Action Strategy Paper: Climate Change and Energy

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Executive Summary

This strategy paper considers how the Chicago Metropolitan Agency for Planning (CMAP) might incorporate goals to reduce greenhouse gas (GHG) emissions, prepare for climate change impacts on transportation systems, and reduce energy within the *GO TO 2040* plan. The intent is to assist CMAP as it incorporates policies, investments, and other actions within scenarios to accomplish climate change and energy goals.

This strategy paper will assist CMAP in identifying areas needing more in-depth exploration. The paper will also provide input for targeted communications materials that CMAP may develop to inform stakeholders of climate change and energy issues and of successful related activities by peer organizations. Such materials will assist CMAP to gain support from key constituencies for climate change and energy actions and for the overall plan, and will assist in developing partnerships required to advance climate change and energy actions.

The paper contains five sections.

- Section 1 is the summary report with three sub-sections. Following the Introduction, the Analysis/Synthesis presents a high-level overview of the research conducted for the paper and key considerations for CMAP as they shape their approach to climate change within the region and possibly beyond. The summary report then presents Recommendations and Conclusions based on the research in the final sub-section.

The research is provided in its entirety in the last four sections of the paper:

- Section 2 – Innovative Practices by Peer Metropolitan Planning Organizations (MPOs);
- Section 3 – Innovative Practices by States;
- Section 4 – Innovative Practices by Multi-State Regions; and
- Section 5 – Current and Evolving Federal Policies and National Initiatives.

Context

CMAP's approach to climate change and energy issues is circumscribed by the legislative and planning context under which it operates. CMAP is bounded by the statutes and regulations that determine the extent to which it can require as opposed to encouraging changes within the region. Unlike Washington State, which has empowering legislation for regional agencies' growth management plans to be translated by the counties and municipalities, Illinois does not have similar legislation. Beyond formal authority, CMAP can take a dynamic approach to the regulatory and statutory authority of its governmental partners (cities, towns, state agencies). CMAP could influence or negotiate to support strengthening how climate change and energy are considered within partners' processes in ways that can support climate change and energy actions in the *GO TO 2040* plan.

CMAP's pursuit of climate change and energy goals can be greatly enhanced by parallel and complementary efforts of its state, regional, and local partners. Chicago is completing its Climate Action Plan calling for reductions in GHG emissions. GHG reduction targets and political commitments of the City to meet targets will be critical underpinnings of the *GO TO 2040* plan. Work is also underway in the region by the Metropolitan Mayors Caucus, the Center for Neighborhood Technology (CNT) and ICLEI, and through city and state participation in Chicago Climate Exchange.

By guiding the MPO planning process and working collaboratively with its partners, CMAP has the opportunity to identify regional policies and transportation projects that can reduce GHG emissions and conserve energy use in the region. On the land use side, CMAP promotes coordinated and sustainable development, redevelopment, and preservation within the region through collaborative local, county, and regional land use planning. Land-use decisions, however, are made at the local level.

Recommendations and Conclusions

The following recommendations and conclusions are drawn from the research presented in Sections 2 to 5 and the key considerations in the Analysis/Synthesis section.

1. **Integrate climate change and energy throughout vision/scenario planning**
   Climate change and energy should be fully integrated into vision/scenario planning -- there should be high-level goals, targets and investment criteria based on carbon dioxide (CO_2) emissions and energy use.

2. **Connect climate change and energy directions in the vision plan to on-going transportation planning**
   The vision plan can provide the policy foundation to guide transportation decision-making at the network and project levels that can result in reduced GHG emissions and energy use, as demonstrated in the Sacramento area example. Criteria can be used in a range of ways (along a spectrum), from:
   - *Informing*, to
   - *Influencing*, to
   - *Contributing to* formal decisions (e.g., in an explicit criterion)

3. **Pursue and engage in key partnerships**
   GO TO 2040 should include new partnerships to pursue actions related to climate change and energy. Since few potential actions fall completely under CMAP's discretion, it will need to enlist city and county agencies (including the Metropolitan Mayors Caucus) to support land use actions and modal transportation authorities to support regional transportation actions. It will be important to carefully present costs, benefits, and risks, balance "winning and losing" on multiple actions, and articulate a clear sense of regional purpose.

4. **Model CO_2 emissions when constructing and using scenarios**
   CMAP should model CO_2 emission reductions and energy savings in its transportation planning process and under various long-range growth scenarios. It is important for CMAP to capture the range of possibilities for scenarios, policies, and investments over the planning horizon while considering critical national and international trends and risks.

5. **Focus on Carbon Dioxide**
   CMAP should focus on CO_2, the dominant GHG, in its vision plan. Climate Change plans of states, cities, and related planning by peer MPOs focus on CO_2 as the key GHG that these entities can influence through transportation and land use. *GO TO 2040* can provide a focus on GHG emission reductions with targets and actions that complement those being

pursued under the Chicago Climate Action Plan, and that later be pursued by other cities and transit agencies.

6. **Approach CO_2 emission reduction as a co-benefit**
   Although peer examples in this paper demonstrate use of CO_2 emission reductions as a top priority goal for vision and long range plans, these are closely anchored to parallel regional goals, including reducing VMT for congestion relief; mode shifts to improve access promote social equity; or reduced energy consumption. If GHG reductions are understood as a co-benefit, there will less likely be resistance to introduction of a new policy goal.

7. **Develop and apply climate change and energy specific indicators**
   CMAP should explore how to advance its Climate Change Roundtable recommendation that GHG emissions be "one of the primary indicators" in the regional planning process. This paper suggests a range of robust indicators including:
   - Direct climate change indicators: CO_2 in million metric tons, or per capita, passenger mile, or freight ton.
   - VMT, particularly avoided auto trips, as a surrogate for energy and CO_2 reductions
   - Mode share or mode shift (targets related to CO_2 reduction)

8. **Communicate about climate change and energy**
   CMAP could develop a communications package tailored to key stakeholder groups – explaining its approach to climate change and energy combined with the broad vision, directed at informing, gaining support, and enlisting partners.

9. **Engage in state and multi-state level climate change planning activities**
   CMAP could advocate for state legislation to empower the regions to play a lead role in climate change, including through regulatory powers that might institute growth management policies for county and municipal planning processes. This would be similar to the legislation that describes the role of MPOs in Washington. CMAP could also consider how it might support regional GHG reductions at the multi-state level.

10. **Build on supportive national trends and policies**
    Federal policies, national initiatives, and major trends related to climate change and energy will have profound impacts on CMAP's actions to reduce CO_2 emissions and energy consumption. As it develops *GO TO* 2040, CMAP should attempt to anticipate these trends in scenarios, and identify how these trends could amplify intended effects of actions.

Section 1 – Summary Report

Introduction

This strategy paper will complement internal work by CMAP on *GO TO 2040* by developing recommendations on how to incorporate climate change and energy considerations in scenarios, indicators, and actions. These recommendations are built upon insights from research on the experiences of the MPOs and other organizations conducting innovative long range transportation and land use planning, with emphases on climate change or energy.

The key starting point for this paper is the recommendations from CMAP's December 2007 regional climate change summit, which include:

- Using GHG emissions as a primary indicator for the regional planning process – recommended actions and projects in the plan should be evaluated for GHG emissions.
- Promoting compact, mixed-use development, or "smart growth" to reduce VMT.
- Facilitating the understanding of climate change through community involvement.
- Understanding the role of cap and trade and its relevance for the transportation sector and other sectors influenced by scenarios (this includes the possibility of earning or buying credits for transportation and land use decisions).

Emphasis/Definitions

Climate change – The primary emphasis of this paper is on the reduction of GHG emissions in the region. Although this paper does not address in detail the parallel concern of adaptation of transportation systems to possible impacts of climate change and extreme weather, this could be addressed in a later expansion of the analysis.

Energy – The energy focus in this paper is on fossil fuel from reductions in transportation related regional GHG emissions. This paper assumes that there is a very close relationship between climate change and energy use. Energy and climate change are the same when efforts to reduce GHG emissions translate into energy savings (e.g., through reductions in VMT) for the region and vice versa. Energy and climate change are not the same when changing the energy mix in the region does not result in changes in GHG emissions. The focus of the paper is on transportation-related GHG and energy reductions from land use changes, such as density, that directly or indirectly reduce VMT rather than on non-transportation related energy reductions. This paper does not consider non-transportation GHG/energy reductions (e.g., from heating) which cannot be captured in transportation analysis, including forecast models.

Links

The paper also attempts to identify potential links between climate change and energy strategies and several other strategies being explored by CMAP, including:

- Public-Private Partnerships – Public-Private Partnerships, including tolls, can be structured to reduce carbon emissions and energy use, e.g., by encouraging traffic management, low carbon vehicles, ride sharing, etc.
- Goods Movement – Alternative modes, primarily rail and marine, are more energy efficient per ton and emit less CO_2 than trucks. Land use decisions affect freight movement; for example, industrial development can be located along rail corridors to

take advantage of rail instead of increasing truck traffic. Residential land use needs to consider the equity of proximity to freight facilities. Since these considerations have VMT impacts, there are indirect energy and climate change impacts.

- Security and Emergency Management – There are and will be climate change related impacts to key infrastructure and populated/developed areas throughout the region. Accordingly, there needs to be evacuation planning for flooding and other extreme weather events. On the *social equity* side of this issue, there are opportunities for parallel efforts to prepare infrastructure for extreme weather/climate change impacts, emergency response, and security (i.e., how to address the "winners and losers in a carbon-constrained Chicago").
- Other topics:
  - Alternatives to single occupant automobile travel – *bicycling*, *walking*, car-sharing, public transit, transportation demand management, or parking.
  - *Land use* – brownfields, development/financial incentives, parking, school siting, teardowns, and urban design/walkability, specifically as they relate to VMT.
  - *Environment and natural resources* – land preservation, waste disposal, and wastewater; environmental justice/equity.
  - *Economic development* – green energy production, industry clusters, and infrastructure to support redevelopment.
  - *Housing* – housing preservation and jobs-housing balance.

Analysis/Synthesis

This section presents an overview of the research conducted for this paper that was used to develop the recommendations and conclusions discussed in the next section of this paper. The paper contains four major sections: Section 2 – MPO and Other Regional Examples, Section 3 – Statewide Examples, Section 4 – Multi-State Examples, and Section 5 – Federal Policy and National Initiatives. Although this report does not focus on similar activities of cities, this could be an additional fruitful direction for research considering the significant number of cities developing climate change action plans. The end of this section concludes with six key considerations for CMAP as it addresses climate change in the region:

1. The political/legislative context for CMAP's climate change and energy work
2. Implications of evolving Federal regulations, policies, and programs
3. Viability and implications of candidate actions
4. Accurately modeling GHG emissions
5. Importance of time horizons
6. Partnership opportunities

Section 2 – Innovative Practices by Peer MPOs

Section 2 provides a summary of work underway by selected MPOs and other regional authorities to include climate change in their transportation planning. Insights from this scan are intended to assist CMAP in considering approaches to address climate change issues. The Puget Sound Regional Council (PSRC) appears to be the peer MPO nationally taking the most comprehensive and substantial approach to climate change – in its vision plan, scenarios, and on-going transportation planning and decision-making. Consequently, this paper examines PSRC's

process in detail. Other MPOs are also beginning similar efforts or have had noteworthy accomplishments in related aspects of planning, and are covered, though in less detail. Although not a peer MPO, Transport for London also provides very valuable insights on successful integration of climate change considerations in long range transportation planning.

Section 3 – Innovative Practices by States

Section 3 provides a summary of statewide climate change planning efforts, including the development of GHG emissions plans, with short summaries of efforts by leading states. Although state departments of transportation (DOTs) face different issues and have different responsibilities than MPOs, there are useful insights available to CMAP from reviewing how DOTs incorporate climate change and energy within statewide transportation planning. Unlike efforts by MPOs, where PSRC may be the first to have a stand-alone climate action plan, there are valuable examples of how states are developing long-range plans that translate climate change and energy goals into targets using indicators, as well as how the states are assessing and selecting actions to accomplish these goals.

This section can help CMAP anticipate possible future state policies and can provide ideas for how CMAP could work with the State of Illinois to advocate measures that would support regional initiatives and leadership on climate change issues. Illinois is completing its Climate Action Plan calling for reductions in GHG emissions. GHG reduction targets and political commitments of the State to meet targets will be a critical underpinning of the vision plan. Illinois DOT is a member of the MPO Policy Committee.

Section 4 – Innovative Practices by Multi-State Regions

Section 4 summarizes the work of multi-state groups on climate change issues in the transportation sector. This information is particularly relevant for CMAP; since the Midwestern Regional Greenhouse Gas Reduction Accord is in its early stages, there may be opportunities for CMAP to participate in and support its evolution in a way that may provide high level leadership that supports future regional climate change and energy actions for the transportation sector. For example, the multi-state collaboration could provide significant support for major inter-urban initiatives that could deliver significant GHG and energy reductions. Illinois is a member of the Midwestern Regional Greenhouse Gas Reduction Accord.[1]

The information in this section serves two purposes. First, the overview of policies in other multi-state agreements, particularly the Conference of New England Governors and Eastern Canadian Premiers, provides CMAP with an idea of possible future multi-state policies so it can position itself accordingly and be informed should it participate in future multi-state transportation working groups. Second, this section provides ideas to consider if CMAP chooses to play an active role in the multi-state region, perhaps by advocating transportation measures that would support its work and potential to be a leader on climate change issues.

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[1] Under the Accord, members agree to establish regional greenhouse gas reduction targets, including a long-term target of 60 to 80 percent below current emissions levels, and develop a multi-sector cap-and-trade system to help meet the targets. Participants will also establish a greenhouse gas emissions reductions tracking system and implement other policies, such as low-carbon fuel standards, to aid in reducing emissions.

Section 5 – Current and Evolving Federal Policies and National Initiatives

Section 5 summarizes selected current and possible future federal regulations and policies that could have significant impacts on how successfully *GO TO 2040* will accomplish goals to reduce GHG emissions and energy use. Some of the trends and policies could support or amplify major actions in the CMAP Vision Plan, while others may reduce the impacts of some actions. For example, although an increase in the cost of driving may be easy to predict, the extent of increases, whether through fuel prices, suppliers' charges, fuel taxes, cap and trade, or congestion or carbon pricing, will be a major factor in selecting investments in alternatives to automobile travel or emphasizing compact development.

The intent of this section is to briefly identify topics for CMAP to consider as it reviews candidate actions within the scenarios to reduce GHG and energy use. The topics are complex, involve uncertainty, and are matters of degree. The summary identifies selected policies or programs that are likely to influence significantly how CMAP implements the climate change and energy-related aspects of *GO TO 2040*. The section reviews relevant or possible future legislation, national initiatives, or trends including:

- National targets for GHG emissions
- Fuel prices
- Peak oil and shortages
- Carbon credits and trading
- Congestion or carbon pricing
- Fuel economy standards
- Alternative fuels
- Reauthorization of Transportation Act

Key Considerations

Based on the research presented in Sections 2-5, there are six key considerations provided for CMAP as it determines how to shape its climate change program.

1) *The political/legislative context for CMAP's climate change and energy work*

   At the state level, Illinois may pass GHG emission reduction legislation that will impact CMAP's planning and decision making processes. CMAP can be prepared by understanding what other states are doing and then considering how proactively to advocate state level actions that may support the Vision Plan. Of particular relevance would be targets for the reduction of VMT over the next several decades. Washington State recently passed this type of legislation.

   At the multi-state level, the Mid-West region recently started to address climate change collectively. CMAP also has the opportunity to be proactive within the Mid-West region by advocating certain policy actions, some of which have been undertaken by the New England Governor's Conference.

2) *Implications of evolving Federal regulations, policies, and programs*

   Federal policies (or even the absence of policies) and national initiatives, ranging from increased fuel economy standards, to research into alternative fuels, CO_2 targets, tax policies, and changes in reauthorization could have profound impacts on what CMAP can accomplish through actions to reduce CO_2 emissions as well as to pursue other goals. New federal policies or shifts in directions such as those discussed below could minimize or perhaps more likely, amplify the impact of CMAP's actions to reduce GHG emissions as well as pursue other sustainability goals.

   CMAP's challenge will be to identify national policies and programs that might significantly influence actions the agency and its partners might pursue. Although far from certain, many of the potential policies and programs described in Section 5 could end up supporting actions that encourage VMT reductions through balanced modal investments and more compact land use. The challenge will be for CMAP to accommodate unavoidable uncertainty as it selects actions for the scenarios.

3) *Viability and implications of candidate actions*

   It is unlikely that CMAP will pursue goals solely for GHG emission reductions. More likely, actions will support multiple goals.

   The most obvious ways to reduce CO_2 emissions and fossil fuel use that CMAP may be able to influence directly involve reducing VMT through transportation policies and investments and policies and through compact development. Candidate actions involve increasing investments in public transit and other alternatives to single occupant vehicle travel, including nonmotorized travel, or demand management strategies. All of these actions would

be undertaken to pursue multiple goals, such as energy savings, air pollution reduction, the spread of smart growth, enhanced public health and increased open space preservation.

Other actions, such as improved fuel economy and use of alternative fuels, will be difficult for CMAP to influence directly, although these strategies, if promoted at federal or state levels, could contribute to major reductions in CO_2 emissions, and will need to be factored into regional GHG analysis.

