

A New Framework for the GreenSTEP Family of Models

VisionEval Open Source Project Vision

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PREAMBLE: Strategic Planning/Open Source/Open Data Benefits

Strategic planning is a means to help governments select policies and actions to address pressing long-term issues fraught with uncertainty. Regions are faced with a number of matters of concern related to the development of sustainable transportation systems (e.g., energy, air quality, water, agricultural lands, public health, and economic development), as well as uncertainties about the future. Strategic planning tools allow exploration of many scenarios to assess policy/investment tradeoffs about complex systems enabling us to “think better” about intended and unintended consequences of our actions.

Open source projects provide for collaboration, investment efficiency and quality control benefits, while their transparent **public access to data** supports a recent emphasis of government at both the federal and local levels.¹ Agencies² note the key benefit of open source projects are that public funds are not spent doing something more than once, as other interested teams can improve or contribute back on projects rather than starting from scratch. Other noted advantages include: flexibility with consultants because the tool is not proprietary with clearly defined intellectual property rights, reuse provides incentives for the development team to follow best practices (e.g., thorough documentation and portability), and the codebase and the collaborative process can serve as a reference and help to expose the project’s lessons learned to the larger community.

MISSION STATEMENT:

Create a collaborative Open Source Tool that houses an award-winning family of strategic models, as a public resource useful for performance-based planning and other uses (e.g., teaching) under an evolving understanding of future uncertainties in order to make **INFORMED DECISIONS** to reach **DESIRED COMMUNITY OUTCOMES** under limited resources. Much like the R language repository of modular components, the **TOOL** would be freely available, flexible, and easy for users and contributors across the globe to understand, use, assemble, and extend in a plug-and-play fashion. The project would be maintained and governed by a **COMMUNITY** of agency sponsors, active users and developers who are able to pool funds to extend these performance-based strategic planning models. The value of the tool would engender long term support for **CONTINUITY**, upgrades and outreach.

- Create something useful to inform decisions:
 - transportation performance-based planning tool
 - flexible framework allows adding features to enable value and use beyond transportation
 - strategic tool for visioning complements more detailed modeling tools used in implementation
 - Interactive web-based scenario viewer allows public to explore policy/investment tradeoffs
- Continued code development in response to application-driven needs (e.g., ease of use or enhanced value to decision-making process)

¹ The Obama Administration “Transparency and Open Government” memorandum, asked agencies to “establish a system of transparency, public participation, and collaboration.” (January 2009). The city of San Francisco’s Executive Directive 09-06 on Open Data, states: “This Directive will enhance open government, transparency, and accountability by improving access to City data that adheres to privacy and security policies. Data which often resides in technology systems...is structured and can be used by other computer applications for analysis or new uses such as mapping.” (Newsom 2009).

² “Creating CountDracula: an Open SourceCounts Management Tool,” 2014 TRB Annual conference, SFCTA.

- Make it painless to use/contribute
- Accept outside contributions
- Make the assumptions and tool code transparent to contributors and users
- Sustain continued maintenance of code and community
- Develop in a phased approach, with sufficient flexibility keeping the end goal in mind.

Common Tool Platform:

Imagine a tool platform with these features and capabilities...

- A common platform where tools are built from components that can be swapped in and out
- Provided specifications and services enable independent model researchers and developers from around the world to create components that work with each other
- The repository is freely accessible over the internet where developers can share their work and modelers can download components to build the models they need
- Model components that are not only documented, input checks are built in, as are model estimation code and data enabling estimations to be reproduced, checked and modified.
- Components include built in automation to estimate custom parameters for a region.

What success looks like:

- **INFORM DECISIONS** – Tool integrates seamlessly into the decision-making process influencing transportation investments and policy tradeoffs and decisions, as well as quantitatively informing other policy discussions.
Measure of Success: Website hits, federal support of base tool, applications of tool/interactive scenario viewer in planning process (once or systematic)
Keys to Success: Visualization of results; ease of use in communicating outputs; approachability and understandability for informing public and stakeholders.
- **TOOL** – Common framework tool (loosely coupled modules which interact through a common datastore) that is open source licensed, hosted on GitHub, with a process for accepting contributing code including standardized tests and requirements. The code is stable, easy to use for both tool builders and users, and extensible to long term needs. Code is well documented for developers, assemblers, and users including user's guide and code examples.
Measure of Success: Website hits, use in published projects, use in classrooms, level of questions received
Keys to Success: modular, open source, scalable, continue successful practices (agile, listen to users, etc.)
- **COMMUNITY** –Users that have policy Qs/needs and resources to implement, as well as developer pool with familiarity with the tool enough to build new code, and others with less familiarity to use/assemble existing code and develop inputs. Training programs/workshops/on-line.
Measure of Success: Participants
Keys to Success: Build development/use capacity within multiple consultants. Compel use through ease of use and/or value to policy process.
- **CONTINUITY** – The tool and community is supported by sponsoring agencies able to pool resources and find independent funding to maintain the basic project needs. This includes governance forums, as well as scheduled releases and tool maintenance, as well as sponsored research to refresh the tool for emerging modes and measures.
Measure of Success: Data sources (estimation data) and units (year of dollars) are current (within 5 years)
Keys to Success: Tool Maintenance Plan; Divers policy maker/developer/academia community support

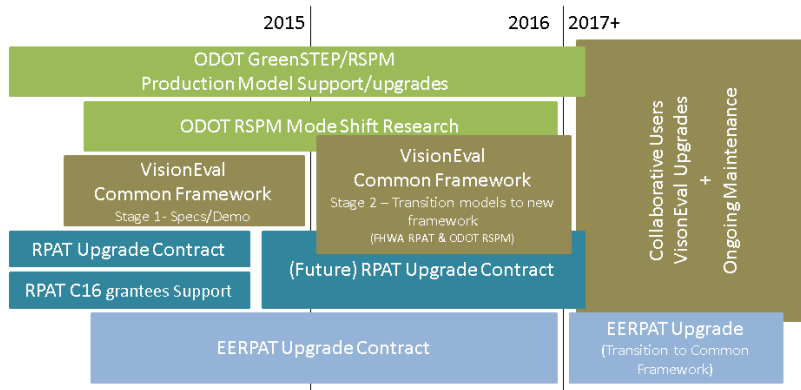
Value to Community

- **Policy Maker** (consumer) – Through evaluation of many scenarios and tradeoffs, enhance the abilities of planners, advocates, the public, and decision makers to reason about complex systems and consider many possible courses of action; ability to test risk/resilience of plans under future uncertainties; cost-effective pooled fund tool upgrades; consultant flexibility/incentives of open source process; credible, maintained tool; collaborative code maintenance/updates; community of active users; Case studies
- **Analysts** (applier) – Use outcomes to support policy. Use what’s already done and using in different way. Users Guide detail on building and interpreting inputs/outputs and understanding sensitivities.
- **Developer/Researcher** (developer) – Simple tool with Synthetic household detail allows many policies to be tested/added (lightweight, short runtimes, estimation datasets included in packages). Easily extend code to use for own purposes (modular, scalable, accessible data); maintained and documented code (Clear standards and guidelines); community of developers.
- **Educators** – Relatively simple tool with synthetic household detail and policy case study examples can be instructive on technical and policy level, and be used to evaluate simple user scenarios.

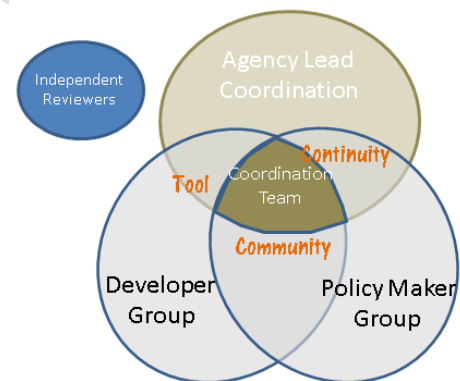
Timeline and Resources

The baseline tool common framework is intended to be accomplished in a 2-phase joint FHWA-ODOT effort, to first specify and test the framework, and a second to transfer at least one ODOT and FHWA existing tool to the framework. This is funded, and anticipated to occur by 2017 (see figure below). Continued use and maintenance Agency support hinge on the value of the project as express by users.

TRANSITION TO COMMON CODE VisionEval Open Source Project



PROPOSED COMMUNITY/GOVERNANCE VisionEval Open Source Project



Each Agency (ODOT, FHWA-RPAT, FHWA-EERPAT) is investing in ongoing updates for their “production” model, While planning a transition to the VisionEval common framework in the long term

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Next steps

- **Codebase:** Common framework phase I+II projects, ODOT Research on mode shift , documentation
- **Community-Technical:** Developers forum starting with Common framework phase I+II projects
- **Community-Policy:** Policy Makers Forum starting with Oct 2015 RPAT Peer Exchange, proposed Performance-Based Planning peer exchange (SLOC), proposed ITM conference workshop
- **Continuity:** “Readiness” review of Open Source Project by outside experts to inform one time and ongoing investment in money and resources to achieve vision (funding TBD).

