INDICATOR RESPONSE
EVALUATING SUSTAINABILITY IN PRESTO SCENARIOS

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SESYNC Workshop, Annapolis, MD
August 2015
Presentation Objective

SESYNC Questions:
- Right indicators to evaluate sustainability?
- Anything missing?
- Can they be represented well with PRESTO scenarios
- Specific Qs

-- Assumed Objective --

Goal: Conversation about Sustainability, Tradeoffs, Options
- What facilitates that conversation?
- What will influence thinking & decisions?
- How to communicate/visualize?
## Indicators - Categories

<table>
<thead>
<tr>
<th>Triple Bottom Line Sustainability</th>
<th>PRESTO Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social</strong></td>
<td><strong>Public Health</strong></td>
</tr>
<tr>
<td></td>
<td>+ Safety &amp; Security</td>
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<tr>
<td></td>
<td>+ Quality of Life/Livability</td>
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<tr>
<td><strong>Economy</strong></td>
<td><strong>Economic, Equity, Opportunity</strong></td>
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<tr>
<td></td>
<td>+ Costs and Financing (of Transport System)</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td><strong>Energy &amp; Carbon</strong></td>
</tr>
<tr>
<td></td>
<td>Chesapeake Bay &amp; Ecosystem Health</td>
</tr>
<tr>
<td></td>
<td>+ LU/Growth Management (Input?)</td>
</tr>
</tbody>
</table>
PRESTO Indicators—Economy, Equity, Opp

<table>
<thead>
<tr>
<th>Name</th>
<th>Source of Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Jobs</td>
<td>Scenario assumptions; INFORUM output</td>
</tr>
<tr>
<td>Job Locations</td>
<td>Scenario assumptions</td>
</tr>
<tr>
<td>Income Distribution</td>
<td>Scenario assumptions</td>
</tr>
<tr>
<td>Total Population</td>
<td>SILO adjusts total population to total jobs</td>
</tr>
<tr>
<td>Total Households</td>
<td>SILO</td>
</tr>
<tr>
<td>Household Location</td>
<td>SILO</td>
</tr>
<tr>
<td>Housing Cost by Income</td>
<td>SILO</td>
</tr>
<tr>
<td>Population Change by Opportunity Areas</td>
<td>SILO + Opportunity Mapping</td>
</tr>
</tbody>
</table>

- Provide Context — growth rates, density; compare across locations, %Pop in Mixed Use densities
- Equity — distribution of benefits/costs by income group or geography, displacements
- Opportunity — Biz+ HH accessibility to destination types (work, shop, rec, med) in given time/dist by mode
- + Transp System costs — public/private capital, O&M, vehicles for transit and roads
- + Funding - Gas Tax revenue, per person fees (e.g., fund transp), other development fees
## PRESTO Indicators - Transportation

<table>
<thead>
<tr>
<th>Name</th>
<th>Source of Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Miles Traveled / Person</td>
<td>MSTM</td>
</tr>
<tr>
<td>Mode Choice</td>
<td>MSTM</td>
</tr>
<tr>
<td>Commuting Time</td>
<td>MSTM</td>
</tr>
<tr>
<td>Hours of Travel Delay</td>
<td>MSTM</td>
</tr>
<tr>
<td>Location of Congestion</td>
<td>MSTM</td>
</tr>
</tbody>
</table>

- + Reliability – Separate HHs from Business
- + Transp Costs – Operating (OOP, parking, mileage tolls/fares, fees)+ownership; separate to tell story
- + Trip Lengths (% below 5 miles as indicator of non-motorized options)
- + Non-Auto modes - Transit (service miles/ridership), non-motorized (trips or miles)
- + Future vehicles – MPG, turnover/fleet age (HH cost implications), lifecycle costs (GHG)
- + Accessibility (see earlier slide)
- Separate household and business impacts
## PRESTO Indicators – Energy & Carbon

<table>
<thead>
<tr>
<th>Name</th>
<th>Source of Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Greenhouse Gas Emission</td>
<td>MEM and BEM</td>
</tr>
<tr>
<td>Greenhouse Gas Emission by Source</td>
<td>MEM and BEM</td>
</tr>
<tr>
<td>Energy Use by Sector</td>
<td>MEM and BEM</td>
</tr>
</tbody>
</table>