Another major category of actions involve pricing – congestion pricing, carbon pricing, or variations. These actions could reduce emissions and fuel use far beyond what could be accomplished through shifting investments to transit or nonmotorized travel. It is unlikely that CMAP could build enough support for major pricing strategies solely based on GHG emissions or fuel savings, short of some type of metropolitan or statewide GHG caps or targets. Support would have to be based on contributions that pricing would make to a broad range of other high priority goals.

4) *Accurately modeling GHG emissions*

Modeling GHG emissions must be as accurate as possible so that decisions on alternatives to pursue or projects to fund can credibly be assessed using a CO_2 emissions criterion. To achieve a high level of accuracy in its modeling, CMAP would benefit from communication with PSRC as they improve their model and work with EPA on MOVES. CMAP should also track progress of California MPOs since they are required to be accurate in their modeling processes for state as well as federal purposes.

Analysis including use of models will need to be able to factor in international and national trends, policies, and laws and consider the degrees of likelihood that federal regulations such as those discussed might be passed during the time period of the Vision Plan.

5) *Importance of time horizons*

CMAP should consider the time horizons for GHG reduction targets very carefully. There are relatively low risks to committing to ambitious goals to be reached at the end of a long time horizon, such as out to 2040. It would make sense to include incremental goals over shorter time periods, thereby forcing careful analysis of trade-offs among alternatives and the difficult choices likely to be required to meet long-term aggressive targets realistically. Long-term goals can be combined with short-term goals that are attainable through specific, measurable actions that can be monitored using appropriate indicators, allowing targets to be adjusted as necessary.

Short-term targets provide public visibility and support for partners to meet commitments. Most land use actions will be long-term and potentially could significantly contribute to reductions against 2040 targets, while investments in transit or nonmotorized alternatives can also produce short-term reductions in VMT, CO_2 emissions, and energy use.

6) *Partnership opportunities*

CMAP could engage all relevant partners, including state, county, and municipal climate change and environmental staff and elected officials, around climate change and energy goals, for example, through follow-on topic forums focused on the vision plan and its implementation. CMAP could also pursue partnerships with business, non-profits, advocacy groups, and other organizations, such as the Metropolitan Mayors Caucus, to benefit from their networks of peers and resources. Partnerships can support development and implementation of the *GO TO 2040*.

The multi-state collaborations described in Section 4 provide opportunities for CMAP to find state and other partners for climate change actions, and could lead to state regulations and programs that support CMAP's actions. Important inter-regional projects, such as high speed passenger rail, balancing air and rail travel, or major freight initiatives involve multiple jurisdictions (such as states, MPOs, cities, and other stakeholders). The NEG/ECP collaboration described later in this paper is an example of how this collaborative approach can further these ambitious but promising major actions.

Recommendations and Conclusions

Based on the research and analysis in Sections 2-5, the Volpe Center developed ten key recommendations and conclusions on how CMAP can incorporate climate change and energy considerations in *GO TO 2040*. The recommendations and conclusions focus on:

- Constructing scenarios
- Creating action packages
- Developing indicators
- Shaping the overall metropolitan transportation planning process, and other regionally significant transportation or land use scenarios.

1) *Integrate climate change and energy throughout vision/scenario planning*

Climate change should be fully integrated into vision/scenario planning (e.g., for PSRC, climate change can be a criterion for selection of the preferred scenario). At a minimum, there should be a high-level criterion based on CO_2 emissions; beyond this, there is the potential to be innovative by expanding criteria also to consider other GHG emissions, such as CH_4 and NO_2, for example, through expanding use of available models and software for scenario planning.

CMAP has the potential to be a national innovator by considering **impacts** of and adaptation to climate change in parallel with considering reductions of GHG emissions in scenario analysis. Impacts could include possible water or energy shortages in the region, the impact of increasing temperature, and potential flooding of key transportation infrastructure and areas developed or planned for development. Serious consideration of climate change, with a combined focus on investments to reduce emissions and to reduce vulnerability of infrastructure, will produce significant policy and technical challenges for CMAP's planning process.

The Chicago area may also be affected indirectly, but potentially significantly, by climate impacts nationally and internationally, including shifts in freight patterns in response to

impacts in vulnerable coastal areas. There may significant demands on limited federal transportation funds to shift investments to areas with vulnerable transportation infrastructure.

2) *Connect climate change and energy directions in the vision plan to on-going transportation planning*

Transportation decision-making at the network and project levels should be informed by estimated changes in GHG emissions as compared to alternative networks or projects, or status quo alternatives (maintain but do not build). The ability to address climate change mitigation and adaptation will be directly associated with the weight CMAP (and its land-use and transportation partner agencies) assign to related decision-making criteria relative to other criteria. Criteria can be used in a range of ways (along a spectrum), from:

- *Informing*, to
- *Influencing*, to
- *Contributing to* formal decisions (e.g., in an explicit criterion, possibly weighted, in combination and in trade-offs with other criteria)

It would be useful for CMAP to think in terms of progression over-time in its planning process using these steps.

3) *Pursue and engage in key partnerships*

As part of the Vision Plan, CMAP should include institutional strategies that establish potential or expand existing partnerships to pursue actions related to climate change and energy. Few potential actions fall completely under CMAP's authority. Instead, city and county agencies can be enlisted to support land use actions and transportation authorities must support transportation actions. If this entails shifts from the status quo, CMAP should carefully present the costs, benefits, and risks, as well as incentives, which may balance "winning and losing" on multiple actions. CMAP should also carefully and completely present a clear sense of regional purpose.

An opportunity exists for CMAP to partner with local air quality agencies and other state offices or organizations to research local sources of GHG emissions and possible strategies to reduce their production and address their impacts on the local environment. CMAP could work with its partners to craft a similar regional climate change action plan to those being developed by the Puget Sound Regional Council and the Delaware Valley Regional Planning Commission (Philadelphia).

There is an important opportunity to establish a substantial partnership with the City of Chicago and the Metropolitan Mayors Caucus to reduce GHG emissions. *GO TO 2040* could include regional transportation and land use policies and investments that support those in the Chicago Climate Action Plan and move toward consistent reduction targets.

Section 5 provides an example of a partnership with manufacturers and shippers that might simultaneously support improved freight efficiency while reducing energy and CO_2

emissions. This type of non-capital action could fit into a green technology/economy scenario that supports economy, energy, and GHG reduction goals.

4) *Model CO_2 emissions when constructing and using scenarios*

CMAP should model CO_2 emissions and energy savings in its transportation planning process and under various long-range growth scenarios. However, from the perspective of what climate change and energy considerations to include in scenarios, CMAP should consider the limitations of available technical tools. CMAP can build on in-house analyses that focus on high level implications for energy and climate change strategies.

It is important for CMAP to capture the range of possibilities, risks, and implications for scenarios, policies, and investments in the over the 30-year planning horizon. This analysis should demonstrate that CMAP is considering critical national and international trends, risks, and broad implications for proposed actions, and recognize the importance of robust approaches.

5) *Focus on Carbon Dioxide*

Although the topic for this paper is climate change, which could include a focus on all GHG including CO_2, methane, and nitrous oxide, CMAP should focus on CO_2, the dominant GHG, in *GO TO 2040*. GHG and Climate Change plans of states, cities, and related planning by peer MPOs focus on CO_2 as the GHG emission that these entities can influence through strategies under their discretion.

According to the EPA, CO_2 accounts for more than 80% of U.S. GHG emissions. Nearly all of this CO_2 is from fossil fuel combustion. The transportation sector accounts for over 30% of CO_2 emissions nationally. Estimates range significantly among metropolitan areas. Estimating this in the Chicago region will provide a key baseline that can be further refined using the performance indicators discussed below. CMAP should consider developing a regional Climate Change Action Plan, building from the regional baseline now being developed.

GO TO 2040 can provide a distinct focus on GHG emission reductions that complements and supports those being pursued by the City of Chicago its Climate Action Plan and that might be pursued in the future by other cities or other entities, such as the public transit agencies[2]. Regional climate change links could involve common goals and targets, indicators, consistent emission baselines, and supportive policies and actions.

6) *Approach to CO_2 emission reductions as a co-benefit*

Although peer examples, particularly from Seattle, Sacramento, and London, demonstrate use CO_2 emission reductions as a top priority goal for vision and long range plans, these goals are closely anchored to other important regional goals including reduced VMT for congestion relief, mode shifts to improve access for social equity, or reduced energy consumption. If

[2] The American Public Transit Association and it members agencies are undertaking a series of new climate change initiatives, including standardizing climate change-related indicators and exploring role of transit in carbon trading.

GHG reductions are understood as a co-benefit, there will less likely be resistance to introduction of a new policy goal in an already complex process.

7) *Develop and apply climate change and energy specific indicators*

CMAP should explore how to make concrete its Climate Change Roundtable recommendation that GHG emissions be "one of the primary indicators" in the regional planning process and scenario evaluations. Among the peer areas examined in this strategy paper, Transport for London included "tackling climate change" as one of four core themes for its 2025 Vision, while PSRC incorporates climate change considerations throughout its long-range land use and transportation planning.

CMAP should assess how to use related indicators as targets for goals in the scenarios (e.g., reduce CO_2 emissions or emissions per capita to X level by Y date), within decision-making processes, and to compare and select scenarios, or, later, to make investment decisions within the metropolitan transportation planning process or other planning processes of CMAP's partners.

CMAP can look to some of the peer organizations identified in this report to identify new tools to use to incorporate climate change and energy into the vision plan. For example, its choice of performance indicators can have major policy implications. Based on discussion below of PSRC, London, and other applications, these can include:

- Climate change indicators: CO_2 in million metric tons (simplest and clearest), per capita or per freight ton mile, per million of GDP (economic intensity), or increased/decreased against a fixed baseline. Consider correspondence to city, state, national, or international targets.
- Key role of VMT changes, particularly avoided auto trips.
- Relevance of VMT not only as a surrogate for mobility but also for energy consumption and CO_2 reductions. Note that while this method of estimation may suffice for large scale relative comparisons of scenarios and major directions in *GO TO 2040*, estimating methods may need to be enhanced for more detailed analysis, e.g., at a corridor or project level.
- Mode share or mode shift (targets related to CO_2 reduction).

8) *Communicate about climate change and energy*

CMAP should adjust its content and message to gain sustained support from key groups and partners and should utilize tools and methods applied successfully by peers. It should develop a communications package that is tailored to key stakeholder – explaining approach to climate change and energy as part of a broad vision, directed at informing, gaining support, and enlisting partners, as appropriate.

9) *Engage in state and multi-state level climate change planning activities*

Similar to the legislation that describes the roles of MPOs in Washington State, CMAP could advocate for state legislation to empower the regions to play a lead role (perhaps providing a regional framework for land use), including through regulatory powers that might, for

example, institute growth management policies for county and municipal planning processes. To ensure cooperation among jurisdictions, these policies could be developed as partnerships, through "bottoms-up" participation of local authorities, perhaps organized around the directions of the new Vision Plan.

Similarly, CMAP can be engaged and proactive at the multi-state level. With the Mid-West region recently starting to address climate change collectively, CMAP has the opportunity to advocate for certain policy actions, some of which have been undertaken by the Conference of New England Governors and Eastern Canadian Premiers. The NEG/ECP created a Transportation and Air Quality Committee to specifically address transportation and air quality issues in the region, and to develop an action plan as well. CMAP could advocate for a similar committee to be formed in the Mid-West and could play a significant role on such a committee if formed.

10) *Build on supportive national trends and policies*

Federal policies (or even the absence of policies) and national initiatives related to climate change and energy, ranging from increased fuel costs, higher fuel economy standards, national CO_2 targets, tax policies, and changes in reauthorization could all have profound impacts on what CMAP can accomplish through actions to reduce CO_2 emissions and energy consumption. These shifts in directions could minimize or perhaps more likely, amplify the impact of some actions that CMAP might take to reduce emissions as well as pursue other sustainability goals.

As it develops *GO TO* 2040, CMAP should reflect anticipation of these major trends in some of the scenarios, and identify how the intended effects of selected actions might be amplified by these trends. For example, reduced VMT and mode shifts from investments in new transit capacity could be amplified many times over by increases in fuel prices.

CMAP could risk marginalizing its vision plan if there is inadequate consideration of these trends. The challenge will be for CMAP to accommodate unavoidable uncertainty as it develops scenarios and selects actions.

Further Research

Based on discussion with CMAP, the Volpe Center could expand research reflected in this paper, including:

- Implications of research on land use patterns and travel (e.g., by Robert Cervero, Reid Ewing, Keith Bartholomew, or Larry Frank);
- Strategies that could include congestion or carbon pricing and carbon credits and trading.
- Expansion of state, MPO, or multi-state summaries in this report or additional summaries of relevant planning practice, including by MPOs, additional state GHG plans, and cities with GHG plans.
- Use of *back-casting techniques* to work back from high level policy goals expressed as quantified targets (specifically for CO_2 and energy), to identify the most promising policies and actions to meet those targets. For example, this technique has been as used

in environmental and energy studies by the Organization of Economic Cooperation and Development (OECD).

- Current U.S. or international applications of models to forecast a CO_2 and energy impacts of transportation plans or major projects, including any insights into appropriate levels of accuracy for different applications (e.g., for 20-40 year scenarios compared to analysis of major alternative investments in corridors or projects). Note that the Volpe Center is tentatively planning a one-day international workshop on a related topic, in partnership with the Dutch Ministry of Transport's research center, hosted by the Netherlands Embassy in D.C. at the end of the TRB 2009 Annual Meeting.

Section 2: Innovative Practices by Peer MPOs

This section provides brief summaries evaluating planning activities of peer MPOs to incorporate climate change and energy considerations into their on-going transportation planning processes, with a particular focus on the development of vision plans with scenarios, and parallel land use planning.

Although there is a broad range of useful insights for CMAP from this brief scan of MPOs, the Puget Sound Regional Council (PSRC), the Seattle area MPO, represents the *"gold standard"* in terms of progress in developing a vision plan with scenarios that will be linked to on-going planning and decision-making. PSRC provides many insights for CMAP as a peer engaged in developing an integrated approach to land use and transportation planning, incorporation of CO_2 reduction goals, performance indicators, institutional relationships and partnerships, and the use of models and forecasts. Consequently, this following section includes an expanded assessment of the PSRC's work. Examples from other MPOs provide helpful insights into specific aspects of developing a vision plan with climate change and energy considerations.

Puget Sound Regional Council (PSRC)

The following section was written with major input from PSRC staff in response to questions and a framework developed by USDOT's Volpe Center. Note that staff responses are expressed in the first person. This framework includes how PSRC climate change work integrates into and overlaps with the major areas of vision/scenario planning, the intersection of vision planning and transportation planning, the political/legislative context, key partnerships, modeling, and decision-making criteria.

Vision/Scenario Planning

PSRC's long-range growth management, economic, transportation, and environmental strategy, termed VISION 2040, contains legislatively-empowered regional policies (i.e., multicounty planning policies) that explicitly refer to climate change and energy efficiency. The full set of multicounty policies address a broad spectrum of environmental issues, development patterns, housing, economic development, transportation, and public services. Climate change and CO_2 emissions were also included as criteria for the selection of PSRC's future growth alternative and were included in PSRC's analysis of future growth alternatives, performed for their VISION 2020 Update Draft Environmental Impact Statement.

Vision Planning and Transportation Planning

Adopted in April 2008, VISION 2040 and its policies must be followed in all subsequent planning processes, including in Destination 2030, the region's long-range transportation plan. Work began in early 2008 to update Destination 2030, with completion of the update scheduled for 2010. Transportation concepts and strategies being developed for the update will go through a screening process whereby they are assessed for consistency with VISION 2040's Regional Growth Strategy and regional policies, as well as additional environmental impacts. Only those concepts and strategies determined to be consistent will go forward to form the alternatives that will be crafted for more detailed analysis. The evaluation of those alternatives will be based on

criteria that relate to the policies and provisions in VISION 2040, as well as additional environmental considerations. These criteria will include greenhouse gas emissions, as well as emissions of criteria pollutants. In addition, the EIS to be performed will include an evaluation of climate change and the plan itself will discuss climate change impacts, both in terms of mitigation and adaptation.

Political/Legislative Context

PSRC integrated climate change and energy efficiency concerns into its multicounty planning policies, which have legislative standing due to empowering state legislation, i.e., the Washington State Growth Management Act (first adopted in 1990 and subsequently amended). Seattle and King County have adopted legislation or provisions calling for reductions in GHG emissions over the coming decades. For example, state legislation first adopted in 2007 and further strengthened in 2008 calls for greenhouse gas emissions to be 50 percent below 1990 levels by the year 2050. Along with California and Oregon, Washington is a partner in the Western Climate Initiative. King County and Seattle are leaders in the national county and city associations on local responses to climate change. More than twenty other municipalities in the central Puget Sound region have signed on to the US Mayors' Climate Protection Initiative, including the central cities of Bremerton, Everett, and Tacoma.

In response to the state legislation, VISION 2040 includes policies and provisions committing to compliance with state initiatives and directives regarding climate change and the reduction of greenhouse gases. Policy language calls for jurisdictions and agencies to include an analysis of climate change impacts when conducting environmental review under the State Environmental Policy Act. VISION 2040 also calls for developing a regional climate change action plan that implements state law, reduces greenhouse gas emissions, and takes specific mitigation steps to address climate change impacts.

For urban regions in states that currently do not have climate change legislation, the opportunity exists for MPOs to partner with local air quality agencies and other state offices or organizations to research local sources of greenhouse gas emissions and possible strategies to reduce their production and address their impacts on the local environment. MPOs can craft a similar climate change action plan to what the Puget Sound Regional Council is developing at the regional level.

