Air Quality Conformity Case Studies

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Case studies of the air quality conformity processes in the Denver, Raleigh-Durham, Philadelphia, and Washington, D.C., nonattainment areas were conducted. The U.S. Department of Transportation's Volpe National Transportation Systems Center conducted these case studies on behalf of FHWA. The case studies focused on travel demand and air quality modeling and included information on regional demographic and economic forecasting, jurisdictional and institutional issues, and technical issues and concerns. This information was intended to help FHWA carry out its responsibilities under the Clean Air Act Amendments of 1990 and set priorities for federal activities in such areas as research and development, development of technical guidance, and information dissemination. Another case study objective was to provide information that other urbanized areas could use to improve their conformity procedures and establish benchmarks for them to assess results.

FHWA recognizes that many metropolitan areas are struggling with how to respond adequately to the Clean Air Act Amendments of 1990 (CAAA) and the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). Of particular concern is the process for establishing the conformity of the transportation improvement programs (TIPs) and long-range transportation plans. Political representatives and technical staff from state, regional, and local governments have expressed interest in the federal government's providing more information on the air quality conformity processes that different metropolitan areas have adopted. In response to this interest, case studies have been prepared to document the processes in the Denver, Raleigh-Durham, Philadelphia, and Washington, D.C., nonattainment areas. These case studies focus on travel demand and air quality modeling; however, they also include information on regional demographic and economic forecasting, jurisdictional and institutional issues, and technical issues and concerns.

The conformity processes described in each case study were conducted under the U.S. Department of Transportation and U.S. Environmental Protection Agency (EPA) Interim Conformity Guidance. Even since the issue of the Final Conformity Guidance in November 1993, the case studies contain relevant information that could be useful to different metropolitan areas in their preparation of the next round of conformity analyses.

Because each metropolitan area has a distinct approach to resolving issues, these case studies are not intended to be paradigms. Nonetheless, similarities among metropolitan areas exist, and the experiences of each area establish benchmarks for other metropolitan areas to assess their approaches or progress toward meeting federal requirements.

The case studies focus on metropolitan-level planning within the ozone nonattainment area. As a result, the case studies include information about the ongoing air quality conformity processes for each metropolitan area [and their urban transportation planning processes (UTPP)] within any of these ozone nonattainment areas (Table 1). The carbon monoxide (CO) or small particulate matter (PM_{10}) nonattainment areas are also of interest and are included in the case studies; however, these areas are typically smaller geographically than the ozone nonattainment areas.

Three of the case studies—Philadelphia; Washington, D.C.; and Raleigh-Durham—discuss how inconsistencies exist between the geographical designation for the nonattainment areas and the planning boundaries for metropolitan transportation planning. The Philadelphia nonattainment area covers four states and includes four metropolitan planning organizations (MPOs). The Washington, D.C., nonattainment area covers Maryland; Delaware, and Washington, D.C. but has only one MPO. Unlike Philadelphia, the Washington, D.C., nonattainment area includes nonurbanized areas outside the MPO's planning boundaries. Despite the geographical proximity of Raleigh and Durham (25 mi), they have separate MPOs and air quality conformity processes.

The four nonattainment areas that were selected represent a cross section of metropolitan areas with varying air quality, transportation, economic, geopolitical, and planning issues. They also vary in population size from small to very large (Table 1). To a great extent, they represent the mix of metropolitan areas in the United States that must meet CAAA requirements.

For example, Raleigh and Durham, which have been designated moderate for ozone and CO, are smaller metropolitan areas that have experienced high rates of population and travel growth in the past 10 years (Tables 2 and 3). Although bus service is available in both cities, their respective transit mode shares are very low. Consideration is being given to adopting policies that will encourage denser land development; however, highway construction is the focus of Raleigh and Durham's transportation investment programs. Because the respective MPOs have limited staff, the required technical analyses, such as travel demand and air quality modeling, are conducted by the North Carolina Department of Transportation (NCDOT).