- Provide Context - % growth, tons/capita, tons/mile
- Energy - Gallons of fuel (by type with different carbon intensities)
- All Modes Energy – Transit (rail/bus), HH+commercial/freight, fuel/electricity
- + Equity measures (energy use and emissions) – HHs vs. Business, by place type, by income
## PRESTO Indicators – Cheasapeake Bay & Ecosystem Health

<table>
<thead>
<tr>
<th>Name</th>
<th>Source of Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Forest Acres</td>
<td>CBLCM</td>
</tr>
<tr>
<td>Total Farm Acres</td>
<td>CBLCM</td>
</tr>
<tr>
<td>Phosphorous from New Development</td>
<td>CBLCM</td>
</tr>
<tr>
<td>Nitrogen from New Development</td>
<td>CBLCM</td>
</tr>
<tr>
<td>Ecosystem Services from Wetlands</td>
<td>CBLCM + Maryland GPI</td>
</tr>
<tr>
<td>Ecosystem Services from Forests</td>
<td>CBLCM + Maryland GPI</td>
</tr>
</tbody>
</table>

- Provide Context – Air & Water Quality & Quantity change/threshold
- + Impervious surface coverage by watershed
- + state/federal species list Habitat affected (acres)
PRESTO Indicators – Public Health

<table>
<thead>
<tr>
<th>Name</th>
<th>Source of Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx Emissions</td>
<td>MEM</td>
</tr>
<tr>
<td>VOC Emissions</td>
<td>MEM</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>Scenario Assumptions</td>
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<tr>
<td>Population Change by Opportunity Areas</td>
<td>SILO + Opportunity Mapping</td>
</tr>
</tbody>
</table>

- Provide Context – AQ emissions growth, emissions/capita, % over health limits
- Life expectancy – impacted by AQ + safety/crashes + physical activity
- + Safety (crash rates) & perceived safety (bike fac/sidewalks, ADT exposure)
- + Active Miles Travelled – obesity/disease rates
- + Access to recreation/parks/open space, medical
- + Noise
Specific Qs

- Can Inputs be outputs? — Yes, as part of scenario story
- Transit Indicators out of a Road-focused model
  - service miles (input) => GHG + Energy + System costs
  - demographic of those with access (equity)
  - service assumptions/targeted user markets (choice to captive)
- Consolidating Transportation to Key Indicators — Biz Impact (delay or reliability), one HH (VMT/capita), equity (HH Tp Costs by income or place type), non-motorized (bike/walk miles or trips, resilience from mixed use areas or shorter trip lengths)
- Households Costs — combine Housing + Transportation? — Split out as needed for story (e.g., mixed density reduces costs with active mode choices, pricing helps push active modes but can offset cost savings)
- Expand Public Health coverage — Env, Eco, Transp — ITHM Model (Active mods, crash rates), access to parks/med, share of HH costs
- Should aggregated effect of localized Health Impacts be included
Specific Qs (continued)

- **Adaptation & Resilience?**
  - ✔ Building Energy heat/cool days vary with climate scenario
  - ✗ % Infr. Value with high risk (sea level rise, earthquake) – Buildings, Transp Facilities, population displaced
  - ✗ Transportation redundancy for vulnerable infrastructure
  - ✗ Economic diversity, especially vulnerable sectors

- **Water pollution – urban development, other sources? - Urban dev/LU management?**

- **How to reflect energy time of day/peak loading effects**

- **Are indicators represented well with PRESTO scenarios**
  - ✗ Maryland GPI ecosystem health measures, appropriate to use?
Facilitating Conversations

- Units & Context matter...
  - absolute numbers (walk trips)
  - relative values (growth in walk trips, 85th percentile)
  - equity (map of walk trips/capita)
  - Thresholds/Levels (L-M-H)

- Which tradeoffs are important?
  - Among indicators
  - Among alternate paths to reach goals
  - Given budget constrained implementation
Comparing Scenarios....

