smart growth and the clean air act

BY CURTIS MOORE

NORTHEAST-MIDWEST INSTITUTE

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ISBN: 1-882061-83-7

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executive summary

The federal Clean Air Act has been both criticized as a cause of sprawl and praised as a useful tool to curb it. Critics contend that by barring increases in air pollution in cities where the air is unhealthy, the law drives businesses and development to outlying areas, thus increasing sprawl and the air pollution from its attendant motor vehicle travel. This is the basis for claims that the Act can have the perverse and unintended effect of increasing air pollution rather than reducing it. However, the Act's defenders argue that it actually can deter sprawl by providing an incentive for transit-oriented, compact development, and urban revitalization. This argument credits the CAA, and the conformity provisions in particular, as a factor in spurring new types of urban development that facilitate transit use and pedestrian traffic and reduce automobile dependence.

This study attempts to reconcile the contrasting views of the law by examining its application in several major metropolitan areas. The results suggest that the Act does not necessarily divert growth from urban centers and indeed can complement efforts to promote growth in areas with existing infrastructure.

Although "sprawl" has no objective definition, generally it is characterized by the following:

- Low population density;
- Rapid population growth in areas adjacent to the metropolitan center;
- Rapid development of rural, wilderness, and agricultural areas;
- Changes in school attendance and quality;
- Low transit boardings per capita;
- High numbers of vehicle miles traveled per person;
- Low average occupancy per vehicle;
- Heavy roadway congestion; and
- Lengthy commute time and distance.

Instead of encouraging sprawling development, the Clean Air Act's conformity requirements and the conformity-related provisions of the Intermodal Surface Transportation Equity Act (ISTEA) may have begun to spur "smart growth" to reduce transportation impacts on air quality.

In theory, the Clean Air Act can encourage sprawl because its requirements for constructing or expanding polluting facilities are more stringent within urban "nonattainment" areas, where the air does not meet federal standards, than in exurban areas, where the air is more likely to be clean. These requirements can mandate elevated pollutant removal efficiencies or the installation of pollution controls. In addition, new facilities in nonattainment areas must offset emissions, often by 1.5 tons of pollutant reduction for every ton of pollutant increase. These requirements can be viewed as an incentive to build new emission sources, development, and transportation projects beyond urban centers, in outlying areas where the air quality still meets federal standards.

However, reality does not necessarily comport with theory. New sources of air pollution, including facilities seeking to expand, must go through a permitting process that typically is as lengthy and complicated in areas with clean air as it is in areas with polluted air. In addition, exurban development undertaken simply to evade Clean Air Act regulations became much more difficult with the enactment of the 1990 Clean Air Act Amendments, which dramatically expanded the geographical boundaries of nonattainment areas. As a result, business and other development seeking to avoid the regulatory reach of the law's nonattainment provisions would have to locate a great distance — in some cases spanning several counties — from the urban core to reach an attainment area with less stringent requirements. The evidence examined in this study suggests this is not occurring.

Instead of encouraging sprawling development, the Clean Air Act's conformity requirements and the conformity-related provisions of the Intermodal Surface Transportation Equity Act (ISTEA) may have begun to spur "smart growth" to reduce transportation impacts on air quality. Smart growth is a new approach to development and redevelopment of land that includes characteristics such as more compact development and greater density, mixed uses, infill and redevelopment of previously

developed areas, provision of transportation choices in addition to automobiles, and intentional protection of green space.[1]

The conformity requirements have compelled the integration of transportation and air pollution control strategies, creating a powerful new incentive for increased local coordination; stronger regional planning across neighboring jurisdictions; and efforts to promote growth based on clean technologies. The U.S. Environmental Protection Agency (EPA) is supporting this integration of air quality, transportation, and land use planning by developing land use methodologies that improve air quality and providing guidance on quantifying the air quality benefits of compact development.

As state and local governments increasingly embrace smart growth measures, Clean Air Act and conformity provisions can provide an impetus and opportunity to enhance the quality of life by linking clean energy and revitalization and strengthening regional planning. EPA and other federal agencies can provide guidance, research, and technical assistance to reinforce the connection between clean air regulations and smart growth.

Clean Air Act and conformity provisions can provide an impetus and opportunity to enhance the quality of life by linking clean energy and revitalization and strengthening regional planning.

Linking Clean Energy with Revitalization. Cities can leverage their efforts to meet clean air standards by promoting redevelopment and revitalization that minimizes air emissions, attracting clean industries and technologies and developing innovative transportation solutions.

Strengthening Regional Planning. To achieve transportation conformity while encouraging smarter growth, cities and states can follow the lead of Atlanta, Georgia, and Portland, Oregon, by establishing regional planning authorities that improve coordination across agencies and jurisdictions, engage the broader community in creating a vision for regional development, and ensure the implementation of transportation and land use plans.

Providing Methodologies for Promising Land Use Policies. EPA can continue conducting and fostering research to document the air quality benefits of specific land use strategies and inform local governments and developers of the most effective options.

Quantifying Air Quality Benefits of Land Use Policies and Projects. EPA can continue and expand its efforts to help state and local authorities account for the air quality benefits of local development choices in their State Implementation Plans (SIPs) and conformity determinations.

Integrating Population and Transportation Data. To support efforts to allow air emissions reduction credit for land use measures, EPA or another agency could consolidate key data on population and transportation generated by metropolitan areas.

introduction

The U.S. Clean Air Act and its many amendments constitute one of the most complex of all American laws. It impinges on virtually every aspect of American life and helps determine the health of U.S. citizens from before birth to, and including, death. Not surprisingly, the law has been assigned responsibility for a number of societal ills and goods alike. Recently, it has been both criticized as a cause of sprawl and praised as a useful tool to curb it.

This study examines the interplay between air pollution, its control and the type of urban growth commonly referred to as "sprawl." Although sprawl has no objective definition, it is generally characterized by the following:

- Low population density;
- Rapid population growth in areas adjacent to the metropolitan center;
- Rapid development of rural, wilderness, and agricultural areas;
- Changes in school attendance and quality;
- Low transit boardings per capita;
- High numbers of vehicle miles traveled per person;
- Low average occupancy per vehicle;
- Heavy roadway congestion; and
- Lengthy commute time and distance.

Does the Clean Air Act induce sprawl? Alternatively, does the Clean Air Act deter sprawl? For that matter, is there any connection between land use and air pollution? Until fairly recently, the first two questions had not been asked — certainly not raised in a systematic way. The third question — whether there is any connection between land use and air quality — has been raised many times in the past, but there has been very little empirical analysis of the connections. This paper examines the provisions of the Clean Air Act and their capacity to both induce and deter sprawl. It also highlights emerging methods to quantify the potential air quality benefits of land use planning that accounts for air quality impacts.

provisions of the clean air act

The Clean Air Act can affect growth by creating regulatory distinctions between densely developed and sparsely developed areas. The Act's regulatory regime for areas that fail to meet ambient air quality standards is more stringent than its requirements for less-developed areas that still meet the standards.[2] In addition, the Act can restrict federal funding for transportation projects needed to support new development in areas that do not meet air quality standards. These differences can be seen as an incentive to build new emissions sources, development, and transportation projects beyond established urban centers, in outlying areas where air quality still meets the Act's requirements.

However, it also can be argued that the Act's air quality standards, and the requirement that transportation plans conform to state strategies to meet those standards, can influence state and local government efforts to foster transit-oriented, compact development and urban revitalization. This view credits the Act as a factor in spurring "smart growth" — a new approach to development and redevelopment of land that includes characteristics such as more compact development and greater density, mixed uses, infill and redevelopment of previously developed areas, and provision of transportation choices in addition to automobiles.[3] Such development facilitates transit use and pedestrian traffic and reduces automobile dependence.

The Clean Air Act's air quality standards, and the requirement that transportation plans conform to state strategies to meet those standards, can influence state and local government efforts to foster transit-oriented, compact development and urban revitalization.

To understand how the Act affects sprawl requires first considering the law's provisions. The 1970 Clean Air Act (CAA) established a regulatory structure that has remained essentially undisturbed in the intervening 30 years. The law requires the Administrator of the U.S. Environmental Protection Agency (EPA) to identify pollutants

that are emitted by numerous and diverse sources, publish criteria documents that summarize what is known about these pollutants, and, based on this information, establish national ambient air quality standards (NAAQS) that protect human health. The standards must protect sensitive groups, such as children and pregnant women, against adverse health effects.

Air pollution must be reduced to the levels of these health-based NAAQS by certain attainment dates, sometimes loosely referred to as deadlines. The attainment deadlines have been extended several times, most recently in the 1990 Clean Air Act Amendments (CAAA), when variable attainment dates were adopted. States bear the primary responsibility for assuring air quality through State Implementation Plans (SIPs).[4] States with areas that do not meet NAAQS must submit a SIP to EPA documenting how the area will meet the standards in the required time frame.

For both new and existing sources, the technology requirements in "nonattainment" areas, which do not meet NAAQS, in theory are considerably more stringent than those in "attainment" areas where the air is clean.

The CAA defines two types of stationary air pollution sources: those that are new (or significantly modified), and those that are existing. New sources are subject to one set of technology-based requirements, while existing sources are subject to a different, more lenient regime. The Act required EPA to establish technology-based emission limits for new or modified sources of air pollution, called new source performance standards (NSPS), that set a national minimum requirement to be implemented by the states.

For existing stationary sources of emissions such as refineries, dry cleaners, or cement kilns, the states set emission ceilings in order to achieve the NAAQS. These limits are incorporated in the SIP, providing a sort of pollution road map for any given area. Thus, existing sources, whether power plants or motor vehicles, are subject only to controls adopted by state or local governments, and then only to those necessary for an area to reduce air pollution to the levels of the federal health-based standards.

For both new and existing sources, the technology requirements in "nonattainment" areas, which do not meet NAAQS, in theory are considerably more stringent than those in "attainment" areas where the air is clean.

Congress also established different categories for nonattainment areas based on their levels of air pollution, with variable attainment dates and control requirements for each category. For ozone, for example, Congress created extreme, severe, serious, moderate and marginal areas, with targets for taking certain actions of 20, 15, 9, 6, and 3 years, respectively, from the date of enactment. (See Appendix A for a detailed summary of the area categories.) Moderate and worse areas were required to adopt inspection and maintenance programs for vehicles, while marginal areas were not.