The climate change action plan is one of 68 implementation actions listed in VISION 2040 (see Box 2.1). With VISION 2040 having just been adopted on April 24, 2008, the policy boards are now reviewing and prioritizing tasks and work related to the implementation actions. It will take several months before PSRC has a better understanding of which actions are going forward at which points on the calendar and at what level of effort. However, the climate change action plan is listed as "short-term", meaning that work on it will start in the first three years after adoption of VISION 2040. As part of the policy board review on the actions now underway, it is likely that some of the short-term actions will start up in 2008, while others will be programmed when the agency begins its next two-year budget cycle in 2009.

Box 2.1: Climate Change Action Plan
Excerpted from VISION 2040, page 43

En-Action-7

The Puget Sound Regional Council and its member organizations will work with the Puget Sound Clean Air Agency, state agencies, and other environmental professionals to prepare an action plan containing regional and local provisions. The plan should investigate ways to: (a) address climate change in accordance with the Governor's 2007 Climate Change initiation and state legislation on greenhouse gas emissions reduction (RCW 80.80.020), (b) reduce greenhouse gas emissions, and (c) take specific mitigation steps to address climate change impacts. The plan should also address establishing a regional climate change benchmark program.

(Short-term)

(MPP-En-20 through 25)

Results and Products: Action plan for climate change, climate change benchmark program

Notes:
- RCW = Revised Code of Washington (i.e., state legislation reference)
- MPP = Multicounty Planning Policy
- MPP-En = multicounty planning policy in the Environment Section of VISION 2040

Key Partnerships

PSRC is partnering with several organizations and agencies to address climate change issues systematically at both the regional level and local level. These partners include the Puget Sound Clean Air Agency and the Regional Council's member jurisdictions and agencies, including four counties, more than 70 cities, 6 transit agencies, port districts, and state agencies.

The Puget Sound Clean Air Agency and the Washington State Department of Ecology in concert with the University of Washington have already done extensive work on identifying the sources of greenhouse gas emissions in the central Puget Sound region and likely outcomes of changes in the region's climate, including increased rates of coastal erosion and landslides, near-shore habitat loss, reduced runoffs from the nearby mountains in the spring, and increased risk of forest fires. Other state agencies, including the Department of Community, Trade and Economic Development and the Washington Department of Transportation are working on best practices for addressing climate change and strategies to reduce vehicle miles traveled.

PSRC is actively working with these and other agencies as the state moves forward with additional initiatives, and as part of working groups for the update to Destination 2030. "We are fortunate to have the leadership from our state, regional and local agencies on the issue of climate change; their forward thinking has advanced the topic and has allowed PSRC to take key steps in addressing the issue in our plans and policies."

The Regional Council was fortunate to have the climate-related work of the Puget Sound Clean Air Agency available as it worked with local elected officials to craft the climate change policies and provisions in VISION 2040. "For the agency's technical work, our long-standing collaborative relationships with our federal, state, regional and local partners have been instrumental to our success in moving forward on both modeling improvements and in our undertaking of guidance and technical assistance for our member jurisdictions."

It is important to note that addressing climate change is highly related to addressing all sources of air pollution. In the central Puget Sound region, and likely in other urban region, it made sense to build on long-standing strategies to improve air quality in turning attention to climate change. Similarly, many of the policies and provisions already in place in the Puget Sound Regional Council's 1995 VISION 2020 strategy were determined to have climate change benefits, such as the development of compact urban communities that are more conducive to walking and transit, transportation demand management strategies, and similar efforts to reduce driving alone.

Modeling Greenhouse Gases

PSRC is involved in several initiatives to improve its model of GHG emissions, and specifically its ability to reflect CO_2 emissions in the region accurately. PSRC estimated how much CO_2 was emitted under each growth alternative.

In line with Appendix 1, the travel demand model improvements are well under way and PSRC has begun "concept analyses" as the first step in crafting alternatives for the Destination 2030 update. In addition, PSRC is the MPO pilot for testing the most current draft version of EPA's new MOVES model, which will allows analysis of GHG emissions at various speeds.

The first three components in Appendix 1 are the most critical to the Destination 2030 update – vehicle assignment, tour generation and mode choice. The remaining three – walkability, costs of driving and operational modeling – are also important, but less critical than the first three. Being able to access the MOVES model, however, is extremely critical to success in addressing the impacts of transportation strategies on climate change, via the analysis of greenhouse gases.

On these improvements, PSRC works closely with its air quality consultation partners – FHWA, FTA, WSDOT, EPA, Ecology, and the Puget Sound Clean Air Agency. In addition, the climate change technical working group includes other agencies such as King County and the cities of Seattle and Bellevue. Our travel demand modeling group has a Regional Technical Forum with representation from our member jurisdictions, and includes a subcommittee of model users.

While more sophisticated modeling tools allow for a more robust analysis with greater certainty for planning decisions, climate change issues can still be taken under consideration in their absence. Particularly if performing comparisons among alternatives, even a simple analysis of greenhouse gas emissions may be conducted with existing tools. In addition, from a policy perspective, the concepts for mitigating emissions from the transportation sector are not new ones – they have been incorporated into multimodal transportation planning for other air quality issues, and are just as valid for climate change issues – transportation demand management, expanded transit, nonmotorized accessibility, as well as land use densities and mixed use. From

this perspective, a region can still undertake a consideration of climate change as they move forward with their planning efforts, even in the absence of sophisticated modeling tools.

Climate Change Criterion

PSRC used CO_2 emissions as one of its criteria to select future growth alternatives. PSRC is considering and planning ways to integrate this criterion into its other planning processes and documents, such as the long range plan, CMAQ selection process, and TIP.

Climate change is not only addressed in the environmental policy section of VISION 2040, but throughout the document. For example, the transportation set of policies opens with an overarching goal that calls for the region to have a "cleaner" and "sustainable" multimodal transportation strategy that both "supports the regional growth strategy" and promotes "environmental vitality" and "better public health." The opening paragraphs of the transportation section then proceed to address the fact that half of the sources of greenhouse gases in the central Puget Sound region are related to transportation, primarily the burning of gasoline and diesel fuel. VISION 2040 recognizes that changes in fuels, technologies, and travel patterns are all needed to meet the region's greenhouse gas reduction goals.

Specific provisions are included in VISION 2040 that call for the Regional Council to update its programming and project selection criteria to address both health impacts and the reduction of greenhouse gas emissions. A related policy calls for the agency's project selection process to reflect the clear policy direction from VISION 2040. It is anticipated that changes to address climate change and other policy revisions related to VISION 2040 will be made to the Regional Council's transportation programming process by 2009. Additional revisions to the process will likely be made following the Destination 2030 update in 2010.

At this point, the nature of the changes is not known. Over the past several years the primary focus of the Puget Sound Regional Council's transportation program has been on designated regional growth centers, i.e., strategic locations that are targeted for increased mixed-use population and employment development. As noted above, creating such compact pedestrian-friendly and transit-oriented centers is already recognized as a valuable land use and transportation strategy for reducing the need to drive alone – having both environmental and efficiency benefits.

In addition, an air quality criterion has been included in the project selection process for many years; this criterion applies to all funding sources that PSRC manages – Surface Transportation Program (STP), Congestion Mitigation and Air Quality (CMAQ) Improvement, and Federal Transit Administration (FTA) programs – and is heavily weighted for CMAQ projects. As PSRC moves forward with the 2009 project selection process, these issues will be brought before the Regional Project Evaluation Committee and Transportation Policy and Executive Boards – we anticipate some inclusion of climate change considerations in this round of funding, which precedes the conclusion of the Destination 2030 update process, but as yet we are in early stages and do not know what the final policy framework and evaluation criteria will be.

It will be as useful for CMAP to consider differences as well as similarities with PSRC. In many ways, PSRC began related work with important advantages over CMAP – multiple years of national-level leadership on climate change by their Mayor and County Executive, state

legislation, a tradition and regulatory framework for growth management, and very strong support for expansive investment in non-automobile alternatives. If CMAP elects to take an aggressive approach to GHG reductions and energy, it will join PSRC as national leader. If CMAP includes new actions that move in PSRC's direction, CMAP may be a unique national model for other MPOs starting in a similar position.

The Southern California Association of Governments (SCAG)

Vision/Scenario Planning

The Compass Blueprint, developed by SCAG, provides a high level land use and transportation vision for the Los Angeles metropolitan area. The Compass Vision calls for modest changes to current land use and transportation trends on only 2% of the land area of the region – "the 2% Strategy," which will lead local communities and the region toward realizing the vision with "modest, targeted changes to land use and transportation systems."

The Compass Blueprint is now in the implementation phase, with SCAG partnering with cities and counties in Southern California to realize the growth vision. SCAG provides technical assistance and targeted funding for projects that support the vision.

Implications: CMAP might consider including technical assistance and targeted funding or mini grants such as employed by SCAG as well as other MPOs, such as the Metropolitan Transportation Commission in the San Francisco area, to encourage sustainability.

For further investigation: Linkages between state energy and GHG regulations, the Compass Blueprint, and on-going area wide transportation and land use planning, particularly as reflected in the RTP and TIP (current or next updates).

San Diego Association of Governments (SANDAG)

Vision/Scenario Planning and Vision Planning and Transportation Planning

GHG emissions were modeled in the MPO's Final Environmental Impact Report (FEIR) for the growth alternatives in their 2030 Regional Transportation Plan, "Pathways for the Future." Climate change is not considered in the MPO's general scenario planning work (that was conducted in 1998 and 2002), although VMT and air pollution were; it is unclear if energy is considered since the document that summarizes their scenario planning work is not available on-line. One of the LRTP's Proposed Actions is to "Update the region's long term energy plan, Regional Energy Strategy 2030, to incorporate energy and climate impacts of land use and transportation measures."

Key Partnerships

One of the LRTP's Proposed Actions is to "Develop a regional climate change action plan in coordination with state and local jurisdiction efforts." On energy work, SANDAG works closely with the San Diego Regional Energy Office.

Modeling Greenhouse Gases

In the FEIR, the MPO models CO_2, CH_4, and N_2O. These emissions are based on fuel consumption by vehicle type (by VMT). The modeling is performed for current emissions and future emissions for each growth alternative.

Climate Change Criteria

In the FEIR, the MPO describes mitigation actions to offset the increase in energy usage and GHG emissions that will result from the construction process of the plan's projects and the increase of VMT as the region continues to drive more and the plan's projects are completed. These actions include studies and plans for an increase in use of alternative fuels, more efficient vehicles, pricing strategies to reduce GHG emissions, ridesharing, more efficient roadway lighting, and outreach to the public so that they are better informed of how decisions and travel behavior affects climate change and energy efficiency in the region.

In sum, however, the FEIR states: "Although the implementation of the mitigation measures listed in Section 4.7 would reduce the project's GHG emissions, global warming impacts are considered cumulatively significant and unavoidable." While these mitigation measures are not criteria per se, some may become criteria and some of the actions will serve to better inform decision-makers as they decide on future transportation planning projects.

Philadelphia (DVRPC)

Pennsylvania is not a member of the Regional Greenhouse Gas Initiative (RGGI) nor does it have a Climate Action Plan that was formulated and adopted by the state. It does have a Climate Change Roadmap that was developed by concerned stakeholders with recommended action items for the state to adopt. The City of Philadelphia has been active in climate action planning work.

Work is underway on the year 2035 update to the MPO's long-range plan for the greater Philadelphia region, entitled Connections – The Regional Plan for a Sustainable Future. As part of the plan update, a scenario planning exercise will be conducted, and new focus areas such as climate change and energy needs will be addressed. While climate change has not yet become part of DVRPC's decision-making criteria, it is likely that DVRPC will consider climate change in future decisions and guiding documents.

The MPO recently posted an RFP for the development of a region wide GHG inventory. As part of this regional inventory, GHG emissions will be estimated for all of the counties and municipalities within the region. The proposal was recently awarded and work will commence shortly. The MPO's RFP mentions that the contractor must work closely with the EPA and ICLEI to develop regional and local GHG emission inventories. If funded, one of the future tasks of the multi-year initiative call for the development of a regional climate action plan. The future tasks are listed below in Box 2.2.

Implications: If CMAP decides to develop a regional climate action plan, it might consider establishing informal collaboration with PSRC and DVRPC, perhaps through an informal working group to exchange ideas and approaches. This would assist CMAP to move ahead quickly on such a plan.

Box 2.2: Key Tasks of DVRPC's Climate Change Initiative

1. *Produce a Regional Greenhouse Gas Emissions Inventory and Forecast*

   Conduct a GHG emission inventory and forecast for the DVRPC region, and allocate this inventory and forecast to each county and municipality. The goal is to develop an understanding of GHG emissions appropriate for making well-informed decisions regarding regional and local policies to reduce such emissions. This work will be carried out in close coordination with municipal, county, state, and federal-level inventory and forecasting efforts, as well as with national organizations such as ICLEI and the Mayor's Climate Protection Agreement.

2. *Evaluate Greenhouse Gas Reduction Options*

   Evaluate the expected cost and effectiveness of a range of potential strategies and activities to reduce GHG emissions in the region. This will result in a catalog of options to consider in policy making discussions.

3. *Initiate Stakeholder Engagement for Action Planning*

   DVRPC will initiate activities to educate and engage a broad set of regional stakeholders, including the public, elected officials, and the business community, for building regional momentum around climate protection and adaptation to climate change.

4. *Develop Regional Climate Change Action Plan*

   Summarize and integrate workshop and other activities to create a regional GHG action plan comprised of regional and sub-regional actions.

5. *Integrate Climate Change and Energy Concerns Throughout DVRPC Activities*

   With the support of DVRPC management, this project will work with DVRPC staff to integrate climate change and energy concerns into all appropriate aspects of DVRPC's work, including the long range plan. This might include, for example, evaluating the greenhouse gas emission and energy usage implications of various TIP projects or assuring that projects are designed and planned taking climate change impacts into account. In addition, this project will work to elevate the climate change and energy conservation implications of long-standing DVRPC goals, such as brownfields development, ozone reduction, and transit-oriented development.

6. *Support for Greenhouse Gas Emissions Inventories and Forecasts for Government Operations*

   Separate from the regional inventory and forecasting effort, this task will provide support, tools, and training for county and municipal officials that wish to conduct analyses of GHG emissions associated with their own government operations, including energy efficiency audits. One key vehicle for this task will be continued participation in the Local Governments Implementing Conservation for Sustainability (LOGICS) project, together with US EPA, PEC, PA DEP, TRF's SDF, PennFuture, and other organizations.

Boston Region MPO and the Metropolitan Area Planning Commission (MAPC)[3]

The Commonwealth of Massachusetts has a Climate Action Plan calling for reductions in GHG emissions over the coming decades, and the state is a member of the Regional Greenhouse Gas Initiative. While the MPO does transportation planning work, MAPC does land use and other planning work.

The MPO recently completed a white paper on climate change that provided a compelling picture of likely climate impacts in the region and began to layout some critical transportation choices to reduce GHG emissions. The MPO models a handful of scenarios based on variations of the projects included in the future transportation network. While VMT and other variables are estimated, neither GHG emissions nor energy are considered or otherwise estimated.

The MPO, however, recently began estimating CO_2 emissions for projects under consideration for the TIP and LRTP. Emissions are based on VMT provided by the model. The MPO has yet to incorporate climate change or CO_2 emissions into its criteria, other than those emissions being present as an informational item as a result of the modeling.

MAPC and the MPO were involved in a three-year study termed CLIMB -- Climate's Long-term Impacts on Metro Boston, which resulted in a final report issued in August 2004. CLIMB was conducted by a team of more than 20 scientists and experts from the Tufts University Civil and Environmental Engineering Department, University of Maryland School of Public Affairs, and the Boston University Department of Geography.

The study looks at how potentially rising sea levels, higher summer peak temperatures, and more frequent and intense storms affect the region's water supply and water quality, wastewater collection and treatment, drainage and flood management systems, transportation and communication, public health, and energy systems. It also considers how these potential impacts relate to each other and what effects they might have on the economy, public budgets, and society as a whole.

Though CLIMB reported on potential climate change impacts to the transportation system, this was quantified mainly in delay hours and did not identify key infrastructure to protect or construct. Accordingly, CLIMB's findings were not integrated into other regional planning processes.

Note that because the Central Transportation Planning Staff (CTPS) supports the MPO as well as the state DOT, transit authority, port and airport authority, there may be some helpful insights on planning collaboration across planning and implementing agencies in pursuit of agreed upon priorities (i.e., climate change or energy).

Wilmington Area Planning Council (WILMAPCO)

WILMAPCO used vision and scenario planning to review six alternative growth and transportation scenarios. The MPO's model was used to compare the performance of the

[3] MAPC is the region's regional planning agency while the Boston Region MPO is the region's federally-designated MPO.

scenarios using measures of air quality performance, including CO_2 emissions as well as criteria pollutants. WILMAPCO is often cited as an example of the exemplary use of the federally required Congestion Management Program in on-going regional planning.

For possible follow-up:

1) Was the CO_2 emissions indicator used in the model runs carried forward in developing the RTP or is it being considered for updates -- in reviews of policies, strategies or investments in the RTP or TIP? What are related considerations?
2) How was the CO_2 indicator used in review and selection of the scenarios? Or, how might it be used in the future? How were any trade-off accomplished between congestion and CO_2 indicators or criteria?
3) Was there institutional support for considering climate change in the vision plan, e.g., from state or city transportation or environmental organizations? How important was climate change or energy policy or is it likely to be more important in future planning updates?
4) Are indicators of energy or climate change impacts considered under the Improve Quality of Life/Environmental Justice criterion?

