



Implementing the Rapid Policy Assessment Tool

Delaware Valley Regional Planning Commission

Case Study Report

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Acknowledgements

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I. Executive summary

The DVRPC implemented the RPAT to further its ability to quickly and inexpensively evaluate future growth scenarios as well as prescreen policy scenarios before undertaking resource-intensive modeling exercises. Using this award, DVRPC compared the use of RPAT to the use of its Travel Improvement Model (TIM) and Geographic Information System (GIS)-based land use forecasting model, UPlan. DVRPC examined RPAT on two projects: Future Forces, a scenario planning exercise being undertaken as part of DVRPC's long range plan update, and an update to the master plan for Gloucester County, NJ, the region's fastest growing county. The types of decisions that were influenced by RPAT include how the region may grow under the Future Forces scenarios and considerations for how and where to grow in Gloucester County.

Key Outcomes:

- DVRPC Planning staff benefitted from being able to run RPAT and interpret its findings without needing in-depth modeling knowledge.
- Because RPAT took much less time to run than DVRPC's TIM, the agency plans to use it in the future run various policy scenarios, including region-wide sustainable transportation scenarios that will be used for an update to Choices and Voices (C&V), DVRPC's online crowdsourced scenario tool.
- RPAT is a robust model designed to do a lot with simple inputs; however, DVRPC found that it was lacking some of the capabilities the agency was looking for. For example, RPAT is not very sensitive to inputs that may vary quite a bit from each other. As such, RPAT is particularly useful when paired with other strategic planning tools.
- Based on their use of RPAT, DVRPC offered a number of refinements for the tool, which are being considered for the next version.

The Rapid Policy Assessment Tool (RPAT)

RPAT is a tool that regional decision-makers and land use and transportation planners can use to estimate impacts of changes to the built environment, travel demand, and transportation supply and demand management policies on peak-hour transportation, as well as effects on sprawl, energy reduction, active travel, and carbon footprints. RPAT is designed to provide a high-level analysis at a regional scale that can be used to evaluate smart growth policies during a regional visioning process and at the project or alternative level in a regional transportation plan.

More information and resources related to RPAT as well as a link to download the software for free are available on the TravelWorks website:

<https://planningtools.transportation.org/551/rapid-policy-analysis-tool.html>

2. Background

DVRPC is the federally designated Metropolitan Planning Organization (MPO) that provides comprehensive, coordinated planning for the orderly growth and development of the bi-state Greater Philadelphia region (Figure 1). This nine-county region includes Bucks, Chester, Delaware, Montgomery and Philadelphia counties in Pennsylvania (PA); and Burlington, Camden, Gloucester and Mercer counties in New Jersey (NJ). There are 352 municipalities in the area served by DVRPC with a population of 5.6 million in 2010 that is projected to grow to over 6.2 million by 2040.

DVRPC provides services to member governments and others through planning analysis, data collection, and mapping services. It has nearly 50 years' experience developing, maintaining, and applying travel demand models. These models are used by DVRPC staff to produce forecasts of future highway and transit travel for their studies. Such studies include long- and short-range plans and programs, highway traffic studies, air quality conformity demonstrations, Federal Transit Administration (FTA) New Starts programs, and member government transportation studies.

DVRPC forecasts future travel using DVRPC's TIM, a best-in-class 4-step travel demand model (TDM), which is robust and detailed, but also complex and takes approximately 15 hours to complete a model run.