REQUIREMENTS FOR ATTAINMENT AREAS

New Sources. In attainment areas that meet CAA standards, new and modified air pollution sources must install the Best Available Control Technology (BACT) as part of a broad-based program for Prevention of Significant Deterioration (PSD). (See Appendix B for a detailed description of the CAA's technology requirements.) A new major stationary source must meet BACT for pollutants that it would have the potential to emit in significant amounts. A major modification must meet BACT for net increases in pollutant emissions that result from a physical change or change in operations. Decreases in emissions can be used to offset increases, thus reducing the net increase to the point that it is no longer "significant."[5] This process of allowing a source to escape BACT is sometimes called "netting out" or "bubbling."

Permitting authorities determine BACT on a case-by-case basis, but it must be no less stringent than the new source performance standard or hazardous emissions standard established by EPA under sections 111 and 112 of the CAAA. If an emissions limitation is infeasible, the permit authority may prescribe a design, equipment, work practice or operational standard, or some combination of them.

BACT can vary over time, as new control technologies become available, drop in price, increase in reliability, or otherwise change. BACT also can vary from place to place, depending on circumstances such as the scarcity of water or availability of alternative fuels needed to operate certain technologies.

The PSD program also restricts the emissions increase in clean-air areas to "increments" of air pollution. Where specially protected "Class I" areas such as national parks, wilderness areas, and wildlife refuges might be affected by air pollution, the increments are so small that, for new sources, they effectively compel state-of-the-art pollution control technology to be operated at very high removal efficiencies. Special visibility provisions protect the ability to see great distances inside and from some Class I areas, thus requiring even more stringent air pollution limits.[6]

Existing Sources. As a practical matter, existing sources in attainment areas typically are not required to retrofit pollution controls, but in theory emissions reductions could be imposed to preclude consumption of the increments.

REQUIREMENTS FOR NONATTAINMENT AREAS

Most large U.S. cities are nonattainment areas, where major air pollution sources must install technology or otherwise reduce their emissions to the established SIP limits needed to achieve attainment. The CAA establishes separate technology-based requirements for new and existing air pollution sources.

New Sources. For new major, stationary sources and modified existing sources of air pollution, the required technology represents the Lowest Achievable Emission Rate (LAER). In theory, LAER is the most stringent of all technology-based standards. Because LAER is determined on a case-by-case basis, it can vary with time and location. As control technologies improve in efficiency or drop in cost, LAER determinations can increase in stringency. Although cost is not supposed to factor in LAER determinations, in practice its limits do not reach levels of stringency that are technologically achievable.

LAER is required of any new stationary source that emits or has the potential to emit 100 tons or more per year of any pollutant subject to regulation under the Act. LAER also is required of existing stationary sources undergoing "major modification," which is any physical change or change in the method of operation that would result in a significant net emissions increase of any pollutant subject to regulation under the Act. As with BACT, sources can "net out" of LAER requirements by using emissions decreases to offset increases, thus reducing the net increase to the point that it is no longer "significant."[7]

In addition to satisfying the requirement for LAER, all major stationary sources owned or operated by the applicant in the state must be in compliance or on a schedule of compliance with all applicable emission limitations and standards under the Act. The CAA also requires a determination that the "benefits of the proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification."[8] Finally, the new source must assure there is no net increase of the pollutant for which the area is in nonattainment by obtaining an offset, or reduction in emissions, from other sources within the area. The offset amount is largest in the most polluted areas.

Existing Sources. The 1990 CAAA requires existing major stationary sources in nonattainment areas to install Reasonably Available Control Technology (RACT). Because states determine what might be reasonably available in any given area, RACT is not a nationally uniform standard. Thus, existing industrial sources of air pollution, such as power plants, refineries, large printers, and cement kilns, remain exempt from explicit technology-based requirements unless they are modified.

Most large U.S. cities are nonattainment areas, where major air pollution sources must install technology or otherwise reduce their emissions to the established SIP limits needed to achieve attainment.

RACT, like BACT and LAER, is determined on a case-by-case basis (although it might be established generically within a state). In most cases, EPA has determined that RACT will result in an overall level of control equivalent to specific maximum allowable emission rates (pounds of NO_x /million Btu) for certain electric utility boilers. Compliance is determined on a continuous basis, using a thirty-day rolling average emission rate. States may adopt market-based trading systems for NO_x, so that individual owner/operators in nonattainment areas (or statewide within an ozone transport region) can exceed emission limits as long as area-wide average emission rates are met on a Btu-weighted basis.[9]

Under the CAAA, state RACT rules had to require the final installation of NO_x controls by no later than May 31, 1995. If a state demonstrated that, due to equipment unavailability or system reliability, it could not meet the deadline, EPA could allow it to define RACT as a phased program. Such programs had to include clearly specified

compliance milestones representing the most expeditious schedule practicable toward final compliance.[10]

Conformity. Of the few mechanisms compelling an integration of transportation, land use and air quality, perhaps the most powerful are the CAAA's conformity provisions. Originally adopted in the 1977 Amendments to the law, the provisions were greatly enhanced in 1990, when Congress explicitly required areas that have poor air quality now — or have had it in the past — not only to examine the long-term air quality impacts of their transportation system, but also to assure that those impacts are compatible with clean air goals.

The conformity process requires states and metropolitan planning organizations to demonstrate that the air quality impacts of their investments, strategies, and transportation activities are consistent with the SIP and do not exceed the SIP emissions targets for mobile sources. The regulations have since been modified on several occasions, but retain their fundamental character, including two tests.

The two types of tests are the budget test and the emission reduction test. The budget test requires areas to show that projected emissions from their transportation network are below the motor vehicle emission budgets established in the state's air quality plan (SIP). In areas that do not have a SIP, conformity must be demonstrated using either or both of the emission reduction tests, depending on the pollutant and the area's classification.

The "build/no-build" test requires areas to show that emissions would be lower if all projects in the plan/program were implemented (under the "action" scenario) than if they were not implemented (under the "baseline" scenario). The less-than-1990 test requires areas to show that emissions in the action scenario would be lower than 1990 emission levels.

provisions of the intermodal surface transportation and efficiency act

Hard on the heels of the CAAA conformity amendments came a second set of complementary requirements contained not in environmental law, but in the 1991 amendments to the federal highway funding program. The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) created a parallel set of pressures for state and regional transportation and planning agencies in the conformity process.

Under ISTEA, metropolitan planning organizations (having populations of more than 200,000) must adopt twenty-year transportation plans and transportation improvement programs (TIPs) consisting of projects to be funded or approved by the Federal Highway Administration or Federal Transit Administration. Both the transportation plan and the TIP must result in emissions consistent with, or conforming to, the SIP budget for mobile source emissions. ISTEA's metropolitan planning requirements prohibit federal approval, funding, or implementation of transportation projects that do not conform to the SIP.

ISTEA not only strengthened metropolitan planning organizations' authority to conduct transportation planning and allocate federal funds, but also created a new category of projects eligible for federal funding under the Congestion Mitigation and Air Quality (CMAQ) program for the express purpose of supporting improvements in air quality. ISTEA also encourages multi-modal planning, requiring a set of six management systems for intermodal facilities, bridges, pavement, public transportation, safety, and congestion.[11]

The confluence of the CAAA and ISTEA amendments may have fundamentally shifted the emphasis in metropolitan transportation planning toward projects that improve

air quality and away from those that impair it. This is especially true in fast growth areas, where transportation departments and planning organizations are improving their analytical capacities and linking them to air pollution.

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As noted by Arnold M. Howitt and Elizabeth M. Moore in their conformity analysis, in older, slower growth areas these changes are less apparent because generally such areas have far less difficulty in passing the conformity test. They typically have mature highway infrastructure networks, well-established transit systems, and relatively slow growth in vehicle miles traveled (VMT). As a result, many projects in their transportation plans and programs, mainly for transit improvements and road reconstruction and maintenance, have neutral or positive air quality effects.

In these well-established areas, projects that expand road capacity are often traffic flow improvements that relieve congestion but do not increase speeds enough to adversely affect emissions. In addition, due to slow growth rates, emissions from increased VMT are more than offset by fleet turnover and the technology-based mobile source measures required by the CAAA in serious and severe ozone areas. Thus, conformity has not required major adaptation of transportation plans in these areas because there are few major capacity expansions on the table. Moreover, the mix of projects already includes many with air quality benefits.[12]

effects of development choices on air quality

Intuitively, there is an obvious relationship between air pollution and sprawl because of sprawling development's inherent reliance on automobiles. This relationship, however, is poorly understood and has not been systematically analyzed, perhaps because data on activities that might be considered indicators of sprawl are not centrally collected and maintained.

Metropolitan areas routinely assemble data on population density, transit use, and commuting patterns and report vehicle miles traveled (VMT) to the U.S. Department of Transportation, and SIPs typically contain VMT and related information on average vehicle occupancy, commute time and distance, and congestion. However, extracting this information to draw meaningful conclusions is painfully difficult and labor intensive. It would be a simple matter for a federal agency to require that this information be reported in a single document. Indeed, if the U.S. Environmental Protection Agency proceeds with plans to provide SIP credit for land use decisions, this information will be essential.

The relationship [between air pollution and sprawl] is poorly understood and has not been systematically analyzed, perhaps because data on activities that might be considered indicators of sprawl are not centrally collected and maintained.

Because Portland, Oregon, is the only major identifiable jurisdiction that has consistently pursued the objective of mixed use development combined with limits on

23 percent of all downtown workers [in Portland] commute by transit, increasing to more than 40 percent during peak commute periods. Partly as a result of these reduced driving rates, the city has experienced no violations of federal ozone standards since 1988, compared to a prior violation record of one day out of every three to five days.

growth and increased public transit, the ability to reach general conclusions based on analyses of the little data that is publicly available is limited. However, a comparison of Portland with another rapidly growing metropolitan area, Atlanta, does crystallize some differences in transit use and air quality that can be attributed at least in part to land use decisions.