AECOM TBL tool
Exploring Tradeoffs…

Example: Corvallis MPO “Scenario Viewer”

Model Outputs: 32 scenarios selected out of 288 scenarios | Clear All Selections

GHG Target Reduction
Average = -18%

DVMT Per Capita
2010 Value = 22 daily miles

Bike Travel Per Capita
2010 Value = 140 annual miles

Walk Travel Per Capita
2010 Value = 130 annual trips

Air Pollution Emissions
2010 Value = 18 daily metric tons

Annual Fuel Use
2010 Value = 24 million gallons

Annual Household Vehicle Cost
2010 Value = 8.4 thousand $

Truck Delay
2010 Value = 110 daily vehicle hr.

http://www.oregon.gov/ODOT/TD/TP/Pages/scenarioviewer.html
Gauging Public Preferences…

Example: Eugene-Springfield “Future Builder”

What actions should the region take?

**Actions**

- **Invest in active transportation**
  
  *Level 1: Investment would be...*

- **Invest in public transportation**
  
  *Level 1: Investments could...*

- **Manage parking to meet demand**
  
  *Level 1: Parking could be...*

- **Change the way residents pay for driving**
  
  *Level 1: This level would...*

**Results Compared to Today**

The tool starts at the “reference case” which is the best assumption about how current policy direction could be implemented over the next 25 years.

- **Greenhouse gas emissions reduction (per person)**
  - 12%

- **Cost of driving**
  - 16%

- **Miles driven**
  - Decrease per person: 7%

- **Freight truck delay**
  - Increase: 68%

- **Increase or decrease in traffic delay**
  - 23%

- **Biking and walking**
  - Increase: 74%

- **Revenue - new, tax or fee revenue generated**

- **Government cost to implement actions**

Questions/Discussion

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Long Term Trends

Demographics
✓ Aging Boomers
✓ Millennials Travel Choices

New Modes
✓ Car Share
✓ Transportation as a service
✓ Electric bikes and light personal vehicles
✓ Electric vehicles with range limitation
✓ Automated/Driverless Vehicles
✓ Mobile Apps

New Pricing
✓ Road User Fee
✓ Carbon Tax
✓ Pay-as-you drive insurance
✓ Electric Vehicle operating costs

Uncertainty
✓ Fuel Price
✓ Income growth/economy
✓ Fleet Turnover rate
RSPM evaluates a full range of factors that affect household travel and emissions.

<table>
<thead>
<tr>
<th>Regional Context</th>
<th>Local Actions</th>
<th>Collaborative Actions</th>
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<tbody>
<tr>
<td></td>
<td>Community Design</td>
<td>Vehiches &amp; Fuels</td>
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<td>Demographics</td>
<td>Pricing</td>
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<td></td>
<td>Income Growth</td>
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<td></td>
<td>Fuel Price</td>
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<td>Future Housing (Single- &amp; Multi-Family)</td>
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<td>Parking Fees</td>
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<td>Transit Service</td>
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<td>Biking</td>
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<td>TDM (home &amp; work-based)</td>
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<td>Car Sharing</td>
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<td>Education on Driving Efficiency</td>
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<td>Intelligent Transportation Systems</td>
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<td>Vehicle Fuel Economy (mpg)</td>
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<td></td>
<td>Fuels</td>
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<td></td>
<td>Commercial Fleets</td>
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<td></td>
<td>Pay-As-You-Drive Insurance</td>
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<td>Gas Taxes</td>
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<td>Road User Fee</td>
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Relative Impacts of Policies by Outcome Measure

Reduced GHG Emissions

Reduced Travel Costs per Household

Reduced Road Congestion

Note: Policies (bars) within each outcome (column) have been scaled to 100%, reflecting relative impact for a single outcome. Policy bars should not be compared across outcomes (e.g., land use is not necessarily more effective in reducing travel costs than in reducing GHG emissions).
Tool advantages
- Broad set of community outcomes
- Broad set of old/new policy inputs
- HH Budget constraints good for pricing
- Quicker setup than traditional tools
- Short runtimes allows for 1000s of runs
- Open source and modular construction
- 4 tools on Common Framework will allow improvements by a community of developers (COMING SOON!)

Tool limitations
- Less detail relative to other planning tools
- What-if Tool can’t tell you how to get there
- Built for understanding GHG/Vehicle Travel, not mode shifts

Regional Strategic Planning Model (RSPM)
Rapid Policy Assessment Tool (RPAT)
Energy and Emissions Reduction Policy Analysis Tool (EERPAT)
GreenSTEP family of Models
Greenhouse gas Strategic Transportation Energy Planning