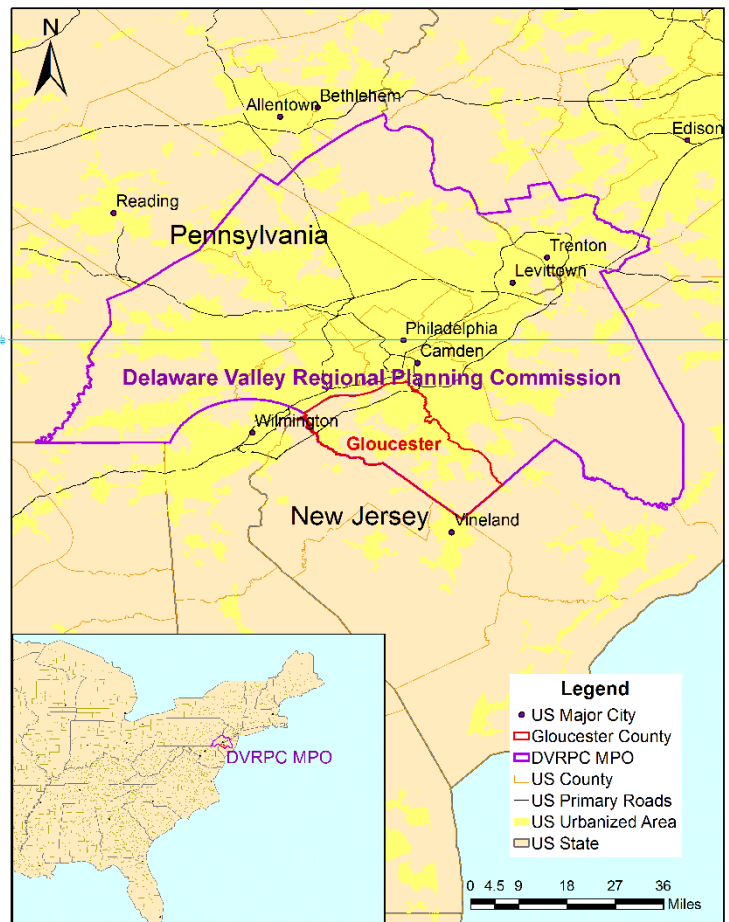


Figure 1. RPAT User Incentive Recipient, DVRPC, with Gloucester County highlighted

3. Project Goals & Objectives

DVRPC planned to use RPAT to augment its use of TIM and UPlan as a pre-screening tool that can be used to test policy scenarios before undertaking extensive travel demand modeling exercises using TIM, which are time- and resource-intensive. The tool was also appealing for its ability to construct scenarios that shift population and employment growth, e.g., away from suburban areas and into the urban core. Running TIM and interpreting the results also requires input and labor from modeling and analysis staff whereas RPAT can be used by planning staff without prior modeling experience. Although UPlan is less resource intensive than TIM, it can only allocate future growth; it cannot shift population and employment growth as RPAT does.

DVRPC tested RPAT on two projects:

Future Forces: DVRPC uses scenario planning to better understand arising needs and challenges, and to guide the development and implementation of the region's long-range plan. This effort builds scenarios off a set of "Future Forces" of change identified for Greater Philadelphia through an online survey. Such forces may accelerate or reverse current trends, or create new trends that significantly impact demographics, development patterns, use of the regional transportation system, the economy, and/or the environment.

DVRPC tested different future population and employment scenarios as part of the Future Forces effort. Each scenario led to very different development patterns. These forces will be incorporated into a future update to C&V allowing for some movement of existing population and employment, which the model does not currently do.

Gloucester County: Gloucester County, NJ contracted with DVRPC's Office of Smart Growth to develop a Unified Land Use and Circulation Master Plan Element. The county's master plan was last comprehensively updated in 1982. This work involves close collaboration with county staff. As Gloucester County is DVRPC's fastest-growing county, the work is particularly critical for setting the vision for how the county should grow, at the same time reducing sprawl and the consumption of open space, farmland and other natural resource lands. RPAT was used to run various future growth scenarios at the county scale, to evaluate their effects on travel demand. Such scenarios included shifting various percentages of population and employment into Gloucester County's existing developed communities, with a proportional reduction away from their rural areas.

4. Results

RPAT was used to test a wide variety of scenarios, and their associated impacts at the regional and county level. The following discussion reviews the results of these scenarios, and associated validation of the RPAT tool.