In a 1997 report, the California Air Resources Board lavished praise on Portland's transportation system. "Portland is well-served by both bus and lightrail transit [with] convenient and attractive pedestrian facilities," the report said. "Downtown Portland consists of relatively small blocks of buildings placed on a gridded street pattern, and is surrounded by older residential neighborhoods, sprinkled with a variety of commercial businesses. Each work day, 23 percent of all downtown workers commute by transit, increasing to more than 40 percent during peak commute periods. Partly as a result of these reduced driving rates, the city has experienced no violations of federal ozone standards since 1988, compared to a prior violation record of one day out of every three to five days."[13]

By contrast, it is unlikely that any metropolitan area in the United States has encountered greater difficulty with the conformity process — or for that matter with growth itself — than Atlanta. Described by one of the city's own newspapers as a "poster child" for sprawl, Atlanta has acquired a national reputation for runaway growth.[14] Much of that growth is fed by the immense amount of inexpensive raw land available for development. As Atlanta's outer reaches have spread further and further from the city center, the daily per capita vehicle miles traveled have climbed steadily, jumping from 32.1 in 1992 to 35.8 in 1998.

TABLE 1

POPULATION AND VMT, ATLANTA AND PORTLAND, 1990-1995[15]

Metro Area	Population 1995	Percent Annual Growth 1990-95	VMT 1995	Percent Annual VMT Growth 1990-95	VMT per Capita
Atlanta, Georgia	3,038,050	2.7 %	105,218,456	4.4 %	34.6
Portland, Oregon	1,050,418	2.1 %	20,413,000	1.9 %	17.2

Source: Arnold M. Howitt and Elizabeth M. Moore, "Linking Transportation and Air Quality Planning: Implementation of the Transportation Conformity Regulations in 15 Nonattainment Areas," Taubman Center for State and Local Government, John F. Kennedy School of Government, Harvard University (Cambridge, Mass., March 1999).

A comparison of vehicle miles traveled (VMT) in Atlanta and Portland illustrates how Portland's growth management and transit-oriented development have helped minimize VMT growth. A study by the Taubman Center for State and Local Government found Atlanta's VMT are increasing at a rate faster than that of population growth. In Portland, however, just the opposite is occurring: VMT is decreasing in comparison to the population. (See Table 1)

Data produced by the Federal Highway Administration paint a somewhat different picture, showing increases in per capita VMT in both cities. However, per capita VMT increased in Atlanta at twice the rate of Portland. (See Table 2)

TABLE 2

PER CAPITA VMT, ATLANTA AND PORTLAND, 1992-1998

Metro Area	Per Capita Daily VMT-1992	Per Capita Daily VMT-1998	Percent Change 1992-98
Atlanta, Georgia	32.1	35.8	11.5
Portland, Oregon	20.2	21.1	4.5

Source: Federal Highway Administration, U.S. Department of Transportation, Highway Statistics Series, http://www.fhwa.dot.gov/ohim/ohimstat.htm

TABLE 3

CARBON MONOXIDE AND OZONE AIR POLLUTION REDUCTIONS IN PARTS PER MILLION, ATLANTA AND PORTLAND, 1988-1997

Area/Pollutant (Percent Reduction, 1988-97)	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Carbon Monoxide Atlanta (-22%)	5.5	6.2	5.4	6.5	5.1	4.9	5.3	4.5	3.7	4.3
Carbon Monoxide Portland (-39%)	8.9	8.2	8.5	9.1	7.0	6.3	7.0	5.7	6.1	5.4
Ozone- 8 hr Atlanta (-9%)	0.11	0.09	0.11	0.09	0.09	0.10	0.09	0.11	0.10	0.10
Ozone-8 hr Portland (-14%)	0.07	0.06	0.08	0.06	0.07	0.06	0.06	0.07	0.09	0.06
Ozone-1 hr Atlanta (-13%)	0.15	0.11	0.14	0.12	0.12	0.14	0.11	0.14	0.12	0.13
Ozone-1 hr Portland (-27%)	0.11	0.09	0.12	0.09	0.10	0.09	0.09	0.12	0.10	0.08

Source: U.S. Environmental Protection Agency, National Air Quality and Emissions Trends Report, 1997.

These differences in VMT appear to translate directly into automobile emissions of air pollutants such as carbon monoxide and ozone. Since 1988, Portland has achieved substantially greater reductions in carbon monoxide and ozone levels than Atlanta has. (See Table 3)

Although it would be simplistic to attribute all of the changes in ambient concentrations of these pollutants to a single local strategy, there is no doubt that when each person in Atlanta drives nearly 15 miles per day more than each person in Portland, it affects the cities' relative air pollution levels. How much of the differences between Atlanta and Portland can be attributed to land use is uncertain. But surely some of the reductions in Portland can be assigned to its land use and transit policies, while some of the continued emissions in Atlanta can be assigned to its lack of land use and transit policies.

the clean air act as an incentive for sprawl

A case has been made that the CAAA can have the perverse and unintended effect of increasing air pollution rather than reducing it. The core of this argument is that the CAAA drives businesses and development to outlying areas, thus increasing sprawl and the air pollution from its attendant motor vehicle travel. Chicago Mayor Richard M. Daley advanced this argument in 1997 when he said, "[T]he new clean air regulations could encourage suburban sprawl (and thus more cars), while hurting the development of industrial jobs in the cities.…Jobs and capital are encouraged to flee to the suburbs and beyond. The result is more people in cars driving to and from work, and more air pollution.…[I]f a city is having trouble meeting the new standards, a moratorium could be placed on industrial development. Industry moves out, promoting more traffic and suburban sprawl."[16]

Theoretically, this exurban development happens when new and expanding businesses seek to avoid the law's more stringent permitting requirements in urban nonattainment areas by relocating to outlying attainment areas with less stringent regulations. First, the CAAA requires a higher level of emissions control in areas where the air is dirty than where it is clean. This can mean both new and existing sources of air pollution must spend more money to build and operate a plant in a nonattainment area than elsewhere. Second, the law requires new facilities that would increase emissions of the air pollutant for which an area is in nonattainment to "offset" the increase. For example, a power plant locating in a moderate ozone nonattainment area would be required to find 1.15 tons of NO_x reductions (or offsets) for every 1 ton it would emit. Thus, a new power plant that would emit 100 tons of oxides of nitrogen per year would be required to secure offsets of 115 tons.

The conformity mandate of the Act also has raised concerns about inducing sprawl. By prohibiting federal funding for road construction in nonattainment areas, it seems

the CAAA may create a deterrent to urban "infill" development that requires federal support for transportation components. State and local authorities as well as developers interested in siting a project would presumably prefer to locate it in an attainment areas where they would be eligible for federal transportation dollars.

The U.S. General Accounting Office (GAO) examined these and other claims about the influence of federal policies on development in an April 1999 report, requested by Senators James Jeffords (VT) and Carl Levin (MI), the co-chairs of the Senate Smart Growth Task Force. The report revealed the need for further investigation of federal influences on sprawl. According to GAO, "[W]e did not find any quantitative research supporting claims that environmental regulations governing air quality and water quality encourage growth in undeveloped areas rather than in existing urban and suburban areas. In fact…a body of research shows that environmental regulations have played a small role in businesses' choices of location."

GAO also reviewed studies of the effects of environmental regulation on decisions about location. It said that "although we cannot conclude statistically that environmental regulations are unimportant without first asking more refined questions, there is little evidence that regulations have become a truly important location factor for a wide spectrum of industries." This may be in part because of the size of the areas in which nonattainment requirements apply. In 1990, Congress expanded the boundaries of most nonattainment areas to include the entire Metropolitan Statistical Area, dramatically increasing the geographic areas subject to air pollution controls and making flight to pollution havens outside the nonattainment area far more difficult. For example, in 1990 the Atlanta, Georgia, ozone nonattainment area grew from four counties to thirteen.[17]

In practice, the difference between the stringency of CAA regulations in nonattainment and attainment areas may not be great enough to significantly influence industrial location. For example, when Seattle, Washington, was a nonattainment area, the principal permitting consequence seemed to be a requirement that sources conduct more research on the availability of control technologies. Officials contend that it was not difficult for industry to find emissions offsets, and the level of technology designated to comply with LAER was not substantially different from BACT. Thus, under present circumstances, there would be no significantly different regulatory requirement imposed on a source located within the metropolitan area than on one outside it.

Ironically, CAA regulations may exert a stronger influence over industrial siting decisions in Portland, Oregon, even though it is an attainment area. Portland's ambient levels remain high enough that the city flirts with nonattainment, and new emissions sources can have difficulty obtaining necessary emissions offsets.

In Portland, new sources of ozone precursors, oxides of nitrogen and volatile organic compounds, with emissions of 40 or more tons per year, are required to comply with Best Available Control Technology (BACT) and obtain offsets at a ratio of 1:1.1. Because the cutoff is measured post-control, a source can avoid new source review and the BACT and offset requirements by installing control technologies. In addition, under Oregon law all major sources, regardless of location or federal permitting requirements, must install Typically Available Control Technology. Therefore, the only major regulatory requirement that a source larger than 40 tons per year could avoid by locating outside the Portland area would be offsets.

Chattanooga, Tennessee, described as "America's Dirtiest City" in 1969, is now one of the few American cities of its size that meets federal air quality standards for all criteria pollutants.

Some Portland companies have created their own private banks of offsets for their own use or trading. Typically, this is done by installing equipment that achieves a higher rate of removal, or greater emissions reduction, than is required. One pool was created by Portland General Electric through a novel approach, offering a $50 credit toward the purchase of an electric mower for every gasoline-powered mower turned in for disposal. Some metropolitan areas have set aside pools of offsets created through the adoption of regional control strategies such as motor vehicle inspection and maintenance (I&M). However, Portland's pool, or Industrial Growth Allowance, has no available offsets because an expanded I&M program was rejected. One person interviewed asserted that in 1997 Intel, unable to obtain an offset in Portland for an increase in its production capacity, shifted its new work to Albuquerque, New Mexico.

Another example illustrates that a city can thrive without losing its attainment status. Chattanooga, Tennessee, the urban core of a metropolitan area of roughly one-half million, is one of the few American cities of that size that meets federal air quality standards for all criteria pollutants. This is due at least in part to concerted efforts by local government and business leaders to redevelop the city, especially its center, in ways that minimize environmental impacts.

Described as "America's Dirtiest City" in 1969, Chattanooga and its manufacturers invested $40 million in pollution control equipment to comply with the CAA. At the same time, many of Chattanooga's industries that historically fed parts and materials to the auto, home construction, and power engineering industries, fell into decline for reasons unrelated to air pollution control. Factories closed, some because they were obsolete, others because the domestic industries that they supplied were themselves shrinking.