Washington, DC, National Capital Region Transportation Planning Board (TPB)

TPB is the MPO for Washington, D.C. metropolitan area. The TPB staff has been analyzing the current Vision Plan and the scenarios developed for that plan to determine the range of in CO2 pacts. The approved 2002 Vision for the D.C. area is based on consideration of a set of growth and transportation scenarios, and was incorporated into the current RTP.

The forecasts for the metropolitan area in 2030 are:

- Households, employment, and VMT up 37-44%
- NOx and VOC down 61 and 87%
- But CO2 up 48%

It is noteworthy to observe that while criteria pollutants will be significantly reduced, primarily due to cleaner fuel and improved fuel economy, VMT and CO_2 will significantly trend up. This is consistent with similar patterns nationwide, and should be confirmed for Chicago by CMAP in its baseline and forecasts as part of consideration of CO_2 and energy reduction actions.

TPB staff analysis contrasted CO_2 reductions from external (national) policies to those that might have resulted from the scenarios they evaluated for the vision plan:

- CAFE (35 mpg by 2020) is estimated to yield reductions of 16%;
- California LEVII is estimated to yield reductions of 22%.

In contrast, under the Vision Plan scenarios, with the range of demand management, land use, and transportation strategies identified as politically reasonable or feasible, there was a very modest range of CO2 reductions possible -- only 1-2% Staff has described the scenarios examined in the earlier vision plan as limited by how extensive the current built environment is, and the limits of making major changes.

Going Forward

In 2007, the Metropolitan Washington Council of Governments established climate change as a leading priority for the organization and appointed a Climate Change Steering Committee to guide climate change planning efforts. TPB (housed within MWCOG) has emphasized that inclusion of climate change reduction strategies supports other on-going work: climate change can be readily integrated into other planning activities including visioning and travel demand management.

TPB has established a new Scenario Study Task Force that is discussing development of two new transportation and land use scenarios to be analyzed in FY 2009. It will be interesting to see how aggressive the new scenarios will be in terms of land use and how significant the CO_2 reduction goal will be – the second scenario described below appears to have a primary focus on CO_2 reductions.

The *Aspirations Scenario* "draws from the strategies explored in previously studied scenarios to develop a scenario that represents realistic yet ambitious levels of transportation investment and accompanying land use stewardship."

The *What Would It Take Scenario* "begins with the performance objective of reducing regional carbon dioxide emissions and will determine the scale and mixture of interventions that might achieve this objective." This will present a good example of what has been called "back casting" by OECD working groups defining strategies and actions that will be necessary to meet fixed climate change, energy or other goals.

Modeling Greenhouse Gases

The TPB recently completed analysis of the projected CO_2 levels of the vision scenarios, alongside VMT and criteria pollutant indicators for 2030. TPB used its technical capacity to forecast population, land use, and air quality emissions (for conformity) as the basis for the CO_2 forecasts. It would be useful to find out how satisfied TPB is with this adaptation relative to its current and future applications.

For follow-up, it would be useful to investigate

- How TPB's current climate change work is being supported by state (MD, VA, or D.C.) legislation, policies, regulations, or GHG plans.
- Fundamental changes that might be made to scenarios in 2009 compared to those used in 2002. Will land use strategies and modal shifts be more pronounced?
- Would TPB staff recommend any enhancements to models or other technical tools for the applications CMAP might undertake? Are any enhancements underway or being considered?

Sacramento Area Council of Governments (SACOG)[4]

The Sacramento Area Council of Governments (SACOG) serves the Sacramento metropolitan area. The planning area covers six counties and approximately two million people. SACOG provides transportation planning and funding for the region, and serves as a forum to study and resolve regional issues. In addition to preparing the region's long-range transportation plan, SACOG approves the distribution of affordable housing in the region and assists in planning for transit, bicycle networks, clean air and airport land uses.

SACOG presents a promising model for CMAP through its Regional Blueprint (broadly based and participatory vision plan), which focuses on the following:

- Land use and development
- Energy
- Building broad based support
- Links to long range plan and investments
- **Plans to incorporate GHG considerations**

Vision/Scenario Planning

In 2004, the SACOG Board unanimously adopted the Blueprint Project, a 50-year smart growth strategy. The Blueprint was initiated by the SACOG Board of Directors after regional computer modeling showed that current growth patterns and transportation investment priorities would result in significant increases in congestion in the future. The Blueprint is based on the following seven growth principles:

- Provide a variety of transportation choices
- Offer housing choices and opportunities
- Take advantage of compact development
- Use existing assets
- Mixed land uses
- Preserve open space, farmland, natural beauty, through natural resources conservation
- Encourage distinctive, attractive communities with quality design

The Blueprint provides several performance measures to assess the Preferred Scenario compared with the Base Case. The measures and the relative performance scores between the scenarios are shown in Table 2.1. Note that along with a measure of particulates, the only other non-direct transportation presented is for mobile-source **CO_2 emissions**. Under the preferred scenario, CO_2 emissions would be reduced by 14% compared to the base case.

One of the next steps in the Blueprint process is to develop and implement a benchmarking system to regularly track the extent to which the region is growing in ways that improve the transportation system and air quality, and are consistent with Blueprint. Examples of elements to be monitored include: transportation system performance (e.g. congestion, travel times, trip

[4] The Sacramento area case study is adapted from the Volpe Center's Transportation Performance Measures paper for CMAP.

distances, and mode choice), type and amount of housing constructed, **air emissions**, mix of land uses, and amount of new land devoted to urbanization.

Table 2.1: Blueprint Performance Measures and Preferred Scenario Scores

Measure	Preferred Scenario	Base Case Scenario
Percent population living in "pedestrian-friendly" neighborhoods	69%	34%
Percent population living in communities with a good, or balanced, mix of land uses	53%	26%
Modal split	Auto: 83.9% Transit: 3.3% Ped/Bike: 12.9%	Auto: 93.7% Transit: 0.8% Ped/Bike: 5.59%
Jobs and housing growth near transit (within walking distance of 15-minute or less headway transit service)	41% jobs; 38% housing	5% jobs; 2% housing
Vehicle miles traveled (per household per day)	34.9 miles	47.2 miles
Daily vehicle minutes of travel (per household per day)	67 minutes	81 minutes
Per capita CO_2 and $PM_{2.5}$ emissions (from vehicles)	14% less than Base Case	

Transportation Assumptions in the Blueprint

Transportation projects were added to the region's road and transit systems in the development and evaluation of each of the scenarios in the Blueprint project. The objective in each scenario was to match the transportation system with the land use parameters. While a list of projects was developed and is available for the Preferred Scenario, the purpose of the project list is to provide a generalized priority of transportation investments that fit with the location, amount of development, and the smart growth planning concepts.

Vision Planning and Transportation Planning

The list of transportation projects in the Blueprint does not constitute a Metropolitan Transportation Plan (MTP) for the region. The more detailed MTP2035 process began after the Preferred Scenario was adopted by the SACOG Board of Directors in December, 2004. The transportation system underlying the Blueprint Map is intended to educate decision-makers and the public on critical choices, and the performance measures help to understand tradeoffs. This sets the stage for the MTP. The Board encourages local governments to seriously consider the Blueprint as they make land use decisions and has committed significant resources to incentivize and assist its members to successfully accomplish this.

The Metropolitan Transportation Plan 2035 (MTP2035) update process began in fall 2005; the draft final plan was approved by the SACOG board in March 2008.

The Metropolitan Transportation Plan 2035 (MTP2035) presents a multi-modal approach to achieve the following principles, which are also consistent with the CMAP 2040 goals:

- Access & Mobility - Improve opportunities for businesses and citizens to easily access goods, jobs, services and housing.

- Equity and Choice - Provide real, viable travel choices for all people throughout our diverse region.
- Economic Vitality - Efficiently connect people to jobs and get goods to market.
- Environmental Quality and Sustainability - Minimize direct and indirect transportation impacts on the environment for cleaner air and natural resource protection.
- Financial Stewardship - A transportation system that delivers cost-effective results that are feasible to construct and maintain.
- Smart Land Use - Design a transportation system to support good growth patterns, including increased housing and transportation options, focusing more growth inward and improving the economic viability of rural areas.

Political/Legislative Context

Environmental Impacts Review
MPOs in California are required to conduct a program EIR on long range transportation plans. The SACOG EIR provides a framework for future environmental analyses and presents a region-wide assessment of the MTP2035's impacts. The EIR addresses the impacts of projects that may be regionally significant. Site-specific impacts of individual projects are not included – they are considered as part of the environmental analysis undertaken for each project prior to approval.

Key Partnerships

A joint effort by SACOG and its civic partner Valley Vision, the Blueprint Project brought together local officials, civic groups, environmental advocates, the development community, business leaders and the public in a first-ever attempt to guide how the region grows over the next 50 years. By the time the workshops and two Regional Forums had concluded in April 2004, more than 5,000 participants had used the project's interactive modeling software to study how the region might look under different land use scenarios.

Modeling Greenhouse Gases

MTP2035 is performance-based, designed to provide a transportation system that meets specific targets, expressed with performance measures (Table 2.2).

Table 2.2: MTP Performance Indicators and Targets

Indicator	Target
Household VMT per Household	Reduce vehicle miles traveled per household
Congested VMT per Household	Limit growth in congestion to 10%, even with a 50% growth in population
Average Transit Trips per Household	Increase transit mode share by 150%.
Average Non-Motorized Trips per Household	

These targets show improved performance over the MTP2025, which estimated an increase in vehicle miles traveled, a 58% increase in congestion, and a 30% increase in transit mode share. The improvement over the previous plan is primarily attributed to assumptions of more compact development patterns, more infill redevelopment, mixed uses, and a better jobs/housing balance.

MTP2035 uses two points of reference to evaluate performance for each key indicator:

- Actual historic trend data, along with future projections for MTP2035.
- The entire package of transportation investments to 2035, compared to outcomes using the prior growth projections and current MTP (defined as the "No Project" alternative).

Roadway and mode choice measures are used to analyze performance of the existing and future transportation systems. Roadway measures relate to travel in vehicles on the roadway system. Total VMT measures overall utilization of roadways, which relates to vehicle emissions, traffic congestion, and the effectiveness of land use patterns and alternate mode options in reducing the need for vehicle travel. Congested VMT relates to the amount of total VMT which occurs on roadways with volume-to-capacity ratios of 1.0 or greater. Mode choice measures relate to the mode of travel chosen for a trip; the MTP focuses on the number and share of trips made by transit and non-motorized modes.

Climate Change and Energy Criteria

The energy and global climate change chapter in MTP 2035 describes the existing energy resources and consumption patterns in the region, and analyzes the effects on energy and **greenhouse gas emissions** that would result from implementing the proposed projects.

Energy

The analysis estimates the total amount of energy expected to be consumed under the MTP 2035 and compares it to existing conditions and the No Project Alternative by considering both operational and construction-related energy impacts. Direct energy consumption involves energy used to operate vehicles within the region. It was assessed based on:

- Annual VMT for on-road vehicles (automobiles, trucks, buses);
- Commuter rail miles for rail travel; and
- Energy consumption rates by vehicle type.

Construction-related energy impacts were assessed qualitatively, with attention given to the efficiency with which construction materials and machinery are produced and the choices made with respect to the construction procedures and type of equipment.

Climate Change

The Air Resources Board vehicle emissions model was used to analyze CO_2 and fuel consumption impacts from on-road travel. Implementation of statewide requirements have produced a set of **CO_2 "savings**," expressed in million metric tons of CO_2 equivalent ($MMTCO_2E$) per year; an annual reduction of about 18 $MMTCO_2E$ by 2020 is assigned to the regional transportation/land use sector. Of that allocation, the SACOG region was assigned approximately 1 $MMTCO_2$ E.

The analysis to determine the SACOG share was based in part on the Preferred Blueprint Scenario. The California Energy Commission analyzed fuel and CO_2 savings from the Blueprint and the Baseline scenarios, as shown in Tables 2.3 and 2.4.

Table 2.3: Regional Total Fuel Consumption Comparison

	Households (000)	VMT (000)	Gas (000 gal)	Diesel (000 gal)	Total Fuel (000 gal)
Baseline	1,494	92,624	4,552.99	613.99	5,166.98
Smart Growth	1,504	86,784	4,273.79	583.17	4,856.96
Percent Difference	0.7%	-6.3%	-6.1%	-5.0%	-6.0%
Difference-Savings	10	-5,840	-279.20	-30.82	-310.02

Source: California Energy Commission, 2007.

Table 2.4: Conversion of Fuel Consumption to Carbon Dioxide Savings

	Fuel Source		
	Gas	Diesel	Total
Daily Fuel Gallons Saved (000)	279.20	30.82	310.02
CO_2 per gallon	19.564	22.384	
Daily CO_2 reduction (000 lbs)	5,462,269	689,875	6,152,144
Daily CO_2 reduction (Tons)	2,731	345	3,076
Daily CO_2 reduction (Metric Tons)	2,478	313	2,791
Annual CO_2 reduction (Metric Tons)	350 equivalent days/year		976,699

Source: SACOG, 2007.

Implementation of the proposed MTP 2035 is estimated to result in a target of 310,000 fewer daily gallons of fuel and 3,076 fewer tons of CO_2 per day by year 2020. This level of reduction would meet the regional CO_2 emissions goal.

Implications: The Blueprint and SACOG's MTP2035 plan provide some useful insights for CMAP.

- Use of a vision and scenario process and plan as a foundation for the long range plan that follows. The Blueprint fostered thinking about critical choices for growth, land use and transportation, with performance measures linked to major goals including mobility but also energy and GHG emissions.
- Approach to CO_2 emission reductions as a **co-benefit** – rather than looking at it in isolation, it is closely anchored to parallel goals to reduce VMT for congestion purposes and reduce energy consumption.
- Use of VMT (and VMT reductions) to address emissions and environmental sustainability, rather than just as a surrogate for mobility.

- Use of VMT as a primary indicator of travel for several reasons:
  - It is relatively easy to measure by counting traffic on roadways at different locations. It is one of the few measures of transportation performance consistently and comprehensively monitored and documented over time in the region.
  - VMT bears a strong and direct relationship to vehicle emissions – with very few exceptions, more VMT in the region will result in more emissions from vehicles.
  - VMT can be influenced by policy. By providing more attractive alternatives to driving alone, VMT can be reduced by shifting from vehicle to non-vehicle modes (i.e., from a car trip to a bike or walk trip), or from low occupancy to higher occupancy vehicles (i.e. from a single-occupant vehicle trip to a carpool or transit trip). VMT can be influenced by land use patterns as well. A better mix of residential, employment, education, and service uses in an area can allow people to accomplish their daily activities with less driving, and consequently, less VMT.
  - VMT correlates with congestion.
- Transit and non-motorized modes are intended to accommodate some of the demand from reduced VMT or long term growth in demand (see London example).

Other innovative regional initiatives in vision/scenario planning

Salt Lake City – Wasatch Front Regional Council (WFRC) and Envision Utah

Vision/Scenario Planning

The MPO does not appear to have considered climate change or energy in its vision or scenario planning work. Envision Utah, however, considered energy efficiency in its plan with a chapter in its 2002 "toolbox" on how local governments can integrate energy saving measures, which are essentially sustainable planning practices, into their planning processes. This chapter mentions energy efficiency's relationship with GHG emissions as well.

Vision Planning and Transportation Planning

With the release of the toolbox, Envision Utah hopes that local governments will integrate energy efficiency practices into their planning processes, which includes transportation planning. Other than simple conversions of VMT to CO_2 emissions in one of its newsletters (see below), it is not clear how WFRC might be considering climate change and/or energy efficiency in its planning processes at this time.

Political/Legislative Context

The Governor's Blue Ribbon Advisory Council on Climate Change states that, "Utah has committed to provide a State recommendation for GHG reduction by May, 2008," and the state is a member of the Western Climate Initiative. Salt Lake City has an ambitious target for reducing its municipal emissions - 70% by 2040 - and it is well on its way to meeting this target.

Key Partnerships

Although these groups do not yet appear to be working together to consider CO_2 emissions, Envision Utah and Mountainland Association of Governments worked closely together with WFRC on its regional visioning process.

- The Utah Transit Authority (UTA) is the regional operator of fixed route bus and light rail. UTA looks to the MPO to conduct regional long range planning and related land use planning, and considers its transit plans to be inter-woven with the regional transportation system considered in the RTP.
- UTA can provide useful insights into how the Envision Utah Vision Plan is setting an important foundation for on-going systems and transit planning, and is doing innovative thinking on the links between transit decisions and CO_2 emissions both in the region and as part of an APTA group considering national implications of the relationship between transit service and climate change.

Modeling Greenhouse Gases

For its February 2008 Air Quality Newsletter, WFRC did a simple conversion of VMT to CO_2 emissions for its LRTP's No Build and Build scenarios. As part of the formulation of its LRTP, three of its 19 evaluation measures of system alternatives were VMT, Air Quality (tons of Nitrogen Oxide, Carbon Monoxide, and Volatile Organic Compounds), and Potential Impacts to Environmentally Critical Lands.

