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Smart Growth Area Planning Tool (SmartGAP)

Prepared for
New Partners for Smart Growth Conference

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Project Team

- RSG
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Agencies Implementing Pilot Tests

- Maryland Department of Transportation
- Atlanta Regional Commission
- Thurston Regional Planning Commission

Open Source Software Platform (GreenSTEP)

- Oregon Department of Transportation



Overview

Purpose

- Provide tools, methods, and resources to evaluate smart growth policies on travel demand

Objectives

- Understand critical decision points in the transportation planning process and how smart growth approaches affect demand for capacity
- Research the dynamics and inter-relationships of smart growth strategies with the performance of a transportation investment
- Identify range of features and capabilities that new tools need to represent
- Facilitate improved communication, interaction and partnerships between decision-makers and planners in transportation and land use arenas



Smart Growth Area Planning Tool (SmartGAP)

Software Tool Design

Developed for regional decision-makers of transportation and land use policies

Evaluates regional scenarios

- Built environment
- Travel demand
- Transportation supply
- Policies

Considers households and firms individually

Easy to use and freely distributed

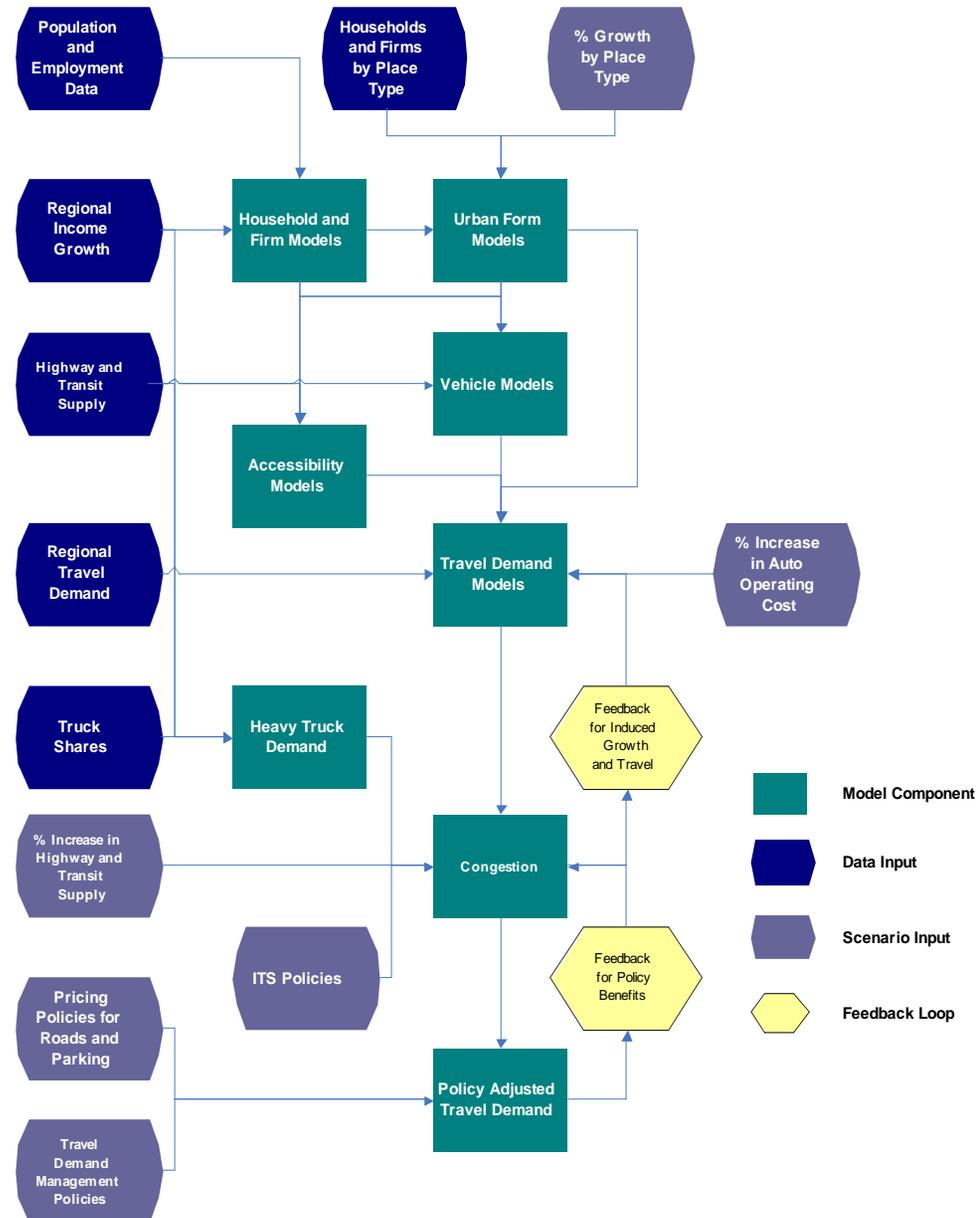
PLACE TYPES

Development Type	Area Type			
	Urban Core	Close in Community	Suburban	Rural
Residential	✓	✓	✓	
Employment	✓	✓	✓	
Mixed-Use	✓	✓	✓	
Transit Oriented Development	✓	✓	✓	
Rural/Greenfield				✓



SmartGAP Process

Evaluates transportation impacts of smart growth strategies



Interface

