,
- Allows for a rapid configuration of scenarios,
- Provides numerous performance measures, and
- Is free, open-source, and user-friendly.

SmartGAP considers 13 built environment place types and features that address the complexity of land use and transportation interactions:

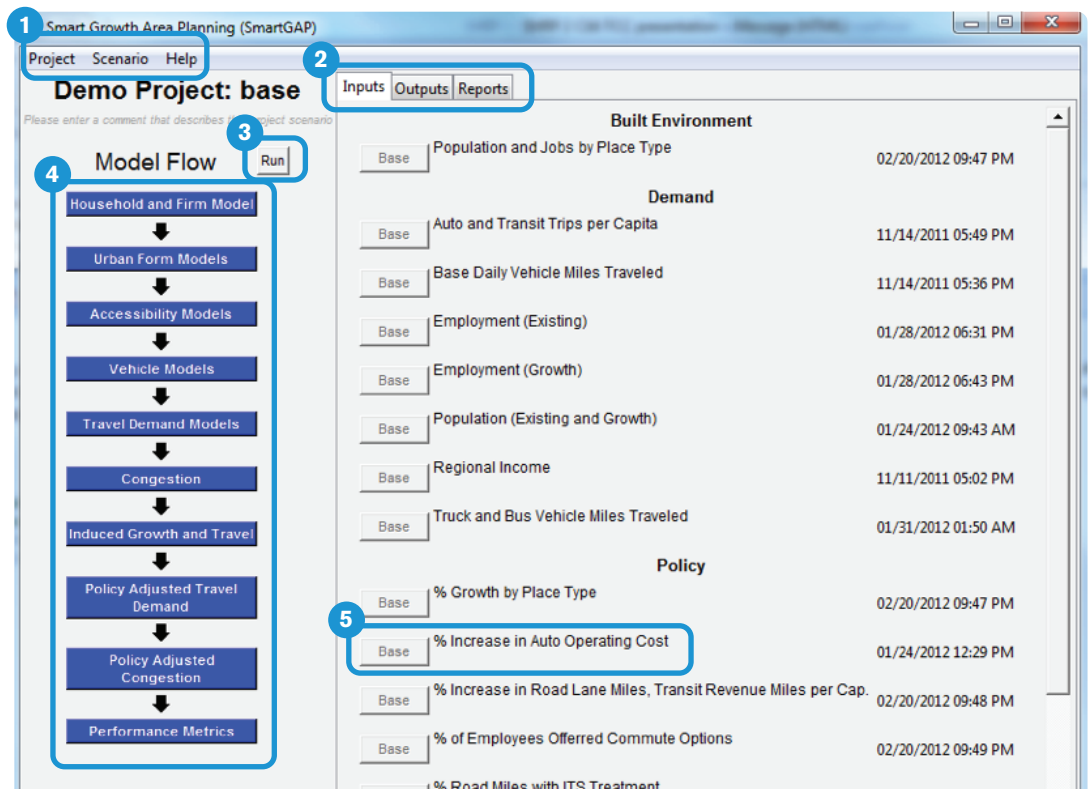
- *Congestion impacts* – Accounts for recurring and nonrecurring congestion on local streets, arterials and freeways as a function of smart growth, VMT from autos, trucks and buses.
- *Induced demand* – Forecasts the change in VMT for each household due to changes in urban form as well as the short and long term induced demand effects.
- *Transportation policies* – Forecasts the change in VMT for each household due to various transportation policies, such as pricing, intelligent transportation system strategies, and vanpool, telecommuting, ridesharing and transit pass subsidy programs.

Place Types for Households and Firms in SmartGAP

DEVELOPMENT TYPE	AREA TYPE			
	Urban Core	Close in Community	Suburban	Rural
Residential	✓	✓	✓	
Employment	✓	✓	✓	
Mixed Use	✓	✓	✓	
Transit Oriented Development	✓	✓	✓	
Rural/Greenfield				✓

SmartGAP Graphical User Interface

- 1 Drop down menus for project and scenario management and help
- 2 "Inputs", "Outputs", and
- 3 Run button executes complete model
- 4 "Model Flow" showing model components
- 5 Individual inputs that can be selected, edited and commented



The screenshot shows the SmartGAP software interface. On the left, a 'Model Flow' diagram shows a sequence of steps: Household and Firm Model, Urban Form Models, Accessibility Models, Vehicle Models, Travel Demand Models, Congestion, Induced Growth and Travel, Policy Adjusted Travel Demand, Policy Adjusted Congestion, and Performance Metrics. A 'Run' button is next to the 'Model Flow' section. On the right, the 'Inputs' section is visible, showing various parameters like 'Population and Jobs by Place Type', 'Auto and Transit Trips per Capita', 'Base Daily Vehicle Miles Traveled', 'Employment (Existing)', 'Employment (Growth)', 'Population (Existing and Growth)', 'Regional Income', 'Truck and Bus Vehicle Miles Traveled', and 'Policy' settings like '% Growth by Place Type', '% Increase in Auto Operating Cost', '% Increase in Road Lane Miles, Transit Revenue Miles per Cap.', '% of Employees Offered Commute Options', and '% Road Miles with ITS Treatment'. The interface includes a menu bar (Project, Scenario, Help) and a toolbar (Inputs, Outputs, Reports).