4.1. Regional Scenarios

4.1.1. Test for Operational Improvements

The region currently has 4% of its road miles covered by some form of ITS. DVRPC's Transportation Operations Master Plan (TOMP) proposes to increase this amount to 6%; however this plan cannot be fully funded in DVRPC's current Connections 2040 Plan, which allows for just 5% of road miles to have ITS coverage. These three levels of coverage (4%, 5% and 6%), along with a no ITS (0 lane miles) scenarios, were tested in RPAT. The RPAT results indicate that only speed and delay are impacted by the different levels of ITS coverage, while there is no change to daily vehicle miles travelled (VMT), daily transit trips, or daily vehicle driver trips (Table 1). The developer of RPAT (RSG), noted that RPAT only considers a few types of ITS

treatments; they don't include emergency service patrol (ESP) and other operational improvements included in the Texas Transportation Institute (TTI) Urban Mobility Report data (current C&V source).

Table I. Effects of Operational Improvements on Travel (Source: DVRPC, 2015)

Percent of Road Network with Operational Improvements	0%	4%	5%	6%
Daily VMT	121,164,580	121,164,580	121,164,580	121,164,580
Avg. Lt. Veh. Speed	30.43	30.49	30.51	30.53
Daily Veh. Hrs. Travelled (VHT)	3,447,561	3,398,481	3,398,481	3,436,821
Daily Transit Trips	875,326	875,326	875,326	875,326
Daily Veh. Hrs. of Delay	199,448	192,263	190,483	188,708
Daily Vehicle Driver Trips	17,744,372	17,744,372	17,744,372	17,744,372

4.1.2. Test for Parking Pricing in Central Business Districts and Pay-as-you-drive Insurance on Greenhouse Gas Emissions

RPAT was used to test the effects of parking pricing in central business districts (CBDs) and pay-as-you-drive insurance on GHG emissions. RPAT returned results similar to those from a study produced by University of Pennsylvania students, *Towards a Low Carbon Philadelphia*. RPAT found that parking pricing in CBDs would result in a 0.1% reduction in GHG emissions by 2040, while the student study found it would have a 0.27% reduction in GHG emissions by 2030. RPAT found that pay-as-you-drive insurance would result in a 3% reduction in GHG emissions by 2040, while the student study found it would have a 0.8% reduction in GHG emissions by 2030.

4.1.3. Test for Future Population and Employment Patterns under Future Forces

Five Future Force scenarios were identified collaboratively by the Greater Philadelphia Futures Group (Futures Group) consisting of regional stakeholder experts:

- Enduring Urbanism: population grows around dense regional centers, but declines slightly in farther-out suburbs;
- The Free Agent Economy: new development centers emerge around universities, which become the creators and incubators of new businesses;
- Severe Climate: more infill development and increased density occur in regional centers;
- Transportation on Demand: a mix of suburban and infill development occurs near transit access and regional centers; and
- The U.S. Energy Boom: industrial growth reactivates the Delaware River waterfront, and spurs residential growth in areas with easy access to industrial jobs.

4.1.4. Test for Numerous Travel Impacts Using the Future Forces

Each Future Force Scenario is envisioned to have different travel impacts on the region, based on the following additional descriptors and assumptions:

- **Enduring Urbanism:** Millennials and empty nesters moving back to walkable urban and suburban centers are the start of a long-term trend, as future generations show an even stronger desire for city living and walking, biking, and transit.
- **The Free Agent Economy:** Individuals must create their own economic opportunities and contribute more toward their healthcare and retirement, as labor efficiency and the rising cost of full-time employees cause large companies to continue to reduce their workforces.
- **Severe Climate:** Increasing atmospheric carbon levels, due to continued global use of fossil fuels, lead to the worst-case outcomes of climate change. The region must prepare for hotter and wetter weather, more frequent and intense storms, and rising sea levels.
- **Transportation on Demand:** Smartphones, apps, and real-time information help people get around using a multimodal network of car sharing, taxis, ride sharing, transit, biking, bike sharing, walking, and new modes such as on demand micro transit bus service and ride sourcing, where a vehicle is e-hailed for a point-to-point trip.
- **The U.S. Energy Boom:** The region’s economy grows with domestic natural gas extraction and distribution and renewed manufacturing. An abundance of domestically produced energy keeps the cost of energy low and helps the nation become more energy independent.