In contrast, the Philadelphia metropolitan area, which has been designated as severe nonattainment for ozone and moderate for CO, has experienced an average annual population growth rate of only about 0.4 percent. The region has an old, complex transportation infrastructure that includes the following transit modes: bus, heavy and light rail, trolley, and commuter rail. Thus, the focus of its transportation plan and program is to reconstruct the existing infrastructure. The MPO for the Philadelphia area has in-house staff capable of completing the required transportation and air quality technical analyses, all of which are conducted with cooperation of the Pennsylvania and New Jersey departments of transportation and environment (or natural resources).

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TABLE 1 Overview of MPOs Within Ozone Nonattainment Areas

Ozone Non-Attainment Area	Urbanized Areas	Metropolitan Planning Organizations	U.S. Census MSA 1990 Populations[1]
Philadelphia	Philadelphia	Delaware Valley Regional Planning Commission	4,856,887
	Wilmington	Wilmington Area Planning Coordinating Council	578,587
	Dover	Dover Metropolitan Planning Organization	
	Vineland	South Jersey Transportation Planning Organization	138,053
Washington, D.C.	Washington, D.C.	National Capital Region Transportation Planning Board/Washington Council of Governments	3,923,574
Raleigh - Durham	Raleigh	Greater Raleigh Metropolitan Planning Organization	735,480
	Durham	Durham - Chapel Hill - Carrboro Metropolitan Planning Organization	
Denver	Denver	Denver Regional Council of Governments	1,848,319
	Boulder		
	Longmont		

[1]For consistency purposes, U.S. Census Metropolitan Statistical Area (MSA) estimates are presented in this table; however, the text of this report also includes MPOs' population estimates. The U.S. Census and MPO estimates do not necessarily agree. The MSA and the MPO's planning boundaries do not always coincide and each of the MPOs use different estimation procedures. For example, the Philadelphia MPO includes Mercer County, New Jersey, which is part of the New York CMSA. With the inclusion of Mercer County, the population within the Philadelphia MPO's boundaries is closer to 5.2 million people.

FINDINGS

This section presents an overview of the case studies, focusing on what was learned in each of the four areas. The discussions of procedures are purely descriptive; no attempt has been made to analyze or critique the approaches that have been adopted. The findings are based on reviews of metropolitan air quality conformity analyses and telephone conversations with federal, state, regional, and local planners and engineers who have been involved in the processes. The discussion highlights similarities and differences in the approaches adopted by these metropolitan areas and identifies problems that might be addressed by future federal government action (either by providing additional technical and informational support or determining future policy changes).

Determining Conformity—Transportation Improvement Program and Transportation Plan

Under CAAA, all transportation plans and programs that include federally funded projects must conform to a state implementation plan (SIP). As interpreted in regulations issued to implement the conformity provision of CAAA, this means that the expected emissions from transportation plans and TIPs must be consistent with the implementation plan's required schedule of motor vehicle emissions reductions.

TIP Evaluation

The conformity analyses conducted by the metropolitan areas were based on projects included in TIPs. The project listings in TIPs were used to establish baseline and action ("build" and "no-build") scenarios for evaluating emission levels in the milestone and attainment years.

Plan Evaluation

Although required by the Interim Conformity Guidance, the region's long-range plans and whether they conformed to SIPs were not the focus of the conformity analyses of the participating metropolitan areas. Instead, TIPs were the focus of the evaluations. Because of the traditional relationship between plan and program in the UTPP, this is a reasonable approach. Implicit in this process is the assumption that the projects in TIPs are based on or derived from the policies, goals, and strategies expressed in the long-range transportation plan.

TABLE 2 Air Quality Designations for Nonattainment and Urbanized Areas

Non-Attainment and Urbanized Areas	Air Quality Designations (As Defined by the EPA's National Ambient Air Quality Standards)		
	Ozone	**Carbon Monoxide**	**Small Particulate Matter**
Philadelphia	Severe	Moderate	
Wilmington	Severe	Attainment	
Dover	Severe	Attainment	
Vineland	Severe	Attainment	
Washington, D.C.	Serious	Moderate	
Raleigh	Moderate	Moderate	
Durham	Moderate	Moderate	
Denver	Transitional	Moderate	Moderate

For many of these metropolitan areas, the task of actually conducting a conformity analysis of their long-range plans would have been difficult. This is because their long-range plans are not always developed at a level of specificity that identifies what transportation projects will be in place at different time frames within the planning period.