Climate Change Criteria

Criteria related to climate change that the MPO applies in its decision-making processes are VMT and Air Quality (tons of Nitrogen Oxide, Carbon Monoxide, and Volatile Organic Compounds) measures. These criteria were used by WFRC to evaluate three transportation systems; the selected system became the base system and a framework of corridors to refine into a Draft Regional Transportation Plan.

London (UK) Transport for London[5]

Along with PSRC, London (and New York City) may provide the most promising and complete models for CMAP and as it considers how to incorporate actions to reduce CO_2 emissions in *GO TO 2040*.

Transport for London (TfL) develops transportation policy for the London metropolitan area covering the City of London and 32 boroughs, in addition to operating public transit. The area has the highest GDP per capita in Great Britain and covers 609 square miles with a 2006 estimated population of 7.5 million. The London area is a useful peer for the Chicago area as it is much closer in population than the two largest U.S. areas (New York-New Jersey and Los Angeles). Although London has a smaller land area and a higher non-automotive mode split (59 percent), it provides planning insights as a global city expecting to add 800,000 residents and

[5] The London regional case study is adapted from the Volpe Center's Transportation Performance Measures paper for CMAP.

900,000 jobs by 2025[6]. London is dealing with major road congestion and public transit crowding as it plans to support a dynamic world economy with equitable sharing of prosperity and improved environmental protection, and prepare for hosting the 2012 Olympics. *It is particularly noteworthy that the London regional plans place top level importance on the policy goal of significantly reducing CO_2 emissions*.

> London's efforts to reduce greenhouse gas emissions, increase energy efficiency, and prepare for a post-carbon future in the London climate action plan is a model worldwide, seeking to reduce emissions by as much as 60 percent by 2025, without compromising quality of life and improving London's business competitiveness.[7]

Vision/Scenario Planning

TfL developed a vision plan to guide transportation investments, with top level political and policy emphasis on climate change, combined with demand management. TfL attempts to meet a significant amount of projected new demand with public transport and nonmotorized travel.

Other noteworthy aspects of the TfL example include:

- Four overall themes: access to work; livability; **climate change**; inequality
- A focus on social inclusion (related to CMAP's focus on social equity)
- **Reliance on four top level goals and indicators, including CO_2**.
- Close links between TfL's planning and investment responsibilities, the 2025 Vision Plan dealing with growth challenge, and the policy direction from the Mayors Climate Change Action Plan.
- Incorporation of the groundbreaking congestion charging program, providing CMAP with valuable example of how pricing can be used to pursue congestion, revenue, and **CO_2 reduction goals** simultaneously.
- Consistency with the London Freight Plan, with its sustainability focus.

Vision Planning and Transportation Planning

Transport 2025: Vision for a growing world city
Transport 2025 (T2025), the 20-year transport vision for London, was published in November 2006. T2025 develops policies, major investments, and other decisions to *"deliver the vision,"* which was based on consensus-building among stakeholders. TfL had a major challenge of integrating policy directions from multiple major plans, including:

- The Mayors Transport Strategy
- London CO_2: The Mayor's Climate Action Plan
- The London Plan: Spatial Development Plan for Greater London
- London Freight Plan

These plans set a policy context for T2025, and contributed to identification of four themes[8]:

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[6] E. Seagriff, et al, "Transport Vision for a Growing World City," Transportation Research Board Meeting, 2008.
[7] From presentation by Nicky Gavron, Deputy Mayor of London.
[8] E. Seagriff, et al, op. cit., p. 5.

- Getting people to work;
- Improving the livability of outer London;
- **Tackling climate change**; and
- Improving social inclusion through making transportation more accessible.

T2025 began with a significant policy challenge: based on projected population growth dispersed across the area and job growth concentrated in the center, TfL forecasted travel as increasing from 27 to 31 million trips, with a 30 percent increase in public transit usage. Furthermore, T2025 had to incorporate the national government's commitment to be a **"world leader in tackling global warming"** by contributing a significant 22 percent towards the 30 percent cut in London's CO_2 emissions required by 2025.[9]

T2025 demonstrates what might be accomplished in pursuit of the themes using a package of polices and investments, as projected in four contrasting scenarios. Central to T2025 were the expectations that growth be accommodated by public transit, walking, and cycling, to the extent possible; and acceptance of the role of road user charging, accompanied by investment in alternatives to automobile travel. TfL forecasted the expected increase of 4 million new journeys (completed origin to destination pairs), and planned mode shifts, to allocate 5 million additional trips to transit, walking, and cycling.

Modeling Greenhouse Gases

TfL used its models to contrast results of the four scenarios using the performance measures presented in Table 2.5.

Table 2.5: Performance Measures Used in Model Results[10]

Category	Performance Measure
Demand	Total journeys
	Morning peak (auto and transit)
	Vehicle kilometers (am peak hour)
	Car kilometers (am peak hour)
	Public Transit Passenger Kilometers (National rail and transit)
Public Transit Capacity	Rail, Bus, Underground seat kilometers
Mode Shares	Modal split – percent share of transit, bicycling, walking, auto, etc. trips
Congestion	Delays (vehicle hours, average am peak hour)
Crowding	Percent passenger kilometers crowded, peak period
Environment	**Total CO_2 emissions (million tons per year)**

Table 2.6 indicates how TfL uses performance indicators to assess the scenarios in terms of the key goals and derived themes from the vision plan and the other regional plans mentioned above. TfL used the measures above to identify the projected benefits that will result from the policies and investments in the recommended scenario:

- Crowding reduced 45%
- Congestion reduced 30%

[9] Transport 2025: Vision for a growing world city, p. 9.
[10] E. Seagriff, et al, op. cit., p. 9.

- Gross GDP benefits of £180bn
- Employment accessibility increased 25%
- **CO_2 emissions reduced 30% from 1990 levels**
- Step free stations up to 66% of network
- Modal shifts from car to public transport, walking and cycling of 9%

In addition, TfL estimated that the policies and investments in the preferred scenario would generate an additional £180 billion in GNP. The top level objectives – economic development, climate change/environment, and social inclusion – are consistent with top goals in CMAP's vision. It is interesting that:

- **CO_2 emissions is the most prominent of environmental concerns**
- The indicator of reduced total CO2 emissions (tons) relies on two measures:
  - Percentage reduction in tons from transport
  - Percentage mode shift from car to transit and nonmotorized travel

Table 2.6: Key T2025 Performance Indicators

Objective	Indicator	Measure
Support economic development	Increase in productivity benefits arising from greater agglomeration	Agglomeration benefits, £bn present value over 60 years
	Increase in GDP attributable to transport investment	£bn present value over 60 years
	Improvement in employment accessibility	Change in number of jobs accessible by public transport within 45 minutes travel time
	Reduction in public transport crowding	Crowding – percentage of Tube and rail networks over planning guidance capacity in am peak
	Reduction in traffic congestion	Road congestion, total hours delay, am peak
Tackle climate change and enhancing the environment	**Reduction in CO2 emissions**	**Percentage reduction in tons emitted per annum from transport**
		Percentage mode shift from car travel to public transport, walking and cycling
Improve social inclusion	Improved access to employment from deprived areas	Percentage of population in the 10% most deprived areas of London within 45 minutes travel time of international and metropolitan centers

Among TfL's initiatives is a Climate Change Fund, which is providing the equivalent of $50 million over the next three years to support new CO_2 reduction initiatives within TfL operations, which include the London Underground and region-wide bus network. CMAP might consider including a similar competitive grant program in *GO TO 2040* tied to expected CO_2 reductions.

Political/Legislative Context and *Key Partnerships*

Actions in Transport 2025 were shaped by policy and programmatic directions from the Mayor and London and coordination with offices responsible for land use and climate change, established through links to the following major plans:

- The Mayors Transport Strategy
- London CO_2: The Mayor's Climate Action Plan
- The London Plan: Spatial Development Plan for Greater London
- London Freight Plan

Transport 2025 is intended to meet targets in the Climate Change Action Plan to reduce CO_2 emissions from transportation by 4.3 million tons as a major part of the overall target reduction of 60 per cent by 2025.

Climate Change Criteria

CO_2 reductions were a major consideration in selection of the policies and investments in Transport 2025 (see above).

Implications:
TfL's vision plan and Transport 2025 provide very helpful insights for CMAP.

- **Linking the transport plan to other high-level policy plans**: Transport 2025 demonstrates how a long-range transportation plan can be built on foundations of areawide land use plan and a multi-sectoral climate change plan with GHG reduction goals for transportation.
- **Measures to connect vision and plan**: the vision sets top level goals, policy directions, and "ambition" or aspirations expressed by stakeholders. T2025 was developed in a separate later step to identify trade-offs among policies, major projects, and costs versus benefits compared using performance measures to demonstrate relative satisfaction of high-level goals.
- **Performance measures as key tools for strategic decisions:** TfL used performance measures to identify a package of policies and investments, within a strategy, that will accommodate a system-wide increase in demand for travel while reducing congestion on the roads and crowding on transit to 2006 levels, and reducing CO_2 emissions from transport by 22% by 2025.
- **Multimodal congestion measures:** a multi-modal approach to congestion, adding measures of crowding on transit to measures of road delay. This allows for balancing shifts from road to transit and nonmotorized travel by looking at both in terms of measured excess demand relative to capacity supply. At its highest level, the plan accommodates projections of growing demand through mode shift and new non-road capacity, while meeting policy goals to reduce VMT and CO_2 emissions.
- **Role of "ambition":** similar to "**backcasting**," using performance measures to express the vision plan's policy goals as quantified targets (i.e., tons of CO_2). This allows TfL to work backward to demonstrate trade-offs among the scenarios expressed using the performance measures.

- **Prominent climate change measure:** TfL gives transportation source CO_2 emissions a prominent role both in its high level performance measures for comparing the scenarios and alongside more traditional transportation performance measures in its model runs.

Section 3: Innovative Practices by States

States can provide useful models for CMAP for how climate change and energy considerations can be incorporated into transportation planning and, specifically, long-range plans. Governors typically provide executive ownership of these multi-sectoral climate change action plans, which are to be implemented by state agencies, including DOTs. With the advantage of political leadership from governors, as with leadership by mayors for city GHG plans, these plans may be progressing more rapidly than climate change initiatives of MPOs, which require agreement of policy boards that typically represent state DOTs, central cities and suburbs, and transportation authorities.

Although state DOTs play different roles in transportation planning than MPOs, there are valuable insights available from their experiences. Some of the plans and programs summarized below may also be relevant at the state level for CMAP as the Illinois Governor continues to support climate change-related policies and Illinois' Climate Action Plan is released. CMAP might consider different ways to support some of the measures outlined below since those measures may lead to opportunities for CMAP to reduce regional GHG emissions either directly or in partnerships.

The use of scenarios, selection of promising policies and other actions, and the limits encountered by states in pursuing GHG targets can provide some hard-earned insights for CMAP, particularly considering the limited experience of peer MPOs. The same can be said for the experiences of the large number of cities and counties that have years of experience developing and implementing GHG reduction plans.

State GHG plans need to be carefully differentiated between those that are early undertakings, with goals, policies (often with CO_2 reduction targets), and encouragement for voluntary efforts from those that move further to include laws and regulations that can cover increased vehicle efficiency and lower carbon content fuels, smart growth planning, and reductions in VMT.

This section provides an overview of related statewide planning activities and a more detailed look at two states, Washington and California, which appear to provide very useful insights for CMAP.

Overview of Statewide Activities

The Pew Center provides a very helpful overview with summaries of state initiatives. Much of the information below on individual states is drawn from the Pew reports at (http://www.pewclimate.org/what_s_being_done/in_the_states/vehicle_ghg_standard.cfm).

From Volpe's brief scan, it appears that only a few states have enacted laws that aim to reduce vehicle miles traveled in the future.

According to a summary by the U.S. House Committee on Energy and Commerce staff[11]:

[11] "Climate Change Legislation Design White Paper," House Committee on Energy and Commerce staff, February 2008.

- Sixteen states have adopted overarching GHG emission reduction targets (six of them codified).
- Although not a focus in this section, nearly 800 mayors in communities representing more than 77 million Americans from all 50 states have signed the U.S. Conference of Mayors Climate Protection Agreement, whereby they agree to reduce community-wide greenhouse gas emissions by 2012 to at least 7 percent below 1990 levels.
- A report in 2007 indicated that many cities will not be able to meet this goal absent complementary state and Federal policies to reduce GHG emissions.

The "Primer on Transportation and Climate Change," newly released by the American Association of State Highway and Transportation Officials (AASHTO), provides useful perspectives on how state DOTs as a group may be approaching climate change, including:

- A high priority as a topic of concern for the current and new Congress; according to AASHTO, it "believes U.S. policies must be balanced in ways that help reduce transportation's impact on global climate change, but which sustain VMT growth at the level needed to support a healthy national economy."
- The sharp focus on VMT levels, including rate of growth, combined with CO_2 reductions provide useful insights for CMAP on how high level indicators can be used in targets in trade-offs that balance economy, emissions, and energy.
- Support for future federal investments in modes that offer travel options to use of automobiles, including public transit, nonmotorized transportation, as well as smart growth.
- Use of national level scenarios that focus on trade-offs between two variables:
  1. Improvements of fuel and vehicles
  2. Reductions in growth of VMT

  In comparing the scenarios, AASHTO identifies different ranges of results, for example, "if VMT grows on average at 1 percent between now and 2050, and average fuel economy gradually rises to 100 mpg by 2050, CO_2 emissions from light-duty vehicles would drop by 68 percent from 2005 levels."

  It is noteworthy that the focus is on growth in VMT rather than on absolute VMT levels.

It is possible that the approaches presented in AASHTO's climate change report will be adapted in the future by many state DOTs, and could be part of AASHTO's recommendations for reauthorization. This is relevant for CMAP both as it develops actions that reduce GHG emissions in *GO TO 2040,* in partnership with the IDOT, and anticipates future federal funding sources for investments.

Table 3.1, compiled by the EPA, lists transportation-specific measures that states are taking to reduce GHG emissions. This table and other searchable matrices of what measures states are taking to reduce GHG emissions in each sector are available at http://yosemite.epa.gov/gw/StatePolicyActions.nsf/matrices/0?opendocument.

Quantified transportation-specific measures in three states' climate action plans that were listed as part of the University of California Transportation Center and the Center for Climate Strategies presentation, are listed in Tables 3.2 - 3.4.

Table 3.1: Transportation-Specific Measures that Sates are Taking to Reduce GHG Emissions

	Alternative Fuel Vehicles	Non-Road Vehicle Technology	Pricing Strategies	Public Transportation	Transportation Education and Outreach Initiatives	Transportation System Efficiency	Vehicle Fuel Economy Improvement Programs
Alabama	1	1		2		2	1
California L	10		5	1		3	
Delaware	1		1	1		3	1
Hawaii	9	11	3	1	1	4	1
Iowa	1		2	1		2	
Kentucky			1				
Maine	1		1	1		5	2
Minnesota	1						
New Hampshire	5	1	1	2	1	8	5
New Jersey				1			1
New Mexico	2	1					1
North Carolina	1		4		1	5	
Oregon L	1					2	1
Puerto Rico				1	1	1	2
Rhode Island	2		1			4	
Tennessee	1			1		3	
Utah	1	1	1	4		5	3
Vermont L	2		6	1		9	4
Washington	2	1	4	2		8	2
Wisconsin L	1					1	

Source: http://yosemite.epa.gov/gw/StatePolicyActions.nsf/(LookupMatrices)/Transportation?OpenDocument

A 2006 review of state climate action plans and their medium term GHG emissions reductions from the transportation sector by a researcher at the University of California Transportation Center and the Center for Climate Strategies concluded that:

- Transportation sector emissions are relatively difficult to reduce and also difficult to forecast.
- Vehicle technology improvements and emissions standards are most promising.
- Fuel conversion to low-carbon intensity biofuels (i.e. biodiesel and ethanol) may be relatively promising.
- VMT growth reduction is analytically difficult to forecast.
- Freight, aviation, shipping, and high speed rail deserve further analysis.
- Caution is in order when a range of uncertainty exceeds the magnitude of expected emissions reductions.
- There is uncertainty about how to include transportation in cap and trade programs.

Table 3.2: Transportation-Specific Measures in New York's Climate Action Plans

New York – 16% Transport Reduction by 2020	
Measures	**Reduction Target(s)**
VMT measures	27% = 1.41 $MMtCO_2e$
Vehicle emissions rate	59% = 3.09 $MMtCO_2e$
Low-GHG fuels	11% = 0.55 $MMtCO_2e$
Freight Measures	2% = 0.12 $MMtCO_2e$
Aviation and HSR	1% = 0.06 $MMtCO_2e$
Total	**5.23 $MMtCO_2e$**

Table 3.3: Transportation-Specific Measures in Connecticut's Climate Action Plans

Connecticut – 24% Transport Reduction by 2020	
Measures	**Reduction Target(s)**
CA LEV II standards	12% = 0.47 $MMtCO_2e$
GHG feebate program	3% = 0.11 $MMtCO_2e$
Fleet vehicle incentives	not estimated
Tailpipe GHG standards	68% = 2.63 $MMtCO_2e$
Public education initiative	not estimated
Hydrogen R&D program	none expected
Transit, Smart Growth, and VMT	13% = 0.49 $MMtCO_2e$
Intermodal freight	4% = 0.14 $MMtCO_2e$
Total	**3.84 $MMtCO_2e$**

Table 3.4: Transportation-Specific Measures in Arizona's Climate Action Plans

Arizona – 13-24% Transport Reduction by 2020			
Phase 1			Phase 2 Measures (not estimated)
Measures	Reduction Target(s)		
	Low Range	High Range	
GHG standards	76% = 5.6 $MMtCO_2e$	39% = 5.6 $MMtCO_2e$	Biofuels ramp-up
Smart growth	9% = 0.7 $MMtCO_2e$	28% = 4.0 $MMtCO_2e$	Hybrid promotion and incentive
Transit bundle	TBD	TBD	Diesel engine retrofits
Truck idling reduction	7% = 0.5 $MMtCO_2e$	5% = 0.7 $MMtCO_2e$	More idle reduction technologies
Ethanol displacement	8% = 0.6 $MMtCO_2e$	28% = 4.0 $MMtCO_2e$	PAYD insurance
Total	**7.4 $MMtCO_2e$**	**14.3 $MMtCO_2e$**	Fuel efficient (LRR) tires
			Feebate

Washington State

With regard to transportation-related climate change policies at the state level, Washington is exemplary in its passage of House Bill 2815 (Appendix 2). This bill was signed by the Governor in March 2008 and is effective on June 12, 2008. Its ambitious targets are to:

- Decrease the annual per capita VMT by 18% percent by 2020;
- Decrease the annual per capita VMT by 30% by 2035; and
- Decrease the annual per capita VMT by 50% by 2050.