Modeling was done with Impacts 2050, a socio-economic systems dynamic model, and RPAT. The two models differed in daily VMT and transit ridership (Figure 2). DVRPC proposes to average the two models outputs in the Future Forces report. A summary of the outputs is provided in Table 2.

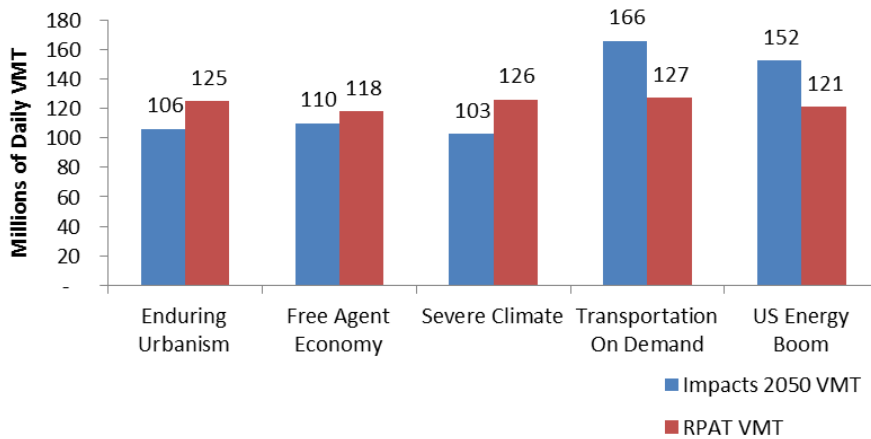


Figure 2. Regional Daily VMT Estimates for Future Forces Scenarios Using Impacts 2050 vs. RPAT (Source: DVRPC, 2015)

Table 2. Summary of What-if Scenario Indicators in 2045 (Bold indicates values fully or partially derived from RPAT; Source: DVRPC, 2015)

Factor	2010	Enduring Urbanism	The Free Agent Economy	Severe Climate	Transportation on Demand	The U.S. Energy Boom
New Footprint Res. and Comm. Acres Developed, 2010–2045	-	46,200	117,000	129,100	208,300	322,000
Percent of Population in Centers	23%	25%	24%	23%	23%	20%
Percent of Employment in Centers	22%	23%	23%	23%	22%	21%
Percent Zero-Car Households	15%	26%	15%	15%	38%	13%
Annual VMT per Capita	6,940	6,440	6,470	6,190	8,220	7,840
Daily Linked Transit Trips (millions)	0.8	1.4	1.2	1.2	1.3	0.9
Daily Walking and Biking Trips (millions)	1.5	3.8	2.3	2.3	2.3	1.7
Daily In-vehicle Minutes (driver & passenger) per Capita	48	53	53	51	84	62
Average Daily Speed (mph)	30	31	31	32	31	30
Annual Recurring VHD per Capita	22	22	20	21	31	30
Annual Fatal Crashes	326	186	194	176	196	225
On-road (Tailpipe Only) & Res. Energy GHG Emissions (Annual MTCO₂E per Capita)	6.8	4.8	5	4.8	4.9	5.6
Annual Household Residential Energy	\$12,080	\$15,640	\$10,360	\$19,340	\$16,530	\$11,830
Transportation Costs as a % of Income	15%	15%	10%	20%	16%	11%

¹In US dollars.

4.2. Gloucester County, NJ Scenarios

DVRPC tested a total of eight scenarios in support of the Gloucester County, NJ master planning process, as described in the following sub-sections. Table 3 provides a summary of the eight Gloucester County Scenarios.