The requirements of the final rules for conformity and metropolitan transportation planning under CAAA and ISTEA will strengthen the relationship between plans and programs. Long-range plans will have to become more than policy statements; they will have to include a level of project specificity that will enable MPOs to establish whether the plans are financially constrained. As a result, future conformity determinations will shift from the present emphasis of evaluating projects listed in TIPs to a more comprehensive assessment of those projects identified in the long-range plans.

Inconsistency Between Nonattainment and MPO Planning Areas

The nonattainment areas (particularly for ozone) and the geopolitical boundaries of the entities responsible for completing the conformity analyses rarely coincide. This situation arises because the boundaries of designated nonattainment areas relate more to the measurement of emission levels than the metropolitan boundaries that form the basis for planning areas. This inconsistency creates a level of complexity. (For example, more than one MPO or state may compose a nonattainment area, a part of a nonattainment area may lie outside an MPO, and more than one nonattainment area may lie within the planning area.) This complexity also makes it difficult to ascertain the total nonattainment area's progress toward reducing emissions because one conformity determination is not completed for the entire nonattainment area.

The interim and final conformity guidelines permit one conformity determination for nonattainment areas with more than one metropolitan area. Because the focus of urban transportation planning from the federal perspective has been at the metropolitan planning level, this has resulted in each MPO in the nonattainment area completing a conformity determination.

There are also areas (sometimes referred to as "donut" areas) that have not selected to join an MPO but must still meet the conformity requirements because they fall within the nonattainment area. The completion of conformity analyses in these donut areas has in some instances required special agreements with an organization capable of conducting the technical analyses. In addition, areas sometimes exist within an MPO's boundaries that are not urbanized and not covered by the region's transportation demand model. Some jurisdictional and institutional issues that were identified in the case studies include multiple MPOS, donut areas, and multiple nonattainment areas within a planning area.

Multiple MPOs

The Philadelphia ozone nonattainment area covers four states and includes four different MPOs. The Delaware Valley Regional Planning Commission (DVRPC), which serves as the MPO for the Philadelphia area (and covers 9 of the 14 counties that make up the ozone nonattainment area), has in-house staff capable of completing the required transportation and air quality technical analyses. The other MPOs located in the nonattainment area have limited staff and must therefore rely on their respective state departments of transportation to complete the technical analyses.

The Raleigh and Durham areas were newly designated as a single, moderate nonattainment area for CO and ozone in 1991, even though the two urban areas maintain separate UTPPs. To comply with the requirements of CAAA, the Greater Raleigh MPO and the Durham–Chapel Hill–Carrboro MPO made separate conformity determinations based on the respective TIPs and long-range transportation plans.

TABLE 3 Overview of Urbanized Areas' Demographic, Transportation, Institutional, and Planning Features