The screenshot displays the SmartGAP software interface. At the top, a menu bar includes 'Project', 'Scenario', and 'Help'. Below this, the main window title is 'Demo Project: base'. A secondary menu bar contains 'Inputs', 'Outputs', and 'Reports' tabs. On the left side, a 'Model Flow' section is highlighted with a red box, showing a vertical sequence of blue buttons: '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 located to the right of the 'Model Flow' section. The main workspace is divided into several sections: 'Built Environment' (with a 'Base' dropdown), 'Population (Existing and Growth)', 'Policy' (with a 'Base' dropdown), and 'Inputs' (with a 'Base' dropdown). A table on the right side of the interface lists various parameters and their values, such as '% Increase in Auto Operating Cost' and '% Increase in Road Lane Miles, Transit Revenue Miles per Cap.'. Callouts in green boxes provide additional information: one points to the 'Inputs', 'Outputs', and 'Reports' tabs, another to the 'Run' button, and a third to the 'Inputs' section. A red box highlights the 'Inputs' section, and a callout explains that individual inputs can be selected, edited, and commented.

76 Smart Growth Area Planning (SmartGAP)

Project Scenario Help

Demo Project: base

Please enter a comment that describes this project scenario

Built Environment

Model Flow

Run

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

Performance Metrics

Inputs Outputs Reports

“Inputs”, “Outputs”, and “Reports” tabs

Drop down menus for project and scenario management and help

Run button executes complete model

“Model Flow” showing model components

Individual inputs that can be selected, edited and commented

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Input Data for Base and Scenario Runs

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Project Scenario Help

Demo Project: base

Please enter a comment that describes this project scenario

Model Flow

```

    graph TD
      A[Household and Firm Model] --> B[Urban Form Models]
      B --> C[Accessibility Models]
      C --> D[Vehicle Models]
      D --> E[Travel Demand Models]
      E --> F[Congestion]
      F --> G[Induced Growth and Travel]
      G --> H[Policy Adjusted Travel Demand]
      H --> I[Policy Adjusted Congestion]
      I --> J[Performance Metrics]
    
```