Local leaders say the city hit rock bottom in the early 1980s, when virtually all downtown stores were shuttered and the streets were unsafe. The city launched a rebuilding effort in 1981, and by 1984 the Lyndhurst Foundation and the new Chattanooga Venture were collaborating in the Vision 2000 program to engage all city residents in imagining a future for their city. A remarkably progressive agenda emerged, calling for downtown and riverfront development, improved inner-city housing, and 233 sustainable projects.

The Riverwalk arguably has had the greatest impact on Chattanooga's revitalization. It replaced the abandoned, rotting buildings on the Tennessee River with seven miles of urban parkland that cuts through the heart of the city with playgrounds, performance spaces, fishing piers, and leaf-shaded walkways. Chattanooga's downtown anchor is the $45 million Tennessee Aquarium, surrounded by warehouses that have been reclaimed as smart shopping malls, newly renovated affordable apartment buildings, and restaurants sandwiched within the rough walls of old factories. Through the newly enfranchised Chattanooga Neighborhood Enterprise, 3,460 units of inner-city housing have been built or renovated through a fully public planning process.

To get around in the new user-friendly downtown, in 1993 Chattanooga created a unique seventeen-vehicle electric shuttle bus service, described by one magazine as "a vital part of downtown redevelopment, helping keep the streets unclogged. Commuters are encouraged to leave their cars in parking garages on the outskirts of town, then take the shuttle in. City officials say the shuttle moves a third of the ridership at a tenth the cost of their own much larger diesel service."[18] In fact, Chattanooga has become the world's electric bus capital, exporting the twenty-two-passenger models made in town by Advanced Vehicle Systems to seed similar shuttle programs in fourteen other cities.

the clean air act as a deterrent to sprawl

despite claims that the CAA can induce sprawl, it can be argued that the Act actually can deter sprawl by providing an incentive for transit-oriented, compact development, and urban revitalization. This argument credits the CAA, and the conformity provisions in particular, as a factor in spurring new types of urban development that facilitate transit use and pedestrian traffic and reduce automobile dependence.

INDEPENDENT SOURCE RULES

California's South Coast Air Quality Management District (SCAQMD) made one of the first attempts to use the Act's authority to influence land use decisions. The district's 1994 Air Quality Management Plan required the long-range implementation of indirect source rules (ISR) designed to regulate developments, such as shopping centers and amusement parks, that contribute to increased pollution through increased traffic. The plan called for a wide range of activities, from car-pooling to increased reliance on public transit. However, SCAQMD had no authority over land use planning, nor was its staff allowed to engage in planning-related activities. The district's experience illustrates the political difficulty of establishing and maintaining such programs, even in a region with an aggressive and committed air quality agency.

District staff devoted a great deal of effort to the ISR, focusing on the air pollution impacts of facilities and events that generate traffic and, hence, air pollution from motor vehicles. The staff conducted a number of studies, including an inventory of all shopping centers in the south coast air basin. SCAQMD staff also assembled task forces that included members of the affected industries in preparation for submitting a rule to the governing board of the district. In addition, the staff prepared a draft rule for special events.

Development of the ISR spurred a campaign to constrain the rules, led by members of the aircraft and aerospace industries, shopping center developers and operators, and commercial real estate developers. "The message we always got was that it was a local issue and the District had no jurisdiction," said a former staff member. Starting in the mid-1990s, developers and others opposed to the ISR mounted successful efforts to remove SCAQMD board members by intervening in local elections, often using issues unrelated to their support of pollution controls and without disclosing their activities. Three years later, after a resulting turnover in board membership, the district dropped the ISR provision.

REGIONAL TRANSPORTATION AUTHORITY

Despite SCAQMD's aborted attempt to implement indirect source review, pressure exerted by the CAAA has led to strengthened land use and transportation planning authority in some major cities. Atlanta, Georgia, is the most recent and impressive example. In 1999, Governor Roy E. Barnes won passage of a bill to create the Georgia Regional Transportation Authority (GRTA) with sweeping authority over land use and transportation decisions in the state's nonattainment areas. As Atlanta struggles with achieving transportation conformity, GRTA holds out the promise of reversing a long history of increasing vehicle miles traveled, worsening traffic congestion, and inability to meet CAAA standards. In July 2000, GRTA was instrumental in winning federal approval of the region's three-year Transportation Improvement Plan (TIP), ending a two-year moratorium on federal funding for local transportation projects.

Atlanta's development challenges are well known. Traditionally, its chief attraction as a place to do business has been the availability of inexpensive land for new home construction and, with it, inexpensive housing. From that perspective, infill development threatens outlying counties that see spreading development as a source of jobs and income.[19] In addition, the area has a burgeoning population that is projected to increase by 48 percent in the next 25 years, with no reduction in per capita VMT.[20]

The Atlanta Regional Council (ARC), the area's metropolitan planning organization, develops the regional transportation plan to accommodate this growth twenty years into the future. ARC officials recognize a direct connection between land use and air quality for the purpose of meeting the conformity requirements.[21] However, ARC has no land use authority. For example, Georgia law requires that ARC review every

"development of regional impact" (DRI), which is defined by objective criteria such as number of square feet of retail space. Even though ARC determines whether or not the DRI is in the best interests of the state and recommends that the project be approved or disapproved, it then returns the matter to the county where it arose, and the county acts as it wishes.[22] (See box below.)

MALL OF GEORGIA

The Mall of Georgia project illustrates the inability of the Atlanta Regional Council (ARC) to control crucial land use decisions that drive highway development and, ultimately, increased motor vehicle emissions.

There is considerable tension in Atlanta between its outlying jurisdictions, which support outward growth as a source of tax revenues from real estate, sales, and income, and core cities and counties that lose these revenues when growth is drained to the suburbs. Once development projects are approved and establish the need for highways, private developers, builders, landowners and others are anxious to see the roads built. In addition, in some cases highway construction and its attendant sprawl can be justified when computer models show that it will reduce vehicle emissions by relieving traffic congestion. Thus, political support for highway capacity expansion tends to be high.

Modeled on Minneapolis' Mall of America, the Mall of Georgia would attract immense numbers of drivers, create congestion and air pollution, and strain the region's resources. As the regional planning agency, ARC was responsible for creating the regional response to the project, but without land use authority it was unable to halt or otherwise influence the mall. That authority was lodged with Gwinett County.

This is a rather typical situation in which a single jurisdiction can effectively commandeer a region's transportation and other resources. Once the county approved the project, the transportation and other needs of such a development had to be filled, even if the agencies that must satisfy those demands had no voice in the approval process. The ARC board could have voted against the Mall of Georgia but, according to one analyst who reviewed the case, ARC "realized that the project would go ahead, even without board approval. It therefore decided to support the project on the assumption that the board would then be in a better position to ask for some concessions from the developers."*

**Arnold M. Howitt and Elizabeth M. Moore, "Linking Transportation and Air Quality Planning," Taubman Center for State and Local Government, John F. Kennedy School of Government, Harvard University (Cambridge, Mass., March 1999).*

Whereas ARC's hands are tied in figuring out how to make the transportation systems that are spurred by runaway development conform to air quality standards, GRTA can step in as needed to steer development and its attendant transportation needs.

ARC's latest transportation plan, unveiled in October 1999, continued to project outfill rather than infill and mixed use growth and rely very heavily on privately owned vehicles for transportation. The result would be a 6 percent drop in low income households within an hour's commute of basic jobs; eight of ten work trips made by solo drivers; and suburban development too thinly populated to support public transportation. "We still have lots of undeveloped land and people are going to live away from transit," Joel Stone, ARC's top planner, told *The Atlanta Constitution*. "We have to worry about the efficiencies of transit."[23]

The newly formed GRTA can overcome many of ARC's weaknesses and forge local coordination by exercising its unprecedented power to:

- Plan, design, construct, lease, operate, manage, and maintain public transportation systems and air quality control installations through contracts with public and private entities.
- Coordinate planning for transportation and air quality purposes among all state, regional, and local authorities.
- Review and approve by a two-thirds majority vote the projects planned by the Georgia Rail Passenger Authority and Georgia Environmental Facilities Authority.
- Review and approve developments of regional impact as a prerequisite to the expenditure of transportation funds.
- Set targets for air quality improvements and standards.
- Make grants or loans to local governments through a $2-billion bonding authority for use in building and running rapid transit and/or commuter rail systems and helping cities come into compliance with federal air-quality standards.
- Acquire property through eminent domain.

Whereas ARC's hands are tied in figuring out how to make the transportation systems that are spurred by runaway development conform to air quality standards, GRTA can step in as needed to steer development and its attendant transportation needs.

As recently noted in *Governing Magazine*, "GRTA can tell the state transportation department not to build a highway. It can tell a county not to allow a new shopping mall inside its borders. If it wants to, GRTA can build and operate a mass transit system in any of the jurisdictions surrounding Atlanta. It can then force those jurisdictions to pay for it by threatening to take their state funds away."[24]

In May 2000, GRTA reviewed the ARC three-year Transportation Improvement Program (TIP), which required approval by two-thirds of the GRTA board. The program also needed approval by federal environment and transportation officials, based on CAAA transportation conformity, in order to gain restoration of federal highway funding for the Atlanta metropolitan area. On May 10, GRTA deferred action on the TIP due to federal officials' concerns about the following program components:

- Reliance on local governments to implement changes in zoning and land use policies without adoption or commitments from them;
- Overstatement of local and federal revenue available to fund transit in the region;
- Reliance on data based on outdated highway vehicle speeds to calculate emissions rates; and
- Lack of responsiveness to environmental justice concerns.

GRTA's resolution specifically deferred consideration of TIP approval "subject to satisfactory resolution of the federal government's concerns."[25] The resolution further requested that before GRTA's June 14 meeting ARC recommend a program for implementing the Regional Development Plan and the state and local funding requirements. The program had to include scheduled enforcement milestones and a mechanism for linking transportation funding priorities and future TIP review to achievement of those milestones. In response, ARC considered a proposal giving local governments 18 months to bring their land use and zoning regulations in line with regional goals. Although ARC has no authority to require local governments to comply, those that refused could have road construction funds withheld by GRTA.