Urbanized Areas	Compound Annual Growth Rate 1980-1990 (%)	Transportation Infrastructure (includes limited comments about highway networks)	Institutional & Planning Issues
Philadelphia (PMSA) (Phila. Non-Attainment Area)	.4	Extensive, but aging highway & transit networks. Transit includes rail, trolley & bus service. Also, have extensive commuter rail.	Due to its geo-political coverage, the MPO must coordinate closely with state agencies in Pennsylvania and New Jersey. This requires completing emission runs which reflect the policies and conditions of the two states.
Wilmington (PMSA) (Phila. Non-Attainment Area)	1	Bus service	The MPO, which also includes Cecil County, Maryland has limited staff. Consequently, it relies on the Delaware and Maryland departments of transportation for technical support. One of its member counties, Salem County, New Jersey, recently left to join a newly created MPO made up of southern New Jersey counties.
Dover (Kent County) (Phila. Non-Attainment Area)	1 (1980-1986)	Limited bus service	The MPO was recently formed and only has one part time staff person. It relies on the Delaware DOT for completing its conformity analyses.
Vineland (PMSA) (Phila. Non-Attainment Area)	.6	Limited bus service	The MPO is a member of the Southern Jersey Transportation Planning Organization which was recently formed to serve Atlantic, Cumberland, Salem and Cape May counties. It relies on New Jersey DOT for completing its conformity analyses.
Washington, D.C. (MSA)	2	Bus and heavy rail service	The multi-state area is served by one MPO. The conformity technical analyses for donut areas located in southern Maryland are being conducted by the MPO's technical staff. A separate independent regional committee has been formed to focus on the development of the regional air quality strategy and implementation plan.
Raleigh	3 (for Raleigh-Durham MSA)	Bus service	The MPO has limited technical staff. The North Carolina DOT has a strong statewide planning staff which prepares the urbanized area's long range plan and conformity analysis. The area has experienced strong growth. New highway construction is the focus of its capital investment program.
Durham		Bus service	The MPO has limited technical staff. The North Carolina DOT has a strong statewide planning staff which prepares the urbanized area's long range plan and conformity analysis. The area has experienced strong growth. New highway construction is the focus of its capital investment program.
Denver (CMSA)	1	Bus service. Have begun constructing one leg of a proposed light rail system through downtown.	The MPO, which has the responsibility for making the air quality conformity determination, shares responsibility for the technical analyses with the Air Pollution Control Division of the Colorado Department of Health. The MPO does the travel demand modeling and the state generates the emission estimates.

Donut Areas

The Washington, D.C., ozone nonattainment area boundary extends beyond the MPO's planning boundaries to include Charles and Calvert counties in southern Maryland. By agreement, the Washington Council of Governments (WashCOG), which conducts the technical analyses for determining conformity on behalf of the region's MPO (the National Capital Region Transportation Planning Board), has incorporated Charles County into its travel demand and air quality modeling efforts. In the coming year, it will also incorporate Calvert County. Incorporating these two counties is good for Washington, D.C., because considerable suburban development has occurred in southern Maryland as a result of high rates of growth and steep increases in housing values in the counties adjacent to Washington, D.C.

The Raleigh-Durham ozone nonattainment area does not coincide with the combined boundaries of the two MPOs. A rural, unincorporated portion of the nonattainment area currently lies outside Durham's MPO planning area. Although EPA has indicated in writing that it would like this area included in the conformity analysis, the MPO and the state have chosen not to do so because the area is rural and these agencies consider it to have little or no impact on the region's ambient air quality.

In response to the 1990 Census and ISTEA requirements, the Greater Raleigh MPO has recently expanded its boundaries so that they now approximate those of their portion of the ozone non-

attainment area. Even so, as a result of a lack of travel data, no adjustments have been made to the region's travel model to incorporate the expanded land area.

Multiple Nonattainment Areas Within A Planning Area

The city of Longmont, which is a member of the Denver MPO (the Denver Regional Council of Governments), is part of a separate nonattainment area for CO. Because it is part of the Denver Regional Council of Government's (DRCOG) regional transportation modeling effort, DRCOG generates socioeconomic and transportation demand estimates for the Longmont urbanized area to use in its air quality planning.

Consultation and Coordination

To meet the requirements of CAAA, MPOs and state agencies (departments of transportation, natural resources, environment, or public health) have had to form close working relationships. Through the Ozone Transport Commission, a group of northeastern states has forged a working relationship for coordinating policy; however, limited consultation or coordination appears to exist among MPOs with conformity responsibility within individual ozone nonattainment areas or in adjacent nonattainment areas. Although it is possible to track the anticipated progress by urbanized area, this would be difficult to accomplish for nonattainment areas with more than one MPO.

Institutional Arrangements for Completing Technical Analyses

In urbanized areas, MPOs are required by CAAA to make the air quality conformity determination. Only the country's larger MPOs appear to have the staff and technical expertise to complete the analysis necessary to support this determination. This means that many MPOs have had to seek technical support from state agencies or consultants. Also, in certain urban areas, political considerations appear to influence the choice of which agencies complete the technical work.