As part of this bill, the Department of Ecology will provide a report to the transportation committees of the legislature by December 1, 2008, on the collaborative process and resulting recommended tools and best practices to achieve the reduction in annual per capita VMT goals. Included in this report, the Department of Ecology shall identify strategies to reduce VMT in the state as well as successful strategies in other jurisdictions that may be applicable in the state that recognize the differing urban and rural transportation requirements.

Washington has also initiated numerous actions to prepare for and adapt to *climate change impacts*. In 2007, the Governor Christine Gregoire issued and Executive directing the Departments of Ecology and Community, Trade and Economic Development to work with other agencies, and stakeholders to formed the Climate Advisory Team to assist with development of action-oriented recommendations for climate change mitigation policies and plans and recommend actions to achieve statewide goals in the order for greenhouse gas (GHG) reductions[12].

California

In California, laws, regulations, plans, and leadership by the Governor set a solid foundation for future efforts by MPOs to reduce GHG and energy consumption. In 2005, Governor Schwarzenegger established Executive Order S-3-05 calling for statewide GHG emission reductions. In September 2006 the California Global Warming Solutions Act was signed into law, which creates a statewide GHG emission limit that will reduce emissions by 25 percent by 2020. The law will first require mandatory GHG emission reporting and reductions from the

[12] Washington Climate Change Challenge, Draft Adaptation Working Groups' Work Plan, May 30, 2007.

electricity sector. It also requires all state agencies to consider and implement GHG emission reporting and reduction strategies. The state is a member of the Western Climate Initiative.

Note that the 2006 Climate Action Report, which is an early attempt to formulate policies and strategies, will to be replaced by a climate action plan that is now under way; early action measures must be adopted and implemented by January 1, 2010. The Governor has also established agreements with Great Britain and Canada to begin to address climate change and low carbon technology. To meet the state's GHG targets, the Governor directed the California Environmental Protection Agency (CalEPA) to coordinate with the state agencies for the Business, Transportation and Housing, Food and Agriculture; Resources; the Air Resources and Energy Commissions; and the Public Utilities Commission. CalEPA leads a Climate Action Team made up of representatives from these agencies "to implement global warming emission reduction programs and report on the progress made toward meeting the statewide greenhouse gas targets that were established in the executive order." The Climate Action Team reports to the Governor and the Legislature every two years[13].

The California example is particularly noteworthy because so many state GHG plans are typically championed by governors, developed by state environmental or energy agencies (but with identification of transportation sources and reduction actions). The California example involves leadership by the California DOT (Caltrans).

Caltrans' Climate Action Report seeks to reduce GHG emissions and fossil fuel use through strategies that improve the efficiency of transportation systems operational improvements, ITS, and smart land use that reduces congestion and lowers growth in fuel consumption and CO_2. Caltrans expects to accomplish GHG emission reductions with collateral benefits for climate change from its strategic growth plan and congestion relief program; more energy efficient transportation systems; and efforts to integrate energy and GHG emission reduction measures into planning, project development, operations, and maintenance.

California's Climate Change Emission Reduction Targets

By 2010: Reduce Emissions to 2000 Levels
59 Million Tons Reduction, 11% below Business as Usual
By 2020, Reduce Emissions to 1990 Levels
145 Million Tons Reduction, 25% Below Business as Usual
By 2050, Reduce Emissions to 80% Below 1990 Levels

Source: Cal EPA Climate Action Team Report 2006

The report estimates that transportation is the source of 41.2% of total CO_2, or 398 million metric tons. It is interesting that these high level policy calculations appear to be based on the following simple conversion formula.

CO_2 emissions =
Number of Vehicles X Average VMT per Vehicle X Average net GHG per VMT

[13] California Climate Action Team

This is a useful example that large picture planning can be based on simple calculations rather than sophisticated modeling.

The Caltrans report recognizes that while smart growth holds the key to energy efficiency through reduced vehicle travel by providing walking, bicycling, and other options, significant challenges result from split responsibilities for transportation management by states and MPOs, and for land use by local agencies. To bridge this gap, the state developed the Regional Blueprint Program to better link land use, transportation, environment, economic development and equity through consensus on preferred growth scenarios in each region.

This combination of a statewide framework for integrated planning and implementation by MPOs may be promising for further investigation in this paper. The program provides incentives, tools, and technical assistance (but apparently without regulations). SACOG is often considered the statewide innovator on its Blueprint vision plan; SANDAG and SCAG are also MPOs that provide insights into how much the framework has supported their ability to bring climate change and energy considerations into their long range planning process and vision plans. The 2006 Caltrans climate report identified the potential for savings of 858,240 gallons per day in the SCAG area and 246,000 in the SACOG area due their Blueprint plans. It would be useful to follow-up on these estimates with the MPOs.

Follow-up: It would be useful to follow-up with SACOG and possibly other California MPOs on their Blueprints, adaptation of climate change considerations, and progress toward meeting the projected energy savings.

Other selected Climate Action Plans include:

- Colorado – discusses VMT in detail and quantifies measures that can reduce VMT, but plan is actually a report to the legislature that was developed by an organization with some high-level project directors
- Delaware – discusses VMT in detail, but plan is actually a report to the state that was developed by the University of Delaware (sponsored by some state agencies) in 2000
- Oregon – "Oregon Strategy for Greenhouse Gas Reductions" was drafted in 2004 and talks about VMT, but has not specific or quantified goals
- Minnesota – discusses VMT in detail and quantifies measures that can reduce VMT, but plan is actually a report to the legislature that was developed by a working group appointed by the governor
- New Jersey – despite legislation requiring a reduction in greenhouse gas emissions, their draft energy plan does not mention VMT, but the development of a climate action plan is under way

Greenhouse Gas Performance Standards for Vehicles

By law states have the option of either following federal emissions standards for cars and light trucks or following California's standards (http://www.pewclimate.org/docUploads/ab1493.pdf). Sixteen states – Arizona, Colorado, Connecticut, Florida, Maine, Maryland, Massachusetts, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Utah, Vermont, and Washington – have or are in the process of adopting California's standards.

Section 4: Innovative Practices by Multi-State Regions

Overview

This summary describes three multi-state regional planning initiatives in the U.S. and Canada that provide insights for CMAP on possible opportunities to advance its vision plan and its goals through participation in and support for similar multi-state initiatives. Opportunities for MPO involvement and action items that have implications for MPOs are underlined.

The Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) began its climate change work in 2000, whereas the other two initiatives began in 2007. In part due to this longer time period of involvement in climate change, the NEG/ECP has had more progress in areas that provide opportunities and implications for CMAP and other MPOs than the other two more recent climate change initiatives.

Conference of New England Governors and Eastern Canadian Premiers

The NEG/ECP was established in 1973. The Conference's many accomplishments over the years include:

- The expansion of economic ties among the states and provinces;
- The fostering of energy exchanges;
- The forceful advocacy of environmental issues and sustainable development; and
- The coordination of numerous policies and programs in such areas as transportation, forest management, tourism, small-scale agriculture, and fisheries.

At their conferences, generally held annually, the Governors and Premiers discuss issues of common interest and concern, and enact policy resolutions that call on actions by the state and provincial governments, as well as by the two national governments. During the year, the Conference convenes meetings of state and provincial officials, organizes roundtables and workshops, and prepares reports and studies of issues of regional import.

Climate Change Action Plan

In July of 2000, the NEG/ECP adopted Resolution 25-9 on global warming and its impacts on the environment. The NEG/ECP recognized that global warming, given its harmful consequences to the environment and the economy, is a joint concern for which a regional approach to strategic action is required.

In August 2001, the NEG/ECP released a Climate Change Action Plan that identifies steps to address aspects of global warming which are within the region's control to influence. Specifically, the action plan includes:

- a comprehensive and coordinated regional plan for reducing greenhouse gases;
- a commitment to reach specified reduction targets for the region as a whole;
- a commitment from each state and provincial jurisdiction to carry on its own planning for climate change gas reductions, with a coordinated process that includes disclosure of our progress, and a sharing of information including case studies of how various programs are working;

- a plan for the adaptation of the region's economic resource base and physical infrastructure to address the consequences of climate change; and
- a public education and outreach effort to ensure that the region's citizens continue to be educated about global warming and climate change in order to protect the earth's natural climatic systems and natural environment better.

The reduction targets articulated in the Climate Change Action Plan are:

- Short-term Goal: Reduce regional GHG emissions to 1990 emissions by 2010.
- Mid-term Goal: Reduce regional GHG emissions by at least 10% below 1990 emissions by 2020, and establish an iterative five-year process, commencing in 2005, to adjust the goals if necessary and set future emissions reduction goals.
- Long-term Goal: Reduce regional GHG emissions sufficiently to eliminate any dangerous threat to the climate; current science suggests this will require reductions of 75–85% below current levels.

Recommendations and Outcomes: NEG/ECP Ministerial Forum on Energy & the Environment

In NEG/ECP Resolution #30-2, from the 30th NEG/ECP in Newport, Rhode Island, in May 2006, the governors and premiers directed that: "a ministerial-level forum of energy and environmental policymaking officials appointed by the governors and premiers be convened to develop protocols, structures and mechanisms for addressing energy issues on a regional level, including but not limited to trade, transmission, infrastructure expansion, renewables, conservation, energy efficiency, environment and alternative sources of energy, and report back [to the 31st NEG/ECP] with recommendations for action."

Pursuant to this charge, over the next eight months a steering committee consisting of members of the NEG/ECP Committee on the Environment and Northeast International Committee on Energy (NICE) oversaw the development of a set of action recommendations and a supporting briefing book by the Climate Change Steering Committee and additional groups. These action steps relate to energy efficiency, energy trade, renewable power and transportation.

The Transportation Action Steps are described in the tables in Appendix 3.
Three of the action steps are particularly relevant for MPOs:

1) Expansion of alternative transportation and commuter services and facilities;
2) Alignment of infrastructure funding with energy and climate goals by encouraging energy-efficient development in municipalities and regional entities; and
3) Collaboration with the private sector to seek new opportunities to enhance regional interconnectivity and efficiency of freight networks in the region.

As described in this document, "Governors and premiers shall appoint a regional standing task force of environmental and transportation officials to pursue the implementation of the commitments included in this document, or any other transportation initiatives to reduce air emissions, and to set a regional goal for greenhouse gas reductions from the transportation sector. This standing committee is directed to produce a regional transportation action plan proposal for submission to the (September) 2008 Conference of New England Governors and Eastern Canadian Premiers."

An opportunity exists for MPOs to become involved in such a standing committee to shape and tailor plan action items for their purview and processes. This involvement would benefit both the committee, since it would have direct MPO representation and knowledge of MPO processes, and the MPO, for the reason stated above. In September 2008, it will become clear what action items of the plan, if any, will be the responsibility of the region's MPOs.

A multi-state (and bi-national) organization such as the NEG/ECP provides a very promising institutional framework for pursuing major projects that are beyond the authority of single states or metropolitan areas but that can have major implications for these areas. For example, NEG/ECP has the potential to support major efforts to invest in rail or waterway transportation that would allow a shifting from truck transportation. This is the type of major multi-regional project that could produce significant energy and GHG emission savings. Although the multi-state group may lack formal statutory authority, it provides the potential to move beyond the limits of current institutions for pursuing major inter-regional projects.

Midwestern Regional Greenhouse Gas Reduction Accord

The Midwestern Governors Association is a nonprofit, nonpartisan organization that brings together the governors of 12 states to work cooperatively on public policy issues of significance to the Midwestern region. The MGA was created in December 1962, when articles of organization were adopted at the first annual meeting in Chicago.

The Midwestern Regional Greenhouse Gas Reduction Accord, signed November 15, 2007, will:

- Establish greenhouse gas reduction targets and timeframes consistent with MGA member states' targets;
- Develop a market-based and multi-sector cap-and-trade mechanism to help achieve those reduction targets;
- Establish a system to enable tracking, management, and crediting for entities that reduce greenhouse gas emissions; and
- Develop and implement additional steps as needed to achieve the reduction targets, such as a low-carbon fuel standards and regional incentives and funding mechanisms.

As part of the Accord, the MGA agreed to establish a Work Group structure and process involving representatives of public, private, and nongovernmental institutions to make recommendations to governors and other participating jurisdictional leaders regarding implementation. MGA state staff and appropriate state agency representatives were to develop a work plan and establish a work group to move forward with the Program, within two months of the effective date of the accord, which was November 15, 2007.

The Midwestern states, including Nebraska and North Dakota, also adopted an Energy Security and Climate Stewardship Platform. The platform establishes shared goals for the Midwest region, including specific timelines for the advance of energy efficiency, the promotion of bio-based products, the production of renewable electricity, and the development of advance coal and carbon capture and storage. Alternative transportation options, land use changes such as smart growth, and other methods to reduce VMT are not mentioned in the Accord or the Platform.

To support the goals stated in the Platform, the Midwestern states launched new cooperative regional initiatives to address the following:

- CO_2 management to create a regional transportation and storage infrastructure;
- A bio-product procurement program to support the growth of the region's bio-economy;
- Electricity transmission adequacy to support thousands of new megawatts of wind energy;
- Renewable fuels corridors and coordinated signage to promote renewable fuel usage across the Midwest;
- Advanced bio-energy permitting to assist states with the latest technologies; and
- Low-carbon energy transmission infrastructure that will provide a cost-effective way to supply the Midwest with sustainable and environmentally responsible energy.

April 2008 Press Release:

Washington, DC - South Dakota Governor, and chair of the Midwestern Governors Association (MGA), Mike Rounds has announced his chair's agenda: Transportation for Energy, People and Products. The agenda will focus on the role of transportation in the Midwest, and the Midwest's role in the upcoming national transportation debate.

Governor Rounds has asked his fellow governors to appoint their top transportation advisors to a working group that is tasked with determining the region's policy goals for the reauthorization of the transportation bill. These goals will allow the MGA to identify specific transportation needs to Congress that are important to the region.

"Transportation is critical in the movement of raw materials and distribution of finished products. That's why transportation is a key factor in the price of every product sold. Transportation is also critical in the production, distribution and price of energy, such as fuels and electricity," Rounds said. "By improving our transportation systems, we can improve the quality of life for our citizens, and hopefully help stabilize energy prices and supplies."

Western Climate Initiative

The Western Climate Initiative is a collaboration which was launched in February 2007 to develop regional strategies to address climate change. WCI is identifying, evaluating and implementing collective and cooperative ways to reduce greenhouse gases in the region. The WCI Partners have each assigned staff from environmental agencies and the Governor's and Premier's offices to undertake the work of creating a cap and trade program for the western region.

The Scope Subcommittee is looking at what sectors should be covered by the cap and trade program. An initial list of options for program elements that can be used to initiate the Scope Subcommittee's discussions includes the following items related to the transportation sector:

- Transportation fuels regulated upstream where they enter into commerce
- Passenger cars and light duty trucks regulated at the manufacturer sales level
- Large transportation fleets regulated at the fleet management level

The list also contains an item on forestry and land use change emissions regulated at the land owner level. However, this item appears to only be about carbon sequestration via the planting of more trees and is not about changing land uses (i.e., infill, mixed use, or higher densities).

A final list of what sectors and items should be covered will be released later this summer. While the items above address two of the three "legs of the stool" of way to reduce emissions from the transportation sector, alternative transportation options, land use changes such as smart growth, and other methods to reduce VMT are not mentioned.

Implications: This absence of transportation and smart growth options may provide CMAP with an opportunity to work with state participants to shape future directions that would support Vision Plan actions.

Conclusions

While the NEG/ECP's work presents several opportunities and implications for MPOs, the other multi-state regional initiatives are much earlier in their development. These recent initiatives can learn from the lead and successes of the NEG/ECP. Additionally, MPOs in other areas of the country (outside of the northeast) have the benefit of seeing the likely role of MPOs in the NEG/ECP and then asserting themselves proactively into the processes of the regional initiatives to ensure that they will have a key role in shaping transportation action items that will be under their purview. Specifically, CMAP has an opportunity currently to become involved with the MGA's Midwestern Regional Greenhouse Gas Reduction Accord.