GRTA finally approved the TIP in June, followed by the approval of the U.S. Department of Transportation in July. The TIP provides $1.9 billion for projects that emphasize alternatives to single occupant vehicles, including more than $20 million for regional bus purchases, $178 million for commuter rail, and $23 million for the Livable Centers Initiative to encourage livable development, mixed uses, and connectivity in town centers.

GRTA also approved ARC's $36-billion, 25-year regional transportation plan, on which the TIP is based. Although GRTA is not technically required to review the plan, it can either endorse it or recommend changes. In addition, GRTA is working to increase mass transit options in the Atlanta area, using funding from the federal Congestion Mitigation and Air Quality Improvement (CMAQ) program to support a public bus system in Clayton County and working with the state transportation department to establish commuter rail lines between Athens and Atlanta and Atlanta and Macon.

REGION 2040 GROWTH CONCEPT

Even Portland, Oregon, well known for its state's successful land use planning laws, has strengthened its regional transportation planning, in part to improve area air quality. In 1979, the voters of Portland and 26 other jurisdictions in the region approved a referendum to create the Portland Metropolitan Area, or Metro, an elected regional government with authority over land-use, transit systems, and other cross-jurisdictional issues.

In 1992, Metro launched a Region 2040 Growth Concept process to plan for a population expected to double to 2.5 million in the next 45 years. This growth had spurred concern about the potential impacts of new development in outlying suburbs on quality of life, traffic congestion, and air pollution. Metro solicited extensive public involvement, including telephone surveys, numerous workshops, and meetings with stakeholder groups. Participants expressed a strong preference for a high quality transit system, a wider choice of living environments, and containing new growth within the existing urbanized area and a few satellite suburban areas.

During the development of the 2040 Growth Concept, planners evaluated several different land use and transportation scenarios using Metro's enhanced transportation demand model. The 2040 plan alternative that was selected for the plan was compared to other land use and transportation scenarios. According to this analysis, the plan is expected to result in 15 to 20 percent less motor vehicle pollution in the region than more auto-oriented development would produce. The plan's concentrated new development is expected to produce no more traffic congestion than typical low density growth. The plan also will require the construction of fewer new

major arterials and freeways, thereby reducing impacts on existing neighborhoods and districts within Portland and outlying areas.

Metro adopted the final 2040 Growth Concept in 1994. It focuses about two-thirds of expected future development within Portland's locally established urban growth boundary through infill, mixed use, and higher density development. About one-third of this new growth will consist of compact neighborhoods and subregional centers. These areas will be situated near transit stations and corridors that are served by high capacity rail. Another one-third of the growth will occur in smaller satellite cities outside the urban growth boundary.

Clearly Portland's rigorous land use and transportation planning requirements benefit local air quality. Consider the following:

- Regional transit ridership has increased 30 percent since 1990 due to significant investments in three new light rail lines and a variety of other measures to encourage use.
- Personal auto travel is now leveling off in Portland, though it is climbing elsewhere.
- Nearly 5,000 new housing units have been constructed in downtown Portland since 1988.
- The city plan encourages bicycle parking and construction of bikeways, so the modal share for bicycle use has increased from 1 to 2 percent of all trips.

quantifying the air quality benefits of compact development

Innovative methods to model and measure air emissions show promise of quantifying the apparent regional air quality benefits of concentrating growth in downtown, transit-oriented development. Efforts are underway to better quantify the emissions reductions that result from compact development for use in SIPs and conformity determinations. Such new accounting models also can demonstrate that net air emissions from downtown development are lower than those resulting from sprawling exurban development, providing a justification for restoring federal funding for certain transportation projects in urban nonattainment areas.

A prime example is a method adopted for the Atlantic Steel Redevelopment project in Atlanta, Georgia. Under a unique agreement among the developer, city, state, and EPA, the entire project will be considered a transportation control measure (TCM) under the CAAA. TCMs are specific actions taken to adjust traffic patterns or reduce vehicle use in order to cut air pollutant emissions.

The Atlantic Steel project will redevelop a 138-acre site near Atlanta's central business district to include a mix of residential and commercial uses. A key component of the project plan is a multi-modal bridge — for cars, pedestrians, bicycles, and rail — to improve access to the site and provide a vital link to a nearby mass transit station. However, because Atlanta is a nonattainment area, the CAAA conformity rule prohibited the construction of new transportation projects that require federal funds or federal approval. Only projects approved as TCMs in the state's SIP can proceed during a conformity lapse.

EPA has begun to identify and develop methodologies for specific urban policies considered most likely to produce significant air quality benefits. Air quality and local planning officials agree that a number of particular land use and other strategies could reduce emissions in urban areas, especially over the long term, by reducing growth in vehicle travel.

Under Project XL, a program to provide regulatory flexibility for projects that can demonstrate superior environmental performance, the entire Atlantic Steel project — including its location, transit linkage, site design, and other transportation elements — obtained approval as a TCM. The approval is based on an innovative approach to measuring the project's air quality benefit. Even though, when considered in isolation, the entire redevelopment will attract new automobile trips and result in new air emissions, the project will result in lower air emissions than a similar development project located elsewhere in the region would produce. Based on models that show the project's relative air quality benefit, the redevelopment qualifies as a TCM.

CREDITING LAND USE POLICIES AND PROJECTS

On a broader scale, EPA has proposed to classify urban zoning and other policies that produce clean air benefits as legitimate control strategies to generate credits under the Clean Air Act. This classification would allow areas that adopt such policies to gain the additional benefit of credit toward requirements to demonstrate emissions reduction, attainment, and maintenance of the NAAQS. Once new control strategies were adopted, EPA would provide technical assistance to encourage the use of the strategies. The agency also would develop formal descriptions of the control strategies and methodologies for calculating emissions credit.

In June 2000, EPA issued a draft guidance document, *Recognizing the Air Quality Benefits of Local and State Land Use Policies and Projects in the Air Quality Planning Process*.[26] The document, which EPA expects to finalize in fall 2000, is designed to assist local air officials in accounting for the air quality benefits of local development choices in their SIPs and conformity determinations. For inclusion as a control strategy in a SIP, a land use policy or project must have the following characteristics:

- Quantifiable: emissions reductions can be reliably calculated and the calculations can be replicated.
- Surplus: emissions reductions are not already reflected in air quality programs and other SIP-related requirements.
- Enforceable: actions required to achieve the reductions can be independently verified, violations are defined, and penalties for violations are established.
- Permanent: emission reductions occur throughout the life of the measure.
- Adequately Supported: the state or responsible party demonstrates adequate personnel and resources to implement the measure.

In addition, the draft guidance notes that land use policies and projects must produce relatively rapid air emissions reductions for use in a SIP, because SIP attainment demonstrations project at most seven years into the future, and maintenance plans cover only ten years. This is perhaps the greatest limitation, because many land use policies and projects require more than a decade to show results. Therefore, the draft guidance suggests that land use policies can be more easily used in conformity determinations, which are revised more frequently than SIPs and project the impacts of land use and transportation over twenty years instead of ten.

DEVELOPING METHODOLOGIES FOR PROMISING LAND USE POLICIES

EPA has begun to identify and develop methodologies for specific urban policies considered most likely to produce significant air quality benefits. Air quality and local planning officials agree that a number of particular land use and other strategies could reduce emissions in urban areas, especially over the long term, by reducing growth in vehicle travel. The same policies could encourage and enhance urban redevelopment. According to agency officials, the policy areas of particular promise include:

- Elimination of minimum parking requirements in zoning codes.
- Zoning that encourages new transit-oriented development or a transit-friendly alignment of new facilities.
- Zoning providing for pedestrian and bicycle facilities, such as sidewalks and bike paths or lanes.

- Elimination of zoning requirements that prevent mixed use neighborhoods in urban areas.
- Public safety and education initiatives to encourage development in pedestrian and transit friendly neighborhoods.
- Local tax incentives to encourage urban redevelopment and infill development.

A joint effort of EPA, the U.S. Department of Commerce, and the U.S. Conference of Mayors is comparing methodologies for quantifying the air quality and other environmental and economic benefits of reusing urban brownfield sites and fostering infill development instead of developing new suburban sites. Known as the Clean Air/Brownfields Partnership Pilot, the project is studying the relationship between clean air, brownfield cleanup, and economic development in Atlanta, Baltimore, Chicago, and Dallas. It is designed to improve air quality while encouraging the redevelopment of cities and sustainable new development.

An interim report of the project poses the basic question: "if the infill development for which emissions credit is being claimed had not been built, where would the development — the 'growth increment' — have gone instead?"[27] In each of the four sample cities, the study is comparing four different methodologies. They show the difference between emissions resulting from an infill development project and those resulting from the same amount of growth in the following areas:

- A single, typical greenfield site.
- The fastest-growing locations in the region.
- Throughout the region in amounts determined by the local land use model.
- Throughout the region in amounts proportional to the distribution of all other growth.

The final results of this study will provide the basis for EPA's first guidance document for quantifying air quality benefits of land use policies, which will focus on brownfield and infill development. EPA will release additional policy-specific guidance documents over time.

conclusions and recommendations

Sprawling development has an obvious relationship to air pollution because of its inherent dependence on personal automobiles for transportation. This relationship is supported by anecdotal evidence, such as a comparison of air quality indicators in Portland, Oregon, which promotes compact, mixed-use development and a variety of transportation options, and Atlanta, Georgia, a metropolitan area known for auto-dependent, scattered development. From 1988 through 1997, Portland achieved substantially greater reductions in carbon monoxide and ozone levels than Atlanta did.

A more complex issue is whether the regulations of the federal Clean Air Act inadvertently discourage compact, mixed-use development by imposing more stringent regulations on urban centers than on exurban areas. This study indicates that the Act, both independently and in conjunction with the conformity requirements of the Intermodal Surface Transportation Equity Act (ISTEA), does not discourage development in urban centers. In fact, it may complement efforts to promote growth in areas with existing infrastructure.

Concerns have been raised that the Clean Air Act might drive business and development to outlying areas beyond urban nonattainment areas in an effort to avoid the most stringent regulation. This study found no evidence of this effect. Moreover, even if the original Act did in some way encourage sprawling development, the geographical expansion of nonattainment areas under the Act's 1990 amendments made it impractical to relocate simply to evade nonattainment regulations.