State Support

The research conducted for these four case studies indicates that MPOs covering urbanized areas with populations less than one million do not usually have large staffs or individuals with the technical expertise to conduct the analyses necessary to determine conformity. The MPOs contacted in Delaware, New Jersey, and North Carolina that fall into this category rely on their state departments of transportation to conduct travel and air quality modeling. Without these centralized statewide functions, many MPOs would have had difficulty completing the air quality conformity analyses mandated by CAAA.

The relationship between NCDOT and the state's MPOs illustrates this point best. NCDOT's statewide planning branch supports, develops, and operates regional transportation models and prepares long-range plans, known as thoroughfare plans, for the state's urbanized areas (except Charlotte). It also conducts air quality conformity analyses (i.e., running EPA's MOBILE model) for the state's seven nonattainment areas.

Consultant Support

Among the agencies contacted, the use of consultants for determining conformity has been limited. The Delaware Department of Transportation (Del DOT), which conducts the conformity analyses for the Wilmington and Dover areas, has contracted with a consultant to assist with its MOBILE runs. Also, Del DOT recognized that it needed consultant support to ensure continued progress in meeting the mandated deadlines. Over time, it plans to augment its in-house expertise and rely less on consultant services. Similarly, WashCOG has contracted a consultant to assist in the development of inputs for the MOBILE model and to run the model for conformity analyses.

Some MPOs and state transportation agencies also use consultants to identify, evaluate, and quantify the impacts of transportation control measures (TCMs). Conformity and SIP requirements necessitate the quantification of the potential effect of TCMs; however, little is known about what effect different TCM categories will have on emissions.

Shared Responsibilities

In Denver, DRCOG and the Air Pollution Control Division (APCD) of the Colorado Department of Health share the responsibility of conducting the technical analyses that support the conformity determination. DRCOG is responsible for making the air quality conformity determination and conducts the travel demand modeling. The APCD generates emission estimates using EPA's MOBILE model.

As a result of DVRPC's geopolitical coverage, the Pennsylvania and New Jersey state departments of transportation are actively involved in the air quality conformity process. This involvement consists primarily of reviewing or providing input data necessary to complete MOBILE model runs.

Formation of Additional Institutional Arrangements

In the Washington, D.C., and Denver metropolitan areas, additional policy-making organizations have been formed to ensure the regional compliance with CAAA. These organizations focus on meeting SIP requirements instead of on making conformity determinations.

Regionwide Air Quality Committee—Washington, D.C., Region

The Metropolitan Washington Air Quality Committee (MWAQC), which includes all of the jurisdictions that make up the ozone nonattainment area, is charged with developing and adopting strategies for reducing emissions from mobile and stationary sources to be included in the nonattainment area's 15 percent volatile organic compound (VOC) reduction plan. Its membership includes a number of jurisdictions that do not participate in the MPO as well as representatives from the Maryland, Virginia, and Washington, D.C.,

departments of transportation. All individuals who represent participating jurisdictions are elected officials.

State Involvement in Establishing Regionwide Air Quality Policy—Denver Region

Air quality planning in the Denver region is a cooperative effort conducted by DRCOG, APCD of the Colorado Department of Health, and the Regional Air Quality Council (RAQC). RACQ, which was created in 1989 by the governor, is designated as the lead agency for air quality planning in the Denver nonattainment area and is responsible for preparing the Denver portions of the SIPs. (As already stated, DRCOG and the APCD share responsibility for conducting the analyses necessary to support a conformity determination.)

The governor formed RACQ after consulting with local units of government in the Denver area. It has a 35-member board, 17 of whom are local elected officials appointed by cities and counties throughout the Denver region. As part of the SIP process, RACQ identifies, analyzes, and recommends control measures to include in the SIP document relating to control of CO and ozone precursor emissions. RACQ accomplishes this by working with the implementing organizations, including the state legislature and local governments.

Transportation Control Measures

Despite their agencies' efforts to evaluate and select TCMs, several participants expressed concern about the focus in CAAA on the use of TCMs to achieve air quality standards. The general sentiment the participants expressed is that TCMs are unlikely to be effective and that too much time is being spent on implementing measures that will not bring air quality results rapidly. Even though TCMs are not perceived to be an effective strategy for achieving air quality goals, they are perceived as a means to influence people's travel choices.