Inputs **Outputs** **Reports**

Built Environment

Base	Population and Jobs by Place Type	02/20/2012 09:47 PM
Demand		
Base	Auto and Transit Trips per Capita	11/14/2011 05:49 PM
Base	Base Daily Vehicle Miles Traveled	11/14/2011 05:36 PM
Base	Employment (Existing)	01/28/2012 06:31 PM
Base	Employment (Growth)	01/28/2012 06:43 PM
Base	Population (Existing and Growth)	01/24/2012 09:43 AM
Base	Regional Income	11/11/2011 05:02 PM
Base	Truck and Bus Vehicle Miles Traveled	01/31/2012 01:50 AM
Policy		
Base	% Growth by Place Type	02/20/2012 09:47 PM
Base	% Increase in Auto Operating Cost	01/24/2012 12:29 PM
Base	% Increase in Road Lane Miles, Transit Revenue Miles per Cap.	02/20/2012 09:48 PM
Base	% of Employees Offered Commute Options	02/20/2012 09:49 PM
Base	% Road Miles with ITS Treatment	11/14/2011 05:39 PM
Base	Auto Operating Surcharge per VMT	01/24/2012 12:29 PM

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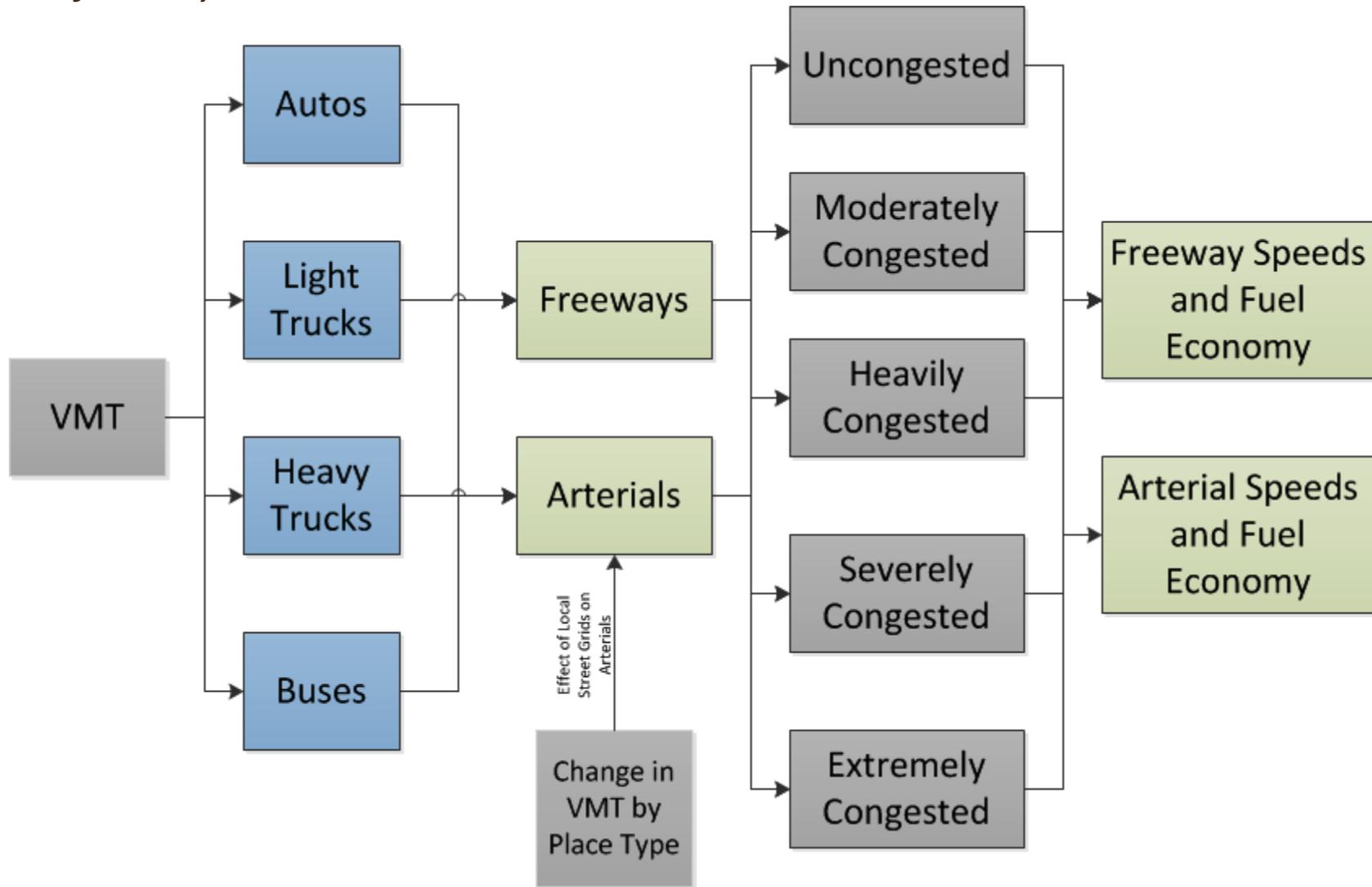
Performance Metrics (Model Outputs)