Section 5: Current and Evolving Federal Policies and National Initiatives

Overview

This section provides a scan of possible future federal and other national level policies, programs, and regulations as well as related trends that will set an important context for actions CMAP might include in its scenarios to reduce greenhouse gas emissions and energy consumption. Clearly, related federal initiatives will change rapidly in the near term, beginning with legislation that will be passed in the next Congress and in a new Administration. In the long-term, over the time horizon to 2040 covered by the vision plan, climate and energy policy will arguably be dominant concerns at the federal level, with major implications at state, regional, and local levels.

The summary below is intended to help CMAP identify some evolving big picture trends that should be considered and perhaps exploited as it decides how best to incorporate climate change and energy considerations in *GO TO 2040* and on-going planning.

1. Rising oil prices and alternative fuels

During the period this paper was written, oil has fluctuated from $90 to almost $130 per barrel; forecasts for the next year alone range up to $150 or more. A gallon of gas increased from a national average just over $3 a year ago to both above and below $4. In the near term, *increased prices* already are having measurable impacts in reducing driving[14], increased public transit use, and shifts in purchasing away from sport utility vehicles and light trucks to more fuel efficient automobiles. At the same time several major transit operators (e.g., Denver and Boston) are recording *major increases in ridership*, they may be forced to respond with fare increases and service reductions to respond to rising fuel prices and reduced local sales tax revenues, and their inability to add more capacity. In terms of gas prices, it is likely that reduced demand will be more than offset by the rapidly rising demand for fossil fuels in India, China, and other developing countries, and within the U.S., by population increases. Supply will also be unpredictable, whether subject to peak oil limitations or spot shortages.

As drivers shift to more fuel efficient vehicles and to alternative fuels and drive fewer miles, less revenue is generated for the Highway Trust Fund from gasoline and diesel sales, which is the major source of federal funds provided to states and metropolitan areas for roads and transit.

Current federal proposals from Congress and the Presidential candidates run the gamut from drawing down the national petroleum reserve, to a "gas tax holiday," to drilling on newly opened land or off-shore, increased reliance on nuclear, wind, coal, solar, or bio-fuel, and increased fuel economy standards (see Volpe Center alternative energy/vehicle strategy paper).

The current Congress is working on alternative fuel legislation, as will the new Congress, which will also revisit fuel economy standards. The 2005 energy law requires that 7.5 billion gallons of biofuels be produced annually by 2012, which was increased in the 2007 energy law to 36 billion gallons by 2022. There is currently push-back against these targets due in large part to concern

[14] According to FHWA, from November 2007 to June 2008, Americans drove 53.2 billion miles less than they did over the same period a year earlier, and 4.7 percent less, or 12.2 billion miles fewer, in June 2008 than June 2007.

over possible shifts of agricultural products from food to fuel uses and links to increased fuel costs. There are some calls for a freeze on biofuel production and requests from states for waivers from the targets.

There is early discussion about transportation of food both in terms of energy consumed ("food miles") and the contribution this makes to a region's carbon footprint. There are examples, including from the UK, where major industries are committing to standard steps to reduce the number food miles including through reducing trips, maximizing vehicle loads, and using rail and marine shipping instead of trucks. For example, after signing on to the "green transport" steps, United Biscuits avoided 2.7 million annual road miles and is expected to save 4,700 tons of CO_2[15].

CMAP might consider actions to foster similar partnerships with manufacturers and shippers, linked to *freight strategies* that improve efficiency, as part of a *green economy scenario* in *GO TO 2040*.

There is also early evidence of trends in some real estate markets in response to recent fuel price expectations: "People are now saying affirmatively they want to live closer to town centers and have a shorter commute. And smaller homes mean less energy consumption. Areas in the suburbs requiring long commutes are very weak."[16]

Rising fuel prices will have clear *social equity* implications as low income populations relying on automobile travel face disproportionate increases as shares of household income. Although CMAP cannot influence prices at the pump, *Go TO 2040* can directly address related equity concerns by offering improved transit and nonmotorized options.

Implications

Although CMAP cannot predict fuel prices over the duration of the plan, it seems prudent to factor increasing prices into planning. There is a strong likelihood that short- and especially long-term price increases (and shortages) could dwarf the effects of some important actions in the plan. To the extent that the plan recommends strategies that reduce VMT (alternatives to single occupant automobiles and more compact development) to pursue reduced CO_2 emissions and energy consumption, rising fuel prices will *compound the effects* of many of these actions. The challenge will be to estimate the rising cost of fuel at least within a range for sensitivity analysis, and to identify transportation and land use actions that will be amplified by the external policies and trends.

2. National targets or regulations for GHG emissions

There are a significant number of Congressional proposals now pending that support national targets for reducing GHG emissions. Both Presidential candidates support targets: Senators Obama and McCain support 80% and 65% reductions by 2050, respectively.

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[15] iNSnet.org, August 4, 2008 http://www.greenbiz.com/news/2008/07/21/food-firms-pledge-cut-mileage
[16] U.S. News and World Report, "Gas Prices May Revive Cities," quote from L. Yun, economist with National Realtors Assoc., based on survey of the nation's realtors, August 8, 2008. http://www.usnews.com/articles/news/national/2008/07/17/gas-prices-may-revive-cities.html

In May 2008, the Group of Eight Environment Ministers, including the US, endorsed slashing greenhouse gas emissions by half by 2050. This was a disappointment to some participating countries and environmental advocates because it did not include binding short-term reduction commitments and did not endorse more aggressive targets. Nevertheless, it points toward the likelihood that the U.S. will join in future commitments to reductions.

There may be ramifications following the Supreme Court's decision in Massachusetts v. EPA, which "virtually ensures federal regulation of greenhouse gases from motor vehicles and other emission sources. While the Court did not order the EPA to regulate with respect to climate change, the majority opinion gives the Agency little option but to regulate, and not just for motor vehicles. Unless the relevant provisions of the Clean Air Act are revised by Congress in new climate change legislation, Massachusetts v. EPA will mean greenhouse gas emission limits on a wide variety of sources."[17]

Some participants in the debate over setting federal targets, such as through the Clean Air Act Amendments, are advocating that EPA respond to the Court decision by "requiring states to develop state implementation plans for meeting these [GHG emission] targets, and mandating that state and *metropolitan transportation plans* and programs conform to state implementation plans. (italics added)."[18]

Implications

There is a strong possibility that the U.S. will join other countries in committing to GHG reduction targets. At this point, it is not clear whether these targets will be translated into sectoral targets (i.e., for transportation) and/or jurisdictional targets (i.e., for states, metropolitan areas, or cities). At a minimum, CMAP can expect that there will be some form of future national targets; any reduction targets that CMAP includes in the Vision Plan or later planning documents should fit into this broad context. Future national targets could help raise the profile and public support for *GO TO 2040*, if it includes a priority for GHG reductions.

Although it is an area of controversy, if CO_2 reductions are included in future provisions of the Clean Air Act Amendments or other similar statutory regulations, it would require CMAP to take a serious look at the emission reduction impacts of policies and actions it might consider, and related reduction goals could have more formal standing.

3. Cap and Trade

Both Presidential candidates are co-sponsors of the 2007 Climate Stewardship and Innovation Act (S. 280), which would establish a cap-and-trade system that would use economic incentives to restrict carbon dioxide emissions. Another proposal under America's Climate Security Act of 2007 (S. 2191) proposes a similar cap-and-trade policy. A cap-and-trade system would set an absolute limit on carbon emissions. If directed toward business, companies would be required to hold permits equivalent to the value of any carbon emissions that exceed their allowed cap.

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[17] J. H. Adler, Case Western Reserve University School of Law, Case Legal Studies Research Paper No. 07-20, June 17, 2007.
[18] R. Ewing, et al, Growing Cooler, The Evidence on Urban Development and Climate Change, (Washington, D.C.: Urban Land Institute, 2008), 14.

Companies that produce less carbon dioxide than their allowed level could sell their excess emissions permits to other companies that exceed their limits.

Permits could be sold on international and national exchanges (the Chicago Climate Exchange is the only such current market in the U.S.). There are numerous technical issues, including whether initial permits would be given away (creating profits for recipients) or auctioned.

Under a variation of carbon credits and use of exchanges, the Kyoto Treaty allows countries to purchase carbon reductions against their national reduction commitments from developing countries that initiate a broad range of projects that reduce CO_2. There are very strict procedures to certify the validity of reductions (i.e., "additionality" or establishing that activities would not otherwise be done without the additional funding). Although there have been numerous proposals for credits for major transportation projects (e.g., Bus Rapid Transit in Mexico City), few proposed projects have not yet met the accreditation standards.

There have been some suggestions that revenues from a carbon tax or carbon trading system be used in part to fund transportation alternatives that would reduce GHG emissions, including public transit or nonmotorized investments or smart growth. For example, "(U)nder cap-and-trade systems, it (land development) may have a role to play in "offset markets. It could be included as an allowable offset in any cap-and-trade climate legislation."[19] If this is supported through federal legislation, regulation, or through other means such as state and industry agreements, this would have major implications for CMAP. Potentially, this approach to credits could lend important support to including land development actions in the vision plan to reduce CO_2. There would be significant technical obstacles to establishing the institutions and procedures to verify reductions. The end result would be that land use (as well as transportation) actions that reduce CO_2 emissions could earn revenues that could be factored into the financial side of CMAP's planning.

Implications

There have been some early suggestions that transportation planning and implementing authorities might participate in carbon trading or be paid for carbon reductions perhaps by receiving credits for a new plan that results in reduced carbon emissions relative to a business as usual scenario or for policies (e.g., carbon or congestion pricing) or for choosing alternative investments that reduce VMT or otherwise reduce CO_2 emissions. The technical issues involved to actually receive credit are complex, but the topic is worth following as CMAP develops and implements *GO TO 2040*. The analysis to build a case for credits is a more rigorous variation of that necessary to compare scenarios, policies, or investments for CO_2 reductions.

4. Reauthorization of Surface Transportation Act

The next authorization of the surface transportation act (currently SAFETEA-LU) may have some major implications for actions that CMAP chooses to include in *GO TO 2040* to reduce CO_2 and energy use. There are a great many points of view being offered as discussion begins on the next authorization. Considerations being raised by different stakeholders include:

- Changes (up or down) in levels of federal funds for transportation;

[19] R. Ewing, et al, op. cit., 14.

- Changes in levels of flexibility in numerous federal programs to shift funds between modal investments to locally defined priorities;
- Addition of new or expanded funding programs, for example, for ITS, public transit, nonmotorized transportation, or low-carbon projects. Also, changes in funding formulas to provide incentives for reducing travel;

In May, the House passed an act called "Recognizing the importance of bicycling in transportation and recreation," which calls for a national bicycle strategy with a focus specifically on reduced GHG emissions, increased physical activity from cycling, and avoided auto trips. Although this is a non-binding resolution, it does indicate strong support within the current Congress for supporting expansion of bicycle use as an alternative to automobile use, with links to GHG emissions and the possibility for related legislation in the future. Items supported include:

- An increased emphasis on energy savings and reduced GHG emissions;
- Encouraging or requiring analysis of GHG emission impacts as part of certain types of environmental reviews;
- Investment in research on new technical tools and technical assistance, possibly including a focus on climate change, e.g., improvements to models to allow more robust and accurate forecasts of GHG emissions from transportation plans, policies, and investments, or compact development or other land use strategies;
- An expanded emphasis on outcomes or performance measures, beyond those for criteria pollutants under the Clean Air Act Amendments.

In a recent interview, Steve Heminger, Executive Director of the Metropolitan Transportation Commission[20] and member of the National Surface Transportation Policy and Revenue Study Commission, expressed the opinion that "if the federal program is to invest in metropolitan areas, and we're trying to achieve greater mobility, less congestion and less CO_2 emissions, then we ought to set some targets and go after them." This could include modifications to the joint transportation planning requirements that would support an emphasis on reducing GHG emissions or energy usage. New planning requirements could encourage consideration of GHG reduction, climate change adaptation, or energy conservation through including these as future planning factors.

Implications

Federal policies (or even the absence of policies) and national initiatives related to climate change and energy, ranging from increased fuel economy standards, to research into alternative fuels, CO_2 targets, tax policies, and changes in reauthorization could have profound impacts on what CMAP can accomplish through actions to reduce CO_2 emissions as well as to pursue other goals. New federal policies or shifts in directions such as those discussed above could minimize or perhaps more likely, *amplify* the impact of some actions that CMAP might take to reduce emissions as well as pursue other sustainability goals.

CMAP's challenge will be to anticipate national policies and programs that might significantly influence actions CMAP and its partners decide to pursue. Although far from certain, many of

[20] The Commission's final report was issued in January 2008.

the potential policies and programs described above could end up supporting CMAP's actions that encourage VMT reductions through balanced modal investments and compact land use. There will likely be important differences in direction and degree – for example, there is a big difference between degrees of emphasis based on different levels of funding or different future fuel costs.

As it develops *GO TO* 2040, CMAP should assess how it might anticipate these major trends in some of the scenarios, and how the intended effects of selected actions might be amplified by these trends. For example, reduced VMT and mode shifts from investments in new transit capacity could be amplified many times over from increases in fuel prices. Alternatively, CMAP could *risk marginalizing its vision plan* if there is inadequate consideration or anticipation of these trends.

The challenge will be for CMAP to accommodate unavoidable uncertainty as it develops scenarios and selects actions.

Appendix 1: PSRC Travel Demand Research and Model Improvements

PSRC has identified a series of short-term travel demand forecasting model improvements that can provide sensitivities and accuracy in the travel forecasting model outputs needed to evaluate the impact of transportation and land use alternatives on climate change. These travel demand model outcomes would be used directly in the emissions models to produce effects on greenhouse gas emissions. The following describes six priority areas of model improvements, including a description of the current problems affecting the outputs used in emissions models, the current data we have to make improvements, and the proposed solution. The cost of these six priority improvements equals $345,000, with expected completion dates of between six weeks and six months.

Vehicle Assignment

Emissions models are dependent on accurate speeds and volumes from the regional travel demand models. The PSRC regional travel demand forecasting model has been validated to both speeds and volumes in recent years, but the speed validation requires more rigorous standards to provide more accurate input to emissions models. The aggregate, regional nature of the PSRC travel model limits the ability of the model to accurately predict impacts from bottlenecks and queues on the roadways, but some improvements and tighter speed validation standards can provide needed improvements to the accuracy of the link speeds.

While the PSRC is evaluating traffic micro-simulation and dynamic traffic assignment models as a longer-term model improvement that will address this issue, we also feel it is useful and possible to improve the current accuracy of speeds in the model using a series of possible changes to the trip assignment parameters. These possible changes will be determined through a series of tests, as follows:

- We will test a measure of arterial delay to see if this improves the arterial speed estimates.
- We will test using smaller increments of time for each assignment in the peak period, either 30 minutes or 1-hour, to take advantage of the additional detail provided by the time-of-day model and to provide a more accurate assessment of congestion during each assignment time period.
- We will update the values of time used in assignment to reflect observed data collected in the Traffic Choices Study using GPS technology.
- We will recode the limited access roadways in the highway network to represent separated directional facilities and ramps. This will allow us to add delay at ramps that our metered and to represent speeds on ramps separately from freeways.
- We will test different volume-delay functions to identify the function that most closely matches observed speeds and volumes.
- We will test using a variable demand auto assignment procedure to recalculate trip tables for each time period.

These proposed solutions are tests to determine whether they improve the validation of speeds and volumes. The tests with the most promising outcomes will be implemented and the trip assignment model will be recalibrated to match observed speeds and volumes.

This task will take approximately 2 months and $45,000 to complete.

Tour Generation

The current trip generation models in the PSRC regional travel forecasting system have some limitations due to the model structure (cross-classification), which limits the number of variables that can be used to influence trip-making. As a result, there is no sensitivity in the current models to congestion, tolling, trip chaining, density, accessibility, urban design, age, and life cycle. These variables can clearly affect whether to make a trip or not (including substitutions for working at home, shopping on the internet, etc.) and how many trips and stops are needed to meet daily requirements for activities.

Tour generation models created in other regions have most, if not all, of the above sensitivities due to the logit model structure, which allows estimation of all possible variables. The development of this tour generation model is possible because the synthesized population and employment at a parcel level is provided by the recently completed Urbanism land use forecasting model. In addition, the 2006 household activity survey can be used to develop a tour generation model that can be used in the short term with the existing trip-based modeling system and in the long-term with a new tour-based modeling system.

The outcome of this tour generation model is tours by type, with stops identified, for each household in the region that are converted to trips by type produced in and attracted to each traffic analysis zone in the region. This conversion is necessary to link the tour generation model with the remaining trip-based modeling components. The tour generation model will be sensitive to changes that may influence climate change in the following ways:

- Increased congestion may cause travelers to stay home or chain trips together;
- New tolls may cause travelers to stay home or chain trips together;
- Density, urban design, or accessibility factors may influence whether travelers take more short trips or fewer long trips; and
- Age and life cycle may cause travelers to take different kinds of trips, chain certain trips together, or stay home more often.

All of the above factors can influence emissions because each cold start and hot start will significantly affect the total emissions.

This task will take approximately 6 months and cost $150,000 to complete.

Mode Choice

As the Puget Sound region moves from a primarily bus-oriented transit system to a mixed bus and rail system, there is a greater need to explore more detailed mode choice models to ensure that the models can accurately predict the modal shifts resulting from new modes. In addition, there is an interest in improving the accuracy of the current ferry mode in the regional model. Currently all transit modes are treated equally in the model, except for changes in service, which is represented by route. There is a need to separate fares by mode and to consider differences in reliability and convenience by mode. Accuracy of the mode choice model will directly affect the estimation of emissions.