TCM Evaluation

A number of individuals who were contacted said they would like the federal government to provide standardized methods or travel demand modeling tools for evaluating the marginal impact of different TCMs. To quantify the marginal impact of a range of TCMs on future levels of emissions, different MPOs and state departments of transportation have sought outside assistance from consultants.

Identification of Effective TCMs for Large Urbanized Areas with Aging Infrastructure

The Philadelphia metropolitan area has been struggling to identify TCMs that are (a) compatible with its older, multimodal transportation infrastructure, (b) will have a measurable impact on air quality, and (c) will be acceptable to an active and demanding environmental community. The region is not committed to constructing high-occupancy vehicle (HOV) lanes on area-wide expressways because many of the region's expressways are only four lanes and limited room exists to accommodate the addition of HOV lanes. Also, the addition of HOV lanes is difficult to justify in corridors that are already served by rail transit and commuter rail.

Appropriateness of TCMs in Smaller Urbanized Areas with High Growth Rates

NCDOTs long-range planning for Raleigh and Durham focuses on reducing systemwide congestion and emissions by building missing highway links (including freeways), widening roads, and improving intersections and signalizations. TCMs are not included in the thoroughfare plans for the different metropolitan areas. They have not been seriously considered as a means to reduce vehicle miles traveled (VMT) and improve air quality because they are perceived to be expensive with no guarantee of effectively reducing VMT and automobile emissions. Given the nonattainment area's moderate designation for ozone and CO, agreeing to these potentially costly and disruptive actions could be difficult for planners and local officials to justify.

Quantification of Effect of TCMs on Statewide Emission Levels

Recently, the New Jersey Department of Transportation (NJDOT) (with the assistance of a consultant) conducted an analysis to determine the extent TCMs proposed by local governments and MPOs throughout the state and employee trip reduction programs would affect statewide air quality. The analysis, which included 500 to 600 TCMs, concluded that these measures would result in an aggregate statewide reduction of 8.39 tons per day of VOC. According to NJDOT staff, this represents 4 percent of the total VOC reduction that New Jersey must achieve by 1996.

Regional Land Use and Air Quality Planning

ISTEA encourages governmental units to consider the interaction between land use and transportation. In addition, environmentalists have advocated adopting policies that would encourage greater residential densities and other changes in land use patterns as a means of reducing VMT.

The MPOs that were contacted have no regulatory power to affect land use or land development. Through the continuing, cooperative, and comprehensive (3C) planning process, MPOs, along with state and regional transportation organizations, have the mechanism for programming transportation capital investments with potential long-term effects on land development.

Various agencies are also initiating planning activities that could affect land development and transportation supply. Specific activities that are ongoing in North Carolina and Delaware at the regional level are described in the following sections.

North Carolina

In response to the growing economic interaction among Raleigh, Durham, and Chapel Hill, the Triangle Transit Authority was recently formed to provide interurban transit service. It is providing bus service to the cities within the Triangle and studying the feasibility of constructing a regional fixed guideway system. As part of this research, the Triangle Transit Authority is considering alternative land-use scenarios that assume the development of transit-dependent communities and much denser interurban corridors.

Also, a neotraditional neighborhood was recently proposed for the Chapel Hill area. Its developers claimed that this land development concept would produce 60 percent fewer trips than a traditional single-family housing development.

Despite these planning activities, NCDOTs Statewide Planning Branch staff generally do not anticipate significant changes in land-use patterns over the long term. The Raleigh-Durham region continues to experience high growth, and local jurisdictions have not yet adopted land use policies or regulations that would encourage denser development patterns.

Delaware

Del DOT, which is responsible for almost all roads within the state (including many minor collectors), has developed extensive computerized representations of the highway networks serving three of its most urban counties. These networks are being used for travel demand modeling purposes (Del DOT uses TRANPLAN to complete the travel analyses). Del DOT has linked TRANPLAN to a geographical information software (GIS) program (MapInfo), which also allows access to extensive demographic, land use and employment location data. This enables Del DOT to conduct interactive analyses. Analysts can produce highway simulations for the base year and any horizon year and analyze the impact of new development proposals on the transportation network. For example, Del DOT used the system to analyze the potential impact of a proposed Mercedes-Benz assembly plant. It also facilitated analyzing travel and emissions under build and no-build scenarios as part of the air quality conformity analysis process for different milestone years.

