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Congestion Mitigation and Air Quality Improvement Program Review

Office of Environment and Planning
Federal Highway Administration
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Congestion Mitigation and Air Quality Improvement Program Review

**Final Report
December 1996**

**Prepared by
Office of Environment and Planning
Federal Highway Administration
400 Seventh Street SW
Washington, DC 20590**

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Forward

In 1994, the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA), in cooperation with the Environmental Protection Agency (EPA) conducted a 10-State review of the Congestion Mitigation and Air Quality Improvement (CMAQ) Program. The CMAQ program was created in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and this mid-term review assessed the first 3 years of program activities. This mandated review was intended to determine whether current projects and policies support the goals of the program.

The program review began in May 1994, with an announcement in the *Federal Register* of a public meeting to solicit input on issues that should be considered in the review and to request comments to a docket on CMAQ policies and procedures. The public meeting was held on July 2, 1994, and provided an opportunity for the Federal agencies to hear public input and formulate the direction of the State reviews. Between July and September, 1994, the Federal agencies conducted reviews in 10 States and 15 cities for a total of approximately 70 separate meetings with government representatives and stakeholders. In the reviews, the Federal agencies met with MPOs, State and local government representatives, State DOTs, air quality agencies, public and private interest groups, and Federal, regional, and divisional staff.

This document presents the results of the CMAQ Program Review and is organized into the following six chapters:

- o General Findings;
- o CMAQ Decision-Making Process;
- o Responses to Policy Questions;
- o Effectiveness of CMAQ Projects;
- o The CMAQ Program and the Climate Change Action Plan; and
- o Conclusion.

Additional copies of this report and others on the CMAQ Program are available by calling the FHWA Hotline at (202)366-2069. Questions regarding its content may be forwarded to Mike Savonis, FHWA, at (202)366-2080, Abbe Marner, FTA, at (202)366-0096, or Mark Simons, EPA, at (313)668-4420.

I. General Findings

CMAQ Obligations

Since its introduction in 1991 as a major program under the ISTEA, the CMAQ program has steadily evolved to become an important component in the funding of State and local transportation projects and programs. The CMAQ program provides funding for a wide variety of transportation and air quality related projects. These include:

- o Transit;
- o Traffic flow improvements;
- o Rideshare programs;
- o Demand management programs;
- o Bicycle/pedestrian projects; and
- o Other transportation control measures (TCMs) (including inspection and maintenance [I/M] programs).

A key measure of success in a significant Federal spending program such as CMAQ, is the level of fund obligations. In the first years of implementation, the CMAQ program experienced relatively low obligation rates. Although the subject of some concern, the low obligation rates are not entirely surprising. State's typically encounter start-up problems with new programs. CMAQ start-up problems included:

- o A lack of understanding of the program goals and procedures;
- o A lack of familiarity with Federal funding requirements;
- o Problems in determining project eligibility; and
- o Difficulties in implementing projects because of State contracting procedures.

Table 1.1 shows the obligation rates for the 10 States that receive the largest allocations of CMAQ funds for the first 3 years of the program and show steadily increasing obligation rates. Florida and Texas, in particular, experienced problems in the first year and did not obligate any of their CMAQ apportionments. By 1994, however, both States overcame many of these problems and increased their obligation rates substantially. In 1994, Maryland made up for its relatively low obligation rates in prior years by obligating 142 percent of its CMAQ funds. Pennsylvania withheld CMAQ funds until it developed a methodology to evaluate the air quality benefits of CMAQ projects. The development of this methodology increased the State's CMAQ obligations in 1995. The CMAQ program obligation rates should continue to demonstrate increases in the future.

**Table 1.1
Selected CMAQ Obligations**

State	Obligation Rate	Obligation Rate	Obligation Rate
	1992	1993	1994
California	79%	80%	99%
Florida	0%	68%	120%
Illinois	43%	104%	65%
Maryland	44%	77%	142%
Massachusetts	83%	97%	75%
New Jersey	99%	103%	71%
New York	44%	95%	74%
Ohio	38%	25%	37%
Pennsylvania	20%	12%	39%
Texas	0%	32%	77%
Total for Ten States	46%	69%	79%
Total for U.S.	42%	62%	85%

Source: The Congestion Mitigation and Air Quality Improvement Program Summary of First Year Activities
CMAQ Improvement Program Summary of Second Year Activities
CMAQ Improvement Program Summary of Third Year Activities

Between 1992 and 1993, for example, the obligation rate increased from 42 percent to 62 percent, a 48 percent increase. In 1994, the rate increased to 85 percent, an annual increase of 37 percent. By 1995, the CMAQ obligation rate topped 99 percent (\$750 million). Cumulatively, between 1992 and 1995, the obligation rate for the CMAQ program more than doubled. The priority that the FHWA set to expend CMAQ funds at levels roughly comparable to the overall limitation set by Congress, was met in 1994 when Congressional spending limits were 91 percent of authorized funds. The 10 States visited in the CMAQ program review receive two-thirds of all CMAQ apportionments and, to a great extent, determine some of the program's success. The steadily increasing obligation rates reflect the resolution of many of the start-up difficulties of the first 2 years including:

- o Greater State and local understanding of the program's intent and experience with the legislative provisions found in ISTEA and the CMAQ program;
- o More detailed guidance from the Federal agencies (FHWA, FTA, and the EPA); and
- o The resolution of eligibility disputes.

CMAQ Program Review

The program review revealed challenges to the programming of CMAQ funds in a few States and these are being addressed. The implementation of enhanced coordination mechanisms and technical tools in these and other States should also facilitate the programming of CMAQ apportionments and increase obligation rates.

During the first few years of CMAQ program implementation, the low obligation rates for CMAQ funds raised concern that CMAQ apportionments would not be spent on time, thereby possibly lapsing and becoming unavailable for States' use. Agencies are now obligating funds more quickly and envision little chance of letting CMAQ funds lapse now or in the future.

CMAQ Flexibility

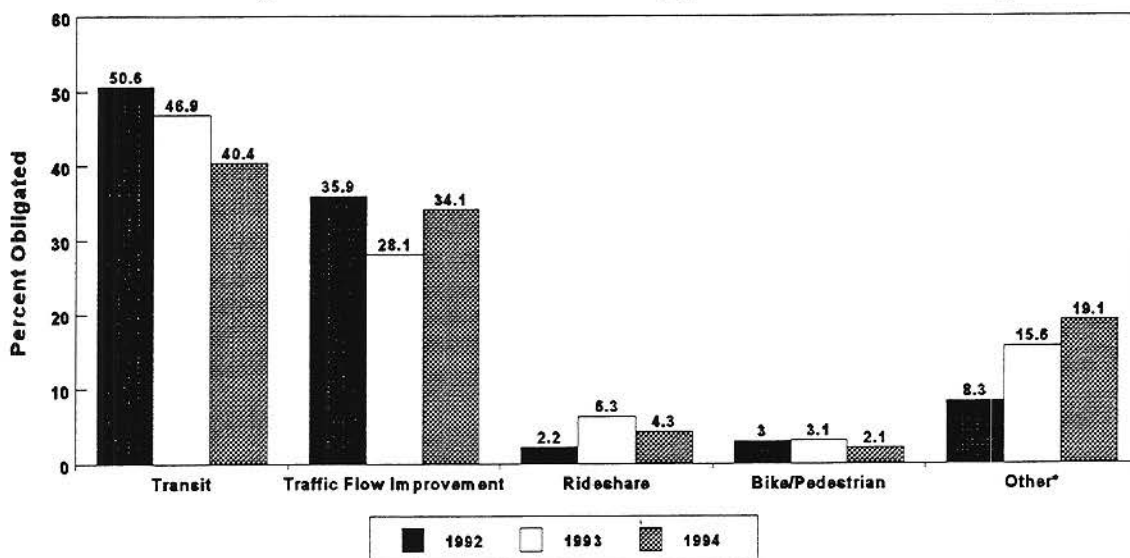
As reported in the Third Annual Summary of CMAQ Activities (dated 12/17/95), the CMAQ program continues to be ISTEA's most flexible program. With the CMAQ program in full swing, 40 percent of the funds were used for transit purposes. The balance was programmed for traffic flow improvements, ridesharing projects, bicycle/pedestrian projects, and other alternatives to single-occupancy vehicle (SOV) travel. While the dollar value of traditional projects using CMAQ funds increased in 1995, the number of less traditional, smaller scale (and less costly) projects such as rideshare programs, bicycle/pedestrian and other TCMs continued to increase.

The CMAQ program is very flexible and encompasses a variety of methods for reducing mobile source emissions. State and local governments have flexibility to choose from among these strategies that are best suited to their needs. The CMAQ program flexibility also derives from the eligibility of 14 of the 16 TCMs listed in Section 108(f)(1)(A) of the Clean Air Act Amendments of 1990 (CAAA), which include a broad range of transportation programs to improve air quality. Of the TCMs listed in the CAAA, only those aimed at reducing emissions from extreme cold-start conditions and programs to encourage the removal of pre-1980 vehicles are ineligible for CMAQ funds.

A review of changes in CMAQ obligations by type of activity i.e., transit, traffic flow improvements, rideshare, bicycle/pedestrian, and other TCMs also helps to illustrate the flexibility of the program. In 1994, as compared to 1993, the States funded 122 more proposals in the categories of shared ride, demand management, bicycle/pedestrian, and other TCMs, a 54 percent increase. Figure 1.1 presents the changes in types of projects by number between 1992 and 1994, a better comparison than dollars spent when looking at these comparatively low-cost projects.

Figure 1.1

Percentage of National CMAQ Apportionments Obligated



*Includes STP/CMAQ funds obligated in States with no nonattainment areas, demand management, and other TCM's

Source: The Congestion Mitigation and Air Quality Improvement Program Summary of First Year Activities
CMAQ Improvement Program Summary of Second Year Activities
CMAQ Improvement Program Summary of Third Year Activities

The number of proposals funded in each of the non-traditional categories individually also increased. The number of bicycle/pedestrian projects nearly doubled from 1993 to 1994. Demand management projects increased from 50 to 79, and rideshare projects increased from 100 to 112. Other TCMs, which include the highly effective I/M projects, more than doubled, going from 31 to 69 projects. In 1994, in the traditional categories, the States funded three fewer transit proposals, and 65 more proposal for traffic flow improvements, about one half of the increase for smaller scale projects. The percentage of proposals funded in both transit and traffic flow decreased between 1993 and 1994 (by 6 and 2 percentage points, respectively). A comparison of 1994 to 1993, indicates a continuing shift in project activity away from those categories with the largest share of expenditures and toward categories with smaller shares. Increases in obligations of funds to rideshare and other TCMs are partly due to increased flexibility in using Federal transportation funds for such projects, and partly due to mandates on States to implement I/M programs and, until recently, employee commute option (ECO) programs.