We propose to segment the mode choice model into different modes, so that fares and other factors can be considered on a mode by mode basis. This segmenting would be implemented by nesting the current multinomial logit mode choice models for transit modes (local bus, express bus, light rail, commuter rail, and ferry) and possibly nesting the auto modes into those driving on the ferry and those not driving on the ferry. PSRC has current plans to expand their mode choice model to explicitly recognize reliability and convenience, along with other transit amenities, but the short term solution will be to indirectly recognize these factors by mode in the nested model through the transit alternative specific constants.

This task will take approximately 2 months and cost $50,000 to complete.

Walk Trips

Walk trips has been a potential source of error in the model in the past due to their short trip lengths and limited data to identify walk trips. They do, however, have a potentially large impact on emissions because shifting from a short auto trip to a walk trip can reduce emissions. Current mode choice models account only for walk time in estimating walk trips, when urban design, street connectivity, and mixed land use can impact walk trips as well. In addition, travel time estimated as input to the distribution model for short trips does not accurately estimate the time to travel within a traffic analysis zone (typically made by walking) because the network representation is too coarse to capture these short trips adequately.

We propose to use new data sources available at PSRC to create walkability factors, including measures of intersection density, retail floor area, and mixed land uses for each traffic analysis zone to improve the walk, bike, and transit modes in the mode choice model. These factors can be used individually or collectively to better represent the walk or bike portion of these trips in the mode choice model.

We also propose to revise the current method of calculating travel times for trips within a traffic analysis zone to include an assessment of weighted average travel times for all parcels in the zone based on XY coordinates of developments rather than based on locations of centroid connectors and distances to nearby zones, which are not also located geographically where the developments are.

This task will take approximately 6 weeks and cost $40,000 to complete.

Costs of Driving

The need to accurately represent the cost of driving is very high because these factors have a significant impact on traveler's modal choices. Both parking and fuel costs are estimated for input to the models and both can fluctuate widely and be affected by statewide and national factors, which are outside the sphere of influence of PSRC and its members. Parking costs vary according to supply (number of spaces and proximity to employment), demand (employment) and degree of employer reimbursement. Fuel costs vary with supply (availability of crude oil, refinery capacity, transportation) and demand (vehicle miles traveled, employment, and vehicle efficiency). Nonetheless, it is important to understand the potential impacts of increasing or decreasing costs and their ultimate impact on emissions.

PSRC has invested some resources in the past to collect parking costs around the region and to forecast these costs for current and potential future parking lots. These data and forecasts have undergone significant local review and revision to account for specific future developments (or lack thereof) and local parking policies. The current parking costs model accounts only for the cost of off-street parking and does not take into account employer reimbursement policies. The current parking cost model estimates an increase in parking costs over inflation from 2000 to 2030, but it's considered to be a very conservative forecast. We propose to test the sensitivity of the model to a range of parking costs from conservative to a realistic high end.

Current PSRC models account for auto operating costs in trip distribution, mode choice, time of day, and assignment models. Forecasts of auto operating costs, based on gas prices primarily, are assumed to increase with inflation. In the last 20 years, this has held true for about 15 years, but in the last 5-7 years, gas prices have significantly outpaced inflation. We propose to review gas prices over the last 40 years in Washington and Puget Sound and any forecasts that have been prepared to determine the potential reasonable range of potential future gas prices. These ranges will then be used to test the sensitivity of the model and predict the potential impacts on vehicle miles traveled and emissions.

This task will take approximately 6 weeks and cost $20,000 to complete.

Methods for Modeling Operational Strategies

In addition to the above short-term travel demand forecasting model improvements, the PSRC has identified the need to develop modeling application methods that will allow for more complete analysis of transportation system operation strategies and their effects on operating speeds, fuel consumption and greenhouse gas emissions. Since traffic operations strategies modify the way existing facilities and services function these approaches are often challenging to model with existing travel demand models. Traffic operations and the applications of intelligent transportation systems can be analyzed with models with more disaggregated supply and demand characterizations. And the performance, or effectiveness, of these approaches has been captured through before and after studies. The intent of this task is to review existing micro-simulation modeling and existing literature on transportation operations in order to develop methods for best applying the region's travel demand models in the analysis of a range of operational approaches to improving the performance of transportation facilities.

This task will take approximately 2 months and $40,000 to complete.

Appendix 2: Washington State HB 2815

NEW SECTION. Sec. 8. A new section is added to chapter 47.01 RCW 28 to read as follows:

To support the implementation of RCW 47.04.280 and 47.01.078(4), the department shall adopt broad statewide goals to reduce annual per capita vehicle miles traveled by 2050 consistent with the stated goals of executive order 07-02. Consistent with these goals, the department shall:

(1) Establish the following benchmarks using a statewide baseline of seventy-five billion vehicle miles traveled less the vehicle miles traveled attributable to vehicles licensed under RCW 46.16.070 and weighing ten thousand pounds or more, which are exempt from this section:
   (a) Decrease the annual per capita vehicle miles traveled by eighteen percent by 2020;
   (b) Decrease the annual per capita vehicle miles traveled by thirty percent by 2035; and
   (c) Decrease the annual per capita vehicle miles traveled by fifty percent by 2050;

(2) By July 1, 2008, establish and convene a collaborative process to develop a set of tools and best practices to assist state, regional, and local entities in making progress towards the benchmarks established in subsection (1) of this section. The collaborative process must provide an opportunity for public review and comment and must:
   (a) Be jointly facilitated by the department, the department of ecology, and the department of community, trade, and economic development;
   (b) Provide for participation from regional transportation planning organizations, the Washington state transit association, the Puget Sound clean air agency, a statewide business organization representing the sale of motor vehicles, at least one major private employer that participates in the commute trip reduction program, and other interested parties, including but not limited to parties representing diverse perspectives on issues relating to growth, development, and transportation;
   (c) Identify current strategies to reduce vehicle miles traveled in the state as well as successful strategies in other jurisdictions that may be applicable in the state;
   (d) Identify potential new revenue options for local and regional governments to authorize to finance vehicle miles traveled reduction efforts;
   (e) Provide for the development of measurement tools that can, with a high level of confidence, measure annual progress toward the benchmarks at the local, regional, and state levels, measure the effects of strategies implemented to reduce vehicle miles traveled and adequately distinguish between common travel purposes, such as moving freight or commuting to work, and measure trends of vehicle miles traveled per capita on a five-year basis;
   (f) Establish a process for the department to periodically evaluate progress toward the vehicle miles traveled benchmarks, measure achieved and projected emissions reductions, and recommend whether the benchmarks should be adjusted to meet the state's overall goals for the reduction of greenhouse gas emissions;
   (g) Estimate the projected reductions in greenhouse gas emissions if the benchmarks are achieved, taking into account the expected implementation of existing state and federal

mandates for vehicle technology and fuels, as well as expected growth in population and vehicle travel;

(h) Examine access to public transportation for people living in areas with affordable housing to and from employment centers, and make recommendations for steps necessary to ensure that areas with affordable housing are served by adequate levels of public transportation; and

(i) By December 1, 2008, provide a report to the transportation committees of the legislature on the collaborative process and resulting recommended tools and best practices to achieve the reduction in annual per capita vehicle miles traveled goals.

(3) Included in the December 1, 2008, report to the transportation committees of the legislature, the department shall identify strategies to reduce vehicle miles traveled in the state as well as successful strategies in other jurisdictions that may be applicable in the state that recognize the differing urban and rural transportation requirements.

(4) Prior to implementation of the goals in this section, the department, in consultation with the department of community, trade, and economic development, cities, counties, local economic development organizations, and local and regional chambers of commerce, shall provide a report to the appropriate committees of the legislature on the anticipated impacts of the goals established in this section on the following:

(a) The economic hardship on small businesses as it relates to the ability to hire and retain workers who do not reside in the county in which they are employed;

(b) Impacts on low-income residents;

(c) Impacts on agricultural employers and their employees, especially on the migrant farm worker community;

(d) Impacts on distressed rural counties; and

(e) Impacts in counties with more than fifty percent of the land base of the county in public or tribal lands.

Appendix 3: NEG/ECP Transportation Action Items

TRANSPORTATION ACTION ITEMS

9) Governors and premiers shall appoint a regional standing task force of environmental and transportation officials to pursue the implementation of the commitments included in this document, or any other transportation initiatives to reduce air emissions, and to set a regional goal for greenhouse gas reductions from the transportation sector. This standing committee is directed to produce a regional transportation action plan proposal for submission to the 2008 Conference of New England Governors and Eastern Canadian Premiers. The initial priority actions to be considered are:		
ACTION ITEM	**DESCRIPTION**	**INITIAL IMPLEMENTATION STEPS**
9a) Development of environmentally friendly biofuels that ad-dress CO_2 and other air emissions using local feedstocks and technologies;	Biofuels development can reduce GHG emissions by displacing petroleum use in vehicles, but also has the benefits of enhancing reliability and security of energy supply, and encouraging economic development.	In development of the regional Transportation Action Plan (TAP), the Transportation & Air Quality Committee (TAQC) will consider policy options like California's proposed Low Carbon Fuel Standard (LCFS) which sets a 10% GHG reduction target for fuel providers by 2020. The TAQC will also coordinate with the CCSC to develop an inventory of biofuel feedstock and potential within the region.
9b) Promotion of fuel efficiency in all modes of transportation through incentives for efficient technologies on the market, research and development initiatives for new and emerging technologies, partnerships with the private sector, and public awareness programs;	Many cost-effective technologies that increase the fuel efficiency of vehicles are already on the market, are emerging, or are in development. However, barriers exist to achieving saturation levels that would significantly increase efficiencies and reduce emissions, including initial cost (even though over the life of the technology the consumer would receive a cost benefit), incomplete information, and the high entry cost for new technologies to make it to market.	The TAQC can recommend best methods to promote fuel efficiency through incentives, increase public awareness, and develop public/private partnerships that will significantly reduce emissions. A number of policy mechanisms are available to spur introduction of more efficient vehicles; these could include feebate programs, public procurement policies, etc. The TAQC will consider these options in the development of its action plan.

TRANSPORTATION ACTION ITEMS

ACTION ITEM	DESCRIPTION	INITIAL IMPLEMENTATION STEPS
9c) Expansion of alternative transportation and commuter services and facilities;	Alignment of infrastructure funding with energy and climate goals by encouraging energy-efficient development in municipalities and regional entities;	In development of the regional action plan, the TAQC will utilize jurisdictional programs, such as the "Com Cap" program in Massachusetts and the Quebec transit improvement program, which could serve as models for regional programmatic initiatives to improve the efficiency of the region's transportation system.
9d) Alignment of infrastructure funding with energy and climate goals by encouraging energy-efficient development in municipalities and regional entities;	Reducing single-occupancy vehicle (SOV) miles traveled and promoting alternative modes of travel is contingent on future land use patterns. These alternative modes are more viable in compact, "mixed use" areas where jobs and residential, commercial and other uses are in close proximity. A commitment to redevelop rural areas already served by basic infrastructure, to encourage compact, mixed use development by towns and cities through revised planning and zoning requirements, and to provide technical assistance to municipalities to assist in preparation of municipal level energy and climate action plans can help the region reach its long-term goals.	The TAQC will seek to develop and promote programs that prioritize transportation and transit funds to municipalities that encourage or require "smart growth" and that can also serve as a model for areas with and without public transit infrastructure. Incentives for encouraging developments near public transit facilities will be explored.

TRANSPORTATION ACTION ITEMS

ACTION ITEM	DESCRIPTION	INITIAL IMPLEMENTATION STEPS
9e) Use of life-cycle greenhouse gas and carbon emission analyses to set indicators for policy and project planning, when appropriate;	Lifecycle analyses (LCAs) estimate greenhouse gas emissions resulting not only from the transportation mode, but also fuel production, fuel distribution, manufacturing and other processes associated with the transportation mode. To fully evaluate the benefits of GHG reduction strategies for transportation lifecycle GHG or carbon emissions must be estimated.	The TAQC will determine if transportation measures have adequate LCA estimates associated with them. If not, the TAQC will suggest sources for LCA estimates from the available literature.
9f) Collaboration with the private sector to seek new opportunities to enhance regional interconnectivity and efficiency of freight networks in the region.	Trucks carry most of the freight in the NEG/ECP regions, and are the second largest user of the energy in the transportation sector. Improved integration and more judicious use of the modes and systems of transporting goods in the regions could result in better fuel efficiency and reduce GHG emissions. Private industry controls most of the region's rail networks and port facilities, meaning government cannot act alone.	The TAQC will engage the private sector in a public/private partnership to study and develop the long-term interconnectivity of freight networks and facilities could reduce the emissions impact of freight movement. The TAQC will also recommend that major ports in our states and provinces adopt growth plans to improve the efficiency of freight movement by truck, rail and ship.

TRANSPORTATION ACTION ITEMS

ACTION ITEM	DESCRIPTION	INITIAL IMPLEMENTATION STEPS
10. Governors and premiers will seek to adopt clean car programs including the CO_2 and air quality standards, such as California standards, throughout the entire region.	In New England, currently five states have adopted the California Low Emission Vehicle (LEV II) program. The program includes emission standards for motor vehicle GHG pollution. Quebec is currently in the process of developing regulations to adopt the standards. Potential expansion of the LEV II program to New Hampshire and other Eastern Canadian provinces would provide approximately a 27% reduction in motor vehicle GHG emissions once fully implemented. The advantages of regional adoption of LEV II include: easing implementation of emissions standards, facilitating the exchange of information between states and provinces, improving economies of scale for motor vehicle GHG reduction technologies, and providing additional reductions in GHG emissions.	The governors and premiers, through their TAQC, can work to forward regional adoption and implementation of the LEV II standards. California LEV program requires development of regulations by state environmental agencies. In some states or provinces this must be preceded by legislation at the state level authorizing adoption of the regulation. No other procedure is necessary - states do not need to receive a waiver from the U.S. Environmental Protection Agency since Section 177 of the Clean Air Act provides states with the authority to choose between the federal and the California motor vehicle emission standards. In Canada, it is most likely that all the provinces have the right to adopt a stricter energy or environment code under article 92 of the constitutional law of 1867. It remains to be determined by each jurisdiction how they can implement an emission standard for vehicles (law or regulation) as each government may or may not have legislated on the subject yet.

Appendix 4: Information Sources

Overview of Statewide, Metropolitan, and Local Transportation Planning for Climate Change

http://climate.dot.gov/publications/docs/reduction.pdf
Update to be released late 2008

Metropolitan Planning Organizations (by metropolitan area)

Boston

http://www.bostonmpo.org/

http://www.mapc.org/

http://masstech.org/renewableenergy/public_policy/DG/resources/2004_MA_Climate_Protection_Plan.pdf

http://www.bostonmpo.org/bostonmpo/4_resources/1_reports/1_studies/4_bicycle/climate_change.pdf

Los Angeles

http://www.scag.ca.gov/

http://www.climatechange.ca.gov/climate_action_team/reports/2007-04-20_CAT_REPORT.PDF

Philadelphia

http://www.dvrpc.org/connections/

Seattle

http://www.psrc.org/

http://www.psrc.org/projects/vision/pubs/vision2040/index.htm#top

http://www.governor.wa.gov/priorities/environment/climate_brief.pdf

San Diego

http://www.sandag.org

http://www.sandag.org/index.asp?projectid=292&fuseaction=projects.detail

Salt Lake City/Utah

http://www.envisionutah.org/

http://www.wfrc.org/cms/index.php

http://www.envisionutah.org/toolbox_pdf/Chapter_7.pdf

http://www.deq.utah.gov/BRAC_Climate/index.htm

http://wfrc.org/reports/0208_feb2008_aq_newsletter.pdf

http://www.rideuta.com/

Washington, DC

http://www.mwcog.org/transportation/tpb/

TPB Scenario Study Task force: http://www.mwcog.org/transportation/activities/regional/

Wilmington

http://www.wilmapco.org

States:

American Association of State Highway Transportation Organizations

"Primer on Transportation and Climate Change," April 2008.
http://downloads.transportation.org/ClimateChange.pdf

California

California Climate Action Team:
http://www.climatechange.ca.gov/climate_action_team/index.html

"Climate Action Program at Caltrans,"
http://www.dot.ca.gov/hq/tpp/offices/opar/climate_files/ClimateReport.pdf

Washington

"Greenhouse Gas Mitigation Options for Washington State," Washington State Energy Office

Washington Climate Change Challenge, Draft Adaptation Working Groups' Work Plan:
http://www.ecy.wa.gov/climatechange/TWGdocs/rci/PAWGdocs/053007PAWGworkplan.pdf

Federal Policy

Presidential Climate Action Project

http://climateactionproject.com/pcap.php

Other

Ewing, Reid, et al. "Growing Cooler," Urban Land Institute, 2008

London

"Transport 2025: Transport vision for a growing world city"
http://www.tfl.gov.uk/assets/downloads/corporate/T2025-new.pdf

"London CO_2: Action Today to Protect Tomorrow, The Mayor's Climate Action Plan,"
http://www.london.gov.uk/mayor/environment/climate-change/ccap/index.jsp

Midwestern Greenhouse Gas Reduction Accord

http://www.midwesterngovernors.org/resolutions/GHGAccord.pdf

Organization for Economic Co-operation and Development

OECD Forum 2008: Climate Change, Growth, Stability
http://www.oecd.org/document/15/0,3343,fr_21571361_39644413_40239695_1_1_1_1,00.html