Performance Metrics

SmartGAP's performance measures are designed to address a variety of impacts useful for decision-making.

Direct Travel Impacts	(1) Daily Vehicle Miles Traveled, (2) Daily Vehicle Trips, (3) Daily Transit Trips, (4) Peak Travel Speed by Vehicle Type, (5) Vehicle Hours of Travel, and (6) Vehicle Hours of Delay.
Environment and Energy Impacts	(1) Fuel Consumption and (2) Greenhouse Gas Emissions.
Financial and Economic Impacts	(1) Regional Highway Infrastructure Costs, (2) Regional Transit Infrastructure, (3) Annual Traveler Cost (Fuel + Charges), and (4) Annual Transit Operating Costs.
Community Impacts	(1) Accident Rates, (2) Walking Percentage Increase, and (3) Job Accessibility by Income Group.
Local Impacts	Regional Accessibility.

The performance measures are reported in SmartGAP's output data files. The metrics can also be charted using the reporting tab in SmartGAP, which also includes the ability to compare the results across scenarios.

Pilot Tests

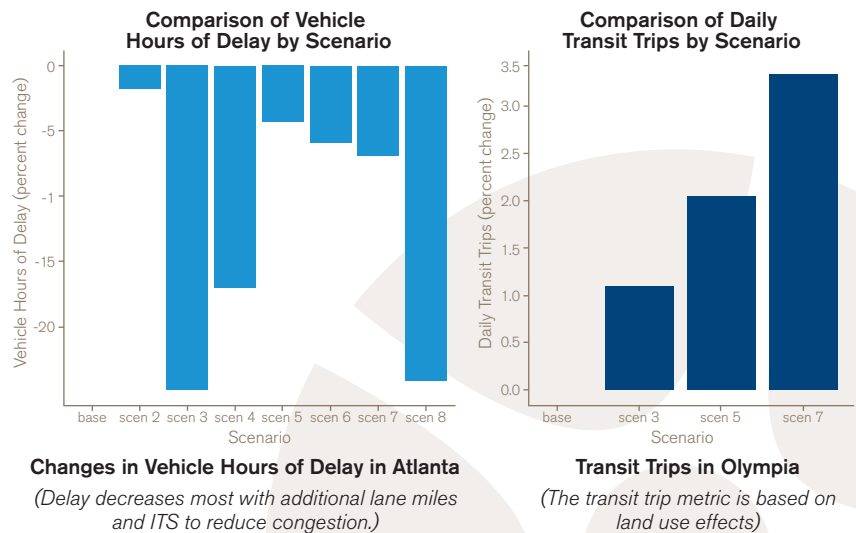
SmartGAP is a decision support tool for planners to test smart growth scenarios and evaluate their impact on travel demand. The software is designed to be accessible to land use and transportation planners with no modeling experience. In certain cases, the tool can be applied to supplement more sophisticated modeling methods.

The SmartGAP tool was piloted by the following planning agencies:

- Maryland Department of Transportation (MDOT): a State DOT-setting
- Atlanta Regional Commission (ARC): a large-MPO setting
- Thurston Regional Planning Commission (TRPC): a small/medium-MPO setting
- Portland Metro, Oregon: a test bed for debugging, reasonableness checking, etc.

Results from the pilot tests indicate that:

- Performance measure outputs were consistent with expectations,
- Installation and input file preparation were easy,
- Regional policy scenario testing is useful for: (a) smaller MPOs, local jurisdictions without advanced travel demand models, and (b) bigger MPOs, state agencies to pre-screen policy scenarios before undertaking extensive travel demand modeling, and
- Model run times are reasonable.



Distribution and Use of SmartGAP

- **SmartGAP software:** The tool is available on the SHRP 2 Web Site. For the final report, software, and user's guide visit: <http://www.trb.org/main/blurbs/168761.aspx>
- **R software:** SmartGAP was developed in R, an open source statistical software platform, and therefore must be installed on the user's computer prior to running the tool. R is available at: <http://cran.r-project.org/>
- **SmartGAP Installation:** Install the software by simply unzipping the file to a location on your computer's hard drive, e.g. c:\SmartGAP.

SmartGAP offers a reliable tool that transportation and land use planners can use to better understand how smart growth strategies will influence travel demand, the environment, the economy, and local communities. This capability reports smart growth benefits from induced travel and from both peak and off-peak travel.