Inputs		Outputs	Reports
Community Impacts			
View	Export	Accident Rates	
View	Export	Job Accessibility by Income Group	
View	Export	Walking Percentage Increase	
Direct Travel Impacts			
View	Export	Daily Transit Trips	
View	Export	Daily Vehicle Miles Traveled	
View	Export	Daily Vehicle Trips	
View	Export	Peak Travel Speeds by Vehicle Type	
View	Export	Vehicle Hours of Delay	
View	Export	Vehicle Hours of Travel	
Environment and Energy Impacts			
View	Export	Fuel Consumption	
View	Export	Greenhouse Gas Emissions	
Financial and Economic Impacts			
View	Export	Annual Transit Operating Cost	
View	Export	Annual Traveler Cost (Fuel and Charges)	
View	Export	Regional Infrastructure Costs for Highway	
View	Export	Regional Infrastructure Costs for Transit	
Location Impacts			
View	Export	Regional Accessibility	



Congestion Impacts

Accounts for recurring and nonrecurring congestion on local streets, arterials and freeways

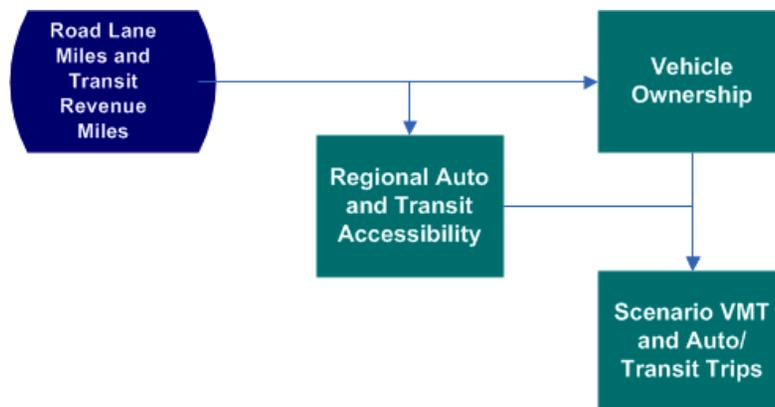


Induced Demand and Urban Form Effects on Travel

Predicts the change in VMT for each household due to changes in urban form and the short and long term induced demand effects of increases in transportation supply.

Primary Source:
Meta Analysis

Category	Urban Form Description	Elasticity for Change in VMT
Density	Household/Population Density	-0.04
Diversity	Land Use Mix (entropy)	-0.09
Design	Intersection/Street Density	-0.12
Distance to Transit	Distance to Nearest Transit Stop	-0.05



Primary Source:
GreenSTEP



Transportation Policies

Predicts the Change in VMT for each Household due to Transportation Policies

Primary Source:
GreenSTEP

Pricing Policies

- VMT charges (cents per mile)

	VMT Charge (Cents per Mile)									
	1	2	3	4	5	6	7	8	9	10
VMT Reduction	0.0%	0.2%	0.4%	0.6%	1.0%	1.3%	1.8%	2.3%	2.9%	3.6%

- Parking pricing based on
 - a) Percent of workplace and non-workplace parking that is priced
 - b) Parking rates per space

ITS strategies

- Percentage of freeways with ITS strategies
- Percentage of arterials with ITS strategies



Travel Demand Management Strategies

Predicts the Change in Work Trip VMT for each Household due to TDM

Primary Source:
CAPCOA

Vanpool Program	Percent VMT Reduction
Low Level of Participation	0.30%
Medium Level of Participation	6.85%
High Level of Participation	13.40%