4.2.1. Base Scenario

DVRPC tested the base Gloucester County, NJ model, using the DVRPC 2040 forecast by Traffic Analysis Zone (TAZ) to create place types.

4.2.2. Test for Impacts of Less Growth in Rural Areas and More Growth in Close-In Communities in Gloucester County

DVRPC tested the base Gloucester County, NJ model against a fictitious scenario where the share of growth slated for rural areas in the base was swapped with the highest density type, CIC (Mixed). The results were consistent with the RPAT regional tests. By developing in CICs rather than rural areas in this scenario, by 2040 Gloucester County would increase transit trips, regional accessibility, and average speeds while also

benefitting from reduced daily vehicle hours of delay, daily vehicle driver trips, daily VMT, daily VHT, accidents, fuel consumption and GHG emissions.

4.2.3. Test for High and Low Growth Scenarios in Gloucester County

DVRPC tested future low and high growth scenarios in Gloucester County out to 2040 with allocation by base scenario place type:

- Low growth: 10% population growth and 20% employment growth
- High growth: 40% population growth and 50% employment growth

The base, low growth and high growth all scenarios resulted in significant declines in walking percentages, due to developing out into rural and suburban areas. Lower growth also resulted in fewer daily VMT, daily VHT, daily vehicle hours of delay, daily vehicle driver trips, and daily transit trips. Average light vehicle speed improved with low growth. Low growth also resulted in fewer accidents and improvements in regional accessibility, GHG emissions and fuel consumption, as well as lower financial and economic impacts. Higher growth resulted in increased VMT, VHT, transit trips, delay, overall trips, accidents, GHG emissions, fuel consumption, infrastructure and traveler costs, and worsening of regional accessibility and walking percentages.

4.2.4. Test for High and Low Growth Scenarios in Gloucester County by Allocating to Place Types Other Than the Base

DVRPC tested future growth in Gloucester County out to 2040 with allocation by place type to scenarios other than the base, namely testing low growth but allocating to “status quo” 2010 place types (distributing growth by the 2010 distribution of place types). In the low growth status quo compared to the low growth base scenario, transit trips increased slightly, and fewer overall trips were taken, though there were negligible impacts on accidents or job access. Walking improved, as did regional accessibility, though GHG emissions increased slightly. There were also slightly higher costs for transit operating and infrastructure costs, with little effect on highway costs.

DVRPC also tested high growth, but allocated 10% of population and employment growth to urban core mixed use and distributed the remainder according to Base 2040 growth patterns. In the high growth urban core mixed use scenario compared to the high growth base scenario, VMT and VHT were reduced, while transit trips increased. By allocating more growth to urban core mixed use areas, accidents were reduced, job and overall regional accessibility were improved, and transit costs increased. There was negligible effect on GHG emissions or fuel consumption.

4.2.5. Test for Percentage Increases in Lane Miles with ITS and Increases in Roadway Supply in Gloucester County

DVRPC also tested for 10% ITS coverage of road miles versus the 5% in the base scenario for 2040. While there was no change in VMT, accidents, transit or driver trips, accessibility, GHG emissions, or infrastructure costs, there were reductions in VHT, delay, annual traveler cost, and a slight reduction in fuel consumption.

DVRPC also tested for a 10% increase in freeway and arterial growth as opposed to approximately 1% growth in the base scenario for 2040. There was a significant increase in VMT and vehicle speeds, though no change in daily vehicle driver trips. Accidents increased, while accessibility remained the same. GHG emissions and fuel consumption increased, as well as traveler cost and highway costs. There was no change to transit trips or costs.