Instead of encouraging sprawling development, the transportation conformity provisions have begun to spur "smart growth" to reduce transportation impacts on air quality. Conformity has created a new incentive for increased local coordination between air quality and transportation authorities; stronger regional planning across neighboring jurisdictions; and efforts to promote growth based on clean technologies. The U.S. Environmental Protection Agency (EPA) is supporting this integration of

air quality, transportation, and land use planning by developing land use methodologies that improve air quality and providing guidance on quantifying the air quality benefits of compact development.

STATE AND LOCAL OPPORTUNITIES

A growing number of state and local governments is embracing smart growth to concentrate development in areas with existing infrastructure; encourage pedestrian-accessible, mixed-use development; increase transportation options; and preserve open space for recreation and wildlife habitat. The Clean Air Act and conformity provisions provide an impetus and opportunity to enhance the quality of life by linking clean energy and revitalization and strengthening regional planning.

Linking Clean Energy with Revitalization. As illustrated by the experience of Chattanooga, Tennessee, the urban core of a large metropolitan area can thrive and grow without losing its attainment status. Cities can promote redevelopment and revitalization in ways that minimize environmental impacts. In addition to attracting clean industries and technologies, urban centers can develop innovative transportation solutions like Chattanooga's electric shuttle bus service.

Strengthening Regional Planning. In struggling to develop plans to meet federal air quality requirements, some local air quality districts and metropolitan planning organizations have been thwarted by their limited or nonexistent authority over land use planning. In some areas, such as Atlanta, Georgia, and Portland, Oregon, this inability to influence development patterns that clearly affect vehicle miles traveled has spurred establishment of regional planning authorities. Regional authorities can improve coordination across agencies and jurisdictions, engage the broader community in creating a vision for regional development, and ensure the implementation of transportation and land use plans.

FEDERAL OPPORTUNITIES

Recognizing the influence of compact, mixed-use development on air quality, EPA has undertaken initiatives to more directly link local smart growth efforts to compliance with federal air regulations. By building on these initiatives and consolidating some environmental and transportation data, EPA can leverage, accelerate, and increase the local use of smart growth strategies to help meet federal air quality standards.

Providing Methodologies for Promising Land Use Policies. A number of land use and other strategies could reduce air emissions in urban areas, especially over the long term, by reducing the growth in vehicle travel. The same policies could encourage and enhance urban redevelopment. EPA has joined the U.S. Department of Commerce and the U.S. Conference of Mayors in launching the Clean Air/Brownfields Partnership Pilot to study the relationship between clean air, brownfield cleanup, and economic development and various methods to improve air quality while encouraging the redevelopment of cities and sustainable new development. EPA should continue conducting and fostering similar research to document the air quality benefits of specific land use strategies and inform local governments and developers of the most effective options.

Quantifying Air Quality Benefits of Land Use Policies and Projects. EPA has proposed to classify urban zoning and other policies that produce clean air benefits as legitimate control strategies to generate credits under the Clean Air Act. This classification would allow areas that adopt such policies to gain the additional benefit of credit toward requirements to demonstrate emissions reduction, attainment, and maintenance of federal air quality standards.

Given the burgeoning state and local interest in smart growth strategies, EPA should continue and expand its efforts to help state and local authorities account for the air quality benefits of local development choices in their State Implementation Plans (SIPs) and conformity determinations. In addition to guidance and technical assistance, EPA should disseminate information on successful efforts to integrate land use policies and regulatory compliance to serve as models for state and local governments.

Integrating Population and Transportation Data. Metropolitan areas routinely assemble data on population density, transit use, and commuting patterns and report vehicle miles traveled (VMT) to the U.S. Department of Transportation. SIPs typically contain VMT and related information on average vehicle occupancy, commute time and distance, and congestion. To increase the utility and accessability of this data, EPA or another suitable federal agency could require that this information be reported in a single document. This consolidation would be of tremendous benefit when EPA provided SIP credit for land use decisions.

appendix a:
CAAA Area Categories

The 1990 Clean Air Act Amendments (CAAA) divided nonattainment areas into five different classes, depending on the severity of the air pollution. From worst to best air quality, these areas are extreme, severe, serious, moderate, and marginal. Depending on the area, different pollution control requirements and deadlines for attaining air quality apply. Every area has to comply with a minimum set of requirements. These become more stringent, or new requirements are imposed, on each succeeding class, from best to worst air quality.

Marginal Areas. Marginal ozone nonattainment areas, which are allowed three years to attain the standard, are required to meet relatively few requirements. However, State Implementation Plans (SIPs) for these areas must include:

- An emissions inventory, updated every three years, that identifies and quantifies sources of hydrocarbons (HC) and nitrogen oxides (NO_x) within the area.
- Elimination of any deficiencies in vehicle inspection and maintenance (I/M) programs that were mandated under the previous versions of the Clean Air Act, even though the new amendments might have eliminated the adoption of such programs.
- New or updated new source review programs requiring offsets in a 1.1:1 ratio.
- The installation of Reasonably Available Control Technology (RACT) on all existing sources emitting more than 100 tons of hydrocarbons or oxides of nitrogen per year for which EPA issued Control Technique Guidelines (CTGs) before the 1990 amendments were enacted. Marginal area sources were not required to meet RACT requirements issued after November 15, 1990.

Moderate Areas. Moderate ozone nonattainment areas were required to attain the standard within six years. They were required to adopt all marginal area requirements, plus the following:

- A new SIP that reduced volatile organic compound (VOC) emissions by a total of 15 percent within six years. The Environmental Protection Agency was authorized to approve a smaller VOC reduction if the state: (a) adopted new source review

measures equal to those required for extreme areas, but for sources emitting as little as five tons of VOCs annually; (b) required RACT on all sources emitting five tons or more of VOCs per year; (c) included all technologically feasible measures in its SIP; and (d) included in its SIP measures that had been achieved in practice by similar sources in the next higher category.*

- Adopt a vehicle inspection and maintenance program equivalent to that which had been required of most nonattainment areas under the 1977 Act.
- Impose RACT on all major sources, including sources (a) for which EPA had issued CTGs, and (b) industrial facilities for which the 1990 act required EPA to issue CTGs.
- Impose the so-called Stage II technologies for capturing gasoline refueling vapors at service stations. Several cities had adopted Stage II controls, including Washington, D.C., St. Louis, Missouri, and cities in California, New Jersey, and New York.
- Require industry offsets of 1.15:1.

Serious Areas. Serious ozone nonattainment areas had nine years to meet the standard. In addition to complying with the requirements for moderate areas, serious areas must:

- Reduce HC and NO_x emissions by 3 percent annually during the seventh, eighth, and ninth years, after reducing them by 15 percent during the first six years;
- Submit a SIP that shows, on the basis of photochemical grid modeling, how it will meet the standards;
- Conduct improved monitoring;
- Implement a vehicle I/M program that is centralized, computerized, and includes other improvements;
- Require centrally fueled vehicle fleets to use clean fuels;
- Adopt certain transportation control measures if SIP predictions regarding vehicle miles traveled (VMT) are exceeded;
- Tighten new source review requirements, including requiring a 1.2:1 offset ratio;
- Lower the minimum size of regulated sources from those that emit more than 100 tons a year to those that emit more than 50 tons a year; and

**Under earlier versions of the law, areas had been required only to make "reasonable further progress" each year toward meeting the standards. The 1990 Amendments resolved this ambiguity in favor of a specific numeric target of 15 percent, but eliminated the requirement for an annual accounting.*

- Adopt contingency measures that go into effect if the area fails to meet applicable deadlines.

Severe Areas. The CAAA divides severe ozone nonattainment areas into severe I and severe II. Severe I nonattainment areas have 15 years to attain the standard. Severe II areas — those with a design value between 0.190 ppm and 0.280 ppm — have 17 years. According to ozone air quality data covering 1987-1989, only Baltimore, Houston, and New York City qualified for the additional two years. In addition to adopting all of the serious area controls, all severe areas must:

- Regulate sources that emit more than 25 tons per year;
- Adopt additional transportation control measures, including restrictions on work-related trips, to offset growth in VMT;
- Implement a reformulated gasoline program;
- Require a 1.3:1 offset ratio; and,
- Impose $5,000-per-ton penalties on certain major VOC sources if the area fails to meet its deadlines.

Extreme Areas. Extreme ozone nonattainment areas — only Los Angeles fits this definition — have 20 years to meet the deadline. In addition to adopting the severe area requirements, extreme areas must:

- Regulate sources that emit more than 10 tons per year;
- Require a 1.5:1 offset ratio; and
- Use low polluting fuels such as natural gas, methanol, and ethanol, or require advanced control technology such as catalytic controls for sources that emit more than 25 tons per year of NO_x.

In addition to these requirements, the CAAA imposes a series of technology-based requirements of varying stringency applicable (1) throughout the United States to new sources and (2) in nonattainment areas to existing sources.

appendix b:
CAAA Technology Requirements

LOWEST ACHIEVABLE EMISSIONS RATE (LAER)

Where required: New or modified major sources in areas that fail to meet the health- based standards of the Clean Air Act must meet the Lowest Achievable Emissions Rate (LAER) for the pollutant in question.[28] In theory, and sometimes in practice, LAER is the most stringent of all technology based standards. It is not uncommon for an area to be nonattainment for one pollutant — thus triggering LAER for that compound — while attainment for other pollutants, thus triggering BACT for those.

When required: LAER is required of any new source that is "major stationary source." This is any stationary source of air pollutants that emits or has the potential to emit 100 tons or more per year of any pollutant subject to regulation under the Act. LAER also is required of any "major modification," which is any physical change or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to regulation under the Act. A net increase of emissions is significant if it equals or exceeds the following thresholds (in tons per year or TPY):

- carbon monoxide: 100 TPY
- nitrogen oxides: 40 TPY
- sulfur dioxide: 40 TPY
- particulate matter: 25 TPY
- ozone: 40 TPY of volatile organic compounds (VOCs)
- lead: 0.6 TPY[29]

Decreases in emissions can be used to offset increases, thus reducing the net increase to the point that it is no longer "significant."[30] This process of allowing a source to escape LAER is sometimes called "netting out" or "bubbling."