Between 1993 and 1994, the cumulative share of traffic flow improvements and transit projects fell from 86.5 percent to 75 percent of total CMAQ obligations. With 40 percent of the funds going to transit projects and programs, transit continues to account for the greatest share of all CMAQ expenditures. In 1994, the greatest shift of funds went towards traffic flow improvements, due in part to the funds spent on Intelligent Transportation Systems.

Preliminary estimates of 1995 CMAQ obligations for transit, indicate that the general trend favoring transit is continuing. According to FTA data, funds "flexed" to transit in 1994 increased to \$484 million, with the share of CMAQ funds obligated for transit increasing to 51 percent, the greatest share to date. Information from States on expenditures in other categories is forthcoming.

As evidenced by the breakdown of obligations by project type, States have become more flexible in using CMAQ funds as their experience with the program matures. As States and MPOs become more accustomed to transportation planning under ISTEA, and as information accumulates on transportation projects that contribute to reduced emissions, the trend toward funding smaller, less traditional, and/or capital intensive projects is likely to continue. Taken together, ISTEA's planning and public participation requirements and the CMAQ program have fostered changes in the way funding decisions are made by opening up the process to newcomers to transportation planning, such as TMAs, agencies who implement I/M programs i.e., departments of motor vehicles, State environmental departments, and local governments

Participant Reactions

Although the CMAQ program review identified specific challenges and concerns facing State and local transportation planners in the implementation of the CMAQ program, most participants agreed that the CMAQ guidance is adequate and that the Federal agencies should not radically change the "rules." Review participants considered a major change at the program's midpoint counterproductive, since it would require State and local governments to learn new rules and procedures.

Aside from suggestions for specific improvements, most of the review's participants agreed that the CMAQ program has engendered a healthy competition for Federal funds among several different categories of projects. The CMAQ program has worked well to encourage greater local control over Federal transportation funds and greater participation in transportation planning. The program review revealed that State and local planners are attempting to restructure their planning processes in order to allow for greater decentralization and public participation. While some States have had more success than others, even those States with a centralized transportation planning framework are making strides to allow for greater local control and participation (see Chapter III).

II. CMAQ Decision-Making Process

Coordination

The ISTEA made dramatic changes in the way we view Federal transportation funding. By introducing new partners and enhancing public involvement, it fosters a needs-based process for determining funding priorities and engenders a more strategic use of funds through local empowerment in decision-making. The CMAQ program has addressed these goals successfully. The program is essentially a local funding program, since funds must be spent in nonattainment areas (often urbanized), and the program was designed to advance ISTEA's goal of decentralization and MPO empowerment. Although the process of incorporating new players is still evolving, it is taking hold.

The result of opening the process to both a wider array of eligible activities and more potential project sponsors, however, is that more issues are raised concerning projects and more agencies must agree to the projects selected for CMAQ funding. Questions about projects have included eligibility issues on specific proposals, expected air quality benefits, impacts on the transportation network, and even philosophical questions regarding the roles of Federal, State, and local agencies in funding and prioritizing.

The sheer number and variety of new players in the CMAQ decision-making process makes coordination a challenging task. In addition to the many levels of government that are involved in CMAQ decisions, in the spirit of ISTEA, many MPOs have taken steps to invite new players—environmental groups, bicycle advocates, and rideshare organizations, as examples—to the table. Groups involved in a typical CMAQ process may include any of the following:

- o MPOs and other regional organizations;
- o Transit operators;
- o State air quality agencies and departments of transportation;
- o City environmental and transportation agencies;
- o County environmental and transportation agencies;
- o Environmental interest groups;
- o Health interest groups;
- o Advocacy groups (bicycle, rideshare, transit, automobile);
- o Business associations;
- o FHWA field offices (region and division);
- o Regional FTA offices; and
- o Regional EPA offices.

As a result, eligibility and other questions that arise often require consultation and coordination at the local, State, and Federal levels. Successful and timely resolution of issues, integration of these new and diverse players into the regional process, and reaching consensus on projects requires a great deal of effort.

Some of this additional effort results from having new and creative ideas which don't necessarily fit neatly into current approaches to determining funding eligibility and thus require individual attention. For example, CMAQ eligibility questions have been raised regarding employer-based trip reduction programs, day care centers at transit facilities, telecommunications capital equipment for telecommuting, freight rail improvements which may also improve service outside a nonattainment area, and transit fare and pass subsidy programs.

In addition, new players prompt the need to address administrative and procedural issues. Many of these issues are not unique to the CMAQ program, but they have been made more difficult because there are few CMAQ-specific statutory and regulatory guidelines to assist in their resolution. Moreover, the CMAQ program provides funds for projects which are distinctly different from traditional highway construction projects on which many of the legal, administrative, and procedural requirements are based. Often Federal field offices will seek assistance from headquarters in resolving these issues, thus requiring additional time and effort for resolution.

Decentralized Decision-Making Varies by State

The ISTEA did not prescribe the process by which State and local agencies would coordinate to select transportation projects. This flexibility has allowed States to tailor coordination needs and develop decision-making processes that best meet their needs. Some States have created very decentralized processes in which the State has ceded much of its traditional control over fund allocation. Program review participants in these States argued that decision-making at the MPO level on project funding was useful in allowing the regions to make decisions based on unique regional needs. Participants in these States agreed that this approach allowed for greater diversity in the types of projects selected and resulted in a more multi-modal approach to addressing transportation needs and problems than had been the case in the past.

Florida offers a good example of a decentralized project selection process. The program review participants in Florida agreed that there is a high level of cooperation between and within different levels of government in the State. The State DOT is seen as having a close working relationship with the MPOs, air quality agencies, and the public. This is partially attributable to the State's decentralized DOT structure. State DOT district offices work closely with local governments and MPOs providing a mix of local, State, and public input in the project selection process.

In southern California, the State enacted a law to suballocate CMAQ funds in the region directly to counties rather than to the regional MPO. This approach allows the counties to determine how CMAQ funds are used and may allow them to be more responsive to community needs. It may also hinder regional integration of transportation and air quality planning. The MPO in southern California, the Southern California Association of Governments (SCAG), does not typically add or remove projects in the Transportation Improvement Plan (TIP), nor play a major role in project selection. With each county having a share of CMAQ funds and control over what projects are selected for funding, consensus on and funding for meritorious "regional" projects that cross county lines can be difficult to obtain.

In contrast, some States have greater central control over CMAQ funds. Officials from these States argued that greater central control allowed for greater flexibility in the programming of funds (another ISTEA goal). This approach can also direct funds toward Statewide or regionally significant projects, which may offer the greatest return on the investment, instead of smaller and less extensive projects.

In Maryland, for example, the State allocates all of its transportation funds, whether State or Federal, to a general fund where the funds are viewed as transportation funds regardless of their source. Because the State guides the direction of transportation and air quality programs, officials argued that instead of reviewing the CMAQ program, the Federal agencies should have reviewed the State's transportation/air quality program, which may be funded from the Surface Transportation Program (STP) or from State monies. They cited the particular example of the State's I/M program, which was funded entirely with State funds.

Many MPOs, local government, and interest group participants in States with more centralized processes, argued that State control of CMAQ funds is counter to the spirit of ISTEA, which promotes greater regional and local participation in the use of the funds. In addition, some participants claimed that the lack of control over Federal funds at the MPO level (CMAQ funds in particular) has resulted in the development of projects to meet broader State objectives rather than specific air quality goals.

Other States have been very successful in integrating the various formal and informal groups in transportation and air quality planning at the local and regional levels. In New York, for example, the State DOT is an active but not dominant participant in the MPOs. The State Department of Environmental Conservation participates in an advisory capacity on the MPO boards but, unlike the State DOT, is not a voting member.

In Illinois, the MPO in the Chicago area, Chicago Area Transportation Study, has also been very successful in creating an open MPO transportation planning process. During the August, 1994, program review representatives from the State DOT, State EPA, the MPO, local governments, and interest groups all agreed that the MPO process has been very effective. All

parties agreed that the process is open and that regional issues have been addressed. It was noted that the MPO in Chicago had a strong role even before the adoption of ISTEA, but the CMAQ program has further enhanced the cooperative process, bringing parties together on common issues involving transportation and air quality.

Coordination Processes Are Evolving

State and local transportation planning has evolved substantially under ISTEA, from a traditionally State-led transportation planning and priority setting process. Allowing for greater local control over Federal transportation funds, and encouraging greater participation in transportation planning, is a considerable departure from the past, and agencies are working hard to coordinate roles and responsibilities to meet this challenge.

New Jersey has made progress in strengthening the role of its MPOs. The North Jersey Transportation Planning Authority, the MPO in northern New Jersey, for example, has become more active in project selection and prioritization. During the CMAQ program review, local, MPO, and State officials all recognized that the MPO role in project selection was weak. This weakness was attributed partly to the lack of understanding of ISTEA and its programs, in particular, the CMAQ program. Greater familiarity with ISTEA and its programs through efforts by the State to educate its partners, and substantial effort by the MPO has fostered the evolution of regional planning in New Jersey.

The process in Maryland has experienced a similar evolution. Prior to the CMAQ program review in June 1994, coordination processes had not yet been established between the State planning and transportation agencies and the State Department of the Environment. Subsequently, however, negotiations were initiated to improve coordination. Progress has been made toward further integration of air quality and transportation planning.

Table 2.1 summarizes the coordination processes in each of the 10 States visited during the CMAQ program review.

Table 2.1

State Approaches

California

The CMAQ process in California is led by either the MPO or county transportation agencies. The State's role in the process is the suballocation of CMAQ funds to MPOs and, in southern California, to the county transportation agencies. The State takes a relatively "hands-off" approach to CMAQ project selection and funding decisions, but plays a substantial role in fund administration.

Florida

The State DOT and the MPO share the lead responsibility for the selection and development of CMAQ projects in Florida. Individual State DOT districts work directly with the MPOs, creating an interactive relationship between the State and MPOs. (This may partially be a result of the decentralized State DOT structure in Florida.)

Illinois

The MPOs play a central role in the CMAQ project selection process in Illinois. During the CMAQ program review site visit, the MPO process in Chicago was cited as open and cooperative, one in which project decisions are based on consensus, and opinions from non-voting members are considered as well.

Maryland

The State DOT in Maryland exerts significant control over the use of CMAQ funds. Maryland puts all of its transportation funds into a general fund where the funds essentially lose their identity. Projects are selected for funding, and coordination is effected with local governments. MPOs play a relatively minor role.

Massachusetts

The State DOT plays the central role in the selection and development of CMAQ projects in Massachusetts. During the program review site visits, some participants voiced concern that the State's active role may come at the expense of an MPO voice in the CMAQ process; however, the State has been working on changing the process to give MPOs a more active role.

New Jersey

The New Jersey DOT is the dominant player in the State's CMAQ process. The State DOT is in charge of project delivery and has control over the placement of projects on the prioritization list, based on the readiness of projects for implementation.

New York

The State DOT in New York is a participating member of 12 MPOs, and key decisions in the CMAQ process are made through the MPO process. The State plays a cooperative role in the CMAQ process through the suballocation of CMAQ funds to the MPOs.

Ohio

The Ohio DOT plays a primary role in the State's CMAQ program. It has implemented its own strict eligibility requirements. Local agencies and interest groups, however, do have significant input in the CMAQ project selection process.

Pennsylvania

The State DOT plays an important role in the CMAQ process in Pennsylvania. The agency developed a Statewide methodology for the selection of CMAQ projects. Implementation of the methodology is an MPO responsibility under a largely open process.

Texas

The Texas DOT (TXDOT) is the key player in the CMAQ process in Texas. Participants in the program review site visit voiced concerns that there should be a policy to suballocate CMAQ funds, and responsibility for meeting Federal requirements to the local governments, because, at the time, TXDOT was unable to process the number of CMAQ projects that were proposed.

Problems Have Been Identified and Addressed

One of our purposes in conducting this program review was to understand what coordination problems existed and to attempt to rectify them if possible. In a few States, we found that inter-agency coordination at the Federal level was causing difficulties in program implementation.

In some of these States, Federal agencies were getting involved in State and MPO project selection late in the process, causing significant disruption to TIP development and to implementation of CMAQ projects. In addition, Federal agencies were taking too long coordinating their efforts, adding to delays. In these States, agreements were reached among the Federal agencies to be more involved at the appropriate points to ensure timely review of CMAQ proposals and early intervention if eligibility issues were identified.

In other places, the lack of familiarity with the administrative requirements of receiving Federal funds was causing a bottleneck in program implementation. States are the usual recipients of Title 23 funds, and they have developed a great deal of expertise in meeting the Federal requirements associated with receipt and accountability for funds. But MPOs, which have substantial new responsibilities under ISTEA, and project sponsors, are with few exceptions, unfamiliar with many of these requirements.

One approach we found being used to address these issues was for the State to process all CMAQ proposals. Some States, however, were overwhelmed by the additional workload this created. In addition, sometimes the State agency administering the program, usually the DOT, often did not have the expertise to handle the wide variety of projects funded under the CMAQ program. The MPO was often better suited to develop and review the proposals, yet still lacked experience in meeting Federal requirements.

In Texas, for example, the participants in the program review stated that ISTEA has imposed transportation planning requirements on the TXDOT that are new to that agency. The Department was praised as efficient in highway planning and construction but fell short in its administration of other types of projects. TXDOT struggled to adapt to implementation of the many smaller, non-highway projects funded under CMAQ. This lack of familiarity with non-highway projects, and a State law that requires that TxDOT to implement all federally funded projects, initially resulted in a low obligation of CMAQ funds (32 percent in 1993).

New York State DOT developed formal master agreements with agencies in New York City making the City responsible for meeting Federal requirements. The effort to negotiate the agreement was arduous, taking approximately 2 years, but has resulted in a streamlined process. Federal agency personnel facilitated a meeting between New York and Texas officials in the hope that the New York approach might be adapted to the Texas situation.

It should be noted that many Title 23 requirements established by Congress had direct application to completion of the Interstate System. These requirements were applied to large, and often complicated high-cost capital projects. By contrast, many CMAQ-funded projects are smaller scale, non-capital intensive projects. Attempts to fully meet the Title 23 requirements can overwhelm their typically small budgets. Efforts continue to address this issue, and administrative changes may provide some relief, but legislative change will be necessary in some cases, and will require some time to be realized.

III. Responses to Policy Questions

This chapter summarizes the responses to the policy questions posed during the CMAQ program review and a request for comments in the Federal Register (FR Vol. 59, No.87, FHWA/FTA Docket No. 94-11). Table 3.1 summarizes the responses to the docket. Although a number of suggestions were made on how the CMAQ program can be improved, many participants urged the FHWA/FTA not to make major changes at this time. They maintained that the State, regional, local, and Federal agencies have improved their understanding of the CMAQ program and that substantial changes could erode gains made in both coordination and overall implementation.

The issue of project eligibility was a dominant theme during the CMAQ program review. In general, participants requested flexibility in making their own eligibility determinations. By and large, participants agreed that local and regional agencies are more aware of their particular air quality problems and are in the best position to determine which projects will provide the best air quality return for the CMAQ dollar. Specific eligibility issues are discussed in the balance of this chapter. In addition, the review team sought to clarify doubts about whether the air quality analysis requirement impedes project development and approval, and/or contributes to lower obligation rates.

A. Traffic Flow Improvements

Early in the CMAQ program, concerns were raised by the environmental community that traffic flow improvements are not effective in reducing transportation-related emissions and should be ineligible for CMAQ funding. On November 15, 1993, five prominent members of the Senate Environment and Public Works Committee echoed these concerns in a letter to Secretary Peña.

Concern about traffic flow improvements were heightened by reports that many State's were using a large portion of their CMAQ funds for traffic flow improvements. The *Summary of First Year Activities under the CMAQ Program* confirmed that traffic flow improvements accounted for the second largest category of CMAQ fund obligations, constituting about 36 percent of obligations. In the third year of funding, the proportional share of funds used for traffic flow improvements, declined to 28 percent, and overall this proportion has hovered around 33 percent.

The Secretary responded to the Senators' concerns, citing the direct eligibility allowed under ISTEA and the support given to traffic flow improvements in the Clean Air Act. Specifically, ISTEA makes the TCMs, including traffic flow improvements, listed in section 108(f) of the Clean Air Act eligible

Table 3.1 Docket Comment Tabulation

POLICY QUESTION	Response	AGENCY				TOTAL	
		MPO	State AQ	State DOT	Other	No.	Percentage
		(Number of responses)					
1. Have coordination mechanisms been established?	Yes	6	1	13	11	31	67.4%
	No	1		2	12	15	32.6%
2. How effective are projects funded under CMAQ?	High				2	2	14.3%
	Medium	2	1	2	3	8	57.1%
	Low			3	1	4	28.6%
3. Is there a problem in dealing with long vs. short term benefits?	Yes			1	6	7	38.9%
	No	2		3	6	11	61.1%
4. Are CMAQ funds expected to lapse?	Yes	3			1	4	16.7%
	No	2	1	11	6	20	83.3%
5. Should projects that increase NO _x be eligible?	Yes	6	2	9	13	30	85.7%
	No				5	5	14.3%
6. Should existing ridership programs be eligible?	Yes	11	3	9	20	43	84.3%
	No			2	6	8	15.7%
7. Should traffic flow improvements be eligible?	Yes	7	2	16	23	48	72.7%
	No				18	18	27.3%
8. Should use of CMAQ funds be allowed in maintenance areas?	Yes	15	2	13	19	49	83.1%
	No	1	1	2	6	10	16.9%
9. Should projects be eligible that will not be operational by the attainment deadline?	Yes	6	2	10	25	43	93.5%
	No				3	3	6.5%

for CMAQ funding, with two exceptions. Further, the CAAA exempt traffic flow improvements from highway sanctions in the event a State fails to meet its State Implementation Plan (SIP) requirements. Finally, the Secretary expressed the Department's belief that traffic flow improvements are viable air quality projects.

The Secretary's response resolved the question of eligibility but left doubts regarding the effectiveness and longevity of traffic flow improvements in terms of emission reductions. To get a broader perspective on State's and MPO's views concerning traffic flow improvements, the issue of their eligibility was raised during the program review.

In general, the majority of the State DOT, regional, and local government participants agreed that traffic flow improvements should remain eligible for CMAQ funding, and are important components of the program. Arguments made by interviewees in favor of traffic flow improvement are persuasive. Well-designed signalization and turn lane projects benefit not only motorists, but urban bus systems and bicyclists as well (the relatively long travel times of bus transit is a frequently cited constraint to increasing ridership).

In addition, some participants from State air quality agencies agreed that traffic flow improvements are beneficial to air quality and should continue to be funded. These participants stated that traffic flow improvements result in positive impacts on air quality—small increases in speed (below 25 mph) in congested areas can reduce both nitrogen oxides (NO_x) and volatile organic compounds (VOCs). In fact, some participants Stated that such traffic flow improvements have the greatest short-term effects on air quality.

Other participants, however, did not agree that traffic flow improvements should be eligible or given high priority for CMAQ funding, citing the issue of diminishing longer-term benefits due to latent demand. These participants believed that the benefits of traffic flow improvements will erode over time as greater capacity enables more travel. Further, they believe that funding traffic flow improvements encourages greater use of automobiles. In addition, a few respondents stated that traffic flow improvements, while reducing VOC emissions on a short-term basis, have the potential to increase NO_x and that the CMAQ program should not fund any projects which increase any pollutant that contributes to the ozone problem.

The response to the docket also favored the continued eligibility of traffic flow improvements. Sixty-six responses to the docket commented on this question with 73 percent of respondents favoring their eligibility. The seven MPOs and two State air quality agencies responding to the docket were unanimous in their support, as were State DOTs. All of the comments opposing eligibility came from other organizations, particularly public interest groups and private citizens. Yet, overall, even these were in favor of retaining the eligibility of traffic flow improvements by a margin of 23 to 18.

Recommendation

The strongest argument for traffic flow improvements which was made by many of those interviewed, is their short term effectiveness. Independent of this review, the General Accounting Office in a report entitled "Benefits of Traffic Control Signal Systems Are Not Being Fully Realized", (March 1994), cited air quality benefits as one of the primary reasons why it believed more funds should be directed toward traffic signalization and traffic flow improvement projects.

Adding further support for the eligibility of traffic flow improvements are the attainment deadlines of 1996 and 1999, faced by about three quarters of the remaining ozone nonattainment areas (or the now-passed 1993 deadline for marginal areas). These are extremely short time frames for the establishment of transportation projects and programs, many of which require many years for project development and environmental clearance. Generally speaking, traffic flow improvements can be implemented much sooner and therefore can assist these areas in meeting short term attainment deadlines.

The review team recommends that traffic flow improvements remain eligible for CMAQ funds. These projects have air quality benefits and can be at least as effective in facilitating attainment as other TCMs.

The minority position presents a valid concern, however, and applies equally to other project types. The concerns that travel demand will overwhelm whatever emission reductions are achieved from flow improvements may be well-founded, particularly in suburban areas. In built-out areas such as dense, congested urban cores, this is less of a concern since it is unclear how additional travel demand would be generated. Moreover, any project that is successful at diverting SOV travelers to alternative modes, a new transit line or bicycle path, for instance, may achieve short-term benefits that can be similarly overwhelmed by increases in latent travel demand for the additional road capacity created by the SOV diversion. That is, the additional capacity could facilitate more automobile trips.

To address this underlying problem, we encourage States and MPOs to consider both short-and-long term implications when developing their approaches, to achieving and maintaining air quality standards. As outlined in the joint DOT/EPA report *Clean Air Through Transportation*, we recommend that States and MPOs develop a comprehensive approach that addresses both the need for additional supply of transportation services, and the need to limit demand for SOV travel, through pricing or regulatory means.

B. NO_x Projects

The VOCs, in combination with NO_x, are the primary precursors to ozone formation. Some projects such as traffic flow improvements and diesel bus replacements have the potential to increase NO_x emissions while reducing VOC emissions. The MOBILE5 emissions model, for example, demonstrates that average speed improvements i.e., traffic flow greater than 25-30 mph result in increased NO_x emissions. VOC emissions, however, tend to decrease with increasing speeds.

The trade-off between NO_x emission increases and VOC emission decreases is an important issue for State and local transportation and air quality planners. Ozone nonattainment areas must meet the conformity requirements, which in most cases require a reduction in NO_x emissions if there is no emissions budget for the region. It is important to note that these requirements do not apply on an individual project basis, but rather to all projects in the TIP, taken as a whole. State and local planners, therefore, are free to choose the mix of projects as long as, on balance, they meet the NO_x test for the region.

A simple but useful description of the impacts of NO_x and VOCs emissions reductions, involves comparing the relative levels of the two pollutants. In general, ozone production may be VOC-limited or NO_x-limited. NO_x-limited conditions occur when NO_x levels are low, compared with VOC levels. If NO_x is the limiting factor, then reducing NO_x levels further can be effective in slowing ozone formation. If NO_x levels are relatively high compared with VOC levels, then reducing NO_x emissions will not be particularly effective. Typically, conditions in rural areas tend to be NO_x-limited, suggesting that NO_x emissions reductions will be more effective than VOC reductions. The opposite condition (VOC-limited) is more typical directly over a major source of emissions, such as a heavily congested area. In such areas, VOC emissions reductions are more effective than NO_x emission reductions in reducing ozone production.

The EPA has historically relied upon VOC emissions controls to attain compliance with ozone standards, based on some older research that showed that NO_x reductions could, in some cases, actually increase ozone levels. More recent data, however, suggest that NO_x reductions may be more effective than previously believed. This issue is still somewhat controversial, and our scientific understanding of these issues is evolving.

During the review, some representatives from States with significant NO_x problems argued against the eligibility of projects that have the potential to increase NO_x. They stated that these projects are counterproductive to air quality goals in general. In one region, participants cited the need to demonstrate a 75 percent reduction in NO_x in order to reach attainment. Other participants stated that while projects that potentially increase NO_x should not be ineligible for CMAQ funding, these projects should be given a lower priority because the goal of the program is the reduction of ozone pollution.

Most participants, however, including those from State DOTs and regional and local governments, agreed with the current Federal policy that projects which have the potential to increase NO_x emissions should remain eligible for CMAQ funding. These participants emphasized that it would be counterproductive to eliminate projects which have the potential to increase emissions of NO_x when they also have the offsetting potential to decrease emissions of VOCs, especially in areas where the ozone problem is not primarily related to NO_x. They argued that regions should have the flexibility to choose projects which reduce VOCs, even if there are minor increases in NO_x. The decision, these participants stated, should depend on whether NO_x is a determining factor for ozone formation in the region.

Public opinion tabulated from the responses to the docket also favored continued eligibility of projects which have the potential to increase NO_x. Over 85 percent of those responding to the docket on this question favored continued eligibility of such projects. Only five respondents opposed that policy.

Recommendation

Current policy does not impose restrictions on projects which have the potential to increase NO_x emissions, provided they demonstrate reductions in VOCs. The review team recommends that this policy continue. It is important that State and local planners continue to be provided the flexibility to determine what air quality impacts are beneficial to their region. This is especially clear in areas where NO_x is not the primary determinant of ozone formation. But even in areas where NO_x may be a determinant, due to VOC/NO_x trade-off issues, it still appears prudent to maintain a flexible position with regard to a project's potential to increase NO_x.

The conformity process requires that overall targets be met to ensure that emissions of NO_x, as well as other pollutants, do not degrade air quality. Also, there is great deal of uncertainty in attempting to predict whether a project will increase NO_x. Coupled with the potential for NO_x-VOC trade-offs and it seems that State transportation and air quality officials are in the best position to determine whether a transportation project should be implemented, based on regional conditions and expected project impacts, even if it may increase NO_x emissions. We would encourage States and MPOs to address this question carefully to ensure that a project does not adversely affect the attainment of their air quality goals.

C. Short- and Long-term Air Quality Goals

Current legislation and guidance target CMAQ projects toward the goal of improving air quality in order for areas to meet the National Ambient Air Quality Standards (NAAQS) on deadlines mandated under the Clean Air Act. The primary focus is on the short-term goal of achieving attainment rather than the longer-term effort of maintaining the standards. Under ISTEA's original provisions concerning the CMAQ program, projects in nonattainment areas were no longer eligible for CMAQ funds once these areas meet the NAAQS and are redesignated as maintenance areas. This restriction on eligibility had prompted concern by areas seeking redesignation as maintenance areas. This issue was effectively resolved by the National Highway Systems Designation Act of 1995 which made "maintenance" (newly redesignated from nonattainment) areas eligible to receive CMAQ funds. Even so, the review results in these areas are included for completeness.

A few participants in the CMAQ program review favored the current approach of targeting the CMAQ program toward helping areas achieve attainment and were not in favor of allowing the use of CMAQ funds in maintenance areas. These participants stated that making CMAQ funds available in maintenance areas would dilute the already small amount of funds available to nonattainment areas.

The majority of participants, however, stated that the Federal policy of not allowing CMAQ funds in newly redesignated areas for maintenance purposes is short-sighted and that areas will continue to require Federal funds even after redesignation. These participants further stated that air quality goals do not diminish after redesignation and that areas must continue to pursue air quality improvement projects during the maintenance period to avoid lapsing into nonattainment. Some participants likened the potential repeal of CMAQ funds after redesignation to a penalty for achieving the NAAQS.

A persuasive argument against current policy is that it is not clear whether nonattainment areas will meet attainment standards by their scheduled attainment dates. The attainment dates were determined by EPA based on an area's ozone and carbon monoxide nonattainment status i.e., areas with more severe ozone and carbon monoxide problems are allowed more time to attain the standard. Depending on local conditions, however, different nonattainment areas may need to pursue different methods and may need more time to attain air quality standards. For example, the rate of fleet turnover, area-wide meteorological conditions, and trends in pollution contributions by various sources of emissions can influence whether an area will meet its attainment deadlines. CMAQ funding, therefore, needs to remain flexible to address the uncertainty about nonattainment areas' abilities to meet the air quality standard by the attainment dates.

In addition, most projects funded by CMAQ i.e., TCMs, have relatively low emission reduction impacts (see Chapter V—Effectiveness). Although TCMs are unlikely to demonstrate immediate large benefits in air quality improvement, they can play an important role in an area's air quality improvement strategies. As long-term strategies, TCMs may be able to play a significant role if they are part of comprehensive programs to reduce the demand for SOV travel and thus, emissions and as part of continued investment strategies in alternative forms of transportation.

The responses to the docket were consistent with that of program review participants. For example, 83 percent of respondents stated that CMAQ funds should be used in maintenance areas and 94 percent of respondents stated that projects should remain eligible even if they will not be operational until after the scheduled attainment date.

Recommendation

It is important to recognize that transportation and air quality planning and project development are continuing, and long-term efforts and resulting emission reductions may take years to materialize. CMAQ-funded projects can be important components in a region's achievement of long-term mobility and air quality goals and loss of these funds upon redesignation may be counterproductive to the area's long-term air quality goals.

The review team is pleased that Congress has made legislative changes to refocus the CMAQ program to both attainment and maintenance of the NAAQS, specifically allowing the use of CMAQ funds in newly redesignated areas. Despite the review team's concerns that this may lead to a loss in the program's overall air quality focus, State and local officials should have the option of addressing both short and long-term goals.

D. Rideshare Activities

Rideshare services are those activities which support and promote efforts to share the use of a van or automobile to make a trip. Under new Federal guidance, capital expenditures related to the establishment of new or expanded rideshare services are eligible for CMAQ funds. Start-up costs covering the new or expanded service operations are also eligible. Under the previous guidance (October, 1992), the routine funding of existing services for ridesharing was ineligible.

Some participants in the review stated that rideshare and other ongoing programs need CMAQ support in order to encourage new participants to join such programs. Other participants claimed that rideshare services are similar to other transportation services such as transit, and that routine funding of these services would not contribute to additional air quality benefits. We examined these ideas during the CMAQ program review and reviewed the eligibility of existing rideshare programs.

Many participants stated that funding of some operations (beyond 2 years) may be more cost-effective than funding capital projects. The operation of vanpools, for example, has some advantages over conventional transit and SOVs, including low capital cost, low user cost (since travel costs are shared), and the ability to leverage private funds.

Several respondents suggested that the time frame on funding such operations should be extended to allow rideshare activities to mature. This is based on the argument that outreach activities associated with ridesharing are different from the provision of vanpools. Rideshare outreach activities, for example, provide carpool and vanpool matching services to commuters but do not operate the vanpool services. Outreach efforts encouraging the use of vanpools and carpools, like transit, are continuous activities and should be eligible for continuing CMAQ funding.

Public opinion favored a change in the 2-year restriction on operating expenses. Of the 51 responses to the docket on the question of whether existing rideshare programs should be eligible for CMAQ funds, over 85 percent were in favor of this change.

Recommendation

The major activities of rideshare programs usually consist of some combination of:

- o Operation of vanpools and other basic transportation services;
- o Computerized carpool/vanpool matching services;
- o Employer outreach, involving education of employers on employee trip reduction strategies and alternative commute options (often linked with ECO programs); and
- o Advertising, marketing, and public outreach activities, including advertising campaigns for the general public and specific groups on the benefits of carpools and vanpools.

The review team believes that a distinction should be drawn between rideshare activities that involve outreach programs and those that provide a transportation service, such as operation of small buses or vanpools. Outreach services are essentially communication services which provide information on available alternative modes of transportation and market the benefits of these modes but do not provide an actual transportation service. Transportation services operate vanpools or other transit services.

Given this distinction, the CMAQ guidance regarding rideshare services was revised. Carpool/vanpool matching, employer outreach and education, and advertising activities can and should be defined as outreach programs, and as such, constitute new service each time they are implemented. These programs should be viewed as continuous outreach activities and not as projects that provide a transportation service.

Outreach activities encompass a variety of transportation services, such as advertising for transit services, marketing uses of pedestrian and bicycle facilities, providing information on general impacts of mobile source emissions, and other strategies to reduce vehicle trips and VMT. The CMAQ guidance has been amended to insure the inclusion of these types of activities. The focus, however, on providing new services for basic transportation, such as the purchase of vans for vanpools remains the same.

E. Air Quality Analysis Requirement

The MPOs and State DOTs use a variety of project selection criteria i.e., air quality benefits, congestion relief, project readiness, cost effectiveness, energy conservation, local match commitments, and equity to rank potential CMAQ projects. Among these criteria, the air quality component of the proposed CMAQ projects is generally considered to be central, as required by Federal guidance. These evaluations ranged from qualitative assessments of air quality impacts to more sophisticated quantitative modeling of these impacts, as well as the consideration of long-term versus short-term air quality benefits.

Current state-of-the-art tests for estimating air quality impacts, however, are not yet fully reliable (Chapter V—Effectiveness). There is a lack of technical expertise in performing these analyses in many State's and MPOs as well as a lack of adequate tools (models) with which to perform them. This often results in unreliable estimates of air quality impacts that may undervalue or overvalue the benefits of many projects.

The number of variables involved in emission modeling adds to the complexity of estimating emission impacts. Air quality analyses, for example, can involve factors such as speed, vehicle characteristics, VMT, daily trips, number of vehicles, types of fuels, temperatures, time of day in which travel occurs, year of analysis, and area under consideration. Accurate assumptions concerning the extent to which mode shift may occur because of a project are particularly difficult to determine. Mode switch measures affect emissions by causing a reduction in vehicle trips and VMT; however, it is difficult to estimate the number of trips that are likely to be eliminated.

Another difficulty in estimating air quality impacts is that many projects are expected to have marginal benefits. The data required in order to predict what are likely to be small differences can be overwhelming. These considerations led some respondents to suggest that relief should be provided from the required project-by-project air quality analysis. A few participants suggested that a system analysis in which air quality impacts are measured for a portfolio of projects (similar to the technique used for conformity analyses) could substitute for project-level examinations.

Other participants disagreed, suggesting that the air quality analysis requirement is important because it imposes discipline on the project selection process. These participants stated that the number of new players involved in the project selection process and the variety of activities eligible under the CMAQ program have created a need for a systematic way of reviewing proposals for CMAQ funding. In particular, they stated that the elimination of air quality quantification for specific projects would make it difficult to compare the benefits of different projects and prioritize them on a level playing field during the selection process.

The air quality analysis requirement also ensures that CMAQ projects have some emission reduction benefit and keeps the various agencies focused on maximizing those benefits. Some analysts told the review team that the analysis of proposed projects assisted the project development process. By estimating the likely emission reductions of projects, sponsors were able to change the project's scope to increase the proposal's air quality benefits.

Recommendation

The review team recognizes the difficulty of determining air quality improvements, but is nonetheless convinced that there are benefits to a systematic approach to the analysis of proposals and selection for funding. The principal benefit is that the analysis requirement imposes a discipline on the State and local political process, maintaining the focus of the CMAQ program on air quality improvements. The air quality analysis requirement also provides a basis for comparison of benefits among vastly different projects, ranging from intermodal freight improvements, to bicycle and pedestrian projects to conversions to alternative fuels.

The air quality analysis requirement under current guidance is very flexible. The guidelines allow sketch planning techniques and grouping of projects. A qualitative analysis is allowed if a quantitative analysis is not possible. Further, the air quality analysis requirement has not burdened the States' abilities to obligate CMAQ funds. According to the 1993 *Annual Summary of Activities*, about 69 percent of the projects included either sketch planning techniques or a quantitative model to determine project air quality benefits.

Certain types of projects do not lend themselves to quantitative analysis, however, and transportation agencies have limited experience in estimating project benefits. In order to make the selection process easier with respect to the air quality analysis requirement, we recommend that there should be categorical exclusions to performing air quality analyses for projects which have intuitive air quality benefits, but are difficult to measure. These projects, for example, could include the following:

- o Education and outreach;
- o Marketing; and
- o Advertising.

At the same time, the air quality analysis requirement should be maintained for basic transportation and mobility services; for example:

- o Transit;
- o Traffic flow improvements;
- o Bicycle and pedestrian projects; and
- o Ridesharing.

We also recommend that Federal agencies serve as a clearinghouse of information on the air quality effectiveness of TCMs and methods used to estimate those impacts, and they serve as a resource for States and MPOs on project effectiveness, exemplary CMAQ projects, and other issues which may help in the project selection process.

F. Greater Flexibility

One theme that emerged from the CMAQ program review is that the Federal agencies (FHWA, FTA, and EPA) have at times been restrictive in the types of projects they determined to be eligible for CMAQ funds. These participants argued that, in the spirit of ISTEA, the Federal agencies need to demonstrate greater flexibility in eligibility determinations on projects which may have air quality benefits. Based on ISTEA's emphasis on decentralization, flexibility, and participation, many participants reasoned that, in general terms, project selection should be based on local discretion. Given that State and local planners have a better understanding of local transportation and air quality needs, and a better understanding of the local political process than the Federal agencies, decisions on which projects will be beneficial to a region should be based on this local expertise.

Participants in the review cited several projects that they asserted would have positive impacts on air quality but which were not eligible for CMAQ funding:

- o Transit fare subsidies on ozone alert days. Some participants stated that this is an effective means of encouraging the use of transit on days when there is a threat of an exceedance in air quality standards. In addition, some participants argued that such strategies could encourage the use of transit in general; and
- o Child care facilities at transportation centers. Such facilities may reduce the number of trips during a typical morning or evening commute. Instead of four trips in one day i.e., two trips to the day care facility, one trip to the transit center during the morning commute, and the return trip to the residence, parents could reduce the number of trips to two (to and from the transit center). Some participants argued that such trip reduction strategies should be eligible for CMAQ funds since the reduction of VMT and vehicle trips would have air quality benefits.

The Chicago area funded some projects as "demonstrations" under the CMAQ program. This gave the area the ability to avoid some of its own eligibility requirements when using CMAQ funds, while giving it the opportunity to use the CMAQ program to fund projects which have a demonstrable potential to improve air quality. Chicago area participants in the CMAQ program review stated that

these demonstrations provided good opportunities to test the impacts of untried projects that may have positive air quality impacts. As part of its demonstration program, the Chicago Area Transportation Study required before-and-after studies to determine which projects were effective.

There was debate, however, on whether the use of the demonstration program is a useful tool in Chicago's air quality program. Since there is an uncertainty about the air quality benefits of demonstration projects, some participants stated that there is an opportunity cost in funding them. These participants said that demonstration projects may take funds away from projects which have proven or more easily quantifiable emissions reductions. Most participants, however, supported greater flexibility in determining which projects are beneficial to regional air quality and transportation goals.

Recommendation

The efforts of the Federal agencies to ensure the proper and equitable uses of Federal transportation funds and adhere to the principles of sound management practice, remove some project types from CMAQ eligibility, however, opportunities remain for substantial flexibility and experimentation.

The review team believes that it would be beneficial to foster greater experimentation with alternative ways to reduce emissions. It recommends the expanded use of demonstration projects under the CMAQ program. Such flexibility is important to the CMAQ planning process because (1) State DOTs, local governments, and MPOs have a better understanding of local and regional needs with respect to transportation and air quality goals than the Federal government; and (2) greater flexibility to fund demonstration projects may result in more innovative solutions to specific local and regional transportation and air quality problems.

In addition, the lack of public knowledge and political support for nontraditional solutions to transportation problems has resulted in a lack of emphasis on new and potentially effective projects. Expanding the opportunities for demonstration projects may encourage greater experimentation with nontraditional air quality improvement projects. Such experimentation could engender new ideas and approaches to mobile source emissions reductions. In addition, funding new types of projects could highlight more effective approaches to reducing mobile source emissions than traditional projects which are currently funded.

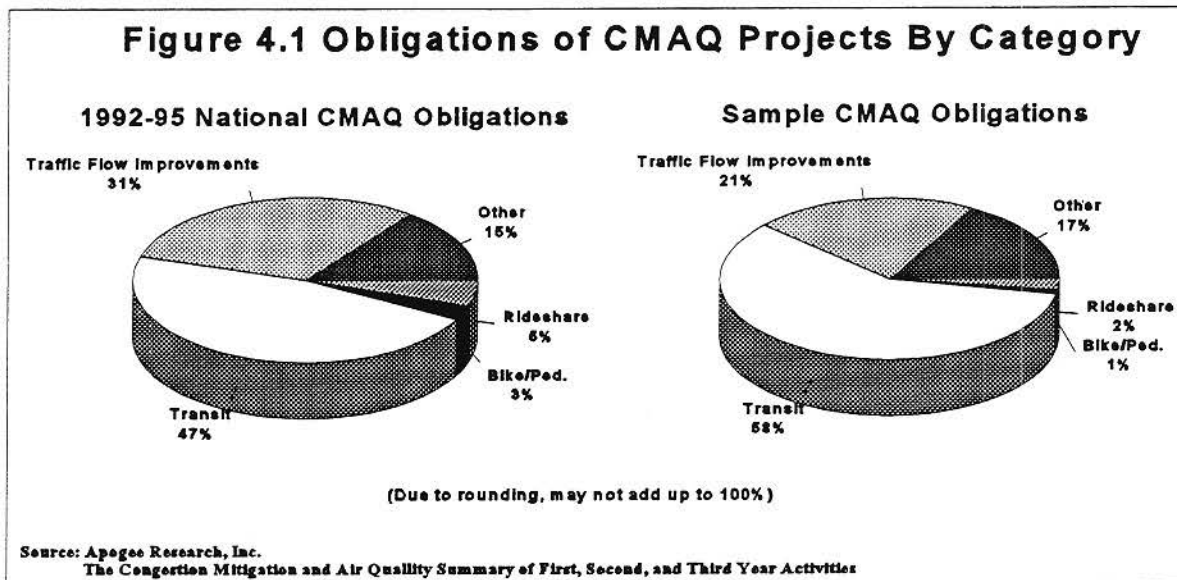
IV. Effectiveness of CMAQ Projects

This chapter presents our analysis of the effectiveness of CMAQ projects. This analysis is based on data received from CMAQ State Reports for 1992 and 1993, and projects selected at random from the 10 States visited during the program review. The emission reduction characteristics of CMAQ projects were also discussed during the program review. The *Annual Summaries of Activities* have consistently concluded that the benefits in emissions reductions from projects funded under the CMAQ program were small, and this is supported by the random sample conducted on CMAQ projects implemented in the 10 States visited during the program review. Participants indicated, however, that CMAQ projects had indirect impacts on air quality. Although more needs to be done to improve the effectiveness of CMAQ projects in reducing emissions, consensus was that the CMAQ program has been important in encouraging changes in State and MPO planning by broadening the array of planning considerations to include air quality implications of projects and advancing new measures to reduce mobile source emissions.

Participants gave numerous examples of projects funded with CMAQ funds such as rideshare or bicycle and pedestrian improvements, which faced little or no likelihood of being funded prior to the availability of CMAQ funding. In addition, many participants in the review thought that the CMAQ program has fostered greater innovation in transportation planning. Yet, due to regional and geographic differences, there was no agreement over what constituted an innovative project. Although the air quality benefits of many of these projects were often estimated to be small, it was generally agreed that CMAQ projects are important in beginning a process to shift travel behavior by funding a broader variety of projects than may have been the case in the past.

We selected projects on the basis of proposals for funding.¹ Of the sample of 80 projects for which data were received, almost one-half were for traffic flow improvements, usually either signalization or intersection improvements. The other projects were distributed between transit, rideshare, bicycle and pedestrian, and other projects. CMAQ obligations for these 80 projects, are concentrated in transit projects, which received nearly 60 percent of the CMAQ funds. Figure 4.1 graphically compares CMAQ obligations nationally to CMAQ obligation levels for the sample of 80 projects. It shows that the random sample closely resembles the obligation distribution for actual CMAQ obligations.

¹ A sample of 10 projects was selected for each State (a total of 100 projects). A questionnaire was prepared for each project and distributed to the contact agencies (either the State DOT or the MPO). The questionnaire, designed to gain better understanding of each project, requested information on process, emission reduction, and cost data. This information was used to determine the effectiveness of the sample of projects. Of the 100 questionnaires distributed, 80 were returned. Of these projects, 56 contained emission reductions data and 73 contained cost data. This limited sample size means the data were not adequate for inferential statistical analysis; therefore, we do not draw conclusions on the CMAQ program at the national level from this information alone. The data does, however, lend themselves to descriptive statistics and does give policy makers an understanding of the *range* of cost and emissions reductions of typical CMAQ projects.



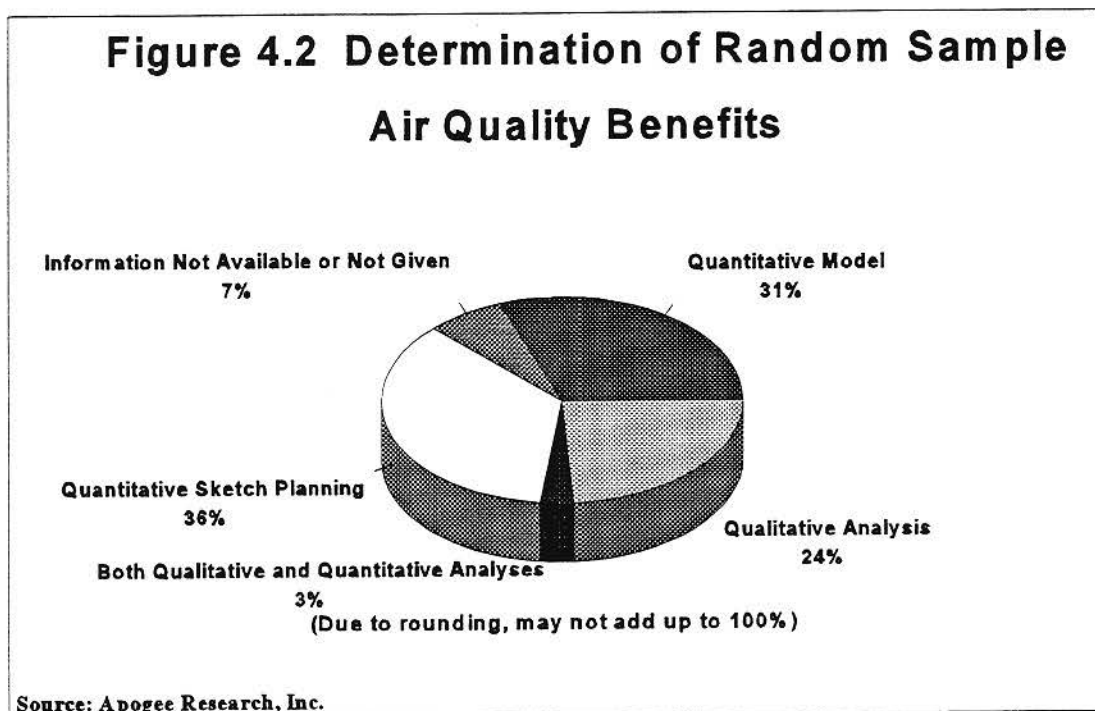
The number of projects now being justified on the basis of an air quality analysis has increased considerably. In 1993, for example, 69 percent of projects listed in FY 1993 CMAQ State Reports included an air quality analysis, an increase from 28 percent in 1992. By comparison, of the 80 projects in the sample, 70 percent reported quantitative emission reduction data. It is important to note, however, that the random sample includes projects for 1992, 1993, and 1994. The growth in the number of projects with reported emission reduction benefits provides the DOT with an increasingly useful database on project effectiveness. In addition, it supports our conclusion in Chapter III that the air quality analysis requirement is not impeding the ability of States' and MPO's to obligate CMAQ funds. The projects which do not contain quantitative emission reduction data conducted qualitative assessments of air quality impacts because they were either unable to perform a quantitative analysis, or because the project was approved prior to the 1992 Federal guidance requiring air quality analyses. In the random sample, 24 projects did not report air quality impacts. Table 4.1 presents the reasons why air quality analyses were not performed for these projects.

**Table 4.1
Sample Projects With Unreported Emissions Data**

Reason	Number of Pro-
Used Qualitative Assessment	9
Information Not Reported	6
Project Approved Prior to Federal Guidance Requiring Analysis	5
Information Not Available	4

Source: Apogee Research, Inc.

Of the 80 projects in the sample, quantitative sketch planning was used in 29 projects (36 percent), 25 projects (31 percent) used a quantitative model, 19 projects (24 percent) relied on qualitative analysis, 2 projects (3 percent) used both quantitative and qualitative analyses, and information on only 5 projects (6 percent) was not provided. Figure 4.2 presents the breakdown of the reported air quality benefits of the 80 projects in the sample.



Analysis

This section presents the data on air quality and cost of the CMAQ projects from the CMAQ State Reports and from the sample of 80 projects. This data includes the following:

- o A description of the air quality and cost distribution of the projects;
- o Frequency distributions of emission reductions and costs; and
- o Tables summarizing descriptive statistics of the emission reductions and costs.

Air quality analyses (emission reduction figures) presented by the States should be viewed with caution. As presented in Chapter III, *Responses to Policy Questions*, there is a high degree of uncertainty in state-of-the-art air quality modeling. In addition, many MPOs and local governments lack the technical expertise and tools (models) to perform air quality analyses and so often produce unreliable estimates of air quality impacts.

Emissions

Based on the limited data available in 1992, FHWA and FTA reported in the *Summary of First Year Activities* that the benefits in emission reductions from projects funded under the CMAQ program was small. This conclusion was further supported by the more numerous air quality analyses provided in the 1993 State Reports. For example, in 1994, 317 of the 659 projects (nearly half), estimated VOC reductions of less than 5 kg/day, and 580 (88 percent) contributed to emission reductions of less than 100 kg/day. Only 79 projects reported VOC reductions or more than 100 kg/day, and 18 of those projects expected to reduce emissions or more than 1000 kg/day. Table 4.2 presents the range of VOC reductions for these projects.

Table 4.2
National CMAQ Air Quality Benefits
(VOC Emission Reductions)

Year	Count	Median	Minimum*	Maximum
1993	497	7	-5	86,182
1994	659	4	-3	86,182

*Negative numbers indicate increases in emissions. These are offset by decreases in other emissions, Making the project eligible for CMAQ funds.

Project level information received from state DOT's and MPO's

Source: The Congestion Mitigation and Air Quality Improvement Program Summary of Second Year Activities
 CMAQ Improvement Program Summary of Third Year Activities

The analysis of the 56 projects chosen at random supports the conclusion that CMAQ projects have low emission reductions. The sample's emission reductions reveal a significant range in VOCs reduced, from 0.1 kg/day to 85,277 kg/day. Because of this range and the small sample size, the mean is effectively meaningless. The median (5 kg/day) is a more useful indicator of a typical CMAQ project in this sample, indicating the middle observation (when ranked lowest to highest), or the 50th percentile. Table 4.3 summarizes the descriptive statistics for the 56 projects that provided emission reduction data.

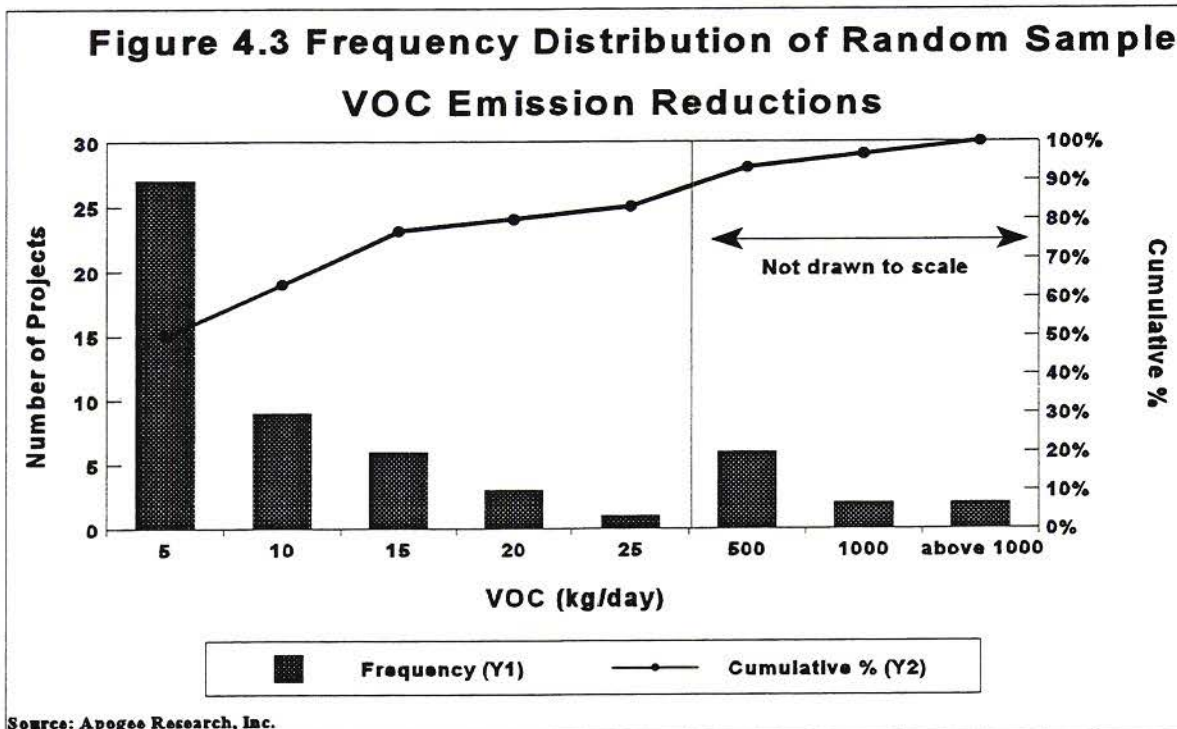
Table 4.3
Summary of Random Sample of CMAQ Projects
(VOC Emission Reductions)

Count	Median	Minimum	Maximum	Range	Std. Dev.
56	5	0	85,277	85,277	11,407

Project level information received from state DOT's and MPO's.

Source: Apogee Research, Inc.

A frequency distribution (Figure 4.3) of the 51 projects reporting emission reduction figures for VOC reveals that almost one half (48 percent) of the projects have reductions of 5 kg/day or less. The distribution also reveals that 82 percent of the projects have VOC reductions of 25 kg/day or less. Only 10 projects were reported to reduce VOC emissions by more than 25 kg/day. Of these projects, six have VOC reductions between 25 and 500 kg/day; two have reductions between 500 and 1,000 kg/day; and two projects are greater than 1,000 kg/day i.e., New Jersey's Statewide I/M project and



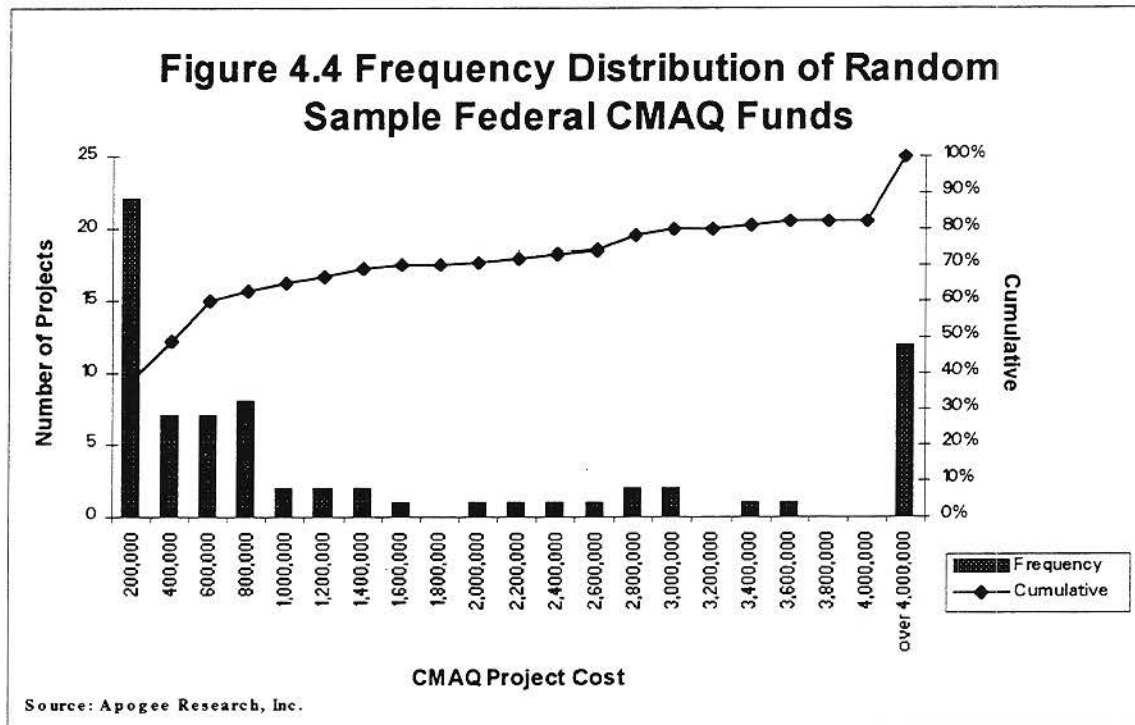
New Jersey Transit's Employee Trip Reduction program. To provide some context for these reported emission reductions, it is useful to examine what is needed in at least one metropolitan area. In Washington, D.C., for example, the emission reductions needed between 1990 and 1996 is 212 tons/day (212,000 kg/day). According to the area's SIP, the total expected contribution from mobile sources will be 152 tons/day. When compared with this level of need, the contribution from TCMs (on the order of 0.1 ton/day or 100 kg/day for each funded project) is very small.

The annual reports of State CMAQ programs, however, may show that some CMAQ projects demonstrate more promising air quality emission reductions than projects that were not necessarily captured in the random sample. The 1994 Annual Summary of CMAQ activities reported 18 projects with at least 1000 kg/day in VOC emissions reductions. In comparison with the 974 proposals funded under the CMAQ program in 1994, the list of promising projects is relatively short, and it should be noted that the analyses for these projects, like those for all CMAQ projects, were not examined in detail. They are provided without comment as to their accuracy.

Cost of CMAQ Projects

Of the 80 projects examined, 73 provided CMAQ cost information. As with the emissions reduction data, there was a wide range of costs for the random sample of CMAQ projects. The CMAQ portion of the projected costs ranged from \$4,000 to \$80 million (multi-year, anticipating future year CMAQ funding) and accounted for 84 percent of the total cost. The median cost (\$631,917) indicates that the average size of a CMAQ funding proposal in the sample was small, which provides a sign that the typical request for funding is in the modest range. A frequency distribution (Figure 4.4) of the 73 observations on CMAQ cost reveals that almost one half (49 percent) of the projects cost less than \$600,000. Only 12 projects cost more than \$4 million. Of these projects, nine are transit or traffic flow improvements, two are construction of intermodal terminals, and one is a Statewide enhanced I/M project.

V. The CMAQ Program and the Global Climate Change Action Plan



The CMAQ program was designed largely in response to ground-level ozone and carbon monoxide (and to some extent particulate matter) pollution caused by motor vehicles. Many of the actions taken under the CMAQ program, however, have benefits that extend beyond the attainment of Clean Air Act standards. The emissions of greenhouse gases, those chemicals predicted to cause global climate change, are also affected by projects funded under the CMAQ program. The greenhouse

impacts of the program are quite difficult to quantify with any degree of accuracy but are probably beneficial to the extent the program reduces fuel use. Effects are unlikely to be dramatic at a national scale, however, because this would require a program focused on the entire Nation's transportation system.

In 1993, President Clinton presented the U.S. Climate Change Action Plan, a group of 50 initiatives designed to reduce emissions of greenhouse gases from the transportation, industrial, commercial, residential, and agricultural sectors. This plan is designed to reduce greenhouse gas emissions to 1990 rates by the year 2000, and was developed as a response to the International Framework Convention on Climate Change. The United States is currently engaged in efforts to identify further cost-effective policy options that could reduce emissions of greenhouse gases.

Greenhouse Gases and Global Climate Change

Greenhouse warming is a well-established phenomenon in which certain gases, referred to as greenhouse gases, trap the earth's radiated heat after allowing sunlight to reach the surface. The stability of global temperatures and climate depend on these greenhouse gases. Atmospheric levels of these gases have been rising significantly over the past century, as various human activities, such as the burning of fossil fuels i.e., gasoline, have increased emissions. While there is considerable uncertainty about the rate and severity of future changes in global climate and the environmental and economic implications of such changes, there is concern that greenhouse gas emissions pose risks in the long term. As a result of this growing concern, the global community has begun to take steps to slow the growth of these emissions and reduce annual emissions to some extent.

The greenhouse gases of greatest concern are carbon dioxide (CO₂), chlorofluorocarbons, methane, and nitrous oxide (N₂O). CO₂ alone is thought to account for roughly half of the annual increase in global warming, and the atmospheric concentration of it has increased by about 25 percent over preindustrial levels, primarily in the past 3 decades. Other greenhouse gases with indirect effects on the global climate include carbon monoxide, NO_x, and nonmethane volatile organic compounds.

Baselines for Emissions Estimates

It is important to remember that the term "emissions reduction" may be misleading in the context of global warming. Annual emissions from transportation are expected to increase in the medium term, and any beneficial impact of a policy will be only a reduction relative to that projected base case. This means that certain policy options may be said to reduce emissions, even though emissions overall are still expected to increase. They will simply increase more slowly as a result of the policy.

The continually increasing baseline makes assessment of emissions reductions slightly more difficult. The same is true in assessment of VMT reductions, so to estimate the impact of transit projects on VMT, one must make assumptions about what VMT would have been in the absence of a given project.

Transportation Sector Emissions

The broad perspective on transportation's greenhouse gas emissions is fairly clear. The transportation sector plays a large and growing role in such emissions, and highway travel accounts for the great majority of the transportation sector's emissions. The entire transportation sector is responsible for approximately 31 percent of total U.S. CO₂ emissions, or roughly 410.5 million metric tons of carbon-equivalent (mmtce) per year in 1990.² Transportation's share of all greenhouse gas emissions is also close to one third. The U.S. Climate Change Action Plan assumes that transportation sector emissions would grow to 503 mmtce by the year 2000 in the absence of any plan but will be limited to 496 mmtce as a result of the Action Plan.³ This suggests that policies aimed at motor vehicle transportation are critical in any plan to reduce greenhouse gas emissions.

Three Routes to Reducing Emissions

In general terms, there are three factors one might target in attempts to reduce emissions:

- o VMT⁴;
- o Fuel economy (miles per gallon); and
- o Emissions per gallon (related to fuel type and carbon content of fuel).

Various CMAQ projects affect certain elements of these factors, although it is not always clear to what extent. The following examples of how CMAQ projects may affect these three factors may illustrate the complexity of any attempt to analyze the program's impacts on emissions. Three examples are discussed here, corresponding to the three factors determining emissions:

- o Transit project impacts on VMT;
- o Traffic flow project impacts on fuel economy; and
- o Alternative fuel project impacts on emissions per gallon.

Alternatives to SOV Travel and VMT reduction

All else being equal, a reduction in VMT reduces emissions. Transit projects, which account for about half of all CMAQ spending, can reduce VMT by encouraging travel by transit instead of by automobile. Similarly, any project that adds or improves transportation alternatives to SOV travel can have VMT-reduction impacts. This would suggest a simple decrease in emissions.

Unfortunately, the situation is far more complicated than a simple decrease in VMT, even if that VMT reduction can be predicted accurately. Transit also generates emissions, although these emissions are several times lower per passenger-mile than SOV emissions of greenhouse gases.

² EPA 1994.

³ U.S. Department of Energy. *The Climate Change Action Plan and Technical Supplement*. Washington, D.C., March 1994.

⁴ VMT is equal to miles driven by the average vehicle multiplied by the total number of vehicles.

Diversion of drivers to transit may induce additional travel by drivers not diverted, since reduced congestion lowers the cost of travel by cutting travel time. Existing evidence, though scanty, suggests that induced travel would not entirely replace diverted travel, but this is highly uncertain.

Furthermore, increased transit ridership may represent new trips rather than a simple diversion from driving, thus, slightly increasing emissions from transit without a concomitant reduction in emissions from automobiles. Also, transit projects may affect land use patterns-job, housing, and commercial location choices-further affecting future travel and emissions.

As this discussion indicates, transit's impacts on emissions are quite complex. On balance, it appears likely that transit projects would reduce greenhouse gas emissions, although accurate quantification of those reductions is challenging.

Traffic Flow Improvements and Fuel Economy

Traffic flow improvements account for approximately 28 percent of CMAQ spending. Such projects have been well studied and are known to affect the speed of travel in the applicable corridors. Since changes in travel speed affect fuel economy, and fuel economy directly affects greenhouse gas emissions, it is likely that traffic flow projects will alter emissions. Accurate quantification of changes in emissions is, again, complex.

The first impact that would have to be understood is how traffic flow improvements change speed of travel. A generic estimate of a percentage increase in speed may not be widely applicable. The initial travel speed, before any improvement, is important because fuel economy is highest in the range of 40-60 mph. Flow improvements that increase speeds above this range would actually worsen fuel economy and increase emissions, all else being equal. In contrast, improvements that increased speed up to this range would reduce emissions in the absence of any other changes. Experience with such projects, particularly in urban settings, suggests that fuel economy would improve in most cases, lowering emissions.

The project could also affect VMT, however, in at least two ways. There is some evidence to suggest that VMT may increase if speeds increase, as shorter travel time induces additional travel. The literature suggests that this effect would be small, but it could be significant in the longer term. VMT could also increase as a result of the improvement in fuel economy since costs to the traveler would decrease. Evidence and theory suggest that improved fuel economy induces additional travel, thereby counteracting the emissions reduction benefits.

Any increase in VMT could represent a shift from other modes or other corridors, either of which would have some emissions implications. Pollution on other modes or corridors would decrease as a result. Shifts from other corridors could have a positive or negative impact, depending on relative travel speeds on the two roads. On balance, it appears that traffic flow improvement projects may reduce emissions of greenhouse gases, but the magnitude of this effect is difficult to quantify accurately.

Alternative Fuel Projects and Emissions Per Gallon

Approximately 9 percent of CMAQ funds have been spent through 1994 on bus conversions and replacements that foster the use of alternative fuels. Alternative fuels are often discussed as a potential solution to global warming, and certain fuels do have the potential to reduce net emissions in the long term. The short-term impacts of currently available alternative fuels under the CMAQ program, however, are quite uncertain and unlikely to make a large contribution to total national emissions reduction.

Most alternative fuel projects under CMAQ involve compressed natural gas (CNG), although some involve alcohols and electricity. Considerable uncertainty surrounds estimates of the emissions impacts of conversion to CNG, and estimates vary widely. One analysis of light-duty vehicles (LDVs) using CNG, for example, states that emissions would be about 14 percent lower than for LDVs using reformulated gasoline but indicates that different plausible assumptions imply anywhere from a 35 percent decrease to a 35 percent increase in emissions, on a carbon-equivalent basis.⁵ A further consideration is that methane, the major component of CNG, is itself a greenhouse gas that is in the order of 20 times more heat retentive than CO₂. The obvious conclusion is that environmentally-safe methods of fuel extraction, distribution and refueling of vehicles, will be required to insure that widespread conversions do not release even more harmful gases.

Two simple comparisons provide additional useful perspective on bus replacement projects. America had only about 53,000 transit buses (but over 600,000 if school buses are included) in 1990, as compared with a total of 190 million registered motor vehicles.⁶ Transit buses therefore accounted for less than 0.03 percent of all vehicles. All passenger buses accounted for only 0.7 percent of U.S. vehicle fuel consumption in 1993, and were probably responsible for a correspondingly low share of greenhouse gas emissions.⁷ If every bus in the country attained a 14 percent reduction in emissions, therefore, this would not result in a large national reduction in greenhouse gas emissions. Over the next 20 years or more, more widespread use of alternative fuels in automobiles could have a significant impact on greenhouse gases. As noted above, however, it is very difficult to estimate whether that impact would be beneficial or harmful from a global climate perspective.

⁵ Deluchi, M.A. *Emissions of Greenhouse Gases From The Use of Transportation Fuels and Electricity - Volume 1: Main Text*. Argonne, IL: Argonne National Laboratory, November 1991. These are estimates of CO₂-equivalent emissions, including total life cycle emissions. The actual volume of emissions from methane, the primary component of natural gas, would be less than that for CO₂ since methane is on the order of 20 times more heat retentive.

⁶ U.S. Department of Transportation, Bureau of Transportation Statistics. *Transportation Statistics: Annual Report 1994*. Washington, D.C.: Government Printing Office, January 1994.

⁷ U.S. Department of Transportation, Federal Highway Administration. *Highway Statistics 1993*. Washington, D.C.: Government Printing Office, October 1994.

Uncertainties in Estimating Emissions Impacts

Quantification of greenhouse gas emissions impacts is a highly uncertain exercise given existing data. Additional uncertainties include the following issues:

- o Limited rigorous data on the effectiveness of many TCMs in a variety of settings (some TCMs have not been widely examined in carefully conducted research);
- o Confounding variables affecting results of a single project (understanding to what extent a project actually caused the VMT change observed);
- o Extrapolating results from a study of a single project to national impacts (site-specific nature of some results);
- o Differentiating between net new travel and shifts from other roads;
- o Projecting long-term trends and impacts; and
- o Possible synergy or antagonism between various TCMs or other policies.

These and other uncertainties highlight the need for additional research to improve analytical capabilities in accurately quantifying emissions impacts of certain transportation policies.

Expecting a targeted program such as CMAQ to have a large effect on total national emissions is unrealistic. Of the CMAQ projects funded to date, most were targeted to a limited number of cities since CMAQ funds must be spent in the ozone and carbon monoxide nonattainment areas. Also, although the CMAQ authorization of \$6 billion is a significant sum of money, it can affect only a small portion of the entire transportation network, valued in the trillions of dollars. Furthermore, to the extent that CMAQ reduces fuel consumption, through reductions in VMT or improved fuel economy, the program will be beneficial in reducing greenhouse gas emissions.

VI. Conclusion

The CMAQ Program Review revealed specific challenges in the obligation and programming of CMAQ funds facing a few States. Many of these challenges, however, were caused by the changes ISTEA and the CMAQ program placed on transportation planning. ISTEA's decentralization of transportation planning to the regional and local levels required MPOs and local governments to take on more responsibilities previously placed on State DOTs. Many MPOs and local governments, for example, lacked familiarity with Federal funding requirements and States' contracting procedures. Furthermore, because CMAQ was a new program, there was a lack of understanding of program goals, procedures, and eligibility requirements. Many of the challenges with obligations and programming of CMAQ funds have been resolved, mainly because of greater familiarity with the program at the State, MPO, and local government levels, and because of enhanced coordination efforts at all levels.

The CMAQ program has been successful in opening the transportation planning process to all interested parties. Although this increased participation has required more time in coordination among the various groups (often delaying the project selection process), it has also introduced new ideas into the planning process.

Although CMAQ projects generally demonstrate small emission reductions, they may assist the development of a more balanced transportation system generating benefits not captured by this analysis. Rideshare projects, for example, provide alternatives to the SOV, and successful intermodal centers can smooth the transition between different modes, making the multi-modal trip more attractive. Furthermore, traffic flow improvements such as intersection improvements and signalization projects, improve the efficiency of the existing highway infrastructure.

Perhaps the most significant impact of the CMAQ program has been its role in encouraging changes in the State and MPO transportation planning processes by broadening planning to address air quality goals. These changes can serve to improve the effectiveness of CMAQ-funded projects by providing transportation planners input on a wider array of planning considerations than may have been the case in the past. Participants in the CMAQ Program Review, for example, agreed that the CMAQ program has resulted in funding projects which may never have been funded (but have air quality benefits), and accelerating projects which were originally given lower priority.

Finally, since the CMAQ program funds projects designed to assist attainment of the NAAQS, it provides an incentive to implement alternatives to SOV travel which maintain the public's mobility in more environmentally sensitive ways. Numerous studies of TCM effectiveness, including the analysis reported here, suggest that TCMs alone will probably not be sufficient to make a demonstrable difference in achieving the air quality standards. However, in combination with parking management, pricing measures, regulatory mechanisms and other efforts to reduce the attractiveness of SOV travel, CMAQ-funded projects may be a significant part of any area's transportation/air quality program.