Travel Demand Modeling

Generally, the travel demand models used by the planning agencies interviewed for this study represent the state of the practice. For the most part, a four-step travel demand estimation process is being used. Travel demand forecasting packages, such as TRANPLAN and MINUTP (operated on high-performance microcomputers), are the typical means for conducting the analysis. Two different MPOs, DRCOG and DVRPC, continue to use their mainframes for all or part of their analyses.

Availability of Current Travel Data and Model Updates

Many of the travel demand models in use were calibrated by using travel behavior inventories or surveys conducted in the 1960s and 1970s. For example, Del DOTs models are based on a travel behavior survey that was conducted in the 1960s.

The Triangle Transit Authority, which serves Raleigh, Durham, and Chapel Hill, will be conducting a multimodal travel survey as part of its intercity rail study. The survey, which will be used to estimate a new regional travel demand model, will be the first comprehensive travel survey to be conducted in North Carolina in 20 years.

Although many regional technical analysts have been interested in undertaking new travel behavior surveys, they have been unable to secure sufficient funds or support from local policy makers. The Denver region has repeatedly included travel demand surveys in its Unified Planning Work Program (UPWP); however, it has been unable to proceed with extensive survey work because of funding constraints.

Nevertheless, travel behavior surveys that are limited in scope have been conducted in different regions so that their transportation planning models can be updated or enhanced. For example, WashCOG adjusted its trip generation, distribution, and car occupancy submodels in 1992 to conform to data that were obtained from a 1987–1988 home interview survey and traffic counts conducted in 1990. Similarly, DVRPC recalibrated its model using cordon counts, with a home survey that was conducted in the late 1980s.

During 1994, WashCOG planned to update and recalibrate its mode choice model and review the entire model chain as U.S. Census data become available. This will consist of comparing estimated and observed trips and then adjusting the model's constant and coefficients to correspond more closely to observed behavior.

For the Philadelphia region, the 1960 Penn-Jersey Study was the original source for the trip generation data. Since then, these trip rate data have been validated in 1970 and 1980 using screenline counts. A home survey completed between 1988 and 1989 indicates that the basic relationships have remained stable, although the number of trips per household has increased. In response to this, DVRPC intends to increase the trip rates in its cross-classification matrix.

Truck Trip Estimation

Only two of the areas that were contacted, Denver and Washington, D.C., are generating internal truck trip estimates.

Mode Split Estimation

The travel demand models that are used in Raleigh, Durham, and southern New Jersey exclude the mode split step. Because transit represents less than 1 percent of total person trips in Raleigh and Durham, NCDOT subjectively estimates transit shares on the basis of actual route patronage and expected extensions of the bus system.

Model Enhancements

Two of the MPOs—DVRPC and DRCOG—are beginning to consider enhancements (e.g., feedback loops) to their travel demand models, which would enable them to estimate peak-hour travel and assess policy and land use changes. WashCOG recently installed a feedback loop in its modeling process for the purpose of differentiating between peak- and non–peak-hour travel during the trip distribution and trip assignment stages. Another enhancement under consideration by some regions includes modifying the travel demand models so they could estimate bicycle travel.

Even though strong interest exists in making many of these improvements, limited progress has been made. The staffs are hampered by funding constraints and approval from policy makers.

For fiscal year 1994, WashCOG programmed a number of these enhancements in its UPWP. In addition to installing a feedback loop for differentiating between peak- and non–peak-hour travel, work activities included improving trip generation by updating a model to estimate car ownership. The model is based on income, transit service availability, area type (e.g., inner city, urban, or suburban), and land use density.

Interface Between Travel Demand and Air Quality Models

Using EPA's MOBILE model to convert the travel assignment output to an estimate of emissions is cumbersome. To improve the interface between the two modeling processes, three of the organizations contacted developed a post-processor program. These programs are being used to convert the daily travel into hourly estimates and compute VMT and associated speeds.