Table 3. Gloucester County Scenarios (Source: DVRPC, 2015)

Outputs	Base Scenario	Less Rural Growth / More CIC Growth	Low Growth allocated to Base Scenario Place Types	Low Growth allocated to 2010 Place Types	High Growth allocated to Base Scenario Place Types	High Growth-10% allocated to Urban Mixed Use	10% ITS Coverage	10% Increase in Freeway and Arterial Growth
Direct Travel Impacts								
Daily VMT (millions of miles)	9.3	9.0	7.8	7.7	10.2	10.0	9.3	11.1
Ave. Lt. Veh. Speed (mph)	31.2	31.6	29.4	29.4	31.9	32.0	31.5	41.9
Daily VHT (hours)	274,421	261,389	279,462	277,683	272,759	270,519	271,806	240,224
Daily Transit Trips	8,723	10,667	3,982	4,189	11,655	13,390	8,723	8,723
Daily Veh. Hrs Delay (hours)	59,077	53,314	72,435	71,563	53,765	52,806	56,463	-12,339
Daily Veh. Driver Trips	257,171	244,747	117,242	115,874	376,636	365,950	257,171	257,171
Community Impacts								
Fatal Accidents	30	29	25	25	33	32	30	36
Injury Accidents	2,688	2,591	2,235	2,226	2,955	2,889	2,688	3,190
Property Accidents	4,416	4,257	3,672	3,657	4,854	4,746	4,416	5,240
Job Access: Income \$0-20k (% change)	-9.0%	-5.2%	-9.6%	-9.4%	-10.0%	-8.2%	-9.0%	-9.0%
Job Access: Income \$20-40k (% change)	-9.1%	-6.2%	-9.6%	-9.4%	-10.0%	-8.3%	-9.1%	-9.1%
Job Access: Income \$40-60k (% change)	-9.2%	-7.0%	-9.7%	-9.5%	-10.0%	-8.5%	-9.2%	-9.2%
Job Access: Income \$60-80k (% change)	-9.3%	-7.5%	-9.7%	-9.7%	-10.0%	-8.7%	-9.3%	-9.3%
Job Access: Income \$80-100k (% change)	-9.4%	-7.9%	-9.8%	-9.7%	-10.0%	-8.9%	-9.4%	-9.4%
Job Access: Income \$100k+ (% change)	-9.5%	-8.4%	-9.8%	-9.7%	-10.0%	-9.1%	-9.5%	-9.5%
Walking (% change)	-21.2%	-0.7%	-21.1%	-16.2%	-27.7%	-15.1%	-21.2%	-21.2%
Location Impacts								
Regional Access (% change)	-6.7%	-0.4%	-6.6%	-5.5%	-8.5%	-5.0%	-6.7%	-6.7%
Env./Energy Impacts								
GHG Emissions (Annual MTCO ₂ per capita)	1,782	1,780	1,524	1,525	1,908	1,907	1,782	2,065
Fuel Consumption (gasoline equivalent gallons)	194,811	194,528	166,526	166,633	208,577	208,431	194,772	225,667
Financial/Econ. Impacts								
Ann. Traveler Cost (\$ millions)	196.1	195.8	167.6	167.7	210.0	209.8	196.0	227.3
Hwy Infra. Costs (\$ per lane mile)	1,543	1,543	521	521	2,029	2,029	1,543	14,809
Transit Infra. Costs (\$ millions)	2.3	2.7	1.0	1.1	3.0	3.5	2.3	2.3
Transit Operating Costs (\$ millions)	10.8	13.2	4.9	5.2	14.5	16.6	10.8	10.8

5. Conclusion

Overall, RPAT is a useful tool for rapid policy assessment with significant future potential. Planning staff within DVRPC (Departments of Long-Range Planning & Economic Coordination and Smart Growth, in particular) benefitted from being able to run RPAT and interpret its findings without needing in-depth modeling knowledge. The types of decisions that were influenced by this tool include how and where to grow in Gloucester County, the fastest growing county in the region, and how the region should grow under the Future Forces scenarios. RPAT is a robust model designed to do a lot with simple inputs; however, it is now several years old and was not designed to answer some of the questions DVRPC was asking in the Future Forces scenarios and updates being sought for C&V calculations. RPAT can be a good fit for smaller MPOs that lack a robust travel demand model, or as an additional tool for larger MPOs with existing models. RPAT would be particularly useful if paired with other strategic planning tools, such as Impacts 2050, which DVRPC found gives additional and alternate outputs. Deployment of RPAT should involve upfront training, an understanding of the effort it takes to upload and calibrate the input data, and confirmation that an agency has the necessary computer hardware availability to run the RPAT software.