In addition to satisfying the requirement for LAER, all major stationary sources owned or operated by the applicant in the state must be in compliance or on a schedule of compliance with all applicable emission limitations and standards under the Act. The applicable implementation plan must be carried out for the nonattainment area in which the proposed source is to be constructed or modified. The 1990 amendments also require a determination that the "benefits of the proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification."[31]

Finally, the new source must assure there is no net increase of the pollutant for which the area is in nonattainment by obtaining an "offset," or reduction in emissions, from other sources within the area. The offset is largest in the most polluted areas.

Legal definition of LAER: LAER is defined in section 171(3) as follows:

> *The term "lowest achievable emission rate" means for any source, that rate of emissions which reflects—*
>
> > *(A) the most stringent emissions limitation which is contained in the implementation plan of any State for such class or category of source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable, or*
> >
> > *(B) the most stringent emissions limitation which is achieved in practice by such class or category of source, whichever is more stringent.*
>
> *In no event shall the application of this term permit a proposed new or modified source to emit any pollutant in excess of the amount allowable under applicable new source performance standards of performance.*

Practical definition of LAER: Because LAER is determined on a case-by-case basis, it can vary with time and location. As control technologies improve in efficiency or drop in cost, LAER determinations can increase in stringency. Cost is a consideration in determining BACT. Supposedly, cost is not a factor in LAER determinations, but this is manifestly untrue since limits fail to reach levels of stringency that are technologically achievable. One handbook for lawyers declares that cost is a factor in LAER decisions, although of "somewhat lesser weight" than in BACT determinations.[32] The LAER limits must be at least as stringent as applicable §111 new source performance standards.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

Where required: BACT is required in areas that meet the health-based ambient air quality standards for the pollutant in question. This is part of the program established in 1977 for Prevention of Significant Deterioration (PSD).

When required: A new major stationary source must meet BACT for pollutants that it would have the potential to emit in significant amounts. A major modification must meet BACT for pollutants that constitute a significant net increase as a result of a physical change or change in operations. Decreases in emissions can be used to offset increases, thus reducing the net increase to the point that it no longer "significant."[33] This process of allowing a source to escape BACT is sometimes called "netting out" or "bubbling."

A net increase of emissions is significant if it equals or exceeds the following thresholds (in tons per year or TPY):

- carbon monoxide: 100 TPY
- nitrogen oxides: 40 TPY
- sulfur dioxide: 40 TPY
- particulate matter: 25 TPY
- ozone: 40 TPY of volatile organic compounds (VOCs)
- lead: 0.6 TPY

Legal definition of BACT: Section 169(3) of the Clean Air Act defines best available control technology as follows:

> *The term "best available control technology" means an emissions limitation based on the maximum degree of reduction of each pollutant subject to regulation under this Act emitted from or which results from any major emitting facility, which the permitting Authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility, through application of production processes and available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of each such pollutant. In no event shall application of "best available control technology" result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard established pursuant to section 111 or 112 of this Act.*

Practical definition of BACT: What constitutes BACT is determined by the permitting authority on a case-by-case basis, but it must be no less stringent than the new source performance standard or hazardous emissions standard established by EPA under sections 111 and 112 of the Act. If an emissions limitation is infeasible, the permit authority may prescribe a design, equipment, work practice or operational standard, or some combination of them.

BACT can vary over time, as new control technologies become available, drop in price, increase in reliability or otherwise change. BACT also can vary from place to place, depending on circumstances such as the scarcity of water in desert regions (e.g. for scrubbers or water injection) and the local availability of alternative fuels (e.g. natural gas).

In cases of modifications, "netting out" can effectively circumvent BACT requirements.

One special consideration is the degree to which the available "increment" allowed under the PSD program of air pollution might have been consumed. If it is nearly exhausted or if permitting authorities anticipate substantial new growth, BACT may be defined more stringently.

NEW SOURCE PERFORMANCE STANDARDS (NSPS)

Where required: The 1970 Clean Air Act required the Administrator of the U.S. Environmental Protection Agency to establish technology based emission limits for sources of air pollution that were being either newly constructed or modified. These new source performance standards (NSPS) are implemented by the states.[35] The standards apply throughout the United States. They establish a national minimum for the technology based "Lowest Achievable Emissions Rate" requirement applicable to area with dirty air and to the technology based "Best Available Control Technology" applicable to areas with clean air.

When required: The standards apply to any stationary source on which construction or modification is begun after the proposed regulations prescribing an applicable NSPS. A "modification" is any physical change or change in the method of operation of a stationary source that increases the amount of any air pollutant emitted or results in the emission of an air pollutant emitted or results in the emission of an air pollutant not previously emitted.[36] Unlike the BACT requirements, sources cannot "bubble" or

"net out" of the NSPS. Thus, it establishes the minimum emissions standard for new sources and modifications in both attainment and nonattainment areas.

Legal definition of NSPS: As a general matter, a new source performance standard is defined as follows:

> *The term "standard of performance" means a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.*[37]

However, the application of this generic definition to thermal power stations was complicated by amendments in 1977 and 1990.

In 1977, the definition was amended to require what became known as "percentage reduction." From 1977 to 1990, the new source performance standard was defined as follows:

The term "standard of performance" means—

> *(A) with respect to any air pollutant emitted from a category of fossil fuel fired stationary sources to which subsection (b) applies, a standard—*
>
> > *(i) establishing allowable emission limitations for such category of sources, and*
> >
> > *(ii) requiring the achievement of a percentage reduction in the emissions from such category of sources from the emissions which would have resulted from fuels which are not subject to treatment prior to combustion…*[38]

The practical effect of this requirement was to require pollution control technology, principally flue gas desulfurization or "scrubbing" on all coal-fired powerplants regardless of the sulfur content of the fuel.[39] Opposition to the percentage reduction requirement was so fierce in the Western states where there are extensive reserves of lower-sulfur coal that the requirement was repealed by the 1990 Clean Air Act Amendments. The repeal was complete with respect to emissions of oxides of nitrogen and particulate matter. However, with respect to emissions of sulfur dioxide, the Administrator was required to —

> *"promulgate revised regulations for standards of performance …that, at a mini-*

mum, require any source subject to such revised standards to emit sulfur dioxide at a rate not greater than would have resulted from compliance (with the percentage reduction NSPS) . . .” [40]

Even though the 1990 amendments repealed the percentage reduction law, they did not repeal the regulations. When a revised NSPS is promulgated, it will be required to take into account the repeal of percentage reduction, but until that happens, the old regulation continues to be legally binding.

Practical definition of NSPS: As a practical matter, the percentage reduction NSPS results in average emissions rates for sulfur dioxide of between 0.3 and 0.4 lbs/Mbtu in the Western states where lower-sulfur coal is burned and between 0.6 and 0.7 in Eastern states where the coal has a higher sulfur content. These limits have largely been achieved through scrubbing, although some new combustion technologies such as fluidized bed combustion have been employed on a limited basis.

EVOLUTION OF THE NEW SOURCE PERFORMANCE STANDARD (NSPS) FOR SULFUR DIOXIDE EMISSIONS

Date	*Standard*
Pre-1971	no standard
1971–77	1.2 lbs/Mbtu heat input
1977–90	“percentage reduction”
1990–present	percentage reduction equivalency: [probably 0.4 in the West, 0.7 in the East]

EXISTING SOURCE REQUIREMENTS

SIP-Driven Limits. Most heavy industrial facilities, such as powerplants, refineries, and smelters in the United States were built before the Clean Air Act requirements became effective in 1971. They are subject to a variety of emission limits.

It is important to distinguish between emissions requirements imposed as a result of federal regulations and those adopted in State Implementation Plans (SIPs).[41]

SIP limits. These emissions controls are adopted for the purpose meeting the health- based ambient standards.[42] They are technically different from Reasonably

Available Control technology because in theory they are set at a level to assure that the ambient standard is met. Typically SIP-driven emission limits are set based on a computer model designed around achieving a 24-hour standard.

SIP-driven emissions controls for sulfur dioxide have typically been driven by the results of dispersion models, while limits on particulate matter have reflected the availability of removal technology, such as electrostatic precipitators. However, SIP-driven emissions controls in ozone nonattainment areas have historically not contained NO_x limits because (1) most areas met the ambient standard for NO_x and (2) the federal ozone control strategy, which was adopted by virtually all states except California, focused on limiting NO_x by controlling hydrocarbons.

The 1990 amendments, however, shifted federal emphasis toward NO_x controls, by establishing a presumptive requirement that states would adopt NO_x RACT for major stationary sources in ozone nonattainment areas (see below), although a waiver is allowed where net air quality benefits would be greater in the absence of NO_x controls.[43] Most SIP rules had NO_x RACT compliance dates of May, 1995, which is the statutory guideline, although EPA allowed later dates.

REASONABLY AVAILABLE CONTROL TECHNOLOGY (RACT)

Where required: Technology based controls for existing thermal powerplants are imposed by several different provisions of the Clean Air. They include the following:

- The nonattainment provisions, which are designed to assure achievement of the health based standards. They require the installation of reasonably available control technology (RACT) on sources of a pollutant for which the area is in nonattainment.
- The acid rain provisions contained in the 1990 Clean Air Act Amendments, which require "affected sources" to achieve average emissions rates of sulfur dioxide. The same affected sources must also comply with technology based NO_x control requirements.

Most major metropolitan areas in the United States are nonattainment areas and therefore must require that major stationary sources of the pollutant for which the area is nonattainment install Reasonably Available Control Technology (RACT).

Nonattainment areas are required to make "reasonable further progress" toward achievement of the standards, and existing sources are required to meet emission limits based on RACT.

There are no remaining nonattainment areas for either sulfur dioxide or oxides of nitrogen, and thermal power stations are not ordinarily regulated as significant sources of hydrocarbons. Therefore, the ozone-related and particulate matter requirements are the major sources of regulation of existing thermal power stations. However, until recently the federal strategy for controlling ozone focused on limiting emissions of hydrocarbons, so RACT limits on power stations was unusual (except in California, which maintained a NO_x based ozone control strategy). Moreover, although the U.S. Environmental Protection Agency issued Control Technology Guidelines (CTGs) to assist states in determining RACT requirements, all these were for sources of VOCs and none for NO_x.