Telecommuting	VMT Reduction based on Percent Employees Participating				
	1%	3%	5%	10%	25%
9/80 Schedule	0.07%	0.21%	0.35%	0.70%	1.75%
4/40 Schedule	0.15%	0.45%	0.70%	1.50%	3.75%
Telecommuting 1.5 days a week	0.22%	0.66%	1.10%	2.20%	5.50%



More on Travel Demand Management Strategies

Predicts the Change in Work Trip VMT for each Household due to TDM based on Development Settings

Primary Source:
CAPCOA

Ridesharing Program	Rural	Suburban	Close In Community	Urban Core
VMT Reduction for Work Trips	0%	5%	10%	15%

VMT Reduction for Work Trips				
Transit Pass Subsidy Level	Rural	Suburban	Close In Community	Urban Core
\$ 0.75	0%	2.0%	3.4%	6.2%
\$ 1.49	0%	3.3%	7.3%	12.9%
\$ 2.98	0%	7.9%	16.4%	20.0%
\$ 5.96	0%	20.0%	20.0%	20.0%



Model Reports

- Community Impacts
- Direct Travel Impacts
- Environment and Energy Impacts
- Financial and Economic Impacts
- Location Impacts
- Input Summaries

The screenshot shows a software interface with three tabs: 'Inputs', 'Outputs', and 'Reports'. The 'Reports' tab is selected. On the left, under 'Scenarios', there are checkboxes for 'base', 'scen2', 'scen3', 'scen4', 'scen5', 'scen6', 'scen7', and 'scen8'. The main area is divided into sections for different metric categories:

- Community Impacts:** Accidents (selected), Equity, Walking.
- Direct Travel Impacts:** TransitTrips, Dvmt, VehicleTrips, AveSpeed, DelayVehHr, VehHr.
- Environment and Energy Impacts:** Fuel, Emissions.
- Financial and Economic Impacts:** TransitOpCost, Costs, HighwayCost, TransitCapCost.
- Location Impacts:** Access.
- Summaries of Inputs:** Emp, Inc, Pop.

On the right, the 'Aggregation' section has radio buttons for 'All' (selected), 'Place Types', 'Area Types', 'Development Types', 'Vehicle Type', 'Accident Severity', and 'Income Group'. Below it, the 'Measure' section has radio buttons for 'Number' (selected), 'Percentage', 'Index (100)', and 'Index (0)'. At the bottom right, there are 'Plot' and 'Export ...' buttons.



Distribution and Use of SmartGAP

SmartGAP is delivered as a .zip file

- Install by simple unzipping to a location on your computer's hard drive, e.g. c:\SmartGAP
- Consists of text file scripts, csv file input files, and .Rdata binary files holding containing models

R is an open source statistical software platform

- SmartGAP runs in R so R must be installed on the computer
- SmartGAP uses several add in packages to R which it will download automatically the first time it is run
- R is available at: <http://cran.r-project.org/>



Summary and Breakout Groups



SmartGAP Summary

Use

- SmartGAP can evaluate smart growth policies on travel demand

Features

- Represents critical decision points in the transportation planning process and how smart growth approaches affect demand for capacity
- Includes the dynamics and inter-relationships of smart growth strategies with the performance of a transportation investment
- Facilitates improved communication, interaction and partnerships between decision-makers and planners in transportation and land use arenas



Breakout Groups to Discuss Pilot Tests

- **Large Region (Guy Rousseau)**
 - Atlanta Regional Commission (ARC) pilot test
 - Large MPO setting
- **Small Region (Colin Smith)**
 - Thurston Regional Planning Commission (TRPC) pilot test
 - Smaller/medium MPO setting
- **County Application (Maren Outwater)**
 - Maryland DOT (MDOT) pilot tests for 2 counties
 - DOT setting
 - Test larger urban/suburban county and smaller rural county





Vermont



Chicago



Salt Lake



New
Hampshire



DC Metro

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