Air Quality Modeling

Different individuals expressed concerns about the accuracy of EPA's MOBILE model and the current practice of air quality planning. According to planners with NCDOT, MOBILE produces higher emission results for high-speed facilities than it produces for arterials, which have acceleration and deceleration cycles of greater amplitude and frequency. In addition, planners stated that the conformity analysis process attempts to produce results at a level of precision and accuracy far greater than the input data. The input data are based on techniques or methods with considerable variability or error. That is, surveys and travel demand models do not produce exact results.

Future Technical and Informational Needs

The technical and informational needs expressed by the case study participants were comparable. To begin with, the participants expressed interest in the federal government providing more technical training regarding the operation of the MOBILE model. They would also like the federal government to develop better quality transportation and air quality modeling by disseminating information about different modeling procedures that have been adopted by metropolitan areas and states. Additional topics that participants stated they would like more information or technical support on included (a) the roles and responsibilities that different organizations are assuming in SIP development, (b) how TCMs are being modeled to measure effectiveness in reducing emissions, (c) different employee commute option programs that are being developed, (d) strategies being identified for reducing the hydrocarbon baseline emissions as well as nitrogen oxides (NO_x) emissions, (e) how different regions are using congestion management and air quality funds, and (f) what new transportation model packages and corridor-specific air quality models are available.

In addition, many participants expressed interest in the federal government conducting more regional or multiregional meetings with representatives from different state or regional transportation agencies. In this way, representatives of various organizations would have an opportunity to share experiences or approaches to meeting CAAA requirements. Participants also suggested that the federal government should consider (a) issuing a bulletin on a regular basis that reports how various metropolitan areas and states are proceeding with their air quality planning and (b) conducting a survey of metropolitan areas followed by a summary report that highlights successes and problems encountered in attempting to meet CAAA milestones.

CONCLUSIONS

The case studies indicate that the metropolitan areas are implementing the required air quality conformity and transportation planning processes; however, continued guidance and technical support are needed from the federal government. A number of conclusions can be reached regarding the progress metropolitan areas have made in conducting air quality conformity analyses and the support or guidance the areas will need to improve the process.

- Completing the air quality conformity process and demonstrating a region's progress in attaining the National Ambient Air Quality Standards is frequently hampered by (a) the inconsistencies between the geographical designation for the nonattainment areas and the planning boundaries for metropolitan transportation planning areas, (b) the differences among the air quality and transportation policies adopted by states that must work together to reduce emissions in a nonattainment area, (c) the lack of consultation among MPOs located within a nonattainment area that are each conducting conformity determinations, and (d) the limited staff size and technical capabilities among many MPOs, particularly in areas with populations less than one million.
- In many metropolitan areas, particularly those with populations less than one million, the demonstration of air quality conformity depends on the technical capabilities of the in-house technical staffs of the state departments of transportation.
- Because of differences among the metropolitan areas, which stem from economic and demographic growth patterns and existing transportation infrastructure, the approaches to meeting the regions' travel demands and emission reduction requirements vary. In fast growing areas, the construction of missing links in the highway network are necessary to improve traffic flow and alleviate congestion. In contrast, the focus of TIP in areas with complex and older transportation systems is on highway and transit reconstruction instead of implementing TCMs and management systems.
- A considerable amount of concern exists among planners and policy makers about the focus in CAAA on the use of TCMs (other than inspection and maintenance programs) to achieve air quality standards. The concern is that TCMs are unlikely to be effective in contributing to the rapid reduction in emissions that are mandated.
- As a result of inconsistencies between the state-of-the-practice urban transportation models that are used and the MOBILE model, serious questions remain about the accuracy of the emission calculations (by link and speed). Resolving this issue requires the development of additional transportation and air quality modeling enhancements.
- Not all metropolitan areas are estimating truck trips and considering their impact on regional air quality. To accommodate trucks, regions could use traffic counts to adjust hourly vehicle mix and directional speeds by highway classification.
- More technical information and guidelines are needed so that regions can improve their air quality analysis and planning for NO_x and small PM_{10}.