When required: Before the 1990 Clean Air Act Amendments, there was no specific deadline for requiring RACT of existing sources. However, the 1990 Clean Air Act Amendments imposed such deadlines and statutorily shifted ozone attainment controls in the direction of NO_x. To aid states in determining RACT, section 193(c) requires the U.S. Environmental Protection Agency to issue Alternative Control Technique documents (ACTs).

RACT must be implemented as quickly as possible, and states, in their RACT rules, are required to insist on the final installation of actual NO_x controls by no later than May 31, 1995. If a state demonstrates that, due to equipment unavailability or system reliability, it cannot meet the deadline, the EPA will consider allowing states to define RACT as a phased program. States' rules that define RACT as a stage-by-stage program of measures will have to include clearly specified compliance milestones representing the most expeditious schedule practicable toward final compliance.[44]

Legal definition: Unlike the other technology based requirements, RACT is not explicitly defined by the Clean Air Act. Section 172(b)(3) states merely that the implementation plan for a nonattainment area must "require…such reduction in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology…" However, in the 1990 Clean Air Act Amendments, Congress defined RACT for existing sources of NO_x in nonattainment areas quite explicitly.

Practical definition: To assist states in defining RACT, EPA has issued ACTs for both utility boilers and turbines. These contain background information, including cost and availability of control technologies, for states to utilize in determining RACT. However, although CTGs established a presumptive RACT, the ACTs do not. Hence RACT, like BACT and LAER, will be determined on a case-by-case basis (although it might be established generically within a state). In most cases, EPA has determined that RACT will result in an overall level of control equivalent to the following maximum allowable emission rates (pounds of NO_x /million Btu) for certain electric utility boilers:

(1) 0.45 for tangentially fired, coal burning

(2) 0.50 for dry bottom wall fired (other than cell burner), coal burning

(3) 0.20 for tangentially fired, gas/oil burning

(4) 0.30 for wall fired, gas/oil burning[45]

Compliance will be determined on a continuous basis, using a thirty-day rolling average emission rate, "calculated each operating day as the average of all hourly data for the preceding 30 operating days." States may adopt market based trading systems for NO_x, so that individual owner/operators in nonattainment areas (or statewide within an ozone transport region) can exceed emission limits as long as areawide average emission rates are met on a Btu-weighted basis.[46]

RACT guidance. A number of entities provide guidance in determining NO_x RACT. These include the Northeast States for Coordinated Air Use Management (NESCAUM) and the association of non-federal regulatory officials, the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Program Officials (STAPPA/ALAPCO).[47]

VISIBILITY PROTECTION: BEST AVAILABLE RETROFIT TECHNOLOGY (BART)

The 1977 amendments added a separate program to address visibility protection on "Class I" lands, which are specially protected areas such as national parks.[48] Visibility regulations promulgated in 1980 include requirements for the installation of the best available retrofit technology (BART) on major stationary sources that may reasonably be anticipated to cause or contribute to impairment of visibility in a mandatory Class I

area.[49] Like BACT and LAER, BART is determined on a case-by-case basis, taking into account the technology available, costs, energy and non-air-quality environmental impacts of compliance, the remaining useful life of the source, and the improvement of visibility likely to result. EPA may grant exemptions from this technology requirement, with the concurrence of the federal land manager. Unlike BACT and LAER, however, records of BART determinations are not maintained by a central clearinghouse.

endnotes

1 Smart Growth Network, Statement of Principles (1999). See also National Governors' Association, Resolution 13 "Principles for Better Land Use" (1999).

2 Although outlying areas may be less stringently regulated because their air quality is genuinely better, sometimes the looser regulations are due to the lack of monitoring data or the area's exclusion from the defined air quality region.

3 Smart Growth Network, Statement of Principles (1999). See also National Governors' Association, Resolution 13 "Principles for Better Land Use" (1999).

4 Section 107(a), 85 Stat. 1678, 42 U.S.C. 91857e-2(a).

5 See *Alabama Power Co. v. Costle*, 636 F.2d 323 (D.C. Cir. 1979).

6 Clean Air Amendments of 1977, Pub. L. 95-95, 91 Stat. 685.

7 See *Alabama Power Co. v. Costle*, 636 F.2d 323 (D.C. Cir. 1979).

8 *Clean Air Deskbook, The Environmental Law Reporter*, Environmental Law Institute, Washington, D.C.

9 Ferrey, Steven, *Law of Independent Power, Development/Cogeneration/Utility Regulation*, Clark, Boardman, Callaghan, (Release #5, 9/94), p. 6-70.

10 Ferrey, Steven, *Law of Independent Power, Development/Cogeneration/Utility Regulation*, Clark, Boardman, Callaghan, (Release #5, 9/94), p. 6-70–6-71.

11 Arnold M. Howitt and Elizabeth M. Moore, "Linking Transportation and Air Quality Planning: Implementation of the Transportation Conformity Regulations in 15 Nonattainment Areas," Taubman Center for State and Local Government, John F. Kennedy School of Government, Harvard University (Cambridge, Mass., March 1999).

12 Arnold M. Howitt and Elizabeth M. Moore, "Linking Transportation and Air Quality Planning: Implementation of the Transportation Conformity Regulations in 15 Nonattainment Areas," Taubman Center for State and Local Government, John F. Kennedy School of Government, Harvard University (Cambridge, Mass., March 1999).

13 California Air Resources Board, *The Land Use-Air Quality Linkage*, 1997.

14 Rebecca Carr, "GRTA request for funds well received; Area fights image as sprawl 'poster child,'" The Atlanta Journal, C9, Feb.11, 2000.

15 Please note this table relies on data collected by other researchers from the metropolitan areas themselves. The numbers differ slightly from those available at publicly accessible data sources, such as the Bureau of the Census, presumably because of varying assumptions in predictive models. Other tables in this paper rely on Census and comparable official data.

16 Richard M. Daley, "Why mayors worry about EPA clean-air standards," *Minneapolis Star Tribune*, p. 25A, June 29, 1997.

17 Serious, severe, and extreme ozone nonattainment areas can exclude part of the MSA or CMSA where they are located if EPA concludes that the omitted area does not "contribute significantly" to the area's nonattainment. Also, marginal or moderate ozone nonattainment areas may choose to include the entire MSA or CMSA.

18 Jim Motavalli, "Chattanooga on a roll: from America's dirtiest city to one of its greenest," *E- Magazine*, p. 13, March 13. 1998.

19 Personal communication, Will Berson, Environmental Policy Analyst, The Georgia Conservancy, Feb. 29, 2000.

20 Personal communication, Dan Reuter, Chief, Land Use Division, Atlanta Regional Commission, Feb. 29, 2000.

21 Personal communication, Dan Reuter, Chief, Land Use Division, Atlanta Regional Commission, Feb. 29, 2000.

22 Personal communication, Dan Reuter, Chief, Land Use Division, Atlanta Regional Commission, Feb. 29, 2000.

23 Kathey Pruitt and John McCosh, "GRTA hears 25-year forecast of more gridlock," *The Atlanta Constitution*, H6, Oct. 15, 1999.

24 Alan Ehrenhalt, "The Czar of Gridlock," *Governing Magazine*, May 1999.

25 Georgia Regional Transportation Authority, Resolution, May 10, 2000.

26 U.S. Environmental Protection Agency, Office of Air and Radiation, *Recognizing the Air Quality Benefits of Local and State Land Use Policies and Projects in the Air Quality Planning Process - Public Comment Draft*, EPA420-P-00-002, June 2000.

27 ICF Consulting, *Comparing Methodologies to Assess Transportation and Air Quality Impacts of Brownfields and Infill Development*, Environmental Protection Agency Contract Number 68-W-99-054, March 22, 2000.

28 Sec. 173.

29 40 C.F.R. 51.165.

30 See *Alabama Power Co. v. Costle*, 636 F.2d 323 (D.C. Cir. 1979).

31 *Clean Air Deskbook, The Environmental Law Reporter*, Environmental Law Institute, Washington, D.C.

32 *Clean Air Deskbook, The Environmental Law Reporter*, Environmental Law Institute, Washington, D.C.

33 See *Alabama Power Co. v. Costle*, 636 F.2d 323 (D.C. Cir. 1979).

34 40 C.F.R. 51.165.

35 Sec. 111(c).

36 Sec. 111(a)(2) and (4).

37 Sec. 111(a)(1).

38 P.L. 95-95.

39 Interestingly, the requirement was not applied in such a way as to require a comparable technology for control of emissions of oxides of nitrogen, selective catalytic reduction, even though it was in use in Japan at the time.

40 Sec. 403, P.L. 101-549.

41 The goal is to meet or "attain" the NAAQS in each air quality region. To this end, each state must develop a State Implementation Plan (SIP), which lays out in detail what measures will be taken both to meet the ambient standard and to maintain it. The SIP includes control strategies, compliance schedules for stationary sources of pollution, projections of mobile source reductions, a process for reviewing new sources of pollution, and a system of enforcement and record keeping.

42 Sec. 110. National Ambient Air Quality Standards (NAAQS) are established by EPA for seven "criteria pollutants": sulfur dioxide, carbon monoxide, nitrogen oxides, ozone, particulates, hydrocarbons, and lead. For each of these, "primary" standards are set at a level that is protective of human health, while "secondary" standards protect the public welfare (e.g. crops, buildings, and water supplies).

43 Sec. 185(f).

44 Ferrey, Steven, *Law of Independent Power, Development/Cogeneration/Utility Regulation*, Clark, Boardman, Callaghan, (Release #5, 9/94), p. 6-70–6-71.

45 Ferrey, Steven, *Law of Independent Power, Development/Cogeneration/Utility Regulation*, Clark, Boardman, Callaghan, (Release #5, 9/94), p. 6-70.

46 Ferrey, Steven, *Law of Independent Power, Development/Cogeneration/Utility Regulation*, Clark, Boardman, Callaghan, (Release #5, 9/94), p. 6-70.

47 See, e.g., STAPPA/ALAPCO, *Controlling Nitrogen Oxides Under the Clean Air Act: A Menu of Options*, Washington, D.C., 1994.

48 The program includes (1) the identification of Class I federal areas where visibility is determined to be important, (2) a study by EPA of means to prevent future visibility impairment and to remedy existing visibility impairment in mandatory Class I federal areas, and (3) regulations to assure reasonable progress to attain these goals.

49 40 C.F.R. §51.302(c).

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