References

- “VisionEval: A New Framework for the GreenSTEP Family of Models, Technical Overview and Approach,” Gregor, & Weidner (October 2015)
- GitHub: <https://github.com/gregorbi/RSPM>
- Federal RPAT & EERPAT Models
 - EERPAT: https://www.planning.dot.gov/fhwa_tool/
 - RPAT: <https://planningtools.transportation.org/10/travelworks.html>
- Oregon DOT GreenSTEP & RSPM Models and applications
 - Statewide Transportation Strategy (GHG): <http://www.oregon.gov/ODOT/TD/OSTI/Pages/STS.aspx>
 - Scenario Planning: http://www.oregon.gov/ODOT/TD/OSTI/Pages/scenario_planning.aspx
 - CAMPO Strategic Assessment & CLMPO Future Builder interactive scenario viewers: <http://www.oregon.gov/ODOT/TD/TP/Pages/scenarioviewer.html>
<http://www.clscenarioplanning.org/future-builder/>

Application/Case Studies

(how influenced decisions, what was involved technically)

- C16 RPAT pilot (proof of concept) + newer grantee
- EERPAT pilots
- Oregon Transportation Options Plan - RSPM quantified statewide impacts if plan was implemented in all MPOs (see text box)
- Oregon Legislature – GHG evaluation of proposed Transportation package
- Eugene-Oregon Climate Recovery Ordinance 20540

Deployment Accomplishments

- (proposed) May 2016 ITM Conference, session and/or C16 workshop
- (proposed) 2015/2016 AASHTO SCOP-funded Performance-Based Planning Peer Exchange
- Nov 2015 RSAI Conference, Portland (Gregor common framework presentation)
- Oct 2015 AMPO Conference, RPAT Peer Exchange, RPAT Training
- July 2015 CAMPO Strategic Assessment (RSPM) received FHWA ‘Environmental Excellence Award’
- July 2015 RPAT Training
- Apr 2015 APA Conference (Weidner presentation)
- 2015 NC state AMPO meeting (RDU presentation)
- Oregon DOT Statewide Transportation Strategy won AASHTO award
- 2010 GreenSTEP model won AASHTO ‘Presidents Award for Planning’

ODOT's GreenSTEP model demonstrates the benefits of transportation options investments

GreenSTEP was developed by the Oregon Department of Transportation (ODOT) to estimate and forecast the effects of various policies and other influences on the amount of vehicle travel, the types of vehicles and fuels used, energy consumption, and resulting GHG emissions. The model estimates vehicle ownership, vehicle travel, fuel consumption, and GHG emissions at the individual household level. One factor or input into the model is the participation of households in transportation demand management/TO programs. Other factors include land use and transportation system characteristics, vehicle ownership, household daily vehicle miles traveled, etc.¹²

The GreenSTEP model was run to evaluate the general outcomes/benefits of increasing transportation options programs and associated community design variables across the state. The analysis hinges off the GreenSTEP setup and inputs assumed in the ODOT Statewide Transportation Strategy (STS) report,⁹ pivoting off the STS-Reference scenario, and assuming levels in the OTC accepted STS-Recommended or Vision scenario.

Results

The effect of ambitious implementation of transportation options programs across all Oregon metropolitan areas in year 2035 was evaluated. This included home and work based TDM programs, car-sharing, and parking cash-out programs. Other related policies were increased marginally to reflect TO program effects (transit service, bicycle promotion, parking coverage, and parking fees). Benefits of transportation options include benefits to individual households and the overall transportation system. This general assessment shows:

- 7 percent reduction in daily vehicle miles traveled per capita
- 7 percent reduction in GHG emissions
- 3 percent reduction in number of vehicles per household
- 2 percent reduction in annual household travel costs
- 10 percent reduction in annual vehicle travel delay per capita
- 3 percent reduction in daily heavy truck delay

Note: Additional information is being pursued to monetize some of the TO benefits from the GreenSTEP model, including cost savings from reduced truck delay.

Source: GreenSTEP model results based on setup for the Oregon Statewide Transportation Strategy (2011)