A conclusion that DVRPC drew from testing RPAT was that the tool is not very sensitive to inputs that may vary quite a bit from each other. For the Future Forces scenarios, DVRPC was expecting a much greater variance in VMT per capita, based on the very different vehicle operating costs they provided, as well as a greater variance in transit trips, but not much change resulted. Thus, DVRPC is unsure whether RPAT is intentionally conservative or not as sensitive as it should be. For C&V and Future Forces, RPAT was not a good fit, because it showed little sensitivity to future scenarios' significant changes from current trends. It was also hard to account for shifting travel behaviors and new modes. Overall, RPAT may not be very responsive in slow growth regions such as DVRPC's region.

RPAT and other tools, such as GreenSTEP, The Energy and Emissions Reduction Policy Analysis Tool (EERPAT), Regional Strategic Planning Model (RSPM), and Integrated Transport and Health Impact Modeling Tool (ITHIM), are proposed to be packaged together as VisionEval. This open source, open data platform would be a very robust tool, and DVRPC is committed to assisting as part of the advisory committee on this effort.

6. Performance Measures and Evaluation

At the start of the project, performance measures were identified in four topic areas (Implementation, Innovation, Deployment, and Communications and Outreach) to ensure the project realizes the intended long term outcomes of the award. Table 4 summarizes DVRPC's efforts to support these measures.

Table 4. DVRPC Performance Measures

Performance Measures	Achievement
Implementation	
Project deliverables submitted to Volpe/FHWA on time and on schedule	Five quarterly progress reports and the final report were submitted by DVRPC on time.
Agency and project partners participated in all required calls/meetings	Two to three DVRPC staff members participated in all monthly calls from September 2014 to December 2015.
Innovation	

New understanding gained or capability available	DVRPC identified several areas where RPAT can answer questions not addressed with their existing models. For example, RPAT offers a greater array of inputs and outputs than DVRPC's TIM 2.0 model.
Deployment	
Skills and abilities gained by agency or partner staff; or new work processes, data resources, analysis capabilities now in use by the agency or partner organizations	RPAT allowed DVRPC to test operational improvements for the region as a whole and to test five Future Forces scenarios, as detailed earlier in this report. These Future Forces scenarios will be added to the C&V Tool. DVRPC also intends to use RPAT to run some region-wide scenarios on sustainable transportation options and their potential impacts on travel to be used in a Municipal Implementation Tool Brochure (part of an ongoing series at DVRPC) to "sell" municipalities on sustainable transportation choices.
Agency developed recommendations for refinements to the RPAT tool	DVRPC provided a number of recommendations for refinements to the RPAT tool, which are outlined in DVRPC's final project report.
Agency supplied lessons learned from participating as a RPAT recipient	DVRPC supplied a number of lessons learned, which are outlined in DVRPC's final project report.
Communications & Outreach	
Project data and information shared with academic and practitioner communities	DVRPC shared project data and information as follows: - Presentation to DVRPC's Board of Directors on October 23, 2014. - Presentation to Gloucester County Planning Commission staff regarding its use in their master planning process on Dec. 17, 2014. - DVRPC Future Forces meetings to discuss how to use RPAT to refine the C&V scenario tool on Dec. 10, 2014 and Sept. 22, 2015. - Presentation to South Jersey Transportation Planning Organization (DVRPC's neighboring MPO), on July 27, 2015. - C16 Peer Exchange on October 19-20, 2015 in Las Vegas. - RPAT practitioners (RSG, ODOT, MD SHA, and DVRPC) call to discuss the Impacts 2050 model and RPAT on Dec. 11, 2015.